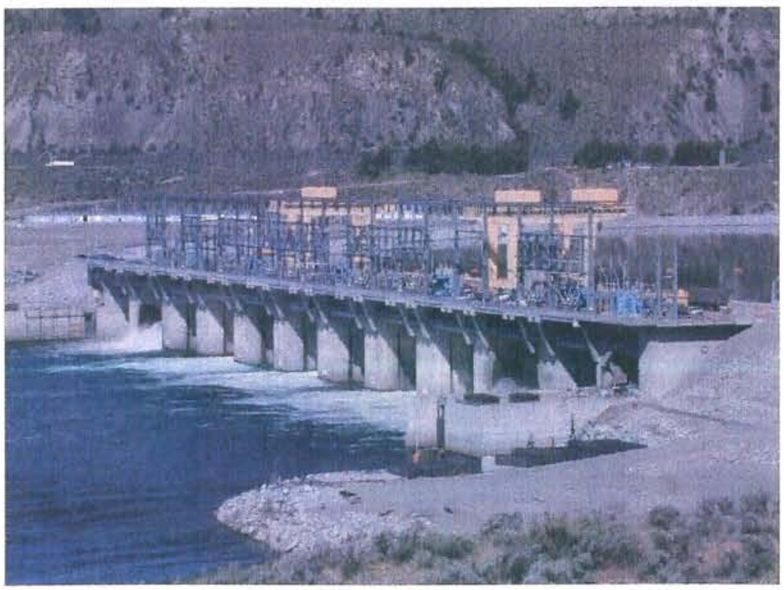
FINAL LICENSE APPLICATION
VOLUME II: EXHIBIT E

EXHIBIT E – ENVIRONMENTAL EXHIBIT

WELLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 2149-131

SECURITY LEVEL: PUBLIC



Prepared by:
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802
www.douglaspud.org/relicensing

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List of Acronyms

ABB .... Asea Brown Boveri Ltd
ac-ft .... acre-feet
ACHP................................ Advisory Council on Historic Preservation
ADA.................................. Americans with Disabilities Act
ANS .... Aquatic nuisance species
ANSC................................ Aquatic Nuisance Species Committee
APE................................... Area of potential effects
APEA................................ Applicant-Prepared Environmental Assessment
APLIC............................... Avian Power Line Interaction Committee
APP .... Avian Protection Plan
ANSMP .... Aquatic Nuisance Species Management Plan
ASA .... Aquatic Settlement Agreement
AWS .... Auxiliary water supply
BA..................................... Biological Assessment
BIA .... Bureau of Indian Affairs
BLM.................................. Bureau of Land Management
BMPs .... Best Management Practices
BO..................................... Biological Opinion
BOR .... Bureau of Reclamation
BPA .... Bonneville Power Administration
BTMP .... Bull Trout Management Plan
BTMMP............................ Bull Trout Monitoring and Management Plan
CBE .... Columbia Basin Environmental
CBFWA .... Columbia Basin Fish and Wildlife Authority
CBIP .... Columbia Basin Irrigation Project
CCT .... Confederated Tribes of the Colville Reservation
CEII .... Critical Energy Infrastructure Information
CFD .... Computational Fluid Dynamics
CFR................................... Code of Federal Regulations
cfs...................................... cubic feet per second

Chelan PUD....................... Public Utility District No. 1 of Chelan County

cm .... centimeter

COE .... U.S. Army Corps of Engineers

coho .... hatchery origin coho salmon

Council Program................ Columbia River Basin Fish and Wildlife Program

CPUC................................. California Public Utilities Commission

CSR-SRI .... Columbia and Snake River Spill Response Initiative

CTEC................................. Colville Tribal Enterprise Corporation

CUR .... Confederated Tribes of the Umatilla Indian Reservation

CWA.................................. Clean Water Act

DAHP/SHPO .... Washington Department of Archaeology and Historic Preservation/State Historic Preservation Officer

DDT .... Dichloro-Diphenyl-Trichloroethane

DEA .... Draft Environmental Assessment

DE&S................................. Duke Engineering & Services, Inc.

DLA .... Draft License Application

DNR.................................. Washington Department of Natural Resources

DO .... Dissolved oxygen

DOE .... Department of Energy

DOI .... Department of Interior

Douglas PUD..................... Public Utility District No. 1 of Douglas County

DPS.................................... Distinct population segment

DSSMP .... Dam Safety Surveillance and Monitoring Plan

DSSMR.............................. Dam Safety Surveillance and Monitoring Reports

DTA .... Devine Tarbell & Associates, Inc.

EA .... Environmental Assessment

EAP................................... Emergency Action Plan

Ecology.............................. Washington State Department of Ecology

EDAW .... EDAW, Inc.

EES .... EES Consulting, Inc.

EFH................................... Essential Fish Habitat

EPA................................... Environmental Protection Agency

ESA .... Endangered Species Act
ESU .... Evolutionarily Significant Unit
EWM .... Eurasian watermilfoil (*Myriophyllum spicatum*)
FCRPS .... Federal Columbia River Power System
FERC .... Federal Energy Regulatory Commission
FPA .... Federal Power Act
FPC .... Federal Power Commission
GAP .... Gas Abatement Plan
GBT .... Gas Bubble Trauma
GCWT .... Greater Columbia Water Trail
GIS .... Geographic Information System
gpm .... gallons per minute
Grant PUD .... Public Utility District No. 2 of Grant County
HCA .... Mid-Columbia Hourly Coordination Agreement
HCP or Wells HCP .... Wells Anadromous Fish Agreement and Habitat Conservation Plan
HGMPs .... Hatchery Genetic Management Plans
hp .... horsepower
HPMP .... Historic Properties Management Plan
IAC .... Interagency Committee
IGCC .... Integrated gasification combined-cycle
ILP .... Integrated Licensing Process
IRP .... Integrated Resource Plan
ITP .... Incidental Take Permit
ITS .... Incidental Take Statement
JBS .... Juvenile Bypass System
kcfs .... thousand cubic feet per second
km .... kilometer
kV .... kilovolt
kVA .... kilovolt-ampere
kW .... kilowatt
kWh .... kilowatt hour

MAF................................ million acre-feet
mg/L................................ milligrams per liter
MOA................................ Memorandum of Agreement
MOU................................ Memorandum of Understanding
MSL................................. Mean Sea Level
MW.................................. megawatt
MWh................................ megawatt-hours
NEPA............................... National Environmental Policy Act
NERC............................... North American Electric Reliability Corporation
NGOs............................... Non-governmental organizations
NHPA.............................. National Historic Preservation Act
NMFS.............................. National Marine Fisheries Service
NNI.................................. No Net Impact
NOAA.............................. National Oceanic and Atmospheric Administration
NOI.................................. Notice of Intent
NPR................................. Non-power requirements
NPS.................................. National Park Service
NRHP............................... National Register of Historic Places
NTUs............................... Nephelometric turbidity units
NWPP.............................. Northwest Power Pool
NWPPC............................ Northwest Power and Conservation Planning Council
NWPPCA.......................... Northwest Electric Power Planning and Conservation Act
ODFW.............................. Oregon Department of Fish and Wildlife
Okanogan PUD................. Public Utility District No. 1 of Okanogan County
O&M................................ Operation and maintenance
PA.................................... Programmatic Agreement
PAD................................. Pre-Application Document
PCBs................................ Polychlorinated Biphenyls
PFMA.............................. Potential Failure Mode Analysis
PGE.................................. Portland General Electric
PIT................................... Passive integrated transponder
PLMP............................... Pacific Lamprey Management Plan

PM&E .... Protection, mitigation, and enhancement measures

PNCA............................... Pacific Northwest Coordination Agreement

PNUCC .... Pacific Northwest Utilities Conference Committee

Power Purchasers............... Puget Sound Energy, Inc., Portland General Electric Company, PacifiCorp, and Avista Corporation

Project .... Wells Hydroelectric Project

PSE .... Puget Sound Energy, Inc.

PSMFC .... Pacific States Marine Fisheries Commission

PSP................................... Proposed Study Plan

PUDs................................ Public Utility Districts

RCO .... Recreation and Conservation Office

RCW .... Revised Code of Washington

RD.................................... Recreation days

RFMP............................... Resident Fish Management Plan

RLF .... Reverse load factoring

RM .... River mile

RMP .... Recreation Management Plan

rpm................................... revolutions per minute

RSP .... Revised Study Plan

RTE.................................. Rare, threatened, and endangered

RWG................................ Resource Work Group

SCORP.............................. State Comprehensive Outdoor Recreation Planning Document

SD1 .... Scoping Document 1

SD2 .... Scoping Document 2

SFA .... Sustainable Fisheries Act

SHPO .... State Historic Preservation Officer

SMP .... Shoreline Management Plan

sockeye .... Okanogan River sockeye salmon

SPCC .... Spill Prevention, Containment, and Countermeasures

spring Chinook .... Upper Columbia River spring-run Chinook salmon

steelhead .... Upper Columbia River steelhead

summer/fall Chinook .... Upper Columbia River summer/fall-run Chinook salmon

SWG .... Settlement Work Group
TCP .... Traditional Cultural Properties
TDG .... Total dissolved gas
THPO .... Tribal Historic Preservation Officer
TMDL .... Total maximum daily load
TSI .... Trophic Status Index
µg/kg .... Micrograms per kilogram
µg/L .... Micrograms per liter
UCR .... Upper Columbia River
UCSRB .... Upper Columbia Salmon Recovery Board
UCSRP .... Upper Columbia Salmon Recovery Plan
U.S. .... United States
USDA .... U.S. Department of Agriculture
USFS .... USDA Forest Service
USGS .... U.S. Geological Survey
USFWS .... U.S. Fish and Wildlife Service
V .... volt
WBMP .... Wildlife and Botanical Management Plan
WBTMMP .... Wells Bull Trout Monitoring and Management Plan
WDFW .... Washington Department of Fish and Wildlife
WDNR .... Washington Department of Natural Resources
WDOH .... Washington Department of Health
WECC .... Western Electricity Coordinating Council
WNWCB .... Washington State Noxious Weed Control Board
WQAP .... Water Quality Attainment Plan
WQC .... Clean Water Act Section 401 Water Quality Certificate
WQMP .... Water Quality Management Plan
WQS .... Water quality standards
WSMP .... White Sturgeon Management Plan
WWA .... Wells Wildlife Area
YN .... Confederated Tribes and Bands of the Yakama Nation

EXHIBIT E - ENVIRONMENTAL EXHIBIT

The following excerpt from the Code of Federal Regulations (CFR) at 18 CFR § 5.18(b) describes the required content of this Exhibit.

Exhibit E—Environmental Exhibit. The specifications for Exhibit E in §§4.41, 4.51, or 4.61 of this chapter shall not apply to applications filed under this part. The Exhibit E included in any license application filed under this part must address the resources listed in the Pre-Application Document provided for in §5.6; follow the Commission's "Preparing Environmental Assessments: Guidelines for Applicants, Contractors, and Staff," as they may be updated from time-to-time; and meet the following format and content requirements:

(1) General description of the river basin. Describe the river system, including relevant tributaries; give measurements of the area of the basin and length of stream; identify the project's river mile designation or other reference point; describe the topography and climate; and discuss major land uses and economic activities.

(2) Cumulative effects. List cumulatively affected resources based on the Commission's Scoping Document, consultation, and study results. Discuss the geographic and temporal scope of analysis for those resources. Describe how resources are cumulatively affected and explain the choice of the geographic scope of analysis. Include a brief discussion of past, present, and future actions, and their effects on resources based on the new license term (30–50 years). Highlight the effect on the cumulatively affected resources from reasonably foreseeable future actions. Discuss past actions' effects on the resource in the Affected Environment Section.

(3) Applicable laws. Include a discussion of the status of compliance with or consultation under the following laws, if applicable:

(i) Section 401 of the Clean Water Act. The applicant must file a request for a water quality certification (WQC), as required by Section 401 of the Clean Water Act no later than the deadline specified in §5.23(b). Potential applicants are encouraged to consult with the certifying agency or tribe concerning information requirements as early as possible.

(ii) Endangered Species Act (ESA). Briefly describe the process used to address project effects on Federally listed or proposed species in the project vicinity. Summarize any anticipated environmental effects on these species and provide the status of the consultation process. If the applicant is the Commission's non-Federal designee for informal consultation under the ESA, the applicant's draft biological assessment must be included.

(iii) Magnuson-Stevens Fishery Conservation and Management Act. Document from the National Marine Fisheries Service (NMFS) and/or the appropriate Regional Fishery Management Council any essential fish habitat (EFH) that

may be affected by the project. Briefly discuss each managed species and life stage for which EFH was designated. Include, as appropriate, the abundance, distribution, available habitat, and habitat use by the managed species. If the project may affect EFH, prepare a draft "EFH Assessment" of the impacts of the project. The draft EFH Assessment should contain the information outlined in 50 CFR 600.920(e).

(iv) Coastal Zone Management Act (CZMA). Section 307(c)(3) of the CZMA requires that all Federally licensed and permitted activities be consistent with approved state Coastal Zone Management Programs. If the project is located within a coastal zone boundary or if a project affects a resource located in the boundaries of the designated coastal zone, the applicant must certify that the project is consistent with the state Coastal Zone Management Program. If the project is within or affects a resource within the coastal zone, provide the date the applicant sent the consistency certification information to the state agency, the date the state agency received the certification, and the date and action taken by the state agency (for example, the agency will either agree or disagree with the consistency statement, waive it, or ask for additional information). Describe any conditions placed on the state agency's concurrence and assess the conditions in the appropriate section of the license application. If the project is not in or would not affect the coastal zone, state so and cite the coastal zone program office's concurrence.

(v) National Historic Preservation Act (NHPA). Section 106 of NHPA requires the Commission to take into account the effect of licensing a hydropower project on any historic properties, and allow the Advisory Council on Historic Preservation (Advisory Council) a reasonable opportunity to comment on the proposed action. "Historic Properties" are defined as any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places (NRHP). If there would be an adverse effect on historic properties, the applicant may include a Historic Properties Management Plan (HPMP) to avoid or mitigate the effects. The applicant must include documentation of consultation with the Advisory Council, the State Historic Preservation Officer, Tribal Historic Preservation Officer, National Park Service, members of the public, and affected Indian tribes, where applicable.

(vi) Pacific Northwest Power Planning and Conservation Act (Act). If the project is not within the Columbia River Basin, this section shall not be included. The Columbia River Basin Fish and Wildlife Program (Program) developed under the Act directs agencies to consult with Federal and state fish and wildlife agencies, appropriate Indian tribes, and the Northwest Power Planning Council (Council) during the study, design, construction, and operation of any hydroelectric development in the basin. Section 12.1A of the Program outlines conditions that should be provided for in any original or new license. The program also designates certain river reaches as protected from

development. The applicant must document consultation with the Council, describe how the act applies to the project, and how the proposal would or would not be consistent with the program.

(vii) Wild and Scenic Rivers and Wilderness Acts. Include a description of any areas within or in the vicinity of the proposed project boundary that are included in, or have been designated for study for inclusion in, the National Wild and Scenic Rivers System, or that have been designated as wilderness area, recommended for such designation, or designated as a wilderness study area under the Wilderness Act.

(4) Project facilities and operation. Provide a description of the project to include:

(i) Maps showing existing and proposed project facilities, lands, and waters within the project boundary;

(ii) The configuration of any dams, spillways, penstocks, canals, powerhouses, tailraces, and other structures;

(iii) The normal maximum water surface area and normal maximum water surface elevation (mean sea level), gross storage capacity of any impoundments;

(iv) The number, type, and minimum and maximum hydraulic capacity and installed (rated) capacity of existing and proposed turbines or generators to be included as part of the project;

(v) An estimate of the dependable capacity, and average annual energy production in kilowatt hours (or mechanical equivalent);

(vi) A description of the current (if applicable) and proposed operation of the project, including any daily or seasonal ramping rates, flushing flows, reservoir operations, and flood control operations.

(5) Proposed action and action alternatives.

(i) The environmental document must explain the effects of the applicant's proposal on resources. For each resource area addressed include:

(A) A discussion of the affected environment;

(B) A detailed analysis of the effects of the applicant's licensing proposal and, if reasonably possible, any preliminary terms and conditions filed with the Commission; and

(C) Any unavoidable adverse impacts.

(ii) The environmental document must contain, with respect to the resources listed in the Pre-Application Document provided for in §5.6, and any other resources identified in the Commission's scoping document prepared pursuant to the National Environmental Policy Act and §5.8, the following information, commensurate with the scope of the project:

(A) Affected environment. The applicant must provide a detailed description of the affected environment or area(s) to be affected by the proposed project by each resource area. This description must include the information on the affected environment filed in the Pre-Application Document provided for in §5.6, developed under the applicant's approved study plan, and otherwise developed or obtained by the

applicant. This section must include a general description of socio-economic conditions in the vicinity of the project including general land use patterns (e.g., urban, agricultural, forested), population patterns, and sources of employment in the project vicinity.

(B) Environmental analysis. The applicant must present the results of its studies conducted under the approved study plan by resource area and use the data generated by the studies to evaluate the beneficial and adverse environmental effects of its proposed project. This section must also include, if applicable, a description of any anticipated continuing environmental impacts of continued operation of the project, and the incremental impact of proposed new development of project works or changes in project operation. This analysis must be based on the information filed in the Pre-Application Document provided for in §5.6, developed under the applicant's approved study plan, and other appropriate information, and otherwise developed or obtained by the Applicant.

(C) Proposed environmental measures. The applicant must provide, by resource area, any proposed new environmental measures, including, but not limited to, changes in the project design or operations, to address the environmental effects identified above and its basis for proposing the measures. The applicant must describe how each proposed measure would protect or enhance the existing environment, including, where possible, a non-monetary quantification of the anticipated environmental benefits of the measure. This section must also include a statement of existing measures to be continued for the purpose of protecting and improving the environment and any proposed preliminary environmental measures received from the consulted resource agencies, Indian tribes, or the public. If an applicant does not adopt a preliminary environmental measure proposed by a resource agency, Indian tribe, or member of the public, it must include its reasons, based on project-specific information.

(D) Unavoidable adverse impacts. Based on the environmental analysis, discuss any adverse impacts that would occur despite the recommended environmental measures. Discuss whether any such impacts are short- or long-term, minor or major, cumulative or site-specific.

(E) Economic analysis. The economic analysis must include annualized, current cost-based information. For a new or subsequent license, the applicant must include the cost of operating and maintaining the project under the existing license. For an original license, the applicant must estimate the cost of constructing, operating, and maintaining the proposed project. For either type of license, the applicant should estimate the cost of each proposed resource protection, mitigation, or enhancement measure and any specific measure filed with the

Commission by agencies, Indian tribes, or members of the public when the application is filed. For an existing license, the applicant's economic analysis must estimate the value of developmental resources associated with the project under the current license and the applicant's proposal. For an original license, the applicant must estimate the value of the developmental resources for the proposed project. As applicable, these developmental resources may include power generation, water supply, irrigation, navigation, and flood control. Where possible, the value of developmental resources must be based on market prices. If a protection, mitigation, or enhancement measure reduces the amount or value of the project's developmental resources, the applicant must estimate the reduction.

(F) Consistency with comprehensive plans. Identify relevant comprehensive plans and explain how and why the proposed project would, would not, or should not comply with such plans and a description of any relevant resource agency or Indian tribe determination regarding the consistency of the project with any such comprehensive plan.

(G) Consultation Documentation. Include a list containing the name, and address of every Federal, state, and interstate resource agency, Indian tribe, or member of the public with which the applicant consulted in preparation of the Environmental Document.

H) Literature cited. Cite all materials referenced including final study reports, journal articles, other books, agency plans, and local government plans.

(2) The applicant must also provide in the Environmental Document:

(A) Functional design drawings of any fish passage and collection facilities or any other facilities necessary for implementation of environmental measures, indicating whether the facilities depicted are existing or proposed (these drawings must conform to the specifications of §4.39 of this chapter regarding dimensions of full-sized prints, scale, and legibility);

(B) A description of operation and maintenance procedures for any existing or proposed measures or facilities;

(C) An implementation or construction schedule for any proposed measures or facilities, showing the intervals following issuance of a license when implementation of the measures or construction of the facilities would be commenced and completed;

(D) An estimate of the costs of construction, operation, and maintenance, of any proposed facilities, and of implementation of any proposed environmental measures.

(E) A map or drawing that conforms to the size, scale, and legibility requirements of §4.39 of this chapter showing by the use of shading, cross-hatching, or other symbols the identity and location of any

measures or facilities, and indicating whether each measure or facility is existing or proposed (the map or drawings in this exhibit may be consolidated).

EXHIBIT E

EXECUTIVE SUMMARY

Public Utility District No. 1 of Douglas County (Douglas PUD) proposes to continue operating the existing 774.3 megawatt (MW) Wells Hydroelectric Project (Project or Wells Project) located on the Columbia River at mile 515.6 near the town of Pateros in north-central Washington State. This Project produces an average net generation of 4,077,400 megawatt-hours (MWh) of power annually (water years 2003 through 2007), and is Douglas PUD's primary generating asset to meet the electrical power needs of over 18,000 retail customers in Douglas County. Project power is also sold under long-term contracts to four wholesale power purchasers, helping to meet the electrical power needs of consumers throughout the Pacific Northwest region.

The Wells Project consists of a dam, forebay, 9,740-acre reservoir, tailrace, hatchery facilities, service buildings, high-voltage transmission lines, recreation facilities and lands, all located within the Wells Project Boundary. The Wells Dam consists of a west embankment, a central concrete structure, and an east embankment. The central concrete structure, referred to as a "hydrocombine," includes 10 generating units, spillways, switchyard, and fish passage facilities, uniquely integrated into a single structure.

The Wells Project reservoir is approximately 29.5 miles long, contains the confluences of the Methow and Okanogan rivers with the Columbia River, and extends upstream to the tailrace of the Chief Joseph Hydroelectric Project. The Wells Project is a run-of-river facility operated in coordination with six other regional hydroelectric projects on the mid-Columbia River. With little active storage at the Wells Reservoir, daily inflow equals daily outflow and fluctuations and power generation are largely driven by the discharge from two large upstream federal projects: Chief Joseph and Grand Coulee.

Douglas PUD owns over 99 percent of the lands adjacent to the reservoir in the Project Boundary. There are 15.15 acres of federal lands located within the Project Boundary. Lands of the Confederated Tribes of the Colville Reservation (CCT) border the Wells Project along the eastern edge of the Okanogan River and along the north and east side of the Columbia River upstream of the confluence of the Okanogan River.

PROPOSED ACTION

The Applicant's proposal to operate the Project is described in detail in section 2.2. Douglas PUD proposes no capacity or operating changes, but does propose new measures for the protection and enhancement of environmental resources. These measures are described in detail in section 2.2.

ALTERNATIVES CONSIDERED

This Applicant-prepared Draft Environmental Assessment (EA) analyzes the effects of continued Project operation and proposes conditions for a new license for the Project. Although there would be no changes in Project capacity or operations under Applicant's proposal, additional environmental measures would be implemented, resulting in a net positive environmental effect compared to a "no-action" alternative. Under the no-action alternative, environmental conditions would remain the same and no further enhancement of environmental resources would occur over and above ongoing measures.

PUBLIC INVOLVEMENT AND AREAS OF CONCERN

Before filing its license application, Douglas PUD conducted an extensive pre-filing consultation process prior to and during the Integrated Licensing Process (ILP). The intent of the prefiling consultation process was to initiate public involvement early in the Project relicensing process and to encourage citizens, governmental entities, tribes, and other interested parties to identify and resolve issues prior to an application being filed with the Federal Energy Regulatory Commission (FERC). After Douglas PUD filed its Pre-Application Document and Notice of Intent (NOI) to seek a new operating license for the Project, the FERC conducted issue scoping to determine what issues and alternatives should be addressed in the relicensing process. The FERC issued Scoping Document 1 (SD1) on January 29, 2007. FERC staff conducted the official site visit on February 27, 2007 and conducted public scoping meetings on February 28, 2007 in the City of East Wenatchee, Washington and the City of Brewster, Washington. On May 15, 2007 the FERC issued a Revised Scoping Document (SD2). The FERC issued an Addendum to SD2 on May 16, 2007. The scoping documents defined potential project effects, including direct, indirect and cumulative effects.

PROJECT EFFECTS ON RESOURCES

According to the FERC's May 2007 Scoping Document 2 and addendum (SD2), potential Project effects to be evaluated during the relicensing process include the following:

Aquatic Resources

- Effects of the Project on the input, movement, accumulation, and retention of toxins (i.e., DDT [Dichloro-Diphenyl-Trichloroethane] and PCBs [Polychlorinated Biphenyls]) originating in the Okanogan River subbasin, and the potential effects of these toxins on aquatic organisms and humans.
- Effects of the Project on total dissolved gas (TDG) levels in the Wells Tailrace and Rocky Reach forebay.

- Effects of the Project on water temperature, dissolved oxygen (DO), pH, and turbidity.
- Effects of the Project on aquatic and wetland plant communities.
- Effects of the Project on the spread of aquatic invasive species.
- Effects of the Project and ongoing actions, including the Wells Hydroelectric Project Anadromous Fish Agreement and Habitat Conservation Plan (Exhibit E; Appendix E-1) on salmon and steelhead.
- Effects of the Project on juvenile lamprey habitat, dam passage and reservoir survival.
- Effects of the Project on adult lamprey habitat use and behavior related to ladder passage, timing, drop back, and upstream migration.
- Effects of the Project on white sturgeon spawning, rearing, recruitment, movements, and abundance.
- Effects of the Project on bull trout survival and habitat.
- Effects of the Project, including reservoir fluctuations, on resident fish and benthic macroinvertebrates.
- Effects of the northern pikeminnow removal program on native resident fish.

Terrestrial Resources

- Whether the Project transmission line represents an avian electrocution or collision hazard.
- Effects of transmission line right-of-way management practices (e.g., weed control and road maintenance) on wildlife and botanical resources.
- Effects of Douglas PUD's land management practices (weed control, soil erosion control) and permitting policies (installation of docks, water systems, fences, landscaping, and agricultural uses) on wildlife and wildlife habitats.
- Effects of Project-related recreation on wildlife and wildlife habitats (e.g., disturbance to wildlife and alteration and modification of habitats).
- Effects of the frequency, timing, amplitude, and duration of reservoir fluctuations on riparian and wetland habitats and wildlife (amphibians and waterfowl) dependent on these habitats.
- Effects of the Project reservoir as a migration and movement barrier to mule deer.
- Adequacy of the existing wildlife management program in reducing Project effects on wildlife.
- Whether the nuisance wildlife control program is targeting the appropriate birds and mammals that may be preying on listed salmon and steelhead juveniles and whether there are more effective control actions.

Threatened and Endangered Species

- Effects of Project operations (reservoir fluctuations) and Project-related recreation on federally-listed bald eagle, Ute ladies'-tresses and pygmy rabbits.
- Effects of Project operations (reservoir fluctuations), land management practices, and Project-related recreation on the following state-listed rare species: little bluestem, chaffweed, northern sweet grass, brittle prickly-pear, American white pelican, sage grouse, and sharp-tailed grouse.
- Effects of the Project on Upper Columbia River spring-run Chinook salmon, Upper Columbia River steelhead, and bull trout.

Recreation, Land Use and Aesthetics

- Effects of Project operations (reservoir fluctuations) on access to and use of public boat launches and docks.
- Effects of aquatic vegetation and sediment conditions (transport and deposition) on public access to and use of the Project waters.
- Adequacy of existing recreation facilities and public access within the Project Boundary in meeting current and future (over the term of a new license) recreational demand, including barrier-free access needs.

Archaeological and Historic Resources

- Effects of continued Project operations or changes in Project operation or facilities on historic, archeological, and traditional resources that may be eligible for inclusion in the National Register of Historic Places (NRHP).

Socioeconomics

- Effects of the Project on local, tribal, and regional economies.

Developmental Resources

- Effects of protection, mitigation, and enhancement (PM&E) measures on Project economics.

SUMMARY OF PROPOSED PM&E MEASURES

Douglas PUD proposes no capacity or operating changes to the Wells Project, but does propose new measures for the protection and enhancement of environmental resources. These measures include implementation of the Wells HCP and associated Hatchery Genetic Management plans (HGMPs), Aquatic Settlement Agreement (ASA), Douglas PUD's Land Use Policy, and Wildlife and Botanical, Avian Protection, Recreation and Historic Properties management plans.

The anticipated expenditure required for PM&E measures during the proposed 50-year license term is $643.6 million. Douglas PUD anticipates spending $550 million under the new license to implement the Wells HCP. In addition to the Wells HCP, Douglas PUD estimates that the costs to implement the Aquatic Settlement Agreement, Wildlife and Botanical, Avian Protection, Recreation and Historic Properties management plans will be $93.6 million over the proposed 50-year license term.

CONCLUSIONS

Relicensing of the Wells Project as proposed in Douglas PUD's Final License Application will further enhance the environmental resources of the Project while continuing to provide safe, clean and economical power to the region. The analyses set forth in this EA support the conclusion that the proposed relicensing of the Wells Project achieves a balance between developmental and environmental resources that is best adapted to serve the public interest.

1.0 INTRODUCTION

1.1 APPLICATION

Public Utility District No. 1 of Douglas County (Douglas PUD) is applying for a new 50-year license for the existing Wells Hydroelectric Project (Project or Wells Project) with the Federal Energy Regulatory Commission (FERC). Douglas PUD used the Integrated Licensing Process (ILP) promulgated by the FERC at 18 Code of Federal Regulations (CFR) Part 5. This document is Exhibit E, the Environmental Exhibit of the license application, which was prepared in the form of an Applicant-prepared Environmental Assessment (EA) as provided for in 18 CFR § 5.18. This EA is supported by data and analyses from 12 resource study reports conducted as part of the relicensing process; the Applicant's Initial Statement; Exhibits A, B, C, D, E, F, G and H (all collectively comprising Douglas PUD's license application), and numerous prior studies conducted by Douglas PUD and other parties.

The 774.3 megawatt (MW) Wells Project consists of a single dam and impoundment located on the Columbia River in Douglas and Chelan counties near the city of Pateros, Washington (Figure 1.0-1). The Project is operated in a run-of-river mode in coordination with other mid-Columbia River hydroelectric projects, under the guidelines of the Mid-Columbia Hourly Coordination Agreement (HCA). The Project occupies 15.15 acres of federal lands located within the Project Boundary. The Project produces an average of 4,077,400 megawatt-hours (MWh) of net generation annually (water years 2003 through 2007).

This EA provides an environmental analysis, by resource area, of the impacts of Douglas PUD's proposal to continue operating the Wells Project. The major issues addressed in the EA include: (1) Project operations and their effect on migratory fish (including salmonids and Pacific lamprey[*Lampetra tridentate*]), (2) Project effects on water quality, (3) Project effects on terrestrial resources, (4) recreation use, needs, and enhancements, and (5) cultural resources within the Project Boundary. Douglas PUD does not propose to add capacity or new construction affecting future power generating operations under the new license.

Douglas PUD developed this application in consultation with state and federal fish and wildlife agencies, local governments, Indian tribes, and other members of the public. A total of 12 agreed-upon resource studies were conducted during the ILP study period.

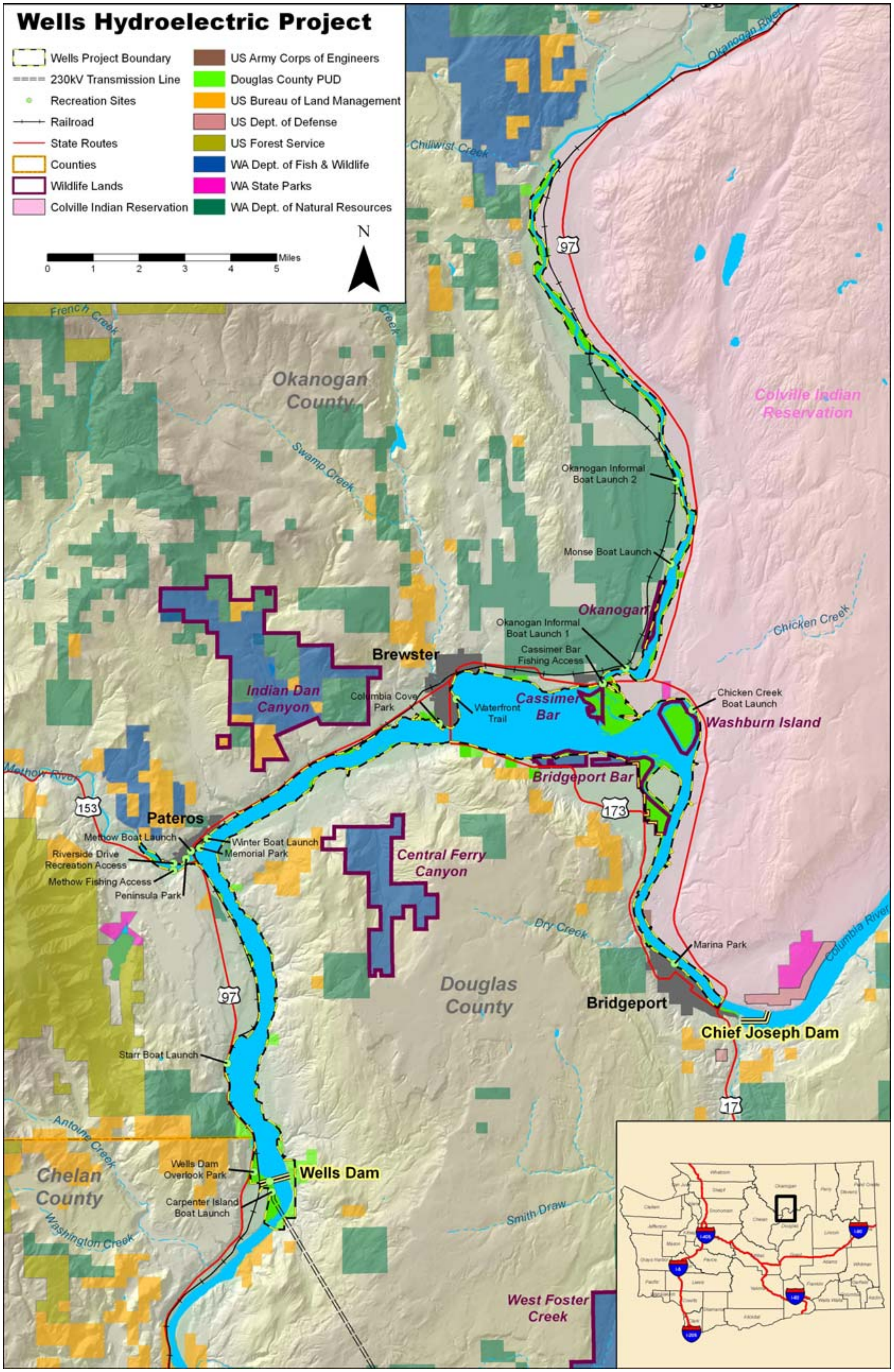

Figure 1.0-1 **Wells Project vicinity map.**

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The FERC must decide if it is going to issue a new operating license to Douglas PUD and what conditions should be placed on any license issued. Under Section 10(a)(1) of the Federal Power Act (FPA), in deciding whether to issue a license for a hydroelectric project, the FERC must determine that the Project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (e.g., flood control, irrigation and water supply), the FERC must give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality.

Issuing a new license will allow Douglas PUD to continue generating electricity at the Wells Project for the term of the new license, producing low-cost electric power from a non-polluting, renewable resource. Issuing a new license will also result in the protection of fish and wildlife resources, additional recreation benefits, and protection of cultural resources.

This EA was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and analyzes the environmental and economic effects associated with the continued operation of the Wells Project, as proposed with the licensee's recommended measures. The effects of the no-action alternative are also considered.

1.2.2 Need for Power

The Wells Project is located within the Western Electricity Coordinating Council (WECC) of the North American Electric Reliability Council (NERC). The NERC's 2008 Long-Term Reliability Assessment reports that there is a need for power in the region; the projected 2008 summer total internal demand of 162,052 MW is expected to increase by about 2.0 percent per year to 193,530 MW in 2017. Electricity planning reserve margins for the majority of WECC subregions are projected to fall below minimum target levels in portions of the WECC by 2017 (NERC 2008).

Within the WECC, the Northwest Power Pool (NWPP) area is comprised of all or major portions of the states of Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming; a small portion of northern California; and the Canadian provinces of British Columbia and Alberta. The coordinated system (Oregon, Washington, and western Montana) collectively operates its hydro resources to serve the demand for electricity, including the need for important ancillary services. The reservoirs are managed to address all of the competing requirements including, but not limited to, current and future electric power generation; flood control; fish and wildlife requirements; special river operations for recreation; irrigation; navigation; and refilling of the reservoirs.

The average annual Wells Project net generation for the period 2003 through 2007 was 4,077,400 MWh. If relicensed as proposed, the power from the Project would continue to meet the electricity needs of Douglas PUD's retail customers, and part of the local and regional need for power through long-term contracts with regional power purchasers. Electricity generation using this renewable resource will continue to displace an equivalent amount of fossil-fuel fired electric generation and capacity elsewhere, continuing to help conserve these non-renewable energy resources while reducing significant fossil-fuel power plant emissions and creating an environmental benefit.

If the future production of power from the Wells Project is reduced, the low-cost power from the Project would most likely be replaced by non-renewable, fossil-fuel fired carbon-emitting electric generation, which further contributes to air pollution through the production of nitrogen oxides and sulfur oxides. At the 1999 average fossil fuel-generated rate of 1.35 pounds of CO_2 emissions per kilowatt hour (kWh) of generation (Department of Energy [DOE] and Environmental Protection Agency [EPA] 2000), replacement of electricity generated at the Wells Project with fossil-fuel derived electricity would result in an average increase of 2.95 million tons of CO_2 emissions annually.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA, 16 U.S.C. § 811, states that the FERC shall require construction, maintenance and operation by a licensee of such fishways as the secretaries of the Department of Commerce and the Department of the Interior (DOI) may prescribe. The Wells Anadromous Fish Agreement and Habitat Conservation Plan (Exhibit E; Appendix E-1) will constitute the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) Section 18 terms and conditions for anadromous salmonids. The Bull Trout Management Plan (BTMP) and Pacific Lamprey Management Plan (PLMP) contained within the Aquatic Settlement Agreement (Exhibit E; Appendix E-2) are intended to constitute the USFWS Section 18 terms and conditions for bull trout and Pacific lamprey, respectively.

1.3.1.2 Section 4(e) Conditions

The Wells Project occupies 15.15 acres of federal lands. Section 4(e) of the FPA gives the Secretary of the land administering agency authority to impose conditions on licenses issued by the FERC for hydropower projects located on "reservations" under the Secretary's supervision. See 16 U.S.C. §§ 796(2), 797(e).

1.3.1.3 Section 10(j) Recommendations

Under the provisions of Section 10(j) of the FPA, each hydroelectric license issued by the FERC is required to include conditions based on recommendations of federal and state fish and wildlife agencies for the protection, mitigation or enhancement of fish and wildlife resources affected by the Project, unless the FERC determines they are inconsistent with the purposes and requirements of the FPA or other applicable law.

The Wells HCP constitutes the NMFS, USFWS and Washington Department of Fish and Wildlife (WDFW) terms and conditions for salmon and steelhead (*Oncorhynchus mykiss*) under Section 10(j). The Wells Aquatic Settlement Agreement (ASA) constitutes the USFWS and WDFW terms and conditions for aquatic resources under Section 10(j).

1.3.1.4 Section 30(c) Fish and Wildlife Conditions

This section is applicable to projects that would impound or divert the water of a natural watercourse by means of a new dam or diversion. Douglas PUD is not seeking a license to construct a new dam or diversion; therefore, this section of the FPA is not germane to the relicensing of the Wells Project.

1.3.2 Clean Water Act

Section 401 of the Clean Water Act (CWA) establishes requirements for state certification of proposed projects or activities that may result in any discharge to navigable waters. Before a federal agency, such as the FERC, may issue a license for any project that may result in any discharge to navigable waters, the state must certify that the proposed project will comply with applicable water quality standards (WQS) and implementation plans of Section 303 of the CWA and any state regulations adopted to implement this section. The state is authorized to condition any certificate to assure compliance with appropriate water quality requirements. The Washington State Department of Ecology (Ecology) is the state agency designated to carry out the certification requirements prescribed by Section 401 for waters of Washington State. Certification determines compliance with the WQS, Section 303 implementation plans, and state regulations. The six aquatic resource management plans contained within the ASA, together with the Wells HCP constitute Douglas PUD's proposed Water Quality

Attainment Plan in support of the CWA Section 401 Water Quality Certification (WQC) for the relicensing of the Wells Project.

Within 60 days following the FERC's Notice of Acceptance and Ready for Environmental Analysis, Douglas PUD will request a WQC from Ecology.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered and threatened species or to cause the destruction or adverse modification of the critical habitat of such species. On December 7, 2005, the FERC designated Douglas PUD as its non-federal representative for the purpose of initiating consultation with the USFWS and NMFS under Section 7 of the ESA. Douglas PUD consulted with the USFWS and NMFS in developing the aquatic and terrestrial study plans for threatened and endangered species, in implementing the studies, and in settlement discussions. Three federally-listed fish species, bull trout (*Salvelinus confluentus*), Upper Columbia River (UCR) steelhead, and UCR spring Chinook salmon (*Oncorhynchus tshawytscha*), exist within the Project. No other federally-listed species are known to occur within the Project.

On August 18, 1997 the NMFS listed the steelhead Evolutionarily Significant Unit (ESU) as an endangered species. On March 16, 1999 the NMFS listed the UCR spring-run Chinook salmon ESU as endangered. Since 1993, Douglas PUD has worked cooperatively with various state and federal fisheries agencies, including the NMFS, USFWS, WDFW, three Native American tribes, and American Rivers to develop an HCP for anadromous salmon and steelhead affected by the Wells Project.

Through this collaborative process, Douglas PUD developed an HCP for the Wells Project. The Wells HCP commits Douglas PUD to a 50-year program to ensure that its Project has "no net impact" (NNI) on five Columbia River salmon and steelhead species (not just federally-listed species). The NNI goal has been accomplished at the Wells Project since 2007 through a combination of juvenile fish bypass operations, hatchery compensation and evaluations, and habitat restoration work conducted in tributary streams upstream from the Wells Project.

Approval of this plan has allowed the NMFS to issue Incidental Take Permits (ITPs) to Douglas PUD under Section 10 of the ESA. In addition to the ESA, the Wells HCP is also intended to satisfy the Project's obligations under the FPA, the Fish and Wildlife Coordination Act, the Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the Pacific Northwest Electric Power Planning and Conservation Act (NWPPCA) and Title 77 Revised Code of Washington (RCW) of Washington State.

The USFWS listed the Columbia River bull trout ESU as threatened on June 10, 1998. This ESA-listed species is not covered by the Wells HCP. The USFWS issued a Biological Opinion (BO) on May 11, 2004, stating that "implementing the proposed action [incorporating the Wells Project HCP into the existing FERC license] is not likely to jeopardize the continued existence of the Columbia River distinct population segment of bull trout, and is not likely to destroy or adversely modify proposed critical habitat for bull trout" (USFWS May 12, 2004 letter of transmittal to the FERC for biological opinion on license amendment).

Douglas PUD has consulted extensively with various state and federal agencies, including the NMFS, USFWS, Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), WDFW, Ecology, the Confederated Tribes of the Colville Reservation (CCT) and the Confederated Tribes and Bands of the Yakama Nation (YN) to develop the ASA for aquatic resources affected by the Wells Project that are not already covered by the Wells HCP. The purpose of the ASA is to resolve all remaining aquatic resource issues related to compliance with all federal and state laws applicable to the issuance of a new operating license for the Project. The BTMP is one of six aquatic resource management plans contained within the ASA. The USFWS anticipates that the measures contained within the BTMP, together with the measures contained within the Wells HCP and bull trout BO, will be adequate to satisfy ESA responsibilities for aquatic species under the jurisdiction of the USFWS.

The assessment of Project effects on listed species is analyzed in section 3.3.2, Aquatic Resources, section 3.3.3, Terrestrial Resources, and section 3.3.4, Threatened and Endangered Species and Critical Habitats.

1.3.4 Coastal Zone Management Act

In a letter to Douglas PUD dated March 28, 2008, Ecology indicated it presently believes that all effects to coastal resources of concern to Ecology will be adequately addressed in the WQC for the Wells Project.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA), as implemented by 36 CFR Part 800, requires federal agencies to take into account the effects of their undertakings on cultural resources that are either listed on the National Register of Historic Places (NRHP) or are determined eligible for listing on the NRHP, and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. Section 106 further outlines the responsibility of federal agencies to consult with the State Historic Preservation Officer (SHPO), tribes, the ACHP, and other interested parties as part of the process of considering impacts to cultural resources that result from the federal undertaking. The federal undertaking that triggers Section 106 compliance for the Wells Project is the proposed issuance of a new operating license by the FERC to Douglas PUD.

Douglas PUD has consulted with the Tribal Historic Preservation Officer (THPO) of the CCT, the Washington State Department of Archaeology and Historic Preservation (DAHP/SHPO), the FERC, BIA, and other interested parties to conduct studies and develop a Historic Properties Management Plan (HPMP). The HPMP provides specific protocols for protecting cultural resources during the term of the new license. The HPMP will be executed through a Programmatic Agreement (PA) among the FERC, ACHP, CCT, THPO, and SHPO.

1.3.6 Pacific Northwest Electric Power Planning and Conservation Act

The Pacific NWPPCA, also known as the Northwest Power Act, was enacted into law on December 5, 1980. The Act serves a number of purposes related to the supply of electric power and protection of fish and wildlife in the Pacific Northwest. The purposes of the law are as follows:

- assure the Pacific Northwest of an adequate, efficient, economical, and reliable power supply;
- provide for participation and consultation of the Pacific Northwest states, local governments, consumers, customers, water users, and the public related to the use of the Columbia River System;
- ensure development of regional plans and programs related to energy conservation;
- protect, mitigate, and enhance fish and wildlife resources; and
- facilitate the planning of the region's power system.

Along with the aforementioned purposes, the Act established the Pacific Northwest Power and Conservation Planning Council (NWPPC or Council) and directed the Council to adopt a regional energy conservation and electric power plan and a program to protect, mitigate, and enhance fish and wildlife on the Columbia River and its tributaries. The Act also provided guidelines for the Bonneville Power Administration (BPA) to follow when selling power, acquiring resources, implementing energy conservation measures, and setting rates for the sale of electric energy.

The NWPPC is a regional agency with two appointed members each from Idaho, Montana, Oregon, and Washington for three-year terms. The Council was directed to create a regional conservation and electric power plan designed to set forth a framework for applying conservation measures and developing resources while meeting the dual obligations of environmental quality and the acquisition of electric power resources. The Council was also charged with developing the Columbia River Basin Fish and Wildlife Program (Council Program) consisting of measures to protect, mitigate, and enhance fish and wildlife affected by the development, operation and management of the hydroelectric facilities within the region while at the same time ensuring the Pacific Northwest region an efficient and reliable power supply. The Council Program requires consultation with federal and state fish and wildlife agencies and Indian tribes during the study, design, construction, and operation of any hydroelectric development in the basin.

As a hydroelectric facility on the Columbia River, the Wells Project is subject to compliance with the NWPPCA. The Council Program is designed to protect, mitigate damage to, and enhance fish and wildlife, including related spawning grounds and habitat on the Columbia River and its tributaries. Anadromous fish are specifically identified within the NWPPCA and the Council Program with the stated goal of providing for improved survival of such fish at hydroelectric facilities located on the Columbia River. Sufficient flows are also to be provided in order to improve production, migration, and survival of anadromous fish.

Under Section 4(h) of the NWPPCA, the Council developed the Council Program to protect, mitigate, and enhance the fish and wildlife resources associated with the development and operation of hydroelectric projects within the Columbia River basin. Section 4(h) states that responsible federal and state agencies should provide equitable treatment for fish and wildlife resources, in addition to other purposes for which hydropower is developed, and that these agencies should take into account, to the fullest extent practicable, the Council Program adopted under the NWPPCA.

Douglas PUD’s proposed fish and wildlife protection and enhancement measures, including the Wells HCP, are discussed in sections 3.3.2 through 3.3.4 of this EA. These measures are consistent with applicable provisions of the Council Program.

1.3.7 Wilderness Act/Wild and Scenic Rivers Act

There are no lands or rivers within the Project Boundary, or in the Project vicinity, to which these acts apply; therefore, these acts are not germane to the relicensing of the Wells Project. The closest wilderness areas are the Lake Chelan-Sawtooth and Pasayten Wilderness Areas, high in the north Cascades Range, including portions of the headwaters of the Methow and Okanogan rivers.

1.3.8 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Act regulates activities affecting fisheries resources and fishing in federal waters (waters extending from the edge of state waters to the 200-mile limit). The Act, originally passed by Congress in 1976, mandates numerous scientific, management, and conservation actions by the NMFS, with the goals of preventing overfishing, rebuilding overfished stocks, protecting essential fish habitat, minimizing bycatch, enhancing research, and to improve monitoring. The Act gives the Secretary of Commerce power to review, approve, and implement fishery management plans and other recommendations developed by the regional fishery management councils. The NMFS provides guidance for applying the national standards of the Act.

The Magnuson-Stevens Act has been amended several times. In 1996, Congress passed the Sustainable Fisheries Act (SFA) which revised the original Act and reauthorized it through 1999. The revision outlined new requirements to prevent overfishing and rebuild overfished fisheries. The SFA also set national standards addressing fishing vessel safety, fishing communities, and bycatch. In 2006, Congress revised and reauthorized the Act through 2010. This most recent revision made changes related to establishment of annual catch limits, function of the Scientific and Statistical Committee, the environmental review process, and other areas. The Act is complemented by various other federal and state laws related to fisheries.

The Magnuson-Stevens Act requires federal fishery management plans to describe the habitat essential to the fish (EFH) being managed. In addition, in order to protect this EFH, federal agencies are required to consult with the NMFS on activities within their jurisdiction that may adversely affect the EFH. For commercially-managed salmon species that are present in the Wells Reservoir (Chinook and coho, *Oncorhynchus kisutch*), the EFH consists of all of the water bodies in the Wells Reservoir. This includes the lower 15.5 mile section of the Okanogan River, the lower 1.5 mile section of the Methow River, and the section of the mainstem Columbia River encompassed within the Wells Project Boundary.

The Wells HCP, approved by the FERC in 2004, contains NMFS conditions relative to the EFH provisions of the Magnuson-Stevens Act. The Wells HCP addresses Project-related impacts to spring Chinook, summer/fall Chinook, steelhead, sockeye (*Oncorhynchus nerka*) and coho (Plan Species). The Wells HCP also provides ESA coverage for all of the permit species—spring Chinook, summer/fall Chinook, sockeye, and steelhead. The Wells HCP satisfies the Wells Project's obligation for the EFH provisions under the Magnuson-Stevens Act.

1.4 PUBLIC REVIEW AND CONSULTATION

1.4.1 Scoping

Before preparing this EA, issue scoping was conducted to determine what issues and alternatives should be addressed. The purpose of scoping was to identify the significant environmental issues to be evaluated in the FERC EA. According to NEPA, the process should be conducted early in the planning stage of the Project. The purposes of the scoping process are as follows:

- invite participation of federal, state and local resource agencies, Indian tribes, non-governmental organizations (NGOs), and the public (collectively, stakeholders) to

identify significant environmental and socioeconomic issues related to the proposed Project;
- determine the depth of analysis and significance of issues to be addressed in the EA;
- identify how the Project would or would not contribute to cumulative effects in the Project area;
- identify reasonable alternatives to the proposed action that should be evaluated in the EA;
- solicit, from participants, available information on the resources at issue, including existing information and study needs; and
- determine the resource areas and potential issues that do not require detailed analysis during review of the Project.

Starting in early 2005, prior to the initiation of the formal Wells ILP, Douglas PUD implemented an intensive stakeholder outreach and education program including the completion of 15 baseline environmental studies.

The baseline environmental studies conducted by Douglas PUD included the following 15 studies and assessments: (1) Aquatic Macroinvertebrate Inventory and RTE Assessment; (2) Bathymetric Mapping; (3) Bull Trout Monitoring Program; (4) Botanical Resources: Cover Type Mapping, RTE Plant Surveys, and Invasive Plant Species Surveys; (5) Effects of Water Level Fluctuations on Natural Resources within the Wells Project: A Review of Existing Information; (6) Limnological Investigation; (7) Macrophyte Identification and Distribution Study; (8) Recreation Visitor Use Assessment; (9) Temperature Monitoring; (10) Total Dissolved Gas (TDG) Study (2005); (11) Total Dissolved Gas Dynamic and Computational Fluid Dynamics Data Collection Study (2006); (12) White Sturgeon (*Acipenser transmontanus*) Population and Life-History Assessment, Wells Reservoir; (13) Wildlife Resources: Avian, Amphibian, Reptile, and Small Mammal Surveys and Rare, Threatened and Endangered (RTE) Wildlife Surveys; (14) Transmission Corridor Botanical and Cover Type Mapping; and (15) Cultural Data Review for the Wells Project. The results of these baseline studies were provided to stakeholders and included in Appendix F of the Pre-Application Document (PAD), which was filed with FERC in December 2006.

In addition to conducting the 15 baseline studies, Douglas PUD hosted an introductory ILP workshop on October 18, 2005, more than a year in advance of the start of the formal ILP. The intent of the workshop was to introduce stakeholders to the ILP, provide stakeholders with information about the Wells Project and to encourage stakeholders to participate in four Resource Work Groups (RWGs): Aquatic/Water Quality, Terrestrial, Cultural, and Recreation. A series of pre-NOI meetings and site tours began in November 2005 and ended in November 2006. Douglas PUD conducted 31 stakeholder outreach meetings, hosted 28 separate Resource Work Group meetings and has posted extensive licensing information on the relicensing website at www.douglaspud.org/relicensing (Exhibit E; Appendix E-8).

Participants in the RWGs included various federal, state and local resource agencies, interested Indian tribes and local government agencies. The primary goals of the RWGs were to identify issues and potential study needs. This process provided stakeholders and Douglas PUD an opportunity to have an open dialogue about issues and concerns in advance of the rigorous timeline of the ILP. Through this process, each RWG cooperatively developed a list of Project-related issues and agreed-upon study plans.

Douglas PUD initiated the formal ILP by submitting the Notice of Intent (NOI) and Pre-Application Document (PAD) to the FERC on December 1, 2006. The PAD included the results of the 15 baseline studies and the 12 agreed-upon study plans developed within the RWGs.

Following the filing of the PAD, the FERC issued Scoping Document (SD1) on January 29, 2007 to federal, state, and tribal entities, local government agencies, NGOs, and other stakeholders to solicit comments on the scope of the EA and encourage stakeholder participation in the relicensing process. It was noticed in the Federal Register February 7, 2007. FERC staff conducted a public site visit of the Wells Project on February 27, 2007, and public scoping meetings on February 28, 2007, in East Wenatchee and Brewster, Washington. As part of the meetings, participants were given the opportunity to tour the Wells Project. The site visit included an overview of the Wells Project and its operations and a tour of the Wells Reservoir and adjacent recreation facilities and wildlife areas. Attendees included representatives from federal and state agencies, Indian tribes, elected officials, business leaders and community members. On May 15, 2007, the FERC issued a Revised Scoping Document (SD2). The FERC issued an Addendum to SD2 on May 16, 2007. FERC's final scoping documents contained a complete list of all of the issues that needed to be addressed during the development of this EA. The scoping documents also defined potential project effects, including direct, indirect and cumulative effects. Prior to the scoping meetings held in 2007, the FERC staff held a tribal consultation meeting on May 16, 2006.

On May 16, 2007, Douglas PUD submitted a Proposed Study Plan (PSP) Document. The PSP Document consisted of Douglas PUD's Proposed Study Plans, Responses to Stakeholder Study Requests and a schedule for conducting the Study Plan Meeting. The Study Plan Meeting was conducted on June 14, 2007. The purpose of the Study Plan Meeting was to provide stakeholders with an opportunity to review and comment on Douglas PUD's PSP Document, to answer questions related to stakeholder study requests and to attempt to resolve any outstanding issues with respect to the PSP Document.

On September 14, 2007, Douglas PUD submitted a Revised Study Plan (RSP) Document. The RSP Document consisted of a summary of each of Douglas PUD's revised study plans and a response to stakeholder comments on the PSP Document.

On October 11, 2007, the FERC issued its Study Plan Determination based on review of the RSP Document and comments from stakeholders. FERC's Study Plan Determination required Douglas PUD to complete 10 of the 12 studies included in its RSP Document. Douglas PUD opted to complete all 12 studies to better prepare for the 401 Water Quality Certification process conducted by Ecology and to fulfill its commitment to the RWGs, which collaboratively developed the 12 agreed-upon study plans with Douglas PUD.

On October 15, 2008, Douglas PUD filed with the FERC both a public and non-public version of the Initial Study Report (ISR) Document for the Wells Project. The ISR Document includes the following 12 studies and assessments: (1) Cultural Resources Investigation, (2) Public Access Study, (3) Recreation Needs Analysis, (4) Piscivorous Wildlife Control Study, (5) Transmission Line Wildlife and Botanical Study, (6) Juvenile Lamprey Study, (7) Adult Lamprey Passage Study, (8) TDG Investigation, (9) Water Temperature Study, (10) Okanogan Toxins Study, (11) DO, pH and Turbidity Study (not required by the FERC), and (12) Lamprey Spawning Assessment (not required by the FERC). On November 24, 2008, Douglas PUD filed a letter correcting a water temperature figure within the original ISR Document. On December 2, 2008, Douglas PUD filed the final Traditional Cultural Property Study for the Wells Project, which was prepared by the Confederated Tribes of the Colville Reservation under a contract with Douglas PUD.

The deadline for stakeholder comment on the ISR Document was December 15, 2008 pursuant to the approved Process Plan and Schedule for the Wells Project. Comments were filed by the City of Pateros on November 7, 2008 and by the City of Brewster on December 5, 2008.

On January 14, 2009, Douglas PUD filed a letter containing its responses to the comments on the ISR Document from the cities. In the same letter, Douglas PUD proposed revisions to the schedule for the Wells ILP. On February 4, 2009, the FERC issued a determination on the requests for modification to the Wells Study Plan and on Douglas PUD's proposed revisions to the schedule. FERC concluded that there was no need to modify the Wells Study Plan. The FERC also approved Douglas PUD's proposed modifications to the Wells ILP schedule.

On April 15, 2009, Douglas PUD filed its Updated Study Report (USR) Document and its Notice of Intent to file a draft license application for the Wells Project. The USR Document provides the final study reports for those studies that were still in progress when the ISR Document was filed in October 2008. The final reports contained within the USR Document include the 2008 Adult Lamprey Passage Study, TDG Investigation, the DO, pH and Turbidity Study and the final Transmission Line Wildlife and Botanical Study. The USR Meeting was conducted on April 30, 2009 and no comments were received on any of the reports or meeting minutes. The filing of the USR Document concluded the study phase of the Wells ILP.

On December 18, 2009, Douglas PUD filed with the FERC the Draft License Application (DLA). Comments on the DLA were received from Ecology and the FERC. Douglas PUD has addressed the comments provided by stakeholders in the appropriate sections of this application.

1.4.2 Interventions

The FERC will solicit interventions on this license application.

1.4.3 Comments on the License Application

The FERC will solicit and compile comments on this license application.

1.4.4 Comments on the Draft Environmental Assessment

The FERC will solicit, compile and respond to comments received on the draft EA in the final environmental document.

2.0 PROPOSED ACTION AND ALTERNATIVES

This EA describes Douglas PUD's licensing proposal for continuing to operate the Wells Project under the new license. This Exhibit describes current and proposed operations of the existing Project, including the facilities, lands, waters, biological resources, and historical and cultural, recreation, and aesthetic resources. Results of the baseline and ILP relicensing studies are also described, including Project and cumulative effects, followed by a summary of the environmental measures proposed with respect to each resource area. This Exhibit also describes the no-action alternative and other alternatives considered but eliminated from detailed study.

2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the Wells Project would continue to operate in the future under the terms of the current Project license (i.e., there would be no change to the existing environment). No new environmental protection, mitigation, or enhancement (PM&E) measures would be implemented. Any ongoing effects of the Project not addressed by current measures would continue. This alternative is used to establish baseline environmental conditions for comparison with other alternatives.

2.1.1 Existing Project Facilities

The Wells Project consists of: (1) a 1,130-foot-long and 168-foot-wide concrete "hydrocombine" with integrated generating units, spillways, switchyard, and fish passage facilities; (2) a 2,300-foot-long and 40-foot-high earth and rock-filled west embankment;

(3) a 1,030-foot-long and 160-foot-high earth and rock-filled east embankment; (4) eleven 46-foot-wide and 65-foot-high ogee-crested spillway bays with two vertical lift gates per bay (upper leaf is 46 feet by 35 feet and lower leaf is 46 feet by 29.7 feet); (5) five spillways modified to accommodate the juvenile fish bypass system; (6) 10 generating units each housed in a 95-foot-wide and 172-foot-long concrete structure with a total installed capacity of 774.3 MW and maximum capacity of 840 MW; (7) five 14.4 kilovolts (kV) power transformers each connected to two generating units converting the power to 230 kV; (8) two 41-mile-long 230 kV single-circuit transmission lines running parallel to each other; and (9) appurtenant facilities.

The body of water formed by Wells Dam is known as the Wells Reservoir. The Wells Reservoir includes 29.5 miles of the Columbia River, 1.5 miles of the lower Methow River, and 15.5 miles of the lower Okanogan River. At the normal maximum pool elevation of 781 feet above mean sea level (MSL), the impoundment covers 9,740 acres, and contains 97,985 acre-feet (ac-ft) of usable storage.

2.1.2 Existing Settlements and Agreements

The Wells Project is operated in a coordinated manner with other regional hydroelectric projects. The management and regulation of upstream reservoirs in both the United States (U.S.) and Canada affect the amount and timing of flows to the mid-Columbia River. Regulation of the upstream reservoirs in the U.S. and Canada is governed by a number of agreements, including the 1997 Pacific Northwest Coordination Agreement (PNCA), the Columbia River Treaty between the U.S. and Canada relating to the cooperative development of the Columbia River and its tributaries, and other accords authorized for purposes of managing power generation, flood control, navigation, recreation, fisheries, and water quality. The Mid-Columbia HCA and Chief Joseph Encroachment Agreement directly affect operations of the Wells Project. Each of these agreements is discussed in section 2.1.4.

Additional natural resource agreements affecting operation of the Wells Project include the Wells HCP, the Hanford Reach Fall Chinook Protection Program Agreement (submitted to the FERC by Public Utility District No. 2 of Grant County, Washington [Grant PUD] on April 19, 2004 and approved in April 2008), and a number of other relevant agreements, all described in section 2.1.5.

2.1.3 Project Safety

The Project has been operating for more than 40 years under the existing license and during this time, the FERC staff has conducted operational inspections which evaluated the condition of the structures, the occurrence of any unauthorized modifications, the efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. In addition, the Project has been inspected and evaluated every five years by an independent consultant, and the consultants' safety reports have been submitted for the FERC's review.

As part of the relicensing process, the FERC staff evaluates the continued adequacy of the proposed Project facilities under a new license. Special articles would be included in any license issued, as appropriate. The FERC staff will continue to inspect the Project during the new license term to assure continued adherence to the FERC-approved plans and specifications, special license articles related to operation and maintenance, and accepted engineering practices and procedures.

2.1.4 Current Project Operation

The Wells Project is a "run-of-river" facility, in that on average, daily inflow to the Wells Reservoir equals daily outflow. This run-of-river operation reflects not only the Project's role as part of the mid-Columbia system, but also the very limited amount of usable storage capacity of the Wells Reservoir when compared to the average daily flows being discharged from the Chief Joseph and Grand Coulee developments located immediately upstream. A detailed description of Project operations, as a component of the mid-Columbia hydroelectric system, can be found in Exhibit B.

The Wells Project has a water right for 220 thousand cubic feet per second (kcfs) for power production with an impoundment right of 331,200 ac-ft, of which 97,985 ac-ft is usable storage. The Wells Project is authorized to maintain its reservoir level between elevation 781 and 771 feet for power and non-power purposes. Through the period 2003 to 2007, the reservoir elevation was maintained at or above 774 feet 99.7 percent of the time (Douglas PUD 2006).

The daily operation of the Wells Project is influenced by the following factors: (1) the FERC license requirements, (2) natural stream flows, (3) regulation of upstream storage reservoirs in the U.S. and Canada, (4) regulation of water releases from upstream power projects on an hourly basis to meet changing power demands, (5) actions in response to fish and other environmental regulations, and (6) variable power demands within Douglas and Okanogan counties and under the long-term power sales contracts with Puget Sound Energy, Inc., Portland General Electric, PacifiCorp, and Avista (collectively, Power Purchasers).

The Wells Project is operated in a coordinated manner with other regional hydroelectric projects. The management and regulation of upstream reservoirs in the U.S. and Canada greatly affect the amount and timing of flows in the mid-Columbia River. Regulation of the upstream reservoirs in the U.S. and Canada is governed by a number of agreements, including the 1997 PNCA and the Columbia River Treaty between the U.S. and Canada.

The purpose of the PNCA is to optimize the firm load carrying capability of resources coordinated under the agreement, including the Wells Project, and also to produce optimal amounts of usable "secondary" energy from those resources. Importantly, the PNCA also sets forth a procedure approved by the FERC for apportioning costs to be borne by the Wells Project for purposes of headwater benefits compensation. This compensation addresses the benefit of improved stream flow regulation provided by the upstream storage reservoirs in the U.S., consistent with Article 47 of the Wells Project license.

Douglas PUD is required by Article 38 of the Wells Project license to use the improved stream flow that results from Canadian storage for power production purposes and to make power available to the federal system for delivery to Canada as compensation for the Wells Project's share of system benefits resulting from such improved stream flow. Consistent with this requirement, Douglas PUD entered into agreements in 1964 and again in 1997 with BPA setting forth the share of Canadian benefits apportioned to the Wells Project.

Douglas PUD is also a party to an agreement with the operators of six other federal and non-federal dams located both upstream and downstream of Wells known as the mid-Columbia HCA. The HCA was originally conceived to protect Wells and other downstream projects from potentially adverse effects of "peaking" operations at the upstream federal projects. The primary objective of the agreement is to optimize the amount of energy produced from available water consistent with power and non-power needs. The regulation of the seven projects to meet the changing hourly load of the combined customer base has a significant effect on the operation of the Wells Project.

The construction of the Wells Project increased the tailwater levels at the Chief Joseph Project, which reduced the hydraulic head available for generation. Douglas PUD entered into an agreement in 1968 with the U.S. Army Corps of Engineers (COE) to compensate the federal system for power loss due to Wells Project encroachment (Encroachment Agreement 1968), consistent with Article 32 of the Wells Project license. The agreement was supplemented in 1982 when the FERC approved raising the elevation of the Wells Reservoir from elevation 779 to elevation 781 (Supplement Agreement 1982).

Additional agreements affecting operation of the Wells Project include the Wells HCP, the Hanford Reach Fall Chinook Protection Program Agreement (submitted to the FERC by Grant PUD on April 19, 2004 and approved in April 2008), and a number of other relevant agreements, all described in section 2.1.5.

2.1.5 Existing Environmental Measures

The following measures represent ongoing Project obligations which affect the quality of the environment and/or Project operations. Under the no-action alternative, these obligations are assumed to continue in accordance with the conditions of the existing license.

2.1.5.1 Anadromous Fish Agreement and Habitat Conservation Plan (2004)

On June 21, 2004, the FERC approved the Wells HCP. The Wells HCP represents the culmination of over 10 years of negotiations. Entities that have signed the Wells HCP (HCP Signatory Parties) include the NMFS, USFWS, WDFW, CCT, YN, the Power Purchasers, and Douglas PUD. The HCP is the first hydropower Habitat Conservation Plan in the nation for anadromous salmon and steelhead. The Wells HCP is a 50-year agreement that FERC approved as an amendment to the Wells Project license in 2004. The Wells HCP addresses all Project-related impacts to Plan Species. With respect to Plan Species, the HCP Signatory Parties have agreed to be supportive of Douglas PUD's long-term license application(s) to the FERC, filed during the term of the Wells HCP. The Wells HCP also provides ESA coverage for all of the ITP species (spring Chinook, summer/fall Chinook, sockeye, and steelhead) and is intended to constitute the HCP Signatory Parties' terms, conditions and recommendations for Plan Species under Sections 10(a), 10(j) and 18 of the FPA, the Fish and Wildlife Coordination Act, the EFH provisions of the Magnuson-Stevens Act, the Pacific Northwest Electric Power Planning and Conservation Act, and Title 77 of the RCW.

2.1.5.2 Hanford Minimum Flows - Operational Consistency with Priest Rapids Project's Article 45

Article 33 of the FERC license prohibits the operation of the Wells Project in such a way as would prevent the licensee of the downstream Priest Rapids Project from meeting its obligation to provide a minimum flow of 36 kcfs to the Hanford Works of the Atomic Energy Commission (now the U.S. Department of Energy) located at the downstream end of the Hanford Reach of the Columbia River. Meeting this requirement is part of the planning and flow management provisions of the mid-Columbia HCA.

2.1.5.3 Lost Valley Storage Replacement

Article 34 of the FERC license requires that each year, before the beginning of flood runoff, the COE District Engineer in charge of the locality shall inform Douglas PUD of the storage space to be provided in the Wells Reservoir to compensate for valley storage that may be expected to be lost during the ensuing flood season. Douglas PUD, without cost to the U.S., must provide this storage space in accordance with specific procedures.

2.1.5.4 Hanford Reach Fall Chinook Protection Program Agreement (2004)

On February 16, 1988, Douglas PUD entered into the Vernita Bar Settlement Agreement between and among Grant PUD, Public Utility District No. 1 of Chelan County (Chelan PUD), BPA, NMFS, WDFW, CCT, YN, the Confederated Tribes of the Umatilla Indian Reservation (CUR), and the Oregon Department of Fish and Wildlife (ODFW). The agreement resulted from extensive negotiations with the aforementioned agencies and tribes in an effort to protect salmon spawning on the Vernita Bar in the Columbia River downstream of the Priest Rapids Project. The agreement attempted to achieve an appropriate balance between power production and the protection of fall Chinook salmon by identifying certain minimum flows to be maintained below Priest Rapids Dam during adult spawning, incubation, and emergence. The term of the Vernita Bar Settlement Agreement was for the remainder of the initial license term for the Priest Rapids Project plus the term(s) of any annual license(s) issued thereafter.

The successor agreement to the Vernita Bar Settlement Agreement, the Hanford Reach Fall Chinook Protection Program Agreement, was submitted to the FERC by Grant PUD on April 19, 2004 and approved in April, 2008. The parties to this agreement include Grant PUD, Chelan PUD, Douglas PUD, NMFS, USFWS, WDFW, CCT, YN, and the BPA. The agreement is designed to extend until the end of the new license term for the Priest Rapids Project. It sets forth the obligations of the three PUDs and BPA related to protection of fall Chinook salmon spawning, rearing, and outmigration in the Hanford Reach of the mid-Columbia River. The Wells Project is the uppermost non-federal project participating in these agreements.

2.1.5.5 Mid-Columbia Hourly Coordination Agreement

In 1972, the owners of the seven dams of the mid-Columbia River system and their power purchasers entered into the Agreement for Hourly Coordination of Projects on the mid-Columbia River. The agreement calls for a coordinated operation of the seven dams.

The HCA was the result of discussions among all the affected parties. In general, the parties agreed to coordinate the operation of the projects to achieve the following objectives:

1. coordinate the hydraulic operation of the projects for the purpose of optimizing the amount of energy from the available water consistent with the need to: (1) adjust the total actual generation to match the total requested generation and (2) operate within all power and non-power requirements;
2. provide flexibility and coordinated scheduling of project generation through centralized scheduling, and the use of composite scheduling and accounting procedures;

3. minimize unnecessary changes in project generation to avoid frequent unit starts and stops; and
4. reduce the amount of fluctuation in river flow that could otherwise occur without such coordination.

A total of 17 northwest utilities receive a share of the output from the hydroelectric projects in the mid-Columbia system. The HCA requires that the power and non-power constraints of the individual projects be recognized in the coordination process. A goal of the HCA is to reduce the extent and rate of fluctuations in river levels as flow moves downstream from Grand Coulee to Chief Joseph Dam and from Chief Joseph Dam to Wells, Rocky Reach, Rock Island, Wanapum and Priest Rapids dams.

The HCA was originally signed for a one-year experimental period from July 1, 1972 to June 30, 1973. Twelve parties representing the federal government, the three mid-Columbia PUDs, and all of the PUD's power purchasers, at that time, signed the original agreement. Several one-year agreements were entered into until a 10-year contract was signed on July 1, 1977. At the end of that term, another 10-year contract was signed, extending the arrangement through June 30, 1997. In 1997, a new 20-year renewal agreement was signed extending the term of the agreement through November 1, 2017. Douglas PUD has executed the 1997 renewal agreement.

Each day, the non-federal Hourly Coordination participants provide an estimated schedule of desired generation from the lower five projects. The federal project operators provide an estimate of water expected to be discharged from Grand Coulee and Chief Joseph. Central River Control located in Ephrata, Washington, then determines an estimated operation schedule for the following day based on anticipated flows from the federal projects, reservoir levels, and load. Central River Control sends the schedule to each of the five lower projects. Each project then pre-schedules its operation, including hourly generation, for the following day based on Central River Control's estimated operation schedule.

During real-time operation, each non-federal project sends Central River Control an uncoordinated load request signal every four seconds. Based on the sum of these load requests, Central River Control's computer system determines the allocation of generation required to meet both load demand and non-power constraints for the system. Central River Control operators use power generation characteristics and reservoir target elevations to establish desired generation and discharges. For example, during reverse load factoring (RLF) operations at Priest Rapids Dam for compliance with the Hanford Reach Fall Chinook Protection Program, maximum and minimum power settings are used to limit flow during the day, and a target elevation is used to lower pool levels and increase flow at night.

More recently, Grand Coulee and Chief Joseph collectively have been providing much of the load-following responsibility for the entire federal system in the Pacific Northwest. The imposition of requirements to maintain turbine operations within the 1 percent of best efficiency range at all lower Columbia and Snake River dams and a 1-foot reservoir level fluctuation limitation for the federal projects on the lower Snake River, as required by the 2008 BO related to the operation of the Federal Columbia River Power System (FCRPS) (NMFS 2008), has limited the load-following capability of much of the federal power system. These requirements have resulted in an apparent shift of load-following to Grand Coulee and Chief Joseph, which tends to increase flow fluctuations and decrease flow predictability in the mid-Columbia River.

2.1.5.6 1997 Pacific Northwest Coordination Agreement

On April 7, 1997, Douglas PUD entered into the 1997 PNCA between and among numerous federal agencies and northwest utilities. Operations under this agreement began on August 1, 2003, and its term extends until September 15, 2024. The 1997 PNCA helps manage reservoir systems by maintaining the independence of each hydroelectric facility while achieving maximum beneficial use of the river. The various projects work cooperatively toward meeting overall load requirements by mutually supporting each other's operations. The 1997 PNCA maintains the efficient use of water by recognizing and integrating both non-power and power requirements as water travels downstream. The 1997 PNCA is a successor to the PNCA that Douglas PUD entered into in 1964.

2.1.5.7 Measures Related to the Two-Foot Pool Raise

On April 26, 1981, Douglas PUD filed an application for a license amendment to raise the elevation of the Wells Reservoir from 779 feet to 781 feet. On September 3, 1982, the FERC issued an order amending the license and added 10 license articles (Articles 49 through 58) as part of its order. These articles included measures to protect cultural resources and recreation facilities, improve wildlife management facilities, compensate the COE for lost generation of Chief Joseph Dam, and undertake various Project safety reviews.

2.1.5.8 Douglas PUD Land Use Policy

In 1993, Douglas PUD developed a detailed Land Use Policy to guide land management decisions and activities associated with lands owned by Douglas PUD, including Wells Project lands. The Land Use Policy was amended in December 2007 to incorporate administrative rules governing boat docks and piers, and again in February 2010 (Exhibit E; Appendix E-13).

Douglas PUD currently owns over 99 percent of the lands within the Project Boundary adjacent to the reservoir. The Land Use Policy was adopted to ensure the compatibility of public and commercial use of Project land (public land) with Wells Project operations, compliance with the FERC license articles, and federal and state laws. The Land Use Policy is also used to ensure that public access and recreation within the Wells Project take place in a safe and environmentally sound manner. In addition, the policy provides guidance for resolving conflicts with adjacent land owners if the policy is violated.

The Land Use Policy includes a permitting process where adjacent landowners are required to submit an application for a Douglas PUD Land Use Permit prior to submitting applications for local, state, federal, and tribal permits. Douglas PUD Land Use Permit applications go through a formal review and approval process before a permit is issued for private or commercial uses of land within the Wells Project Boundary. The following paragraphs illustrate Douglas PUD's land use permitting process.

First, a Land Use Permit Application, including a detailed project plan, is submitted to Douglas PUD. Douglas PUD's environmental staff conducts an environmental review of the application to evaluate consistency with Douglas PUD's Land Use Policy. If approved by Douglas PUD staff, the applicant will then acquire all other necessary permits from the appropriate regulatory agencies. The applicant must also arrange for a professional archaeological review of the site, if appropriate.

Douglas PUD will also request comments on the application from state, federal, and tribal fish and wildlife agencies including the WDFW, USFWS, NMFS, CCT and YN, according to the "Reservoir as Habitat" provision of the Wells HCP. Douglas PUD may conduct surveys of fish, botanical, and wildlife resources, to determine the level of impact.

After obtaining all necessary environmental permits from the reviewing regulatory agencies, Douglas PUD staff would review the permits for consistency with the Land Use Policy and, if deemed appropriate, provide a recommendation to Douglas PUD's Board of Commissioners for approval.

Douglas PUD's Land Use Policy applies to all Douglas PUD-owned lands, and is intended to continue to be in effect during the new license.

2.1.5.9 Current Historic Properties Management Plan

The Douglas PUD cultural resource management program is guided by a Memorandum of Agreement (MOA) with the DAHP to address the potential adverse effects of the Wells Project on historic and archaeological sites. Under the MOA, Douglas PUD identifies, evaluates and applies treatments to historic and archaeological sites within the

Wells Project area of potential effects (APE). The MOA also established protocols for triennial monitoring and treatment of human remains.

In 1981, the FERC's standard land use article was added to the Project license as Article 48. This article delegates authority to Douglas PUD to manage routine conveyances, leases and easements for non-project use of lands within the Wells APE. Section (e) of this article mandates consultation with the DAHP SHPO for certain activities permitted by Douglas PUD within the Wells APE.

In 2004, Article 60 was added to the Project license to ensure that potential impacts to cultural resources would be considered for ground-disturbing activities related to the Wells HCP. The article states that, prior to the commencement of any ground-disturbing activities at the Project or on non-federal lands pursuant to provisions in the HCP Tributary Conservation Plan, Douglas PUD shall consult with the SHPO and affected Indian tribes regarding potential impacts to cultural resources.

Under the MOA, archaeologists contracted by Douglas PUD conduct a cultural resource monitoring program within the APE every three years. Areas of erosion are also inspected for newly exposed sites. The results are summarized in written and photographic reports. The reports are sent to the SHPO and to the CCT for review and comment. The most recent monitoring survey was completed in 2008.

Future management of cultural resources under the new license will be implemented through the HPMP described in section 2.2.3.4.

2.1.5.10 Wells Wildlife Area Funding

On July 15, 1974, Douglas PUD entered into a wildlife mitigation agreement with WDFW (1974 Agreement) as a result of a FERC hearing involving wildlife mitigation for the Wells Project. The 1974 Agreement required Douglas PUD to transfer, in fee title, 5,715.8 acres of land to WDFW and to provide a lump-sum payment of $1,250,000 to establish the Wells Wildlife Area (WWA). The money was deposited by WDFW into a Special Wildlife Fund. The fund has paid for the operation of WWA since that time. On July 19, 1994, WDFW notified Douglas PUD that the fund did not contain adequate monies to ensure the continued operation of the WWA through the term of the Wells Project license. To ensure continued operation of the WWA, Douglas PUD and WDFW voluntarily entered into a MOA in which Douglas PUD began providing "Supplemental" funding of approximately $80,000 to $90,000 annually to augment the income from the Special Wildlife Fund.

The WWA is located in Douglas and Okanogan counties of Washington State and consists of six units—three shoreline/riparian units and three upland units. Bridgeport Bar (502 acres), Okanogan (100 acres), and Washburn Island (261 acres) are located along the shoreline of the Wells Reservoir and a portion of each unit lies within the Project Boundary. West Foster Creek (1,025 acres), Central Ferry (1,602 acres), and Indian Dan Canyon (4,716 acres) are upland units and are entirely outside the Wells Project Boundary. WDFW also leases 1,550 acres of land from the Washington Department of Natural Resources (WDNR). Management of the WDNR land and 180 acres of BLM land located within the Indian Dan Unit boundary are funded through this agreement.

WDFW's original management objective for the WWA was to develop habitat for game species and to release upland game birds, primarily ring-necked pheasants (*Phasianus colchicus*) with the goal of replacing hunting opportunities that were lost due to the original construction of the Wells Project. Over the years, WDFW's wildlife management directives evolved, at a state-wide level, from solely managing the mitigation lands for game species to providing hunting recreation (upland birds, waterfowl, and big game) to protecting both game and non-game species and their habitats, managing for species diversity, and providing consumptive (hunting) and non-consumptive (wildlife viewing) wildlife related recreation.

Funding of the WWA will continue through an Off-License Settlement Agreement between Douglas PUD and WDFW, dated December 10, 2007, described in section 2.2.3.7).

2.1.5.11 Recreation Action Planning

The Wells Project includes 17 recreation access facilities and use areas, including major parks, boat launches, fishing access sites, and access points along both shores of the Wells Reservoir and on the Methow and Okanogan rivers. Recreation facilities are described in detail in section 4.0 of Exhibit A.

Ongoing recreation needs within the Wells Project have been addressed through the Wells Recreation Action Planning process. The Wells Recreation Plan (1967), Wells Recreation Plan Supplement (1974), Public Use Plan (1982), and Recreation Action Plans (1987, 1992*b*, 1997*b*, 2002*a*, and 2007) were established as part of compliance with Article 44 of the original FERC license. The purpose of the Recreation Action Plan process is to identify, evaluate, and plan for the implementation of current or short-term recreation needs over the subsequent five-year period. This long-term and on-going planning and implementation process has helped in the development and maintenance of Wells Project recreation facilities.

2.1.5.12 Oil Spill Response Plan

Douglas PUD operates the Project in a manner that will minimize spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill, including oil. The Project Spill Prevention Control and Countermeasures Plan (SPCC) is used to implement the FERC requirements and recommendations as provided by Ecology.

Douglas PUD participates in the Columbia and Snake River Spill Response Initiative (CSR-SRI). The CSR-SRI is a collaborative effort made up of local, state, and federal oil spill response entities as well as members of industry and was developed to address the immediate need for oil spill preparedness and response in the area along the Columbia and Snake rivers.

2.2 APPLICANT'S PROPOSAL

Douglas PUD is not proposing any changes to the facilities or operation of the Wells Project during the term of the new license, other than the implementation of the proposed environmental measures described herein. Douglas PUD is proposing to carry forward all of the measures described in section 2.1.5, except 2.1.5.7 (Measures Related to the Two-Foot Pool Raise), 2.1.5.9 (Current Historic Properties Management Plan), 2.1.5.10 (Wells Wildlife Area Funding), and 2.1.5.11 (Recreation Action Planning). Future oil spill prevention and response measures are incorporated within the proposed Water Quality Management Plan (WQMP; Exhibit E; Appendix E-2).

2.2.1 Proposed New Project Facilities

Douglas PUD is not proposing any new generation facilities. Non-generating facilities proposed to be constructed during the term of the new license include: (1) Douglas PUD's participation in a white sturgeon hatchery and rearing facility; (2) new visitor interpretive displays, located within the Project Boundary but away from critical energy infrastructure; (3) major redesign and construction of new facilities and rehabilitation of aging infrastructure located at the Wells and Methow fish hatcheries, as directed by NMFS requirements for UCR spring Chinook salmon and UCR steelhead HGMPs; and (4) the construction of additional Project-related recreation facilities.

2.2.1.1 White Sturgeon Hatchery

The ASA for the Wells Project includes plans to implement a comprehensive White Sturgeon Management Plan (WSMP; Exhibit E; Appendix E-2). As part of the WSMP, Douglas PUD will supplement the white sturgeon population in the Wells Reservoir. In order to supplement the sturgeon population within the Wells Reservoir, Douglas PUD will participate in a regional white sturgeon hatchery.

2.2.1.2 Wells Dam Overlook Interpretive Displays

The Wells Dam Visitor Center, previously located inside the Wells Dam, has been closed to the public since 2001 due to security concerns. Douglas PUD is proposing to construct a new Visitor Interpretation Facility to be located on lands owned by Douglas PUD at the access point to the Wells Dam in the vicinity of the current Wells Dam Overlook. Exhibits to be provided at the new facility may include, but are not limited to, power generation, the history of Wells Dam, benefits of hydropower, fish and wildlife, and recreation. A live video feed of the Wells Project fish ladder will also be provided at the facility (Exhibit E; Appendix E-5).

2.2.1.3 Boat-in Tent Camping Facilities and Signage

The Recreation Needs Analysis (DTA 2008) identified a need to improve access for non-motorized boats. The study further identified potential opportunities for coordination with the Greater Columbia Water Trails (GCWT) Coalition so that non-motorized boating facilities would be consistent with other sections of the Columbia River.

To provide camping for non-motorized boat users, Douglas PUD will construct a formal tent camping facility within the Project Boundary, including restrooms, picnic shelter, and four designated tend pads. In addition, Douglas PUD will designate and provide basic improvements for an informal/rustic tent camping location on the west side of the river in the vicinity of Wells Dam. Douglas PUD will implement several measures to improve access for non-motorized boaters, including installing GCWT signs and informational material at appropriate Wells Project recreational access facilities; providing information on portaging around Wells Dam (Exhibit E; Appendix E-5).

2.2.1.4 Marina Park Expansion

The Recreation Needs Analysis (DTA 2008) indicates Marina Park in Bridgeport receives the most visitation of any location on the Wells Project. Marina Park is often filled to capacity during peak recreation season. To accommodate increasing use, Douglas PUD will expand Marina Park to include an additional 10 recreation vehicle (RV) spaces. The park will be expanded to the north along the river within Project Boundary. The expansion will include all facilities needed to accommodate recreation use associated with 10 additional RV spaces, including restroom facilities, lift stations, landscaping and access roads (Exhibit E; Appendix E-5).

2.2.1.5 Wells and Methow Hatchery Upgrades

Hatchery Genetic Management Plans (HGMPs) are used to address the take of ESA-listed species that may occur as a result of artificial propagation activities. The primary goal of an HGMP is to devise biologically-based artificial propagation management strategies that ensure the conservation and recovery of ESA listed stocks of salmon and steelhead. In 2010, new HGMPs, required by NMFS, were developed by the HCP Hatchery Committee for ESA-listed UCR spring Chinook salmon and UCR steelhead. These new HGMPs require substantial modifications and upgrades to the facilities and operations at the Methow and Wells fish hatcheries (Exhibit E; Appendix E-9).

2.2.1.6 Additional Recreational Facilities

The Chicken Creek Boat Launch is located on Washburn Pond within the Wells Project Boundary. Washburn Pond is hydraulically isolated from the Wells Reservoir. Lower pond levels on Washburn Pond are often observed in the fall season, and public access can be restricted due to the short length of the launch. Douglas PUD will place additional concrete planks at the end of the launch in order to extend the launch for improved access during the fall season.

For the term of the new license, Douglas PUD will continue to ensure the operation and maintenance of all of the Wells Project recreation facilities. Administration, operation, and maintenance activities will include, but are not limited to, maintaining parking areas, lawns, restrooms, lights, water, power, sewer/septic, playground equipment, shelters, and playfields.

2.2.2 Proposed Project Operations

Due to the interconnected nature of the seven-dam mid-Columbia River hydroelectric system, and in consideration of the numerous settlements and agreements already in place that will continue to affect the future operations of the Wells Project, Douglas PUD is not proposing any substantial change to the operations of the Project. In addition to the existing plans, settlements, and agreements included in the proposed action, Douglas PUD is also proposing to implement new measures for the protection and enhancement of the environmental resources found within the Wells Project. A detailed description of these measures can be found in section 2.2.3. The measures proposed include upgrades to the Wells and Methow hatcheries, implementation of the Wells HCP and Aquatic Settlement Agreement, Wildlife and Botanical, Avian Protection, Recreation and Historic Properties management plans, and Douglas PUD's Land Use Policy. The Aquatic Settlement Agreement and Wildlife and Botanical, Avian Protection, Recreation and Historic Properties management plans are being submitted to the FERC as part of the application for a new license for the Wells Project. The Aquatic Settlement Agreement and Wildlife and Botanical, Avian Protection, Recreation and Historic Properties management plans, to be implemented during the next license term, are not anticipated to result in any material changes in generation at the Wells Project.

2.2.3 Proposed New Environmental Measures

Douglas PUD proposes to implement the following new environmental protection, mitigation and enhancement measures at the Wells Project. These proposed measures are based upon Douglas PUD's assessment of the Project and consultation with conditioning agencies and stakeholders, and settlement agreements with agencies, tribes and other stakeholders, and are predicated upon Douglas PUD receiving a 50-year license term.

2.2.3.1 New HCP Measures

Since 2004, there have been new developments relevant to the Wells HCP that will require implementation of additional measures during the term of the new license. HGMPs for ESA-listed UCR spring Chinook and UCR steelhead are currently under development and are expected to require extensive modifications to the Wells and Methow hatcheries. The CCT have received approval for a new hatchery near Chief Joseph Dam (Chief Joseph Hatchery) that will produce summer/fall Chinook intended to enhance populations in the Okanogan and Columbia rivers (NWPPC 2009). The anticipated future construction of the Chief Joseph Hatchery will require additional mitigation for spring and summer/fall Chinook.

HGMPs are used to address the take of ESA-listed species that may occur as a result of artificial propagation activities. The primary goal of an HGMP is to devise biologically-based artificial propagation management strategies that ensure the conservation and recovery of listed ESUs. Information from HGMPs is used to evaluate impacts on ESA-listed anadromous salmon and steelhead, and inform issuance of ESA Section 10 ITPs for artificial propagation activities.

The Wells HCP, together with issued ITPs and HCP Hatchery Committee-approved HGMPs, will form the basis for the NNI hatchery programs for the Wells Project. The new HGMPs for ESA-listed UCR spring Chinook salmon and UCR steelhead are currently being developed in close consultation with NMFS and the HCP Hatchery Committee. The new HGMPs, when final, are expected to result in substantial modifications to the facilities and operations at the Methow and Wells hatcheries during the term of the new license. Appendix E-9 provides a detailed assessment of the potential effects associated with the implementation of the UCR spring Chinook HGMP.

2.2.3.2 Aquatic Settlement Agreement

On January 19, 2009, Douglas PUD executed a settlement agreement related to aquatic resources found within the Wells Project (Exhibit E; Appendix E-2). Entities that have signed the Aquatic Settlement Agreement include the WDFW, BLM, USFWS, Ecology, CCT, YN, and Douglas PUD (Aquatic Settlement Parties). The ASA is designed to address potential Project-related impacts to white sturgeon, bull trout, Pacific lamprey, resident fish, aquatic nuisance species, and water quality resources. The purpose of the agreement is to resolve all remaining aquatic resource issues related to compliance with all federal and state laws applicable to the issuance of a new operating license for the Wells Project.

The Aquatic Settlement Parties have agreed to support a 50-year term for the new operating license. The measures contained within the agreement will be implemented upon FERC's issuance of the new operating license. The measures are incorporated within six management plans, each of which is described below.

White Sturgeon Management Plan

The goal of the WSMP is to increase the white sturgeon population in the Wells Reservoir to a level that can be supported by the available habitat and characterized by a diverse age structure consisting of multiple cohorts (juvenile and adult). In addition, the WSMP is intended to support spawning, rearing, and migration as identified by the aquatic life designated use under Washington Administrative Code (WAC) 173-201A in the Washington State WQS. Based upon the available information, the Aquatic Settlement Work Group (SWG) determined that an assessment of Wells Project effects on white sturgeon was not practical given sturgeon life history characteristics and the limited number of fish estimated to exist in the Wells Project. Therefore, the Aquatic SWG concluded that resource measures related to white sturgeon should focus on population protection and enhancement by means of supplementation as an initial step in order to increase sturgeon numbers within the Wells Reservoir. In addition to the initial supplementation activities, implementation of a monitoring and evaluation program shall be conducted to assess natural recruitment, juvenile habitat use, emigration rates, Wells Project carrying capacity, and the potential for natural reproduction in order to inform the scope of a future, longer-term strategy. All objectives listed below were developed in order to meet the WSMP goal.

Objective 1: Supplement the white sturgeon population in order to address Wells Project effects, including impediments to migration and associated bottlenecks in spawning and recruitment.

Objective 2: Determine the effectiveness of the supplementation activities through a monitoring and evaluation program.

Objective 3: Determine the potential for natural reproduction in the Wells Reservoir in order to appropriately inform the scope of future supplementation activities.

Objective 4: Adaptively manage the supplementation program as warranted by the monitoring results.

Objective 5: Evaluate whether there is biological merit to providing safe and efficient adult upstream passage.

Objective 6: Identify white sturgeon educational opportunities that coincide with WSMP activities.

The WSMP is intended to be compatible with other white sturgeon management plans in the Columbia River mainstem. The implementation measures identified within the WSMP are designed for implementation in two phases based upon a proposed 50-year license term. Phase I of the PM&E measures will be implemented during the first 10 years of the new license and consist of supplementation and monitoring and evaluation activities. Results of Phase I PM&E measures will be used to inform the scope of continued measures during Phase II, which will be implemented for the remainder of the new license (Exhibit E; Appendix E-2).

Bull Trout Management Plan

The BTMP was developed by Douglas PUD and the federal, state and tribal entities who are parties to the ASA. The goal of the BTMP (Exhibit E; Appendix E-2) is to identify, monitor, and address impacts, if any, on bull trout resulting from the Project in a manner consistent with the USFWS Bull Trout Recovery Plan and the terms of the Section 7 Incidental Take Statement (ITS). This BTMP is intended to continue the implementation of management activities to protect bull trout during the new license term in a manner consistent with the original Bull Trout Monitoring and Management Plan (BTMMP) (Douglas PUD 2004). The 2004 BTMMP was developed in coordination with the USFWS, as required by the USFWS Bull Trout Section 7 BO in association with the FERC's approval of the Wells HCP. The PM&E measures presented within the BTMP are designed to meet the following objectives:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP.

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage.

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate the effectiveness of these measures.

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations.

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan including information exchange and genetic analysis. Should bull trout be delisted, the Aquatic SWG will re-evaluate the needs and objectives of the BTMP.

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult bull trout.

This BTMP is intended to be compatible with other bull trout management plans and the Upper Columbia Salmon Recovery Plan (UCSRP) in the Columbia River mainstem. Furthermore, this management plan is intended to be compatible with other management strategies of federal, state, and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington State WQS.

Pacific Lamprey Management Plan

The PLMP was developed by Douglas PUD and the federal, state and tribal entities who are parties to the ASA. The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Project during the term of the new license. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several Pacific lamprey PM&E measures in support of the PLMP. The PM&E measures presented within the PLMP are designed to meet the following objectives:

Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific lamprey.

Objective 2: Identify and address any Project-related impacts on downstream passage and survival and rearing of juvenile Pacific lamprey.

Objective 3: Participate in the development of regional Pacific lamprey conservation activities.

The PLMP is intended to be compatible with other Pacific lamprey management plans in the Columbia River mainstem. Furthermore, the PLMP is intended to be supportive of the Wells HCP, the critical research needs identified by the Columbia River Basin Technical Working Group, the Resident Fish Management Plan (RFMP), BTMP, and WSMP by continuing to monitor and address on-going impacts, if any, on Pacific lamprey resulting from Project operations. The PLMP is intended to be not inconsistent with other management strategies of federal, state, and tribal natural resource management agencies and supportive of designated uses for aquatic life under Washington State WQS found at WAC 173-201A.

Resident Fish Management Plan

The RFMP was developed by Douglas PUD and the federal, state and tribal entities who are parties to the ASA. The goal of the RFMP (Exhibit E; Appendix E-2) is to protect and enhance native resident fish populations and habitat in the Project during the term of the new license. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several resident fish PM&E measures in support of the RFMP. The PM&E measures presented within the RFMP are designed to meet the following objectives:

Objective 1: Continue to provide additional benefits to resident fishery resources in the Project as a result of continued implementation of the HCP, Predator Control Programs, and Land Use Policy activities.

Objective 2: In year 2 and every 10 years thereafter during the new license term, Douglas PUD will conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Project. The study objectives will focus on: (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species (ANS) management plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir. The results of this study may be used to inform the implementation activities of the other Wells aquatic resource management (ANS, bull trout, Pacific lamprey, and white sturgeon) plans and HCP predator control activities.

Objective 3: If any statistically significant adverse changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through implementation of other aquatic resource management plans or activities (white sturgeon, Pacific lamprey, bull trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas PUD.

Objective 4: In response to proposed major changes in Wells Dam operations requiring FERC approval, Douglas PUD will assess the potential effects, if any, on Project habitat functionally related to spawning, rearing, and migration of native resident fish, in order to make informed management decisions towards the success of the RFMP. Douglas PUD will implement reasonable and appropriate measures to address any effects on social, economic, and culturally important native species.

This RFMP is intended to be compatible with other resident fish management plans in the Columbia River mainstem. Furthermore, the RFMP is intended to be supportive of the Wells HCP, BTMP, PLMP, and WSMP by continuing to monitor changes in the resident fish assemblage within the Project. The RFMP is intended to be compatible with other management strategies of federal, state, and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington State WQS.

Aquatic Nuisance Species Management Plan

As part of the ASA, Douglas PUD is proposing to implement an Aquatic Nuisance Species Management Plan (ANSMP; Exhibit E; Appendix E-2). The ANSMP was developed by Douglas PUD and the federal, state and tribal entities who are parties to the ASA. The goal of the ANSMP is to prevent the introduction and/or spread of ANS in Wells Project waters. Objectives of the ANSMP include:

Objective 1: Implement best management practices to prevent Eurasian watermilfoil (*Myriophyllum spicatum*) proliferation during in-water (i.e., construction, maintenance and recreation improvements) improvement activities in the Project.

Objective 2: Continue participation in regional and state efforts to prevent the introduction and spread of aquatic nuisance species. Activities include continued monitoring for the presence of ANS, monitoring bycatch data collected during other aquatic management plan activities, and conducting education outreach within the Project.

Objective 3: In response to proposed changes in the Project requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, with respect to the introduction or proliferation of aquatic nuisance species in the Project to inform management decisions to support success of the ANSMP and will implement reasonable and appropriate measures to address potential effects.

The ANSMP is intended to be compatible with other aquatic nuisance species management plans in the Columbia River mainstem. In addition to protecting macroinvertebrate habitat and preventing the introduction of deleterious exotic species, the ANSMP will also maintain the existing native assemblages by providing information and educational outreach to the public and through the monitoring of all bycatch collected during other aquatic management plan activities. Douglas PUD will continue participating in state and regional coordination efforts to prevent the introduction and spread of aquatic invasive species that may threaten the diversity or abundance of native species, aquatic habitat, and the ecological stability in the Wells Project.

Water Quality Management Plan

To ensure that the Wells Project remains in compliance with the WQS over the length of the new license term, Douglas PUD proposes the implementation of a Water Quality Management Plan (Exhibit E; Appendix E-2). The implementation measures outlined in the WQMP are intended to be consistent with the conditions of Ecology's 401 WQC.

The goal of the WQMP is to protect the quality of the surface waters affected by the Wells Project. Studies conducted during the relicensing process have found water quality within the Wells Project to be within compliance. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement measures in support of the WQMP. Reasonable and feasible measures will be implemented in order to maintain compliance with the numeric criteria of the Washington State WQS, Chapter 173-201A WAC. The measures presented within the WQMP (section 4.0) are designed to meet the following objectives:

Objective 1: Maintain compliance with state WQS for TDG. If non-compliance is observed, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD.

Objective 2: Maintain compliance with state WQS for water temperature. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD.

Objective 3: Maintain compliance with state WQS for other numeric criteria. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD. Also, Douglas PUD will demonstrate whether it is in compliance with turbidity on the Okanogan River, and if not in compliance, work with the Aquatic SWG to identify appropriate implementation measures.

Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill.

Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin.

Measures contained within the WQMP include continued monitoring of a variety of water quality parameters to ensure that the Wells Project remains in compliance with the WQS over the new license term. Douglas PUD plans to continue to operate the Juvenile Bypass System (JBS) for anadromous salmonids as required by the Wells HCP. Operating the juvenile bypass system and spilling water in excess of project generation requirements can results in elevated levels of TDG requiring an Ecology-approved Gas Abatement Plan (GAP). Continued TDG monitoring is proposed at the Project in support of the GAP. Continued temperature monitoring within the Wells Project, including in Wells Dam fishways, is also proposed. Douglas PUD plans to operate the Wells Project in a manner that will minimize spill of hazardous materials, implement effective countermeasures in the event of a hazardous materials spill, and comply with and update the SPCC Plan as required. Participation in regional water quality forums such as the CSR-SRI and the development and implementation of the Columbia River temperature total maximum daily load (TMDL) are also proposed.

2.2.3.3 Wildlife and Botanical Management Plan

Douglas PUD, in coordination with federal, state and tribal entities, developed the Wildlife and Botanical Management Plan (WBMP; Exhibit E; Appendix E-3) to address the upland habitat concerns related to the relicensing of the Wells Project. The implementation of the WBMP during the term of a new license is expected to minimize or eliminate detrimental effects of the Project on upland habitats.

The goal of the WBMP is to protect, maintain, and enhance wildlife and habitat on Project lands commensurate with ongoing effects of operating the Wells Project. The plan is also intended to guide wildlife management activities and to protect RTE wildlife and plant species on Project lands during the term of the new license for the Wells Project. A detailed list of specific actions and schedule for implementation are included in the WBMP.

The objectives of the WBMP are:

Objective 1: Protect and enhance RTE wildlife species' habitat on Wells Project lands.

Objective 2: Protect RTE botanical species from land-disturbing activities and herbicide sprays.

Objective 3: Conserve habitat for species on Wells Project lands protected by the federal ESA, Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act.

Objective 4: Protect native habitat on Wells Project lands.

Objective 5: Maintain productive wildlife habitat on the Cassimer Bar Wildlife Management Area.

Objective 6: Control noxious weeds on Wells Project lands.

Objective 7: Consultation.

Additionally, the Douglas PUD Land Use Policy and proposed future monitoring activities will also serve to protect, maintain, and enhance upland habitats of the Wells Project.

2.2.3.4 Historic Properties Management Plan

The HPMP (Exhibit E; Appendix E-4) was developed to guide Douglas PUD in protecting historic properties within the Wells Project APE during the term of the new FERC license. The HPMP was developed by Douglas PUD in consultation with the Cultural RWG which included the Washington SHPO, THPO of the CCT, FERC, BLM, and BIA.

The purpose of the HPMP is to provide guidelines to Douglas PUD for managing historic properties affected by the operation and maintenance of the Wells Project and complying with the NHPA during the term of the new FERC license. The HPMP includes protocols for achieving NHPA compliance through protection of historic properties and consultation with the SHPO, THPO and other interested parties.

The HPMP will guide management of cultural resources within the Wells APE for the term of the new license. The HPMP contains provisions for: (1) coordination and consultation with the SHPO, THPO, FERC, and other parties as appropriate; (2) education and interpretation; (3) inadvertent discoveries and emergency situations; (4) management standards for monitoring and treatment of cultural resources; (5) curation and data management; and (6) periodic updates to accommodate for environmental and regulatory changes.

2.2.3.5 Recreation Management Plan

Douglas PUD has developed a Recreation Management Plan (RMP; Exhibit E; Appendix E-5) to address recreation resource issues related to the relicensing of the Wells Project.

The Wells Project provides substantial recreation opportunities and recreation benefits. The planned implementation of the RMP during the term of the new license will enhance these recreation benefits while also protecting wetland, riparian, and shallow-water habitats.

The goal of the RMP is to provide recreational opportunities at the Wells Project throughout the term of the new license in accordance with the relevant FERC requirements and the needs of the Project. This includes providing for current recreational uses and opportunities within the Project Boundary and identifying the need for any new measures or facilities to enhance recreational opportunity at the Project over the term of the new license. The RMP provides a comprehensive list of measures to enhance recreation uses and opportunities at the Wells Project. This plan also serves as the roadmap for operating, maintaining, updating, and improving the existing recreation facilities and a process for meeting recreation needs as they change over time.

Measures proposed within this plan are based on the recreational resources available at the Project as well as statewide and regional recreation use trends identified through studies conducted as part of the Wells ILP.

The goal of the RMP will be met through the implementation of two programs that encompass Douglas PUD's overall approach to managing recreation resources for the term of the new license: Recreation Facility Improvement Program, and Recreation Facility Operation, Maintenance and Monitoring Program.

Douglas PUD has entered into agreements with the cities of Pateros, Brewster and Bridgeport (Exhibit E; Appendix E-12). These agreements cover operation and maintenance of recreation facilities. Through these agreements, the cities have agreed to support Douglas PUD's application for a new 50-year license for the Wells Project.

2.2.3.6 Avian Protection Plan

Douglas PUD will also implement the Wells Project 230 kV Transmission Line Avian Protection Plan (APP; Exhibit E; Appendix E-6) to further address wildlife resource issues related to the relicensing of the Wells Project. The goal of the APP is to protect resident and migrant birds that interact with the Wells Project 230 kV transmission lines. Douglas PUD is committed to maintaining the reliability of the transmission lines in a cost-effective manner while meeting the regulatory requirements to conserve migratory species, special-status wildlife, raptors, and other avian wildlife.

Douglas PUD will implement the following practices and protocols under the APP:

- **Reporting Protocol**: All avian mortalities found in the transmission line corridor will be reported to the appropriate parties.

- **Nest Management Protocol**: Douglas PUD will implement a Nest Management Protocol in compliance with federal and state bird protection laws.
- **Tree Removal Protocol**: Tree removal as part of transmission corridor maintenance will only occur between August 31 and January 31 to protect migratory birds.
- **Training Protocol**: All appropriate utility personnel will be trained to evaluate avian issues when performing maintenance on the transmission lines and corridor.

2.2.3.7 WDFW Off-License Settlement Agreement

In December 2007, WDFW and Douglas PUD signed an Off-License Settlement Agreement (Exhibit E; Appendix E-11) that addresses WDFW's wildlife, wildlife habitat, botanical, resident fish, and resident fish habitat and potential lost resident fish harvest opportunities. While not intended to be included as a measure under the new FERC license, it complements the goals and objectives of the aquatics and terrestrial management plans, and is described here for informational purposes only.

The wildlife management goals of the Off-License Settlement Agreement include creating, protecting, maintaining and enhancing wildlife habitat within the WWA. The funding obligations of the agreement include Douglas PUD providing WDFW $200,000 annual funding for maintenance and operations of the WWA; up to $50,000 over the term of the agreement for habitat restoration after wildland fires on the WWA; and provisions for replacement of certain capital equipment used to meet the program goals. The Off-License Settlement Agreement also provides for the protection of RTE wildlife and botanical resources, noxious weeds management and wetland habitat protection on all six units of the WWA (including the three shoreline units that are partly or completely within the Wells Project Boundary).

The resident fish management goals include enhancing Resident Fish resources within Okanogan and Douglas counties by providing 20,000 pounds of rainbow trout equivalents to be stocked annually in Okanogan and Douglas counties for the enhancement of recreational fishing harvest opportunities. The fish for this program will be raised at the Wells Fish Hatchery, provided sufficient hatchery capacity exists after Wells HCP Plan Species hatchery needs are met, unless otherwise agreed.

Implementation of the Off-License Settlement Agreement will commence June 1, 2012.

2.2.3.8 Douglas PUD Land Use Policy

Douglas PUD will continue to implement the Land Use Policy (Exhibit E; Appendix E-13) to address land use issues under the new license. Continued implementation of the Land Use Policy is expected to address any future adverse effects.

The goal of the Douglas PUD Land Use Policy is to ensure that Project operations are in compliance with the FERC license and other federal and state regulations, including the protection of fish and wildlife habitat, protection of critical habitat for ESA-listed species, protection of significant historical, cultural and natural features, and compliance with existing settlement agreements including the Wells HCP, Aquatic Settlement Agreement and HPMP. In particular, the Wells HCP requires Douglas PUD to solicit comments on various land use permit applications from state, federal, and tribal fish and wildlife agencies including the WDFW, USFWS, NMFS, CCT and YN, according to the "Reservoir as Habitat" provision of the Wells HCP.

The Land Use Policy is Douglas PUD's decision-making process for issuing any land use permit for commercial and private use of Wells Project land and waters. An important feature of the Douglas PUD Land Use Policy is a prohibition on new docks and piers outside the city limits of Pateros, Brewster, and Bridgeport. This restriction is implemented to facilitate attainment of the Wells HCP's No-Net-Impact standard for Plan Species.

2.3 OTHER ALTERNATIVES

No other alternatives have been proposed or considered. The FERC staff may develop a staff-recommended alternative to the Applicant's proposal.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

2.4.1 Federal Government Takeover of the Project

16 U.S.C. § 828b provides that Section 14 of the FPA pertaining to the taking over by the United States of any project upon or after the expiration of a license shall not be applicable to any project owned by a state or municipality. Douglas PUD is a municipality as defined in Section 3(7) of the FPA, and therefore the Wells Project is not subject to federal takeover.

2.4.2 Issuing a Non-power License

The FERC may issue a non-power license if it finds that in conformity with a comprehensive plan for improving or developing a waterway a licensed project should no longer be used for power purposes. A non-power license is a temporary license which FERC would terminate whenever it determines that another governmental agency is authorized and willing to assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this time, no governmental agency has suggested a willingness or ability to assume such responsibilities. No party has sought a non-power license for the Wells Project and there is no evidence suggesting that such a license would conform to a comprehensive plan for the waterway. Therefore a non-power license was not considered a reasonable alternative to relicensing the Project.

2.4.3 Retiring the Project

Decommissioning of the Project could be accomplished with or without dam removal. Either alternative would require denying the relicensing application and surrender or termination of the existing license with appropriate conditions. There would be significant costs involved with decommissioning the Project and/or removing any Project facilities. The Project provides a viable, safe, and clean renewable source of power to the region. With decommissioning, the Project would no longer be authorized to generate power.

No party has suggested Project decommissioning would be appropriate in this case, and there is no basis for recommending it. Therefore, Project decommissioning was not considered a reasonable alternative to relicensing the Project with appropriate environmental enhancement measures.

3.0 ENVIRONMENTAL ANALYSIS

This section presents a general description of the environmental setting of the Columbia River basin, particularly that portion where the Project is located; a summary of the scope of the cumulative effects analysis; and an analysis of the resources affected by the operation of the Wells Project. The resource analysis is organized by resource area. The existing environment is the baseline against which the environmental effects of the proposed action and alternatives are assessed, including any potential cumulative effects of the proposed actions and alternatives.

3.1 GENERAL DESCRIPTION OF THE COLUMBIA RIVER BASIN AND WELLS PROJECT

The Columbia River is one of the largest rivers in North America and is the dominant water system in the Pacific Northwest region. The Columbia River basin is bounded principally by the Rocky Mountain system on the east and north, the Cascade Range on the west, and the Great Basin on the south.

The mainstem of the Columbia River originates in Columbia Lake on the west slope of the Rocky Mountain Range in Canada. After flowing a circuitous path for approximately 1,200 miles, 415 miles of which are in Canada, the Columbia River joins the Pacific Ocean near Astoria, Oregon. The Columbia River enters Washington State in its northeastern corner, along the state's border with British Columbia, Canada. Upon entering Washington, the Columbia flows south, then west into central Washington State, and then south again toward its confluence with the Snake River near Richland, Washington. The Columbia River then turns westward, forming the Washington-Oregon border for 320 miles before entering the Pacific Ocean.

Most of the annual precipitation in the Columbia River basin occurs in the winter months with the bulk of the precipitation falling as snow in the higher elevations of the Rocky and Cascade Mountains. Snowfall is heaviest between November and February. Natural winter stream flows are generally low with high-sustained runoff flows occurring in the spring and early summer. Roughly 60 percent of the natural runoff of the Columbia occurs during May, June, and July.

The Columbia River has an average annual runoff at its mouth of 198 million ac-ft or 275 kcfs (BPA et al. 2001) and drains an area of approximately 219,000 square miles of the U.S. including the states of Washington, Oregon, and Idaho, and the northwestern portion of Montana and small areas of Wyoming, Nevada, and Utah. An additional 39,500 square miles of the Columbia Basin, or about 15 percent, is contained within Canada, principally draining the southern portion of British Columbia (COE 2005). Within the U.S., the farthest upstream hydroelectric project on the mainstem Columbia River system is Grand Coulee Dam located at river mile (RM) 596.6. Grand Coulee Dam is federally owned and operated by the Bureau of Reclamation (BOR). It has extensive storage capacity (5.22 million ac-ft) and has the largest installed capacity of any dam on the Columbia River with a nameplate capacity of 6,809 MW, making it a significant point-of-control for regulating flows and project operations throughout the entire downstream Columbia River system. Coordinated water releases from Grand Coulee Dam arrive first at Chief Joseph Dam which is federally owned and operated by the COE. Chief Joseph Dam (RM 545.1) is a run-of-river project, i.e., a project with limited storage capacity. It has a nameplate generation capacity of 2,069 MW.

From Chief Joseph Dam, the next five downstream dams are owned and operated by the Public Utility Districts (PUDs) and are all run-of-river dams. At RM 515.6, Wells Dam is owned and operated by Douglas PUD and has a nameplate capacity of 774.3 MW. The next two projects are Chelan PUD's Rocky Reach and Rock Island dams, which are located at RM 473.7 and RM 453.4, and have nameplate capacities of 865.8 MW and 623.2 MW, respectively. The next two dams are Grant PUD's Wanapum (RM 415.8) and Priest Rapids (RM 397.1) dams, which have nameplate capacities of 1,038 MW and 855 MW, respectively.

Below Priest Rapids Dam, the Columbia River joins with the Snake River before flowing west through the four Lower Columbia River projects to the Pacific Ocean. These COE owned and operated run-of-river projects are McNary (RM 292, nameplate capacity 980 MW), John Day (RM 215.6, nameplate capacity 2,160 MW), The Dalles (RM 191.5, nameplate capacity 1,779.8 MW), and Bonneville (RM 146.1, nameplate capacity 1,050 MW) dams.

In order to accommodate all of the authorized purposes of the Columbia River system and those contemplated in the Columbia River Treaty between the U.S. and Canada, a number of agreements, such as the PNCA, have been enacted. The PNCA established processes that coordinate the use of planned Canadian storage operations with federal and non-federal hydroelectric projects and thermal generation operations in the Pacific Northwest. This enables the region's power producers to optimize dependable power production (referred to as "firm load carrying capability") and usable secondary energy consistent with individual project and "system" non-power objectives to serve multiple river uses. The PNCA was revised in 1997 and extended through 2024.

Spurred by the development of the Third Powerhouse at Grand Coulee Dam, the owners, operators and purchasers of power from the seven dams that include both federal (Grand Coulee and Chief Joseph) and non-federal (Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids) dams of the mid-Columbia River entered into a series of operating agreements since 1972. These agreements are intended to mitigate the potential adverse impacts of federal peaking operations on the downstream non-federal dams and achieve power and non-power benefits through the coordinated operation of the seven projects. The primary objective of the current Mid-Columbia HCA, signed in 1997, is to coordinate the hydraulic operation of the projects to optimize the amount of energy from the available water consistent with each individual project's power and non-power needs while meeting all power and non-power requirements of the system as a whole. The other stated objectives of the agreement are to provide ease and flexibility of generation scheduling and to minimize unnecessary generation changes, which would otherwise result in frequent generator starts and stops.

The Wells Project Boundary encompasses lands and waters necessary for the construction, operation, and maintenance of the Project, and for other Project-related purposes (Figure 1.0-1). Detailed maps of Project features, including the Project Boundary, are found in Exhibit G of this application. Douglas PUD owns 2,649 of the 2,664 acres of land within the Wells Project Boundary or over 99% of the land adjacent to the Wells Reservoir. Lands within the Wells Project Boundary include shrub steppe, irrigated agriculture, wildlife habitat, such as the WWA, and recreation lands, including parks in Pateros, Brewster, and Bridgeport.

Within the Wells Project Boundary, there are small, scattered parcels of federal land. The DOI administers the majority of federal lands within the Project Boundary. Other tracts within the Project Boundary are administered by the COE. There are no National Park Service (NPS), U.S. Forest Service (USFS) or USFWS lands within the Wells Project Boundary.

The PAD (Douglas PUD 2006) includes a thorough review of existing information about the Wells Project, including 12 baseline studies conducted in anticipation of relicensing. The PAD also provides a thorough review of relevant Project information available prior to the start of relicensing, including: license articles; Project history and operations;

monitoring activities; geography, geology and soils; water resources, water uses, and water quality; biotic resources; land uses, demographics, recreation and socioeconomics; historic properties and cultural resources; the Wells HCP; and PM&Es implemented during the current license term. The PAD is incorporated by reference into this license application, and should be referred to for detailed descriptions of baseline conditions at the Project.

The Wells Project lies in a north-south trending valley in north central Washington between two significantly different physiographic areas: the North Cascade Mountains to the west and the Columbia Plateau to the east. The North Cascade Mountains are characterized by rugged peaks averaging approximately 5,000 feet and reaching elevations of over 10,000 feet. The Wells Project lies in a relatively narrow valley and is joined by three tributaries and a multitude of large, but dry, side canyons. The major tributaries to the Columbia River within the Wells Project are the Methow and Okanogan rivers. Foster Creek is a tributary outside the Wells Project Boundary but is within the Wells Project area.

The Wells Project consists of a single dam and reservoir. The design of Wells Dam is unique to the Columbia River with the generating units, spillways, switchyard, and fish passage facilities combined into a single concrete structure referred to as the hydrocombine. Earth embankments extend from the hydrocombine to the west and east abutments. Fish passage facilities are located on both ends of the hydrocombine structure. The hydrocombine itself is 1,130 feet long and 168 feet wide with a crest elevation at 795 feet above MSL. Its design includes a series of 11 spillway bays and 10 separate generating units. The generating units are isolated in individual silo-like structures and were designed so that the spaces between the units serve as spillway bays. The turbine water passages are located below the spillway bays.

Wells Reservoir extends from Wells Dam upriver 29.5 miles to the tailrace of the Chief Joseph Dam. The Wells Reservoir has 108 miles of shoreline and a surface area of 9,740 acres at the normal reservoir elevation of 781 feet. The Wells Reservoir is between 1,300 and 8,000 feet wide, with an average width of 2,700 feet, and contains a total storage volume of 331,200 ac-ft with 97,985 ac-ft of usable storage within its 10-foot operating range. The Wells Reservoir also extends 1.5 miles and 15.5 miles up the Methow and Okanogan rivers, respectively. The Wells Project drains an area of 85,300 square miles and has an annual average runoff of 82 million ac-ft.

The Methow River enters the Columbia River at RM 523.9 near the city of Pateros, Washington, approximately 8.3 miles upstream of Wells Dam. The Methow River has a watershed of 1,791 square miles. The northern portions of the Methow Basin are located in the Pasayten Wilderness and the Okanogan National Forest. The western portion of the basin is formed by the North Cascade Mountains with the middle and lower portions of the river basin defined by a U-shaped, moderately-confined, alluvial valley. Elevations range from 781 feet at the river mouth to just under 9,000 feet at the highest upper watershed peaks. Principal tributary watersheds are the 245-square-mile Twisp River watershed and the 525-square-mile Chewuch River watershed. Annual precipitation in the Methow River basin ranges from 15 to 80 inches per year.

The Okanogan River originates near Armstrong, British Columbia and flows south through a series of lakes entering the Columbia River at RM 533.3, approximately 17.7 miles upstream of Wells Dam. The Okanogan River watershed covers an area of approximately 8,200 square miles, 2,342 square miles (29 percent) of which is located in the U.S. The northern portion of the watershed is in the Okanogan Highlands of the U.S. and Canada. The southern part of the basin, near the river mouth, is in the northwest corner of the Columbia Plateau. Elevations range from 781 feet at the river mouth to over 8,400 feet at the highest upper watershed peaks. The principal tributary of the Okanogan River is the Similkameen River which accounts for approximately one-half of the drainage area of the entire Okanogan watershed. Annual precipitation in the Canadian portion of the Okanogan Basin ranges from 30 to 40 inches and from 10 to 15 inches in the U.S. portion of the basin.

Annual precipitation in portions of the North Cascades is over 100 inches and heavy snow accumulations are common. This contrasts with the Columbia Plateau which is characterized by desert and shrub steppe conditions, averaging approximately 10 inches of precipitation a year. Eastern Washington, including the Project area, is characterized by a continental climate, and occurs within a large inland basin between the Cascade and Rocky Mountains. In an easterly and northerly direction, the Rocky Mountains shield the Project area from the winter season's cold air masses traveling southward across Canada. In a westerly direction, the Cascade Range forms a barrier to the easterly movement of moist and comparatively mild air in winter and cool air in summer. Most of the air masses and weather systems crossing eastern Washington are traveling under the influence of the prevailing westerly winds. Infrequently, dry continental air masses enter the inland basin from the north or east. In the summer season, this air from over the continent results in low relative humidity and high temperatures, while in winter clear, cold weather prevails. Extremes in both summer and winter temperatures generally occur when the area is under the influence of air from over the continent. During July and August, it is not unusual for four to eight weeks to pass with few to no scattered showers (NOAA 1985).

Upland areas that have not been converted by human activities are dominated by shrub steppe habitat. Dominant land uses include irrigated and dry-land agriculture, residential, and small towns. The human environment is rural in character and agriculturally based. The combined populations of the three towns in the immediate Project area total less than 5,000; much of the human population in the Project vicinity live in rural, unincorporated areas. The nearest metropolitan center, Wenatchee, is 45 miles southwest of Wells Dam.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council for Environmental Quality regulations implementing the NEPA (40 CFR § 1508.7), cumulative effects are defined as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably-foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. Such actions can include hydropower, as well as other land and water development activities.

An analysis of the cumulative effects of the proposed action and alternatives with regard to other existing and foreseeable hydroelectric development and non-hydroelectric activities in the Columbia River basin was undertaken. Based on the information in the PAD, agency comments, other filings related to the Project, and preliminary staff analysis, the FERC identified water quality and migratory fish as resources that could be cumulatively affected by the continued operation and maintenance of the Wells Project.

The operation of the Wells Project and other mainstem Columbia River dams can influence water quality conditions and fisheries resources in the mid-Columbia River. During periods of high flows, spillway releases at these dams can increase TDG levels throughout the river. Additionally, impoundment of water behind the dams and fluctuating reservoir levels and Project releases may influence water temperatures, dissolved oxygen (DO) levels, pH, and turbidity within the basin. In regard to migrating fish species, the dams inhibit upstream and downstream fish movements and alter spawning and rearing habitat within the mainstem Columbia River. Other factors that may cumulatively affect aquatic resources in the basin include non-native fish, macroinvertebrate and plant introductions, human development and recreation activities, agricultural practices, timber harvest, and mining operations.

3.2.1 Geographic Scope

The geographic scope of analysis for identified cumulatively affected resources is defined by the physical limits or boundaries of: (1) the proposed action's effect on the resources, and (2) contributing effects from other hydropower and non-hydropower activities within the Columbia River basin. Because the proposed action can affect resources differently, the geographic scope for each resource may vary.

The geographic scope of analysis for cumulative effects on aquatic resources encompasses the Columbia River from the tailrace of the Chief Joseph Project to the downstream end of the Wells Project tailrace (i.e., the beginning of the Rocky Reach Project reservoir); and includes inundated portions of tributaries to the Wells Reservoir, such as the lower Methow and Okanogan rivers.

3.2.2 Temporal Scope

The temporal scope of the cumulative effects analysis includes a discussion of past, present, and future actions and their effects on each cumulatively affected resource. Based on the Applicant's requested term of a new license, the temporal scope looks 50 years into the future, and concentrates on the effect to the resources from reasonably-foreseeable future actions. The historical discussion is limited to the amount of available information for each resource.

3.3 PROPOSED ACTION AND ALTERNATIVES

In this section, the effects of the Proposed Action on environmental resources are discussed. For each resource, the affected environment, which is the existing condition and baseline against which effects are measured, is described. The specific environmental impacts of the Proposed Action are then discussed and analyzed.

3.3.1 Geologic and Soil Resources

The Wells Project lies in a north-south trending valley between two significantly-different physiographic areas: the North Cascade Mountains to the west and the Columbia Plateau to the east. The North Cascade Mountains are characterized by rugged peaks averaging approximately 5,000 feet and reaching elevations of over 10,000 feet. Annual precipitation in the North Cascades is over 100 inches and heavy snow accumulations are common. The Columbia Plateau is characterized by desert and shrub steppe conditions, averaging approximately 10 inches of precipitation a year. The Columbia River in the area of the Wells Project lies in a relatively-narrow valley and is joined by two tributaries and a multitude of large, but dry, side canyons. The major tributaries to the Columbia River within the Wells Project Boundary are the Methow and Okanogan rivers.

The Wells Reservoir extends from Wells Dam upriver 29.5 miles to the tailrace of the Chief Joseph Dam. The Wells Reservoir has 108 miles of shoreline and a surface area of 9,740 acres at the normal maximum reservoir elevation of 781 feet. Ponds, with Washburn Pond being the largest, located within the Project Boundary but isolated from the reservoir, bring the total shoreline to 123 miles. The Wells Reservoir is between 1,300 and 8,000 feet wide, with an average width of 2,700 feet, and contains a total storage volume of 331,200 ac-ft with 97,985 ac-ft of usable storage within its 10-foot operating range. The Wells Reservoir also extends 1.5 miles and 15.5 miles up the Methow and Okanogan rivers, respectively.

3.3.1.1 Geologic Resources

Affected Environment

The Columbia River canyon between Wenatchee and Bridgeport separates two distinct physiographic provinces. North and west of the river rugged mountainous highlands prevail; south and east is a vast plateau with small undulating hills and occasional shallow, steep-walled valleys. The mountainous areas north and west of the Columbia River are underlain primarily by a variety of structurally-complex, pre-Tertiary crystalline rocks. The Columbia Plateau surface, on the other hand, is controlled by the wide-spread Miocene basalt flows. Although commonly mantled by relatively-thick Quaternary loessial soils and morainal deposits, the plateau topography reflects the structure of the underlying basalt.

The Pleistocene was a time of repeated glaciation along the Columbia Plateau boundary. The entire Wells Project area was buried under a thick sheet of glacial ice on several occasions during approximately the past two million years. These Pleistocene-age ice sheets developed in Canada and flowed southward across the Columbia Plateau as far south as the Waterville area. At the glacial maximum, more than 2,000 feet of ice existed on top of the Wells Project area, extending higher than the valley walls and blocking the flow of all major rivers.

Both continental and alpine glaciers contributed to the glaciated terrain along the Columbia River canyon northeast of Chelan Falls and on the adjacent Waterville Plateau. Erosional and constructional glacial landforms are present; most notable is the morainal topography on the Waterville Plateau and along the south wall of the Columbia River canyon near Chelan. The Columbia Plateau boundary area is characterized by a relatively-simple sequence of stratigraphic units. These include: (1) a pre-Tertiary basement complex composed of a variety of igneous and high-grade metamorphic rocks; (2) the Wenatchee Formation, a sequence of early Oligocene continental clastic rocks that overlie the crystalline basement complex; (3) the middle Miocene Lower Yakima Basalt and interbedded continental sediments that lie above the Wenatchee and older formations; and (4) a variety of Quaternary glacial, fluvial, eolian, and landslide deposits.

Glacial deposits, lake sediments, and river terraces associated with the waning glaciation cover the bedrock in much of the Wells Project area. These glacial, lacustrine, and alluvial deposits form much of the valley floor of the Wells Reservoir area, as well as the floor of the Methow River and Okanogan River valleys. The valley floor is about 4,000 feet wide at the location of Wells Dam.

The east side (left bank) of the valley consists of a series of narrow terraces. The west side (right bank) consists of a terrace at elevation 720 feet that is about 2,000 feet wide, followed by a 2,000-foot-wide terrace extending from elevation 750 to 775 feet, where it meets a steep bedrock face that serves as the west abutment for Wells Dam. The valley bottom continues with another glacial-age terrace at an elevation of 880 feet and another at 1,200 feet that meets the bedrock west valley wall. An elongated north-south trending body of granitic rock crops out on the right (west) abutment.

Prior to construction, the active river channel flowed in the east side of the valley where the east embankment is now located. A gently rising flood plain at average elevation 718 feet occurred west of this active river channel. This flood plain was about 1,000 feet wide. The combined spillway and powerhouse ("hydrocombine") was located on this flood plain encroaching somewhat into the active river channel. Beyond this flood plain and a steep rock face, against which the right side of the dam abuts, was a broad 2,000-foot-wide terrace, which rose gradually westward from elevation 755 feet to elevation 775 feet. West of the right abutment rock is a second terrace at about elevation 890 feet which is terminated at its western end by another steep rock face. This is the ancestral channel of the Columbia River and bedrock was found at a lower elevation than beneath the present river channel. Beyond the steep cliff west of the ancestral channel are other approximately parallel rock cliffs and isolated rock masses.

Outcrops of gray granitic rock, composed of medium-size crystals of quartz and feldspar, occur at the dam site. The rock contains hornblende and mica as the principal accessory minerals. It also includes pyrite mineralization, a few inclusions, and faint indications of gneissoid texture. A dark-colored, basic igneous dike rock intrudes the granitic rock. The dike rock has a dense, finely crystalline texture and contains occasional, small phenocrysts of possible calcite. Both rock types are generally unweathered, sound and hard, although weathered rock was encountered in some core holes. Thin, infrequent basic igneous dikes intrude the granite. Well-developed joints give this outcrop a blocky appearance. The joint surfaces are clean and relatively tight. Mechanical weathering processes have opened a few of the near vertical joints. Slickensides occur on some fractures. The outcrop remains intact as most fractures have been reheated. Many small talus piles consisting of blocks with an average length of 3 feet have collected at the base of the outcrop. Well-developed joints occur in several directions and are the most prominent structural feature of the exposed rock.

There are no known major fault zones in or near the Wells Project (Jacobs 2009). Project seismicity was thoroughly reviewed as part of the FERC Potential Failure Mode Assessment (PFMA) in 2009 and seismic risk was considered low (Category III). No geologic hazards of significance, such as the potential for major landslides or land movements, have been identified. The Project continues to be periodically assessed for seismic and other geologic hazards through the required Part 12 inspections under FERC authority.

Environmental Effects

Douglas PUD proposes to continue operating the Wells Project in a run-of-river mode to generate power. The impoundment level would continue to fluctuate in order to utilize the available storage for power generation and for purposes of coordination with upstream and downstream hydroelectric facilities. Douglas PUD is not proposing any changes to Project operations. No new or on-going Project effects on geologic resources were identified during relicensing studies.

Unavoidable Adverse Impacts

The Wells Project has no known unavoidable adverse effects on geologic resources.

3.3.1.2 Soil Resources

Affected Environment

Soil types in the Wells Project area are variable and reflect a diversity of parent materials and slope conditions that surround the Wells Reservoir. All of the surface soils are relatively youthful, having formed after deglaciation about 13,000 years ago. The local soil units are developed in a variety of glacial and alluvial deposits, in weathered bedrock and in slope deposits (colluvium). Along the river terraces in the Wells Project area, well-drained soils have formed in deposits of loess, which is a mixture of wind-blown silt and fine sand. Soils have also formed in volcanic ash deposits and ancient lake bottom sediments (NMFS 2002*a*).

Dam Site and Reservoir

The site for Wells Dam was selected because of the presence of bedrock on either side of the valley. Prior to construction, the river channel was 700 feet wide located against the east valley wall (Galster 1989; NMFS 2002*a*). The east side of the dam is an embankment 1,030 feet long, with underlying glacial and alluvial sediments that rest on granitic bedrock. The west side of the dam is an embankment 2,300 feet long, with underlying layers of glacial and alluvial sediments as thick as 200 feet to granitic bedrock. The concrete portions of the dam (spillway, powerhouse, and fish ladders) are constructed on an irregular surface of granitic bedrock that is cut by north-trending igneous dikes. The dam site and reservoir valley floor are underlain by a sequence of glacial and fluvial deposits consisting of gravel and sand with local cobble and boulder units, and silty, sandy gravel with lenses of fine sand and silt (lacustrine) deposits (Galster 1989; NMFS 2002*a*).

Dominant soil types at the Wells Dam site includes the Peoh soil series, formed in old alluvium with a surface layer of loess and volcanic ash; and the Cashmont soil series, formed in alluvial and colluvial materials. The Peoh soils are a gravelly, fine, sandy loam with slopes of 3 to 15 percent on the river terraces. They have moderately rapid permeability, slow to moderate runoff potential, and a water erosion susceptibility of slight to none. The Cashmont soils are a sandy loam with slopes of 3 to 8 percent at the edges of the terraces and near the valley walls. They have moderately rapid permeability, slow to medium runoff potential, slight to moderate water erosion susceptibility, and slight to moderate wind erosion potential (NMFS 2002*a*).

Methow River

The Methow River is located in a fault-bounded graben underlain with highly-folded sedimentary and volcanic rocks of Tertiary age (NMFS 2002*a*). The Methow valley lies between the Gardner Mountain Fault and the Pasayten Fault. The sedimentary rocks within the graben weather easily compared to the older igneous and metamorphic rocks and are typically covered by a thick section of glacial and alluvial deposits. The lower Methow River occurs within hills underlain by igneous and metamorphic rocks. The Methow River occupies a U-shaped, confined alluvial valley from near Carlton to RM 6.5 and a U-shaped, moderately confined alluvial valley from RM 6.5 to the mouth.

The terraces of the Methow valley have Pogue-Cashmont-Cashmere soils downstream of the town of Carlton. These soils formed in glacial deposits at elevations from 700 to 1,050 feet. They are typically deep, somewhat excessively drained or well drained with moderately rapid permeability. Their runoff potential is slow on low-gradient slopes and medium to rapid on steep slopes. Water erosion susceptibility is none to slight on low-gradient slopes and moderate to high on steep slopes. The Cashmont and Cashmere soils have moderate wind erosion potential. Surface erosion is not considered a major issue in the Methow basin (NMFS 2002*a*).

Okanogan River

The Okanogan River valley is a part of the Colville complex of granitic and metamorphic rocks. The Omak Lake Fault runs up the Okanogan valley. West of the fault is a mix of igneous plutons, gneiss, and metamorphosed deep ocean sediments of the Okanogan trench deposit. The Okanogan valley has a thick deposit of glacial deposits that covers the bedrock in most areas. The entire Okanogan valley, in the Wells Project area, was modified by glaciation. This area has steep to rolling hills along the valley walls, with flat to moderate slopes on ancient terraces and along the valley bottoms (NMFS 2002*a*). On the terraces, ridges, hillsides and glacial till plains, the common Okanogan Basin soils include the Nighthawk-Conconully-Lithic Xerochrepts and Disautel-Conconully-Nespelem associations. These are deep to very shallow soils formed on grasslands, rock outcrops, terraces, and dissected upland plains (NMFS 2002*a*).

The Nighthawk-Conconully-Lithic Xerochrepts association soils formed in glacial deposits and weathered granite. Most of the association soils are on ridges and hillsides. The ridges are gently rounded and the hillsides are steep. They have moderate to moderately rapid permeability, and their runoff potential is slow to rapid on low-gradient slopes and rapid to very rapid on steep slopes. Their susceptibility to water erosion is slight to high on low-gradient slopes and high to very high on steep slopes. Nighthawk-Conconully-Lithic Xerochrepts soils occur at elevations from 700 to 3,000 feet. Common soil associations along the valley bottoms of the Okanogan River and tributaries include the Pogue-Cashmont-Cashmere and Colville-Okanogan associations. These are deep, mostly grassland and meadow soils on terraces and floodplains. The terraces along the valleys consist of Pogue-Cashmont-Cashmere association soils as described for the Methow Basin. The Colville-Okanogan association soils are found along the valley bottom floodplains that are subject to flooding. They are deep, somewhat poorly-drained or well-drained soils formed in alluvium. They have moderately slow to moderate permeability, and their runoff potential is very slow. Their susceptibility to water erosion is none to slight. These soils occur at elevations from 700 to 2,000 feet.

Much of the floodplain on the Okanogan is used for crops and wintering livestock; during the summer, livestock graze the uplands. Some of the tributaries support year-round ranching. High runoff and erosion rates deliver sediment to ditches and creeks during rainstorms and periods of rapid snowmelt.

Surface erosion on bottom lands and mass wasting on adjacent hill slopes were serious problems in the 1970s, when clean cultivation and rill irrigation were common in the basin. This erosion source has been reduced somewhat by a switch to alfalfa (*Medicago sativa*) and seed production and by adoption of Best Management Practices (BMPs).

Environmental Effects

Shoreline conditions vary throughout Wells Reservoir. The majority of shoreline is stable and vegetated; while other areas have varying degrees of erosion ranging from active, nearly stabilized, to exposed bedrock and riprap. Varying amounts of erosion of the Wells Reservoir banks have occurred along the reservoir perimeter since the Wells Project was constructed. The greatest amount of erosion has occurred along the left bank (looking downstream) of the Columbia River between Pateros and Wells Dam, on the left bank downstream from the Brewster Bridge, on the right bank downstream from the mouth of the Okanogan River and along the banks of the lower Okanogan River (Bechtel 1970). As part of activities associated with protection of cultural resources, monitoring of erosion conditions on the reservoir has occurred every three years since 1989. No major land mass movements have occurred. Since 1980, steps have been taken to protect 15 cultural resource sites from damage due to erosion (Douglas PUD 2006).

Erosion is an ongoing natural process, making the influence of the Wells Project difficult to determine. However, ongoing Wells Project operations may have modified the rate and location of shoreline erosion. Most of the shorelines along the Wells Project appear to be stable and any ongoing erosion appears to be progressing relatively slowly. Most eroding areas are gaining moderate protection from riparian vegetation and natural armoring by cobbles along the toe of eroding faces. Additionally, the relatively-stable Wells Reservoir elevation and slower velocities may reduce the erosion influences of natural run-off in the Project and of discharge from the upstream Chief Joseph Project.

The lower Okanogan River both within and upstream of the limits of Wells Reservoir has experienced erosion and attempts to control it with hardened surfaces have been successful. The banks are composed of fine alluvial material which is easily eroded by wave and current action, making the formation of a stable beach a difficult and sometimes lengthy process. Erosion along the Okanogan River, as is customary for alluvial streams, occurs primarily as a result of flood flows when tractive forces exceed the shear forces necessary to begin to mobilize the alluvial deposits.

Douglas PUD has studied reservoir erosion in the lower Okanogan River (Jacobs 2003) and has evaluated the extent of erosion over the next 50 years throughout the Wells Reservoir. Douglas PUD has addressed erosion issues on a case-by-case basis through a combination of shoreline erosion protection methods or through acquisition of the affected property.

During the initial issues scoping process, the Terrestrial RWG reviewed existing information and conducted a shoreline tour of the Project to inspect areas of active erosion. The Terrestrial RWG determined that erosion effects were minor, and did not require further study or measures to mitigate environmental effects of erosion (Douglas PUD 2006). Furthermore, measures to control shoreline erosion, such as placing hardened surfaces, can be detrimental to habitat utilized by ESA-listed salmon, steelhead and bull trout, and are generally not supported by fish and wildlife management agencies.

Douglas PUD conducted bathymetric surveys of the reservoir including comparing recent river data to historic river bed levels prior to dam construction. A comparison of this data indicates that sediment accumulation has not been significant over the last 50 years (ENSR 1997). This may be due, in part, to the sediment capture of Lake Roosevelt (formed by Grand Coulee Dam), and the run-of-river attributes of the Wells Reservoir where storage is limited and water velocities are closely tied to rates of inflow. Additionally, in 2006 Douglas PUD conducted a specific analysis to assess sediment accumulation within the Project portion of the Okanogan River. Detailed bathymetric data was obtained at nine transects which were at the same locations as those collected in 1997. A comparison of these transects indicate that sediment is not accumulating in the Project portion of the Okanogan River (Exhibit E; Appendix E-2).

Douglas PUD proposes to continue operating the Wells Project in a run-of-river mode to generate power. The impoundment level would continue to fluctuate as it has historically. Douglas PUD is not proposing to change Project operations; therefore, there are no new environmental effects on soil resources to analyze under the Applicant's proposal. However, any soil-disturbing or dredging activities conducted under existing operations may result in some temporary and localized erosion, which can be mitigated through the use of BMPs.

Unavoidable Adverse Impacts

The Wells Project has no known unavoidable adverse effects to soil resources.

3.3.2 Aquatic Resources

3.3.2.1 Water Quantity and Quality

Affected Environment

The drainage area of the Columbia River upstream of the Wells Project is approximately 85,300 square miles. The Wells Dam is located at RM 515.6 on the Columbia River in north central Washington State. The Wells Project Boundary encompasses 29.5 miles of the mainstem Columbia River extending upstream to the tailrace of the Chief Joseph Project at RM 545.1. The Wells Reservoir has riverine characteristics in the uppermost 5-mile section located below the Chief Joseph Dam tailrace. The middle 10-mile section is more characteristic of a lacustrine environment. The lowermost 15-mile section is relatively narrow and fast flowing, compared to the middle section, but eventually slows and deepens as it nears the Wells Forebay (Beak and Rensel 1999).

The two major tributaries to the Columbia River within the Wells Project Boundary are the Methow and Okanogan rivers. The Methow River enters the Columbia River (RM 523.9) at the city of Pateros, Washington, approximately 8.3 miles upstream of Wells Dam. The Methow River watershed has a drainage area of 1,791 square miles. The Wells Project Boundary extends 1.5 miles up the lower Methow River. The Okanogan River originates near Armstrong, British Columbia, and flows south through a series of lakes to the Columbia River. It enters the Wells Reservoir at RM 533.3, approximately 17.7 miles upstream of Wells Dam. The drainage area of the Okanogan River is approximately 8,200 square miles, 2,342 square miles (29 percent) of which are located in the U.S. The Wells Project Boundary extends 15.5 miles up the lower Okanogan River.

Water Quantity

The Columbia River system is primarily fed by snowmelt. Numerous dams and impoundments located in Canada and the U.S. developed for hydropower and flood control alter the natural flow regime in the basin. The inflow to the Wells Reservoir is largely dependent upon the operations of Grand Coulee and Chief Joseph dams. In general, the Columbia River system is operated to fill upstream storage reservoirs by the end of June; provide augmented summer flows for fish passage, navigation, and power production through the summer, draft storage reservoirs to meet power demand and salmon spawning requirements through the fall and winter, and, depending on snow accumulations and runoff forecasts, draft for flood control and fill to meet the June refill target through the spring (Douglas PUD 2006). The FCRPS manages the waters of the Columbia River to achieve objectives using the storage capacity controlled by Grand Coulee Dam, adjusting for inflow from tributary streams above the Wells Project (Okanogan and Methow rivers), and below the Wells Project (Wenatchee, Entiat, Chelan, Yakima, and Snake rivers).

The Wells Reservoir has a surface area of 9,740 acres at the normal maximum reservoir elevation of 781 feet and is between 1,300 feet and 8,000 feet wide, with an average width of 2,700 feet. Total Wells Reservoir storage volume is 331,200 ac-ft with 97,985 ac-ft of usable storage (based on the 10-foot operating range from elevation 781 to 771 feet). The Wells Project is considered a run-of-river facility, meaning that on average, daily inflow to the Wells Reservoir equals daily outflow (Douglas PUD 2006). The amount of usable storage and the ability to modify river flows are limited. River flows in excess of powerhouse capacity are spilled when reservoir elevations approach the forebay elevation of 781 feet.

Douglas PUD records daily measurements of flow through turbines plus spillway flow, when occurring, at Wells Dam. The average flow in the Columbia River at Wells Dam from 1968 to 2007 was 111.7 kcfs and average monthly flows ranged from 77.1 kcfs to 163.3 kcfs (Table 3.3.2.1-1).

Table 3.3.2.1-1 Monthly flows (kcfs) of the Columbia River at Wells Dam from 1968 to 2007.

	Jan*	Feb*	Mar*	Apr*	May*	Jun*	Jul	Aug	Sep	Oct	Nov	Dec
Min	67.4	65.9	56.3	52.1	55.2	73.7	53.4	63.9	57.2	56.0	63.8	72.6
Mean	108.6	108.7	107.4	114.2	147.2	163.3	130.7	104.8	77.1	77.3	87.6	101.4
Max	159.2	180.7	193.9	184.9	262.6	348.7	221.9	181.2	123.0	108.9	110.0	149.0

*Discharge data for 1968 were not available.

A gauge station located near Pateros measures flow in the Methow River (USGS Gauge No. 12449950). The average discharge of the Methow River for the years 1959 to 2007 was 1,539 cubic feet per second (cfs) with average monthly flows ranging from 422 cfs in February to 5,738 cfs in June. Table 3.3.2.1-2 provides mean, minimum, and maximum monthly flows for the period of record of the Methow River gauge station.

A gauge station located near Malott measures the flow of the Okanogan River (USGS Gauge No. 12447200). The average discharge of the Okanogan River for years 1966 to 2007 was 3,010 cfs with average monthly flows ranging from 1,125 cfs in September to 9,764 cfs in June. Table 3.3.2.1-2 provides mean, minimum, and maximum monthly flows for the period of record of the Okanogan River gauge station.

Water Rights

In western states, water rights are based on the principle "first in time, first in right," meaning older claims have precedence over newer ones. A water right is a legal authorization to use a pre-defined quantity of public water for a designated purpose. In Washington State, Ecology has jurisdiction over the issuance of water rights on the Columbia River.

Table 3.3.2.1-2 Monthly flows (cfs) at USGS gauging stations for the Methow (12449950) and Okanogan (12447200) rivers.

	Methow River (1959-2007)			Okanogan River (1966-2007)		
Month	**Ave**	**Min**	**Max**	**Ave**	**Min**	**Max**
January	426	248	938	1,267	540	3,013
February	422	262	803	1,417	569	2,979
March	621	237	1,670	1,730	601	3,975
April	1,639	309	3,567	2,924	928	7,015
May	4,946	1,415	9,768	8,490	4,319	16,420
June	5,738	1,583	13,150	9,764	2,625	29,290
July	2,069	471	4,960	3,915	938	10,990
August	675	283	1,860	1,566	390	4,150
September	432	235	1,196	1,125	372	2,963
October	479	293	1,458	1,143	605	1,847
November	544	273	1,327	1,480	574	4,747
December	478	270	1,361	1,300	566	4,402

Currently, there are a total of 183 unique water rights claims, permits, or certificates issued within the Wells Reservoir by Ecology (Table 3.3.2.1-3). There is no practical means of determining the level to which these rights might be exercised in a given year.

The CCT is responsible for issuing water permits on the Colville Indian Reservation. In total, there are 14 active permits for water use on Colville Reservation lands that are within the Wells Project Boundary. Four out of the 14 active permits are for surface water withdrawals. Three of these surface water permits allow withdrawals of water from the Wells Reservoir in amounts ranging from 400 to 700 gallons per minute (gpm). The fourth surface water permit allows 1 gpm to be withdrawn from the Okanogan River. All four of these permits are for irrigation purposes.

Douglas PUD holds surface water rights from Washington State for the use of 220 kcfs for power purposes. A reservoir permit for the Wells Project allows 331,200 ac-ft of water to be impounded. Douglas PUD also holds several other surface and ground water rights for fish propagation, wildlife, hydro operations, domestic supply, and irrigation within the Wells Reservoir (Tables 3.3.2.1-4 through 3.3.2.1-6).

Water Use

Water from the Wells Reservoir is used or withdrawn at various locations for consumptive and non-consumptive uses. Types of use associated with water rights issued within the Wells Project include irrigation, domestic, industrial, fish and natural resources, and maintenance and power production (Table 3.3.2.1-3). Fruit orchards represent the primary agricultural activity throughout the area and are dependent upon a reliable source of irrigation water. Irrigation withdrawals constitute the largest segment of consumptive water use in the Wells Project. Fish propagation and power generation are considered non-consumptive uses.

Table 3.3.2.1-3 Summary of water rights issued in the Wells Project by Ecology.

Type of Water Right[1]	Type of Use	Number of Water Right Holdings	Total Allocated Annual Diversion (ac-ft)
Certificate	Irrigation	89	30,292
	Industrial	1	274
	Domestic	1	2
	Maintenance	1	1,328
	Fish Propagation	4	11,375
	Mixed Use[2]	27	22,906
Permit	Irrigation	26	14,806
	Power Generation	1	220[3]
	Impoundment	1	331,200
	Mixed Use[2]	9	5,036
Claim	Irrigation	20	7,890
	Domestic	1	32
	Stock Watering	2	6
	Mixed Use[2]	2	6

1 Information based on Ecology water rights records.
2 Water rights with mixed-use descriptions consist of a combination of any of the following: irrigation, power, fish propagation, wildlife, domestic, industrial, frost protection, stock watering, and erosion.
3 kcfs.

Table 3.3.2.1-4 Reservoir and surface water certificates associated with the operation of the Wells Project.

Certificate Number	P - Date	CFS	GPM	QA Total	Purpose	Permit Holder
S3-00362 (Power Generation)	October 2, 1963	220,000			PO[1]	Douglas PUD
R3-00363 (Reservoir Impoundment)	October 2, 1963			300,000	PO	Douglas PUD
R4-26075 (Pool Raise)	December 1, 1978			31,200[2]	PO	Douglas PUD
S4-26074[3] (Power Generation)	December 1, 1978	220,000			PO	Douglas PUD

1 PO = Power operation

2 R4-26075 added 31,200 acre-feet to the Wells Reservoir water right for a total reservoir impoundment right of 331,200 acre-feet.

3 Water right certificate S4-26074 confirms the 220,000 cfs water right stated within S3-00362.

Table 3.3.2.1-5 Groundwater and surface water certificates for the Wells Fish Hatchery.

Certificate Number	P - Date	CFS	GPM	QA Total	Purpose	Permit Holder
G4-22856 (Wells 1 & 4)	April 2, 1974		4,700	7,520	FS, PO[1]	Douglas PUD
G4-24462 (Wells 2, 3)	November 23, 1976		1,500	2,400	FS[2]	Douglas PUD
G4-22857 (Wells 5, 6,15)	April 2, 1974		2,800	4,480	FS	Douglas PUD
G4-28847 (Wells 7, 8, 9)	January 2, 1986		2,960	2692	FS PO	Douglas PUD
G4-28598 (Wells 10 & 11)	January 17, 1985		2,100	2,087	FS	Douglas PUD
G4-29184 (Wells 12, 13, 14)	January 15, 1987		3,000	2,408	FS	Douglas PUD
S3-00362 (Power Generation)	October 2, 1963	220,000			PO	Douglas PUD
S4-26074 (Power Generation)	December 1, 1978	220,000			PO	Douglas PUD
R3-00363 (Reservoir Impoundment)	October 2, 1963			300,000	PO	Douglas PUD
R4-26075 (Pool Raise)	December 1, 1978			331,200	PO	Douglas PUD

1 PO = Power operation

2 FS = Fish propagation

Table 3.3.2.1-6 Groundwater and surface water certificates for the Methow Fish Hatchery.

Certificate Number	P - Date	CFS	GPM	QA Total	Purpose	Permit Holder
S4-848 (Methow)	January 10, 1922	7.0 (SR)		3619.8	FS[1]	Douglas PUD
S4-29912 (Methow)	January 19, 1989	18.0 (JR)		13,099.2	FS	Douglas PUD
G4-29911 (Wells 1, 2, 3, 4, 5 ,6)	January 19, 1989		4,500	7,277.3	FS	Douglas PUD
S4-29914 (Chewuch)	February 6, 1989	6.0		1,487.6	FS	Douglas PUD
S4-29915 (Twisp)	February 6, 1989	6.0		1,487.6	FS	Douglas PUD

[1] FS = Fishery propagation

Fish hatcheries and other artificial propagation facilities within the immediate vicinity of the Wells Project withdraw water primarily for non-consumptive uses. Since the water from these facilities is returned close to the point of withdrawal, there is a negligible effect on instream flow. Douglas PUD holds water rights for the various purposes of the Wells Project. These uses are considered non-consumptive uses (Douglas PUD 2006).

Irrigation

The primary consumptive use of water withdrawn from the Wells Reservoir is orchard irrigation. Orchards with apple, cherry, pear, peach, apricot, and other fruit trees represent the primary agricultural activity in the Columbia River Valley and the surrounding tributary valleys throughout North Central Washington. All orchards throughout the area are dependent upon a reliable source of irrigation water. The irrigation season begins in late March or April and continues through October. Peak irrigation use occurs in June, July, and August when temperatures in the region are highest.

Domestic Water Supply

Domestic water supply withdrawals from the Wells Reservoir are very limited. Some withdrawals are for use in irrigating yards and gardens. Water withdrawals for drinking water are primarily from groundwater sources and are concentrated in Brewster, Bridgeport, and Pateros.

Commercial and Industrial Use

Commercial and industrial uses are limited and account for about 7.9 cfs of surface water withdrawals in the Wells Reservoir. Similar to domestic water withdrawals, commercial and industrial use are concentrated in the cities adjoining the Wells Reservoir. Stock watering use is also limited to approximately 1.6 cfs.

Fisheries and Natural Resources

Douglas PUD holds four water rights within the Wells Project that are used exclusively for the propagation of fish at the Wells Fish Hatchery. These four water rights withdraw 11,375 ac-ft/year from the ground surrounding the hatchery. All of the water rights associated with either Wells Dam power generation or hatchery propagation within the Wells Project can be found in Tables 3.3.2.1-4 through 3.3.2.1-5). Douglas PUD also has water rights for fish propagation at the Methow Fish Hatchery located outside the Wells Project. These five water rights include one ground water right for a total of 7,277.3 ac-ft/year and four surface water rights totaling 37 cfs (Table 3.3.1.4-6).

Power Production

As described earlier, the Wells Project holds a surface water permit to use 220 kcfs for power production purposes. A reservoir permit allows impoundment of up to 331,200 ac-ft of water within the Wells Reservoir.

Currently, Wells Project operations occur in concert with all other existing instream flow uses within the Wells Reservoir, as discussed above. An instream flow restriction for the Wells Project arises under Article 33 of the current FERC license. Article 33 requires Douglas PUD to operate Wells Dam in a manner that would not prevent Grant PUD from maintaining a minimum instream flow below Priest Rapids Dam of 36 kcfs. This operation is conducted to respect the minimum flow requirements at the Hanford Works of the Department of Energy.

Water Quality Standards

Ecology is responsible for the protection and restoration of the state's waters. State WQS are the means employed by Ecology to protect and regulate the quality of surface waters in Washington State. The standards implement portions of the federal CWA by specifying the designated and potential uses of waterbodies in Washington State. They set water quality criteria to protect those uses and acknowledge limitations. The standards also contain policies to protect high-quality waters (antidegradation).

The WQS are established to sustain public health and public enjoyment of the waters and the propagation and protection of fish, shellfish, and wildlife. Ecology applies a three-part approach to protect the waters of the state consisting of designated uses, numeric and narrative water quality criteria, and antidegradation policies (www.ecy.wa.gov/programs/wq/ swqs/index.html).

Designated Uses

Designated uses are sometimes called "beneficial uses." The designated uses established by Washington State are summarized in Table 3.3.2.1-7.

Numeric and Narrative Criteria

Water quality criteria are designed to protect the designated uses and are used to assess the general health of Washington State surface waters and set permit limits. Criteria may be numeric (i.e., not to exceed a specified concentration level) or narrative. Water quality criteria are applied in conjunction with the designated use associated with each water body in the state. Numeric criteria are developed to protect designated uses. Individual numeric criteria are based on specific data and scientific assessment of adverse effects. The numeric criteria are numbers that specify limits and/or ranges of chemical concentrations, like oxygen, or physical conditions, like water temperature. A typical numeric criterion for aquatic life protection usually contains a concentration (e.g., 5 milligrams per liter [mg/L]) and averaging period. For example, for toxics a one-hour averaging period applies for an acute (short-term) concentration, while a four-day average applies for a chronic (long-term) concentration. The criteria are values that should rarely be exceeded if uses are to be supported (Ecology 2008*a*). Numeric criteria relevant to the Wells Project are discussed in greater detail below.

Table 3.3.2.1-7 Summary of designated uses based on the 2006 Washington State Water Quality Standards.

Use Designation	General Categories[1]
Aquatic Life	Char Spawning/Rearing Core Summer Salmonid Habitat Salmonid Spawning/Rearing/Migration Salmonid Rearing/Migration Only Non-anadromous Interior Redband Trout Indigenous Warm Water Species
Recreation	Extraordinary Primary Contact Recreation Primary Contact Recreation Contact Recreation
Water Supply	Domestic Agricultural Industrial Stock Watering
Miscellaneous	Power Generation Wildlife Habitat Harvesting Commerce and Navigation Boating Aesthetics

[1] General categories specific to each designated use.

Washington State adopted narrative criteria to supplement numeric criteria. The narrative criteria are statements that describe the desired water quality goal, such as waters being "free from" pollutants such as oil and scum, color and odor, and other substances that can harm people and fish. These criteria are used for pollutants for which numeric criteria are difficult to specify, such as those that offend the senses (e.g., color and odor).

Antidegradation

The CWA requires that state WQS protect existing uses by establishing the maximum level of pollutants allowed in state waters. The standards must also protect those waters of a quality that are higher than the standards requirement. The antidegradation process helps prevent unnecessary lowering of water quality, and provides a framework to identify those waters that are designated as an "outstanding resource" by the state. Washington State's antidegradation policy follows the federal regulation guides (Ecology 2008*b*).

Total Maximum Daily Load Regulations

Every two years, the EPA, as specified in Section 305(b) of the CWA, requires Ecology to compile an assessment of the state's water bodies. Data collected from the water quality assessment are used to develop a 305(b) report. The report evaluates and assigns each water body into five categories based upon the Ecology's evaluation of the water quality parameters collected from within each water body. There are no active TMDLs for waters within the Wells Project.

Wells Project Site-Specific Water Quality Standards

Currently, no waters within the Wells Project Boundary are managed under the antidegradation policy. Under the 2006 WQS, the Wells Project includes designated uses for spawning/rearing (aquatic life), primary contact recreation, and all types of water supply and miscellaneous uses. Numeric criteria to support the protection of designated uses consist of various physical, chemical, and biological parameters including TDG temperature, DO, pH, turbidity, and toxins.

Total Dissolved Gas

TDG is measured as a percent saturation. Based upon criteria developed by Ecology, TDG measurements shall not exceed 110 percent at any point of measurement in any water body. The WQS state that an operator of a dam is not held to the TDG standards when the river flow exceeds the seven-day, 10-year-frequency (7Q10) flood. Ecology has determined that the 7Q10 flow at Wells Dam is 246 kcfs (Pickett et al. 2004).

In addition to allowances for TDG standard exceedances during flood flows in excess of 7Q10, the TDG criteria may be adjusted to accommodate spill to facilitate fish passage over hydroelectric dams when consistent with an Ecology-approved GAP. Ecology has approved, on a per-application basis, an interim exemption to the TDG standard to allow spill for juvenile fish passage on the Columbia and Snake rivers (WAC 173-201A-200(1)(f)(ii)). Dams in the Columbia and Snake rivers may be granted such an exemption. The GAP must be accompanied by fisheries management, physical, and biological monitoring plans (WAC 173-201A-200(1)(f)(ii)). Annually since 2002, Douglas PUD has filed a GAP and received TDG exemptions (Le 2008).

On the Columbia and Snake rivers, three conditions apply to the TDG exemption. First, in the tailrace of a dam, TDG shall not exceed 125 percent as measured in any one-hour period during spillage for fish passage. Second, TDG shall not exceed 120 percent in the tailrace of a dam, as an average of the 12 highest consecutive hourly readings in any one day (24-hour period), relative to atmospheric pressure. Third, TDG shall not exceed 115 percent in the forebay of the next dam downstream, also based on an average of the 12 highest consecutive hourly readings in any one day (24-hour period), relative to atmospheric pressure.

The increased levels of spill resulting in elevated TDG levels are intended to allow increased downstream fish passage without causing more harm to fish populations than caused by turbine fish passage. The TDG exemption provided by Ecology is based on a risk analysis study conducted by the NMFS (NMFS 2000).

Temperature

Temperature is measured by the 7-day average of the daily maximum temperatures (7-DADMax). The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date (WAC 173-201A-020).

Under the WQS, the 7-DADMax temperature within the Columbia, Methow, and Okanogan river portions of the Project shall not exceed 17.5°C (63.5°F) (WAC 173-201A-602 and 173-201A-200(1)(c)). Additionally, the WQS contains additional supplemental temperature requirements for the Wells Project portion of the Methow River (see Methow River Supplemental Requirements section below). When a water body's temperature is warmer than 17.5°C (or within 0.3°C [0.54°F] of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the 7-DADMax temperature of that water body to increase more than 0.3°C (0.54°F).

When the background condition of the water is cooler than 17.5°C, the numeric criteria for warming of state waters due to human actions is restricted as follows:

(A) Incremental temperature increases resulting from individual point source activities must not, at any time, exceed 28/(T+7) as measured at the edge of a mixing zone boundary (where "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge); and

(B) Incremental temperature increases resulting from the combined effect of all non-point source activities in the water body must not, at any time, exceed 2.8°C (5.04°F).

Temperatures are not to exceed the criteria at a probability frequency of more than once every 10 years on average. Temperature measurements should be taken to represent the dominant aquatic habitat of the monitoring site. This typically means samples should:

(A) be taken from well-mixed portions of rivers and streams; and

(B) not be taken from shallow stagnant backwater areas, within isolated thermal refuges, at the surface, or at the water's edge.

The following guidelines on preventing acute lethality and barriers to migration of salmonids are also used in determinations of compliance with the narrative requirements for use protection established in WAC 173-201A (e.g., WAC 173-201A-310(1), 173-201A-400(4), and 173-201A-410 (1)(c)). The following site-level considerations do not, however, override the temperature criteria established for waters in WAC 173-201A-200(1)(c) or WAC 173-201A-602:

(A) Moderately acclimated (16 to 20°C, or 60.8 to 68.0°F) adult and juvenile salmonids will generally be protected from acute lethality by discrete human actions maintaining the 7-DADMax temperature at or below 22°C (71.6°F) and the 1-day maximum (1-DMax) temperature at or below 23°C (73.4°F);

(B) Lethality to developing fish embryos can be expected to occur at a 1-DMax temperature greater than 17.5°C (63.5°F);

(C) To protect aquatic organisms, discharge plume temperatures must be maintained such that fish could not be entrained (based on plume time of travel) for more than two seconds at temperatures above 33°C (91.4°F) to avoid creating areas that will cause near instantaneous lethality; and

(D) Barriers to adult salmonid migration are assumed to exist any time the 1-DMax temperature is greater than 22°C (71.6°F) and the adjacent downstream water temperatures are 3°C (5.4°F) or more cooler.

Methow River Supplemental Requirements

Additionally, Ecology has identified water bodies, or portions thereof, which require special protection for spawning and incubation in accordance with Ecology publication 06-10-038. This publication indicates where and when the following criteria are to be applied to protect the reproduction of native char, salmon, and trout. The Methow River is subject to certain supplemental temperature requirements. Water temperatures are not to exceed 13°C from October 1 to June 15 in the lower Methow River including the portion within the Wells Project Boundary (up to RM 1.5).

Dissolved Oxygen

DO criteria are measured in mg/L. Under the WQS, DO measurements shall not be under the 1-day minimum of 8.0 mg/L in the Wells Project. The 1-day minimum is defined as the lowest DO reached on any given day. When a water body's DO is lower than the 8.0 mg/L criteria (or within 0.2 mg/L of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the DO of that water body to decrease more than 0.2 mg/L. Concentrations of DO are not to fall below 8.0 mg/L at a probability frequency of more than once every 10 years on average.

DO measurements should be taken to represent the dominant aquatic habitat of the monitoring site. This typically means samples should:

(A) be taken from well-mixed portions of rivers and streams; and
(B) not be taken from shallow stagnant backwater areas, within isolated thermal refuges, at the surface, or at the water's edge.

pH

The term "pH" is defined as the negative logarithm of the hydrogen ion concentration. Under the WQS, pH measurements shall be in the range of 6.5 to 8.5 in the Project, with a human-caused variation within the above range of less than 0.5 units.

Turbidity

Turbidity is measured in nephelometric turbidity units (NTUs). Turbidity shall not exceed 5 NTUs over background when the background is 50 NTUs or less; or a 10 percent increase in turbidity when the background turbidity is more than 50 NTUs in the Wells Project.

Toxins

Toxic substances shall not be introduced above natural background levels in waters of the state which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by Ecology.

Ecology shall employ or require chemical testing, acute and chronic toxicity testing, and biological assessments, as appropriate, to evaluate compliance with WAC 173-201-240 and to ensure that aquatic communities and the existing and characteristic beneficial uses of waters are being fully protected.

Within the Project Area, specifically within the Wells Project portion of the Okanogan River, two toxic substances are of concern: DDT and PCBs. DDT is a synthetic organochlorine insecticide that was frequently used in agriculture prior to being banned in 1972. PCBs are an organic compound that were used as coolants and insulating fluids for transformers and capacitors. PCBs are classified as persistent organic pollutants and production was banned in the 1970s due to their high level of toxicity.

Toxic substances criteria identified in the WQS for these two substances are as follow:

(A) In freshwater, DDT (and metabolites) shall not exceed 1.1 micrograms per liter (µg/L) as an instantaneous concentration at any time. Exceedance of the criteria is defined as an acute condition. DDT (and metabolites) shall not exceed 0.001 µg/L as a 24-hour average. Exceedance of the criteria is defined as a chronic condition; and

(B) In freshwater, PCBs shall not exceed 2.0 µg/L as a 24-hour average. Exceedance of the criteria is defined as an acute condition. PCBs shall not exceed 0.01 µg/L as a 24-hour average. Exceedance of the criteria is defined as a chronic condition.

Project Water Quality Assessment

Comprehensive Limnological Investigation

In 2005, Douglas PUD implemented a study to collect baseline limnological information for waters within the Project (EES Consulting 2006). The objectives of this study were to further document existing water quality conditions within the Project and to collect information to fill water quality data gaps identified by Douglas PUD to support the water quality certification process administered by Ecology. A total of nine sampling sites, consisting of five mainstem sites, two tributaries, and two littoral habitats, were selected to represent the spatial variability within the Project (Table 3.3.2.1-8). The year-long study began in May 2005 and investigated various water quality parameters at each of the nine sampling sites. Sampling included physical, chemical, and biological water quality characteristics. A total of 22 water quality characteristics were sampled. All procedures used for the purpose of collecting, preserving, and analyzing samples followed established EPA 40 CFR 136 protocol.

Table 3.3.2.1-8 Water quality sampling sites for the 2005-2006 Comprehensive Limnological Investigation.

Site	Description
1	Downstream of Chief Joseph Dam (at Hwy 17 bridge)
2	Columbia River just downstream of the Brewster Bridge
3	Bridgeport Bar littoral site
4	Columbia River downstream of Pateros where the thalweg approaches maximum depth in the lower Wells Reservoir
5	Okanogan River upstream of confluence with Columbia River
6	Methow River upstream of confluence with Columbia River
7	Lower Wells Reservoir/Starr Boat Launch littoral site
8	Wells Forebay
9	Wells Tailrace

Results from the Comprehensive Limnological Investigation showed that the Project is characterized by low- to moderately-low levels for nutrients, slightly basic pH (range 7.5 to 8.5), well-oxygenated water, and low turbidity with moderately-low algae growth. Average Secchi depth for the Wells Reservoir varied minimally during May through August with only a slight increase as the season progressed (study average per site range 4.1 meters to 4.5 meters). Secchi depth (transparency) increased to a seasonal peak in September of 6.25 meters before slightly decreasing in October to a mean depth of 5.3 meters. Transparency increased downstream at the Brewster Bridge and Wells Forebay relative to the head of the reservoir at the Chief Joseph Dam tailrace for all months.

Turbidity in the Columbia River showed little seasonal variation with an annual average of 0.98 NTU and a variation of 0.38 NTU in September 2005 (Wells Forebay site) to 3.81 NTU in February 2006 (Brewster Bridge site). Longitudinal variation in turbidity was also minimal; sampling did not occur within the mixing zone plume of the Okanogan River. Turbidity in the Okanogan River was consistently higher than the Columbia River. Turbidity in the Methow River was higher than in the Columbia River in May (due to sediment load) and in August due to phytoplankton growth. The only turbidity reading over 5.0 NTU was in the Methow River during May where turbidity was 5.6 NTU.

Water temperature in the Wells Reservoir is primarily governed by the temperature of inflowing water at Chief Joseph Dam with little warming occurring as water traverses the

Wells Reservoir's length (EES Consulting 2006). Similar to the Wells hourly temperature monitoring data (section 2.2.2), results of the study indicate that the Project waters remained unstratified throughout the entire study period and was vertically homogeneous for DO. Figure 3.3.2.1-1 shows a vertical water profile of the Project. Low respiration rates at depth, a lack of vertical stratification, and short water retention times resulted in homogeneous DO levels at all depths within the Project.

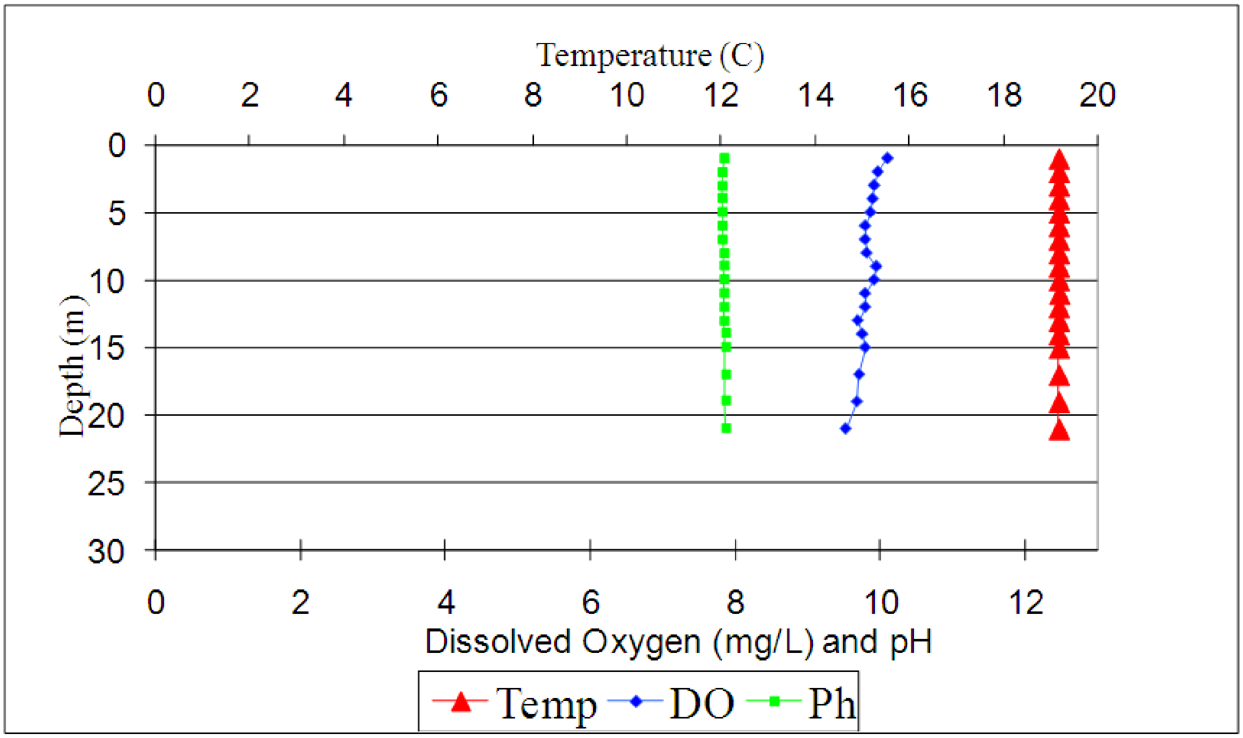

Figure 3.3.2.1-1 Vertical water quality profile of the Wells Forebay from sampling date August 17, 2005.

DO levels at 1 meter depth increased from upriver to downriver; the average difference (May through October) was 1.07 mg/L. The difference was more pronounced during May through August. The difference in September and October was 0.3 mg/L, which is at the limit of instrument reliability. Upstream to downstream differences in surface DO were negligible for the February 2006 sampling event. Littoral DO was similar or slightly higher than pelagic DO for surface waters. DO saturation levels were equal to or greater than 100 percent for all sites and all depths in all months except October when DO percent saturation for surface waters ranged from 110 percent to 91 percent saturation. The lower saturation levels in October may be due to reduced primary productivity while water temperatures were still relatively warm. All DO readings were above 8.0 mg/L and in compliance with the WQS numeric criteria.

Nitrogen and phosphorus are the two primary macronutrients needed for plant growth. Silica is important for diatomaceous phytoplankton. Ammonia (Nitrogen) levels were near or below detection levels for pelagic and littoral Columbia River Project waters as well as the Okanogan River for May through August and in February. Ammonia levels were only slightly higher in September and October. Ammonia peaked in the Methow River in August. Nitrates/Nitrites (Nitrogen) for Columbia River Project waters were higher in May before leveling off during the summer and fall. Nitrates/Nitrites were significantly higher at all sites for the February sample than any other month. Nitrates within littoral waters were lower than pelagic waters except in February when levels were similar. Nitrates/Nitrites in both the Okanogan and Methow rivers showed an increasing trend during the growing season. Total nitrogen levels for Columbia River pelagic and littoral waters were similar and relatively constant with the exception of significantly higher levels at most sites during February.

Orthophosphorus peaked for all stations in July. Orthophosphorus levels for pelagic and littoral waters were similar in all months except July when littoral orthophosphorus concentrations were significantly higher than observed for pelagic areas. Orthophosphorus levels in the Methow and Okanogan rivers were higher than in the Columbia River. Orthophosphorus was partially depleted in the Okanogan River but not in the Methow River at the time of the August sampling. Total phosphorus was slightly higher in littoral waters than in pelagic areas. Wave disturbance to bottom sediments may be a factor for this difference. Total phosphorus levels in pelagic surface waters ranged from below detection limits to 30.8 µg/L. Total phosphorus was higher for the Okanogan River than elsewhere, which is likely due to the higher sediment load. Total phosphorus for all stations peaked in July before gradually declining throughout the rest of the growing season.

The range in Nitrogen to Phosphorus (N:P) ratios for the Project waters was 2.5 to 30.8. The average Total Nitrogen to Total Phosphorus (TN:TP) ratio in the Project waters was 13.7 for the photic zone and averaged 14.8 for samples from all depths. These values are within the suggested literature ranges for phosphorus limitation. The N:P ratios peaked in July with pelagic and littoral waters showing similar trends. A decreasing N:P ratio through the major part of the algae growing season is typical of moderate to low nutrient waters as algae assimilate available nutrients. The N:P ratios were higher in the tributary rivers relative to the Columbia River. The N:P ratios are an indicator but not an absolute confirmation of factors limiting productivity.

Moderate to low chlorophyll *a* concentrations (range 0.5 to 5.8 µg/L) occurred throughout the sample period with peaks in July and October for the Project waters. Concentrations were lowest in August and also had the least variability among sites for the August sampling event. Pelagic and littoral waters were similar for chlorophyll *a* concentrations in most months except October when littoral waters reported twice as high chlorophyll *a* levels.

Phytoplankton were dominated by diatoms for all months at all sites sampled with Chryptophyta (small unicellular flagellates) being second dominant based on biovolume. Diatoms and Chryptophyta are both considered a good food source for the rest of the aquatic food web. Diatoms comprised 75 to 84 percent of the total phytoplankton biomass for the Project sites. Chlorophytes (green algae) were sub-dominant in the tailrace but only a minor component elsewhere. Total phytoplankton biomass was relatively low for all Project sample sites; total biomass was generally less than 200,000 um^3/ml. Biomass peaked in July and August for pelagic areas of the Project waters and minor peaks occurred in October for littoral sites. The timing of peaks varied among all stations. Cyanophyta (blue-green algae) were only recorded in the Project sites for the July sample at Brewster Bridge where they comprised 16 percent of the total biomass; however, the biomass of Cyanophytes were comprised of relatively few but very large multicellular units. Cyanophytes also were recorded in the Wells Tailrace (4.7 percent biomass) in July. Diatoms dominated phytoplankton in the Methow River where peak biomass occurred in August (1,455,158 um^3/ml). This peak is much higher than biomass observed anywhere else in the Project. Biomass levels in the Okanogan River were only slightly higher than in the Columbia River for most months with minor peaks occurring in May and October. Cyanophytes were a small proportion of the August biomass sample for the Okanogan River.

Diatoms also dominated periphyton. Seasonal lows occurred in July for all sites except Bridgeport shallows where the trend was decreasing periphyton biovolume as the season progressed.

Zooplankton density for pelagic waters was greatest in July (6,080/m^3) and lowest (1,289/m^3) in August. Copepods dominated the zooplankton population. Zooplankton densities in the tributary river mouths peaked in May. Although rotifers were present in all months, their density dropped to very low levels after May. Cladocera were the third most prevalent group with a minor peak occurring in July for this group.

Trophic Status Index (TSI) developed by Carlson (1977; Carlson and Simpson 1996) and modified for nitrogen by Kratzer and Brezonik (1981) is an indication of the productivity of a lake based on Secchi depth, TP, TN, and chlorophyll *a* concentrations for summer months (June through September). Project waters are classified as oligo-mesotrophic based on a mean TSI score of 36.5 with 40 to 50 being the range for mesotrophic classification.

TDG Monitoring

TDG supersaturation is a condition that occurs in water when atmospheric gasses are forced into solution at pressures that exceed the pressure of the overlying atmosphere. Water containing more than 100 percent TDG is in a supersaturated condition. Water may become supersaturated through natural or dam-related processes that increase the amount of air dissolved in water. Supersaturated water in the Columbia River may result from the spilling of water at Columbia River dams. The occurrence of TDG supersaturation in the Columbia River system is well documented and has been linked to mortalities and migration delays of salmon and steelhead (Beiningen and Ebel 1970; Ebel et al. 1975).

At Wells Dam, Douglas PUD has monitored TDG for compliance with state and federal water quality regulations since 1998 and more recently in support of its GAP and TDG exemption issued by Ecology for juvenile fish passage (Le 2008). Douglas PUD is required to monitor TDG in the Wells Forebay and tailrace area (on the Columbia River, near RM 515.6). Douglas PUD uses Rocky Reach Forebay TDG data collected by Chelan PUD for downstream forebay monitoring compliance data.

A TDG study conducted in 2006 indicated that the current location of the TDG compliance monitoring stations are appropriate in providing representative TDG production information both longitudinally and laterally downstream of Wells Dam (EES Consulting et al. 2007).

Since 2003, Douglas PUD has operated the Project during the juvenile fish passage season (April to August) in accordance with an Ecology-approved GAP and associated TDG exemption. TDG monitoring at Wells Dam is facilitated through the deployment of Hydrolab MiniSonde probes in the center of the Wells Forebay and approximately 3 miles downstream of Wells Dam. TDG data are logged every 15 minutes, averaged (four in an hour), and transmitted on the hour. Probes are serviced and checked monthly for accuracy and calibrated if necessary. Average, minimum, and maximum TDG measurements in the Wells Dam Forebay and Tailrace since monitoring began are provided in Table 3.3.2.1-9. Also included in Table 3.3.2.1-9 are the Rocky Reach Forebay TDG data acquired from Chelan PUD's TDG monitoring program.

Table 3.3.2.1-9 Average, minimum, and maximum TDG measurements at Wells Dam from Hydrolab MiniSonde stations placed in the Wells Forebay, Wells Tailrace, and Rocky Reach Forebay. Values are in percent dissolved gas and are 12-hour high (non-consecutive) averages.

Location	TDG	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Wells Forebay	Avg	108.3	110.1	108.5	107.1	110.8	108.1	108.2	107.4	109.9	108.3
	Min	104.4	104.0	101.8	100.1	102.6	101.3	102.0	110.8	102.5	100.9
	Max	113.7	113.9	113.2	111.7	118.5	114.5	113.5	100.9	116.1	113.2
Wells Tailrace	Avg	111.1	112.4	110.1	108.1	113.9	109.8	109.6	109.1	114.0	110.9
	Min	105.5	105.6	102.2	100.4	103.9	101.9	101.6	102.8	103.2	103.5
	Max	122.4	125.7	125.4	112.0	136.9	126.0	113.7	116.8	131.3	122.0
Rocky Reach Forebay	Ave	109.4	N/A	108.5	108.5	112.9	110.1	109.1	109.6	114.4	110.4
	Min	101.8	N/A	101.9	104.7	103.9	103.8	104.7	103.3	102.7	104.5
	Max	118.7	N/A	112.6	113.0	133.8	120.8	114.3	120.4	130.0	118.0

Levels of TDG at Wells Dam and the Rocky Reach Dam Forebay that result in exceedances of the numeric criteria are most likely to occur during April through August as a result of high flows caused by either rapid snow melt or federal flow augmentation intended to aid downstream juvenile salmonid passage. Douglas PUD monitors for TDG at Wells Dam between April 1 and September 15 annually to coincide with this observation (Figures 3.3.2.1-2 and 3.3.2.1-3). Chelan PUD monitors for TDG at Rocky Reach Dam between April 1 and August 31 (Figure 3.3.2.1-4). High TDG values at both Wells Dam and Rocky Reach Dam are often associated with various factors including high spring flows and operations at upstream federal dams, including federal flow augmentation, resulting in water entering the Project with relatively high TDG levels. During these time periods, river conditions in the mid-Columbia River system are conducive to exceedances of the TDG criteria.

In past years, Wells Forebay monitoring data show that in the spring and summer TDG values in the forebay range from 107 to 110 percent with maximum values sometimes exceeding the 115 percent. Rocky Reach Forebay monitoring data indicate that TDG values range from 108 to 110 percent with maximum values sometimes exceeding the 115 percent standard. In general, Wells Dam adds relatively small amounts of TDG through the use of spill intended to aid in the passage of juvenile salmonids (0 to 2 percent). However, similar to other hydroelectric facilities on the Columbia River system, probabilities for exceedances are more likely during late spring periods of high river flow. Table 3.3.2.1-9 contains historic average, minimum, and maximum TDG measurements associated with the Wells Project. Note that the high TDG values recorded during 2006 were a direct result of the 2006 TDG Study that required Douglas PUD to intentionally spill water in various spillway configurations. This study was intended to define the gas generation dynamics of the Wells Project under various operating parameters.

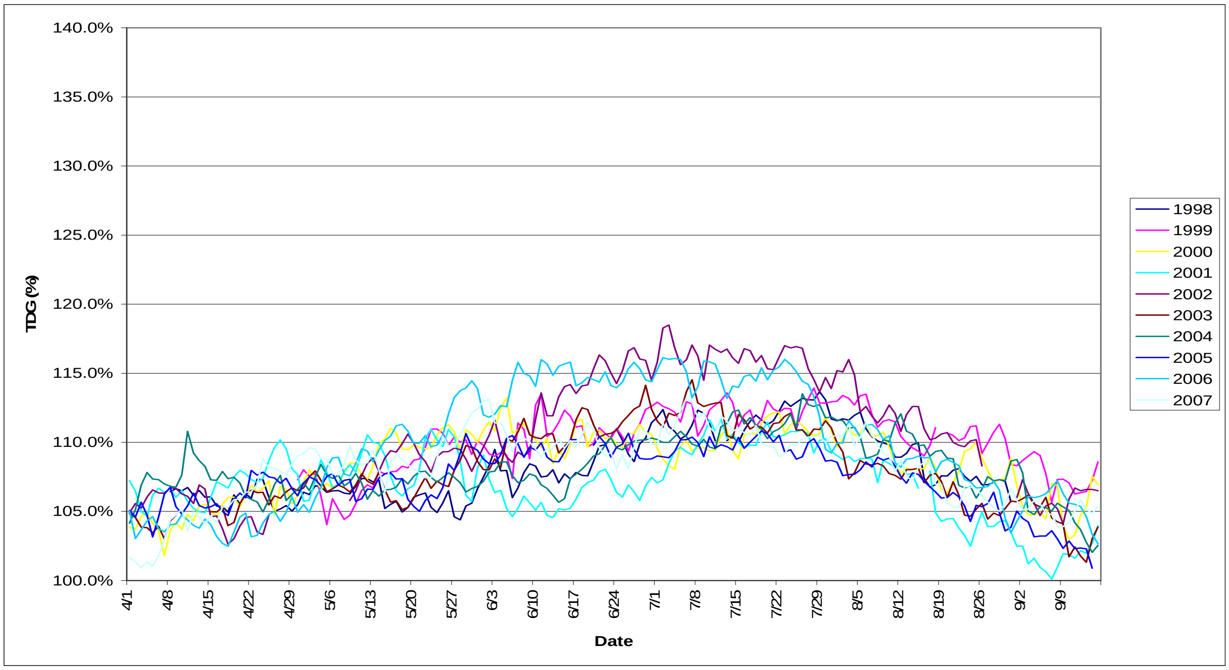

Figure 3.3.2.1-2 Wells Dam Forebay average 12-hour high TDG measurements. The average 12-hour high is defined as the average of the 12 highest hourly readings within a 24-hour period. Monitoring season is typically April 1 to September 15. Data for years 1998-2007.

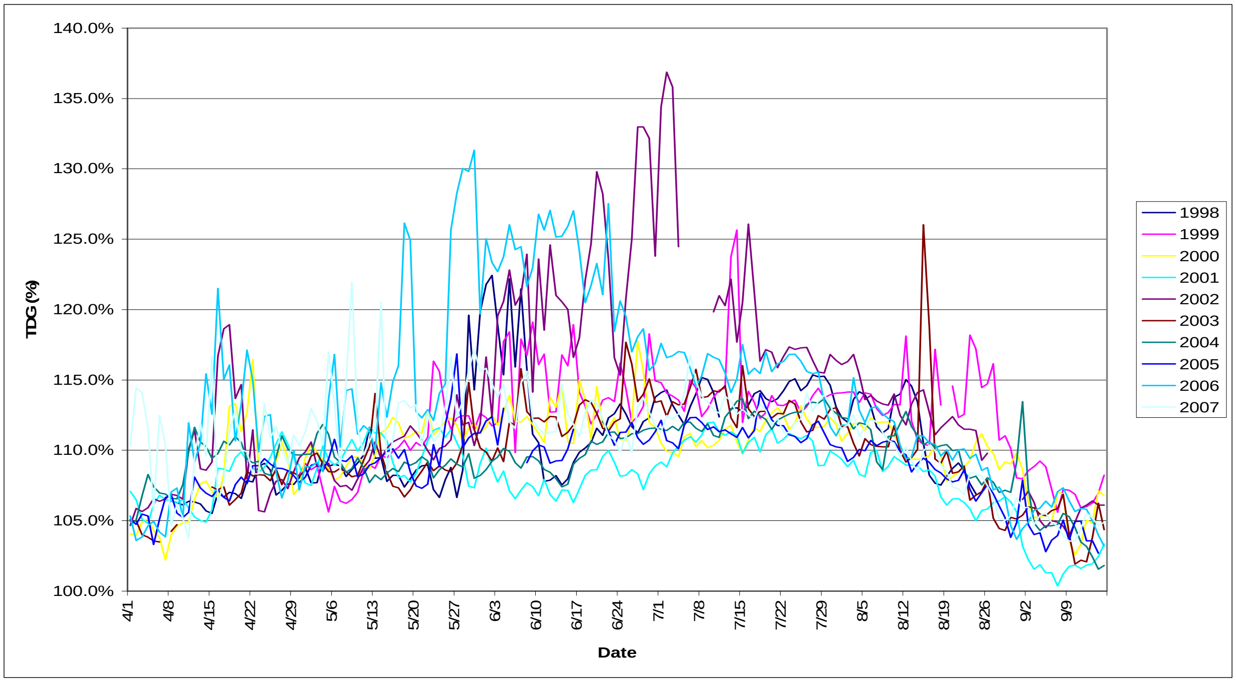

Figure 3.3.2.1-3 Wells Dam Tailrace average 12-hour high TDG measurements. The average 12-hour high is defined as the average of the 12 highest hourly readings within a 24-hour period. Monitoring season is typically April 1 to September 15. Data for years 1998-2007 (breaks in data are the result of equipment malfunction).

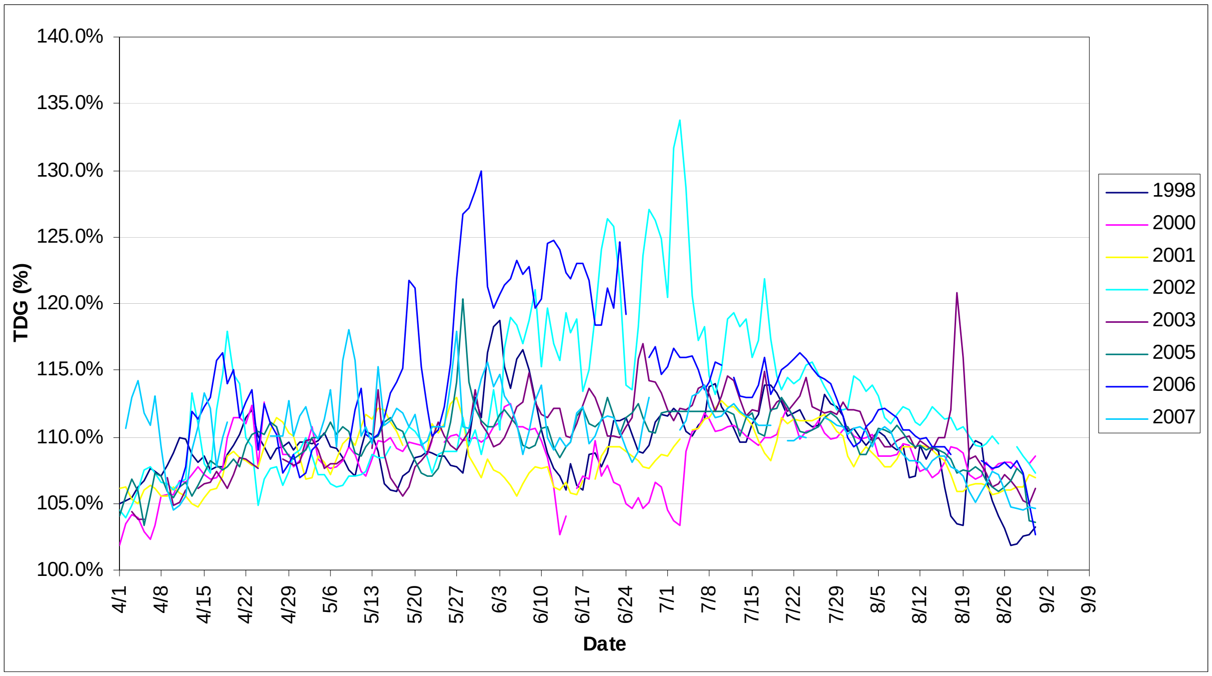

Figure 3.3.2.1-4 Rocky Reach Forebay average 12-hour high TDG measurements. The average 12-hour high is defined as the average of the 12 highest hourly readings within a 24-hour period. Monitoring season is typically April 1 to August 31. Data for years 1998-2007 (breaks in data are the result of equipment malfunction).

Since 2007, spill at Wells Dam has been annually managed through the implementation of spillway operating guidelines (playbooks). The original spill playbook in 2007 focused on a range of operations to evaluate TDG production along with potential operational constraints. The subsequent playbooks evolved to the current 2009 format that simply focuses on strategies that have been identified to effectively manage TDG production in the tailrace of Wells Dam. The resulting spill strategies are based on three basic principles:

- Spill operations concentrated through a single spillbay (as opposed to spread through several spillbays) reduce TDG production and increase degasification at the tailwater surface;
- Discharge from spillbays (denoted S hereafter) located near the middle of the dam (e.g., S7) prevent water with high TDG from attaching to the shoreline; and
- Forced spill exceeding JBS flows of 2.2 kcfs must be increased to ≥ 15 kcfs to ensure that the submerged spillway lip below the ogee is engaged. The resulting force creates flows that are surface oriented, ultimately promoting degasification at the tailwater surface.

The above principles are used as a guideline for Project operators to spill at a range of outflows to ensure the future compliance with the Washington State WQS for TDG.

TDG Study Results

Each year from 2003 to 2008, Douglas PUD implemented spill testing activities to examine the relationship between water spilled over the dam and the production of TDG. These results were subsequently used by IIHR-Hydroscience and Engineering of University of Iowa to develop and calibrate an unsteady state three-dimensional (3-D), two-phase flow computational fluid dynamics (CFD) tool to predict the hydrodynamics of gas saturation and TDG distribution within the Wells Tailrace. These tools were then used to reliably predict TDG production at Wells Dam and establish preferred operating conditions and spillway configurations to be used as methods to manage TDG within WQS numeric criteria (Politano et al. 2009*a*).

In 2003 and 2004, Douglas PUD determined the effectiveness of the tailwater sensor relative to the tailwater cross-section profile for TDG and to better define the relationship between spillway operations and TDG production (Columbia Basin Environmental [CBE] 2003, 2004). Based on the results of these studies, the tailwater station provided an accurate record of daily average TDG values in the Wells Tailrace. The studies also showed that TDG concentrations in turbine discharge were being affected by spill.

In spring 2005, Douglas PUD implemented a TDG study at Wells Dam designed to measure TDG pressures resulting from various spill patterns at the dam (CBE 2006). An array of water quality data loggers was installed in the Wells Dam tailwater for a period of two weeks between May 23, 2005 and June 6, 2005. The Wells Dam powerhouse and spillway were operated through a predetermined range of operational scenarios that varied both total flow and shape of the spillway discharge. A total of eight configurations were tested including flat spill patterns (near equal distribution of spill across the entire spillway), crowned spill patterns (spill is concentrated towards the center of the spillway) and spill over loaded and unloaded units (Table 3.3.2.1-10).

Table 3.3.2.1-10 Test matrix for 2005 Wells Dam TDG Production Dynamics Study.

Test	Description
1A	Spill over load, east spill/east generation
1B	Spill over unloaded units, east spill/west generation
1C	Spill over unloaded units, west spill/east generation
1D	Spill over load, west spill/west generation
2A	Crowned spill, modest flow
2B	Dentated spill, modest flow
2C	Crowned spill, high flow
2D	Flat spill, high flow

Results from the study indicated that spill from the west side of the spillway resulted in consistently higher TDG saturations than similar spill from the east side. All dentated and flat spill patterns at high river flow yielded higher TDG saturations than crowned spill for similar total discharges. The results of this study also indicated that TDG levels of turbine discharge may have been influenced by spill.

In 2006, Douglas PUD continued TDG assessments at the Project by examining the best spillway configurations and Project operations to minimize the production of TDG. Douglas PUD designed a monitoring program for a study that would examine various operational scenarios and their respective TDG production dynamics.

Thirteen sensors were placed along three transects at 1,000, 2,500, and 15,000 feet below Wells Dam. There were also three sensors placed across the forebay, one being the fixed monitoring station midway across the face of the dam and two more a distance of 300 feet from the dam. While there were 30 scheduled spill events, there were an additional 50 events where the powerhouse and spillway conditions were held constant for a minimum three-hour period. These “incidental” events provided an opportunity to collect additional TDG data on a variety of Project operations that met study criteria and are included in the results of the 2006 TDG Abatement Study. Spill amounts ranged from 5.2 to 52 percent of Project flow; the volume of spill ranged from 2.2 to 124.7 kcfs, and the total discharge ranged from16.4 to 254.0 kcfs. There were six tests that were done at flows that exceeded the Wells Dam 7Q10 flows of 246 kcfs.

Results of the study indicated that two operational scenarios, spread spill and concentrated spill, produced the lowest levels of TDG. Douglas PUD continued testing of operational measures to ameliorate TDG production at Wells Dam (EES Consulting et al. 2007). The 2006 study confirmed that the current locations of the forebay and tailwater TDG compliance monitoring station are appropriate in providing representative TDG production information both longitudinally and laterally downstream of Wells Dam.

A study was initiated with the University of Iowa IIHR-Hydroscience and Engineering in 2007 to develop a numerical model capable of predicting the hydrodynamics and TDG concentrations in the tailrace of the Wells Project. The purpose of the model was to assist in the understanding of the underlying dynamics of TDG production allowing an accurate evaluation of the effectiveness of various spill configurations and plant operations in reducing TDG at Wells Dam. The modeling efforts were divided into three phases. Phase I was a developmental stage for calibration and validation. The results from Phase I were successful and the model was proven to provide a reliable predictor of tailrace TDG and therefore a useful tool to identify Project operations that can minimize TDG concentrations downstream of Wells Dam (Politano et al. 2008). Phase II was a series of model runs using varying spill configurations based on typical 7Q10 events observed over the past decade. The final model scenario showed that preferred operating conditions and spillway configurations are able to reduce tailrace TDG to levels within Washington State WQS (<120 percent) during a 7Q10 flow (Politano et al. 2009*a*).

Phase III included a series of operating criteria to further reduce tailrace TDG by reconfiguring the spillway operations used to achieve the tailrace standard in Phase II. In addition to gaining additional reductions in TDG, IIHR-Hydroscience and Engineering ran a "Standard Compliance Comparison" scenario. The Standard Compliance Comparison scenario included a forebay TDG of 115 percent, along with 9 of 10 units operating at full capacity (i.e., 90 percent of total powerhouse capacity), to provide results comparable to downstream hydroelectric project TDG evaluations. The Phase III report also demonstrated compliance with two other requirements of the state WQS: (1) the ability to meet 115 percent in the forebay of Rocky Reach Dam during fish spill; and (2) the ability to maintain 110 percent in the tailrace during non-fish spill periods (Politano et al. 2009*b*).

A recent literature review of TDG literature produced between 1980-2007 indicates that in most field situations TDG levels of 110 to 120 percent produce little if any Gas Bubble Trauma (GBT), and that the severity of GBT under these conditions is likely to be minor if it does occur (Weitkamp 2008). The hydrostatic compensation available to fish and invertebrates in field conditions and used by their natural behavior generally avoids the effects seen in laboratory investigations. The literature reviewed in this document, and a previous literature review (Weitkamp and Katz 1980), do not support population effects resulting from TDG levels of 120 percent and lower.

Water Temperature Monitoring

Beginning in 2001, an extensive water temperature monitoring effort was initiated by Douglas PUD in order to better understand the temperature dynamics throughout the Wells Reservoir. Temperature data was collected by Douglas PUD at four locations in the Columbia River (RM 544.5, 535.3, 530.0, and 515.6) and at one site each on the Okanogan (RM 10.5) and Methow (RM 1.4) rivers. Data collected by Douglas PUD were collected hourly using Onset tidbit temperature loggers. Monitoring start and end dates varied from year to year but generally began in the early spring and ended in late fall. Quality assurance and control measures were implemented prior to deploying and upon retrieving temperature loggers to ensure that data collected were accurate. Due to sensor loss or sensor malfunction in some years, the availability of data at some of these monitoring locations is sporadic.

In general, 7-DADMax temperature data indicate that the portion of the Columbia River upstream of and within the Project generally warms to above 17.5°C (WQS numeric criteria) in mid-July and drops below the numeric criteria by early October (Figure 3.3.2.1-5). Water temperatures in the Methow River upstream of the Project warm to above 17.5°C in mid-July and drop below the numeric criteria by September

(Figure 3.3.2.1-6), while trends in the Okanogan River (upstream of the Project) indicate warming above 17.5°C from early June with cooling by late September (Figure 3.3.2.1-7). Maximum water temperatures typically occur in late summer (August) with temperatures below Chief Joseph Dam, the Methow River (RM 1.4), and the Okanogan River (RM 10.5) reaching 20.0°C, 22.5°C, and 27.0°C, respectively. It is important to note that these data are representative of water temperatures as they flow into the Project.

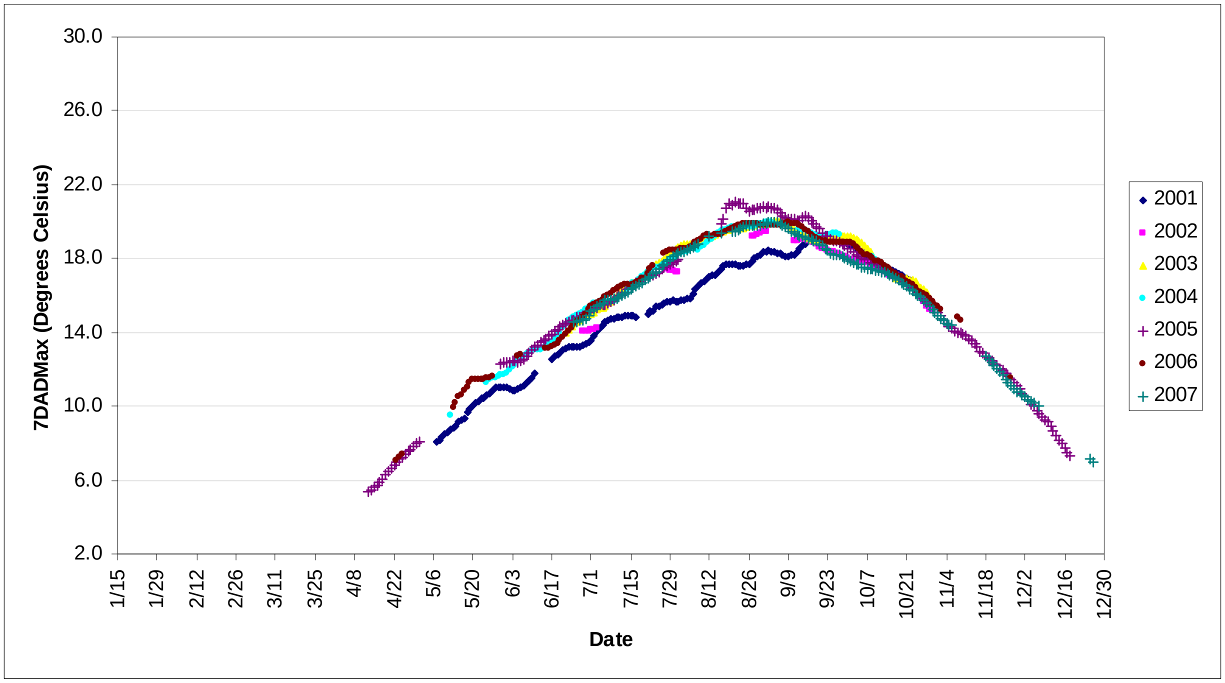

Figure 3.3.2.1-5 7-DADMax water temperature collected in the tailrace of Chief Joseph Dam (RM 544) using Onset temperature loggers for years 2001-2007.

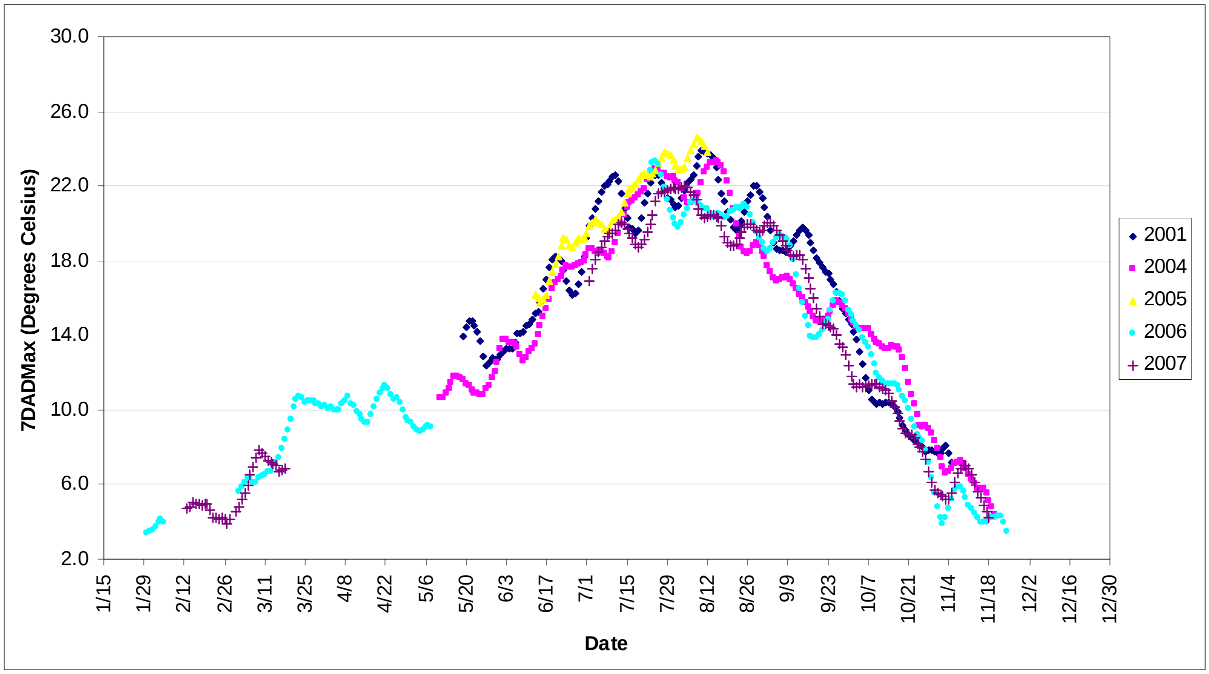

Figure 3.3.2.1-6 7-DADMax water temperature collected in the Methow River upstream from the influence of Wells Dam (RM 1.4) using Onset temperature loggers for years 2001-2007. Data were unavailable in 2002 and 2003.

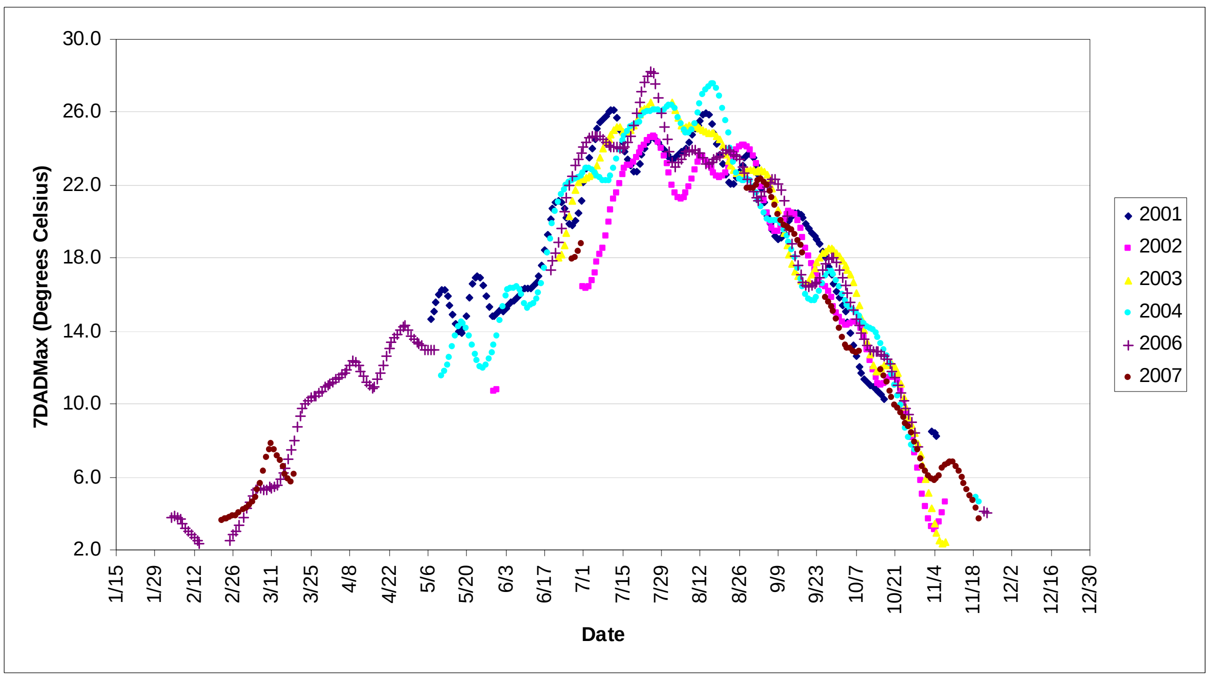

Figure 3.3.2.1-7 7-DADMax water temperature collected in the Okanogan River (RM 10.5) using Onset temperature loggers for years 2001-2007.

In 2006, Douglas PUD expanded the Project temperature monitoring season to cover the entire year and implemented a more frequent downloading schedule. Douglas PUD also added additional monitoring stations at the mouths of the Okanogan (RM 0.5) and Methow (RM 0.1) rivers. These have been used to model temperature and the effects of Project operations on water temperatures at Wells Dam and within the Wells Reservoir as they relate to compliance with the WQS numeric criteria for temperature.

Wells Dam has two fish ladders, one at each end of the dam. The two fish ladders are conventional staircase-type fish ladders with 73 pools. The water source for the upper pools is the Wells Dam Forebay. The ladders are enclosed and are not subject to direct insolation.

According to the Wells HCP BO issued by NMFS, all entities that use the fish trapping facilities at Wells Dam are required to discontinue trapping operations when fish ladder water temperatures exceed 68.0º F (20.6°C). In 2001 and 2003, Douglas PUD added supplemental temperature recording equipment at Pool 39 near the broodstock collection facilities in the east fishway at Wells Dam to ensure compliance with requirements in the NMFS BO. In 2001, hourly data indicated that water temperatures at this location in the east fish ladder did not exceed 68.0ºF (20.6°C) at any time during the monitoring period (Figure 3.3.2.1-8) from late July to early December. In 2003, data were recorded every two hours and exceedances of greater than 68.0°F (20.6°C) were observed on three hourly occasions (Figure 3.3.2.1-9).

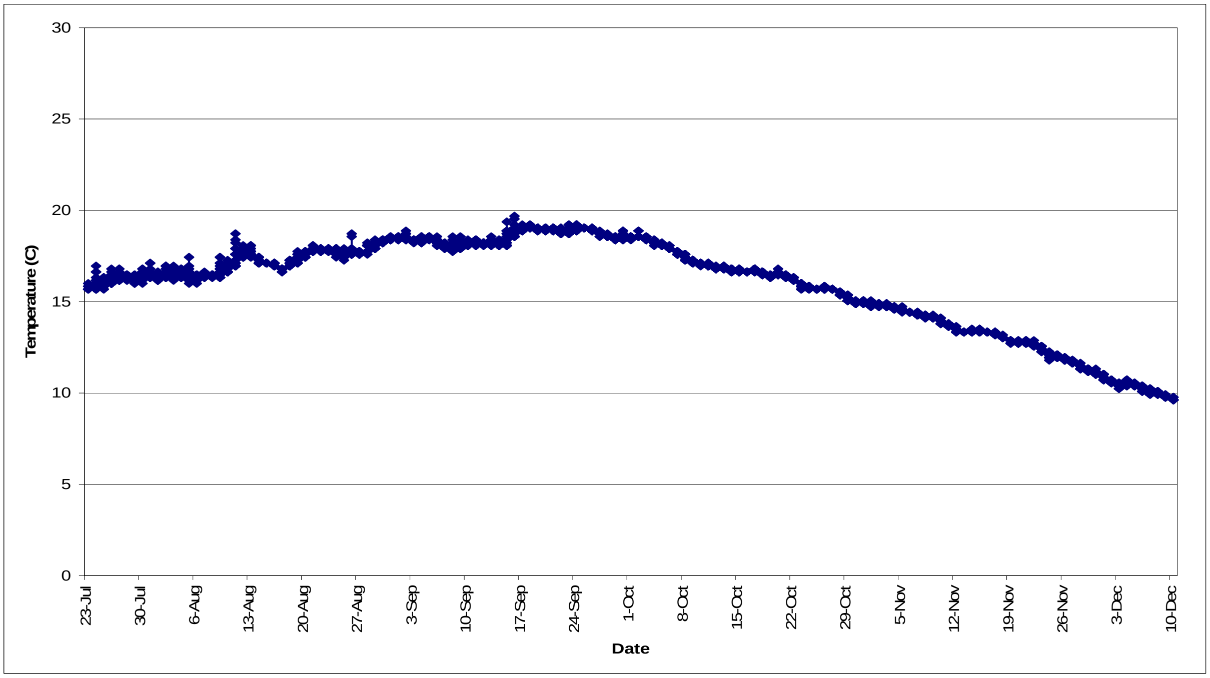

Figure 3.3.2.1-8 Hourly water temperatures collected at the Wells Dam east fish ladder trap during 2001.

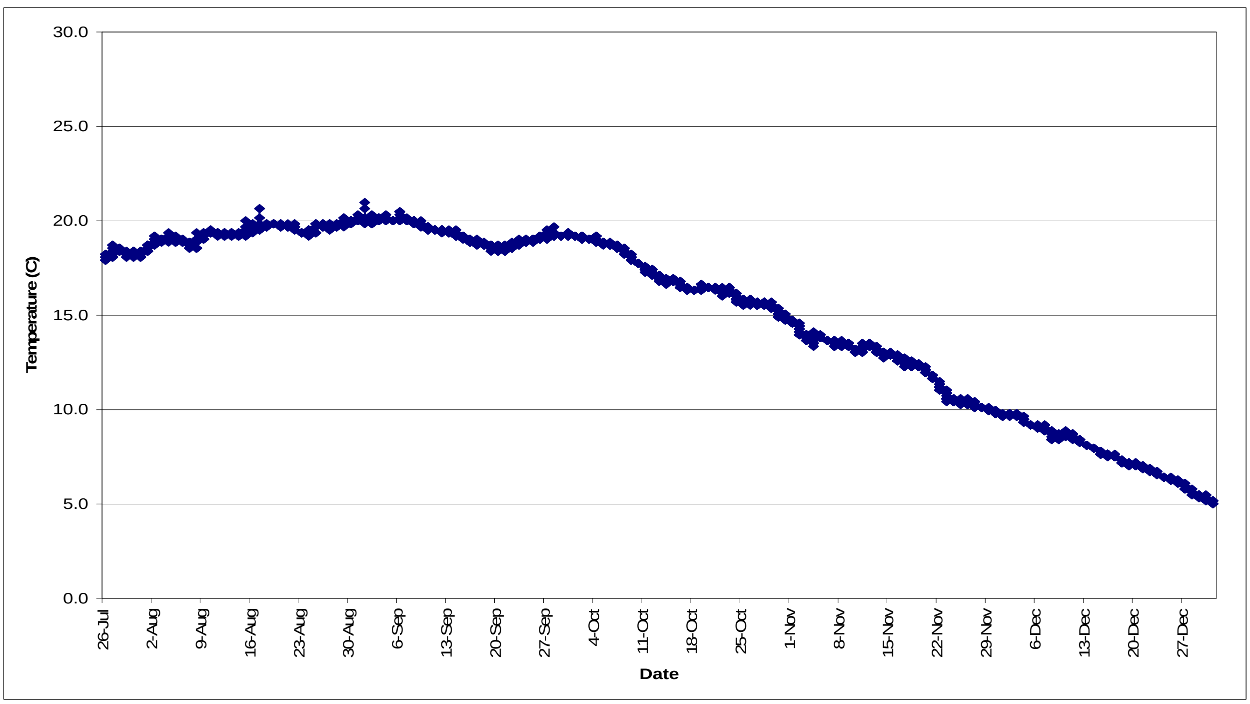

Figure 3.3.2.1-9 Water temperatures collected every two hours at the Wells Dam east fish ladder trap during 2003.

Water Temperature Study Results

To assess compliance with the WQS numeric criteria, two two-dimensional (2-D) laterally-averaged temperature models (using CE-QUAL-W2) were developed that represent existing (or "with Project") conditions and "without Project" conditions of the Wells Project including the Columbia River from the Chief Joseph Dam tailrace to Wells Dam, the lowest 15.5 miles of the Okanogan River, and the lowest 1.5 miles of the Methow River. The results were processed to develop daily values of the 7-DADMax, and then compared for the two conditions (West Consultants, Inc. 2008).

In the Okanogan River, upstream of approximately RM 5, the river is moderately influenced by backwater conditions from the Columbia River. A comparison of observed temperatures at Malott (RM 17) and Wakefield Bridge (RM 10.5) shows that backwater from Wells Dam generally creates a deeper pool that tends to reduce the very high upstream summer temperatures found farther upstream in the free-flowing Okanogan River. The daily high temperatures within the inundated portions of the Okanogan River were often lowered relative to the daily high temperatures upstream of the Project during the hottest summer months (West Consultants, Inc. 2008).

The lowest 1 to 2 miles of the Okanogan River are influenced by the intrusion of Columbia River water. This too has the significant effect of reducing summer high temperatures by 2 to 6°C, and increasing winter temperatures 1 to 3°C, reducing the extent and length of freezing. In the fall months, as the Okanogan River temperatures drop more quickly than those in the Columbia River, the lowest 1 to 2 miles of the Okanogan River may see fall increases of about 1°C, as Columbia River water intrudes into the lower Okanogan River during a period when flows in the Okanogan River are quite small. However, additional analyses indicate that while backwater from the Columbia River does tend to slow the speed of the Okanogan River, the additional thermal "exposure" does not cause increases in temperatures of more than 0.3°C. Rather, the differences in the lower river temperatures are a result of Columbia River water intruding into the lower Okanogan River and not warming of Okanogan River water (West Consultants, Inc. 2008).

The thermal processes in the lowest 1.5 miles of the Methow River are similar to those in the lower Okanogan River. While the summer high temperatures in the Methow River are not as high (they can reach 24°C) as those upstream in the Okanogan River, backwater from the Columbia River still reduces the summer high temperatures by about 1°C and increases the winter temperatures by 2 to 3°C, reducing the extent and length of freezing. In the fall months, as the Methow River temperatures drop more quickly than those in the Columbia River, the lowest 1.5 miles of the Methow River may see fall increases of about 2 to 3°C, as Columbia River water intrudes into the lower Methow River during a period when flows in the Methow River are quite small. Again, additional analyses indicate that while backwater from the Columbia River does tend to slow the speed of the Methow River, the additional thermal "exposure" does not cause increases in temperatures of more than 0.3°C. Rather, the differences in the lower river are attributed to the mixing of Columbia River and Methow River waters within the geographic confines of the lower Methow River (West Consultants, Inc. 2008).

DO, pH, and Turbidity Monitoring

In 2005, Douglas PUD added sensors to its existing forebay TDG monitoring equipment (Hydrolab Minisonde) in order to collect preliminary information on pH and DO within the Project. In 2006, Douglas PUD expanded the monitoring period to include the entire late summer period. In 2007, Douglas PUD further expanded the monitoring period to begin in July and end in early December (Figures 3.3.2.1-10 and 3.3.2.1-11).

At Wells Dam, Secchi disk readings are taken daily during the adult fish passage assessment period of May 1 to November 15 to examine turbidity. A standard Secchi disk is lowered into the forebay on the west side of Wells Dam near the exit to the west fishway. Measurements are recorded in meters of visibility and records have been made since the early 1970s; however, continuous, reliable information adhering to a standard protocol has been collected since 1998. General trends of Secchi disk data suggest relatively lower periods of visibility (0.6 to 1.2 meters) during the spring and early summer. These relatively low periods of visibility are highly correlated with high flows during the spring runoff period. As the high flow period subsides, Secchi disk values increase to between 3.4 and 4.6 meters for the remainder of the monitoring period. In 2008, Douglas PUD installed a fixed turbidity sensor near the east fishway exit in the Wells Forebay and collected turbidity data in the Wells Forebay.

DO, pH, and Turbidity Study Results

A study to collect additional DO, pH, and turbidity data from within the Wells Project was proposed by the Aquatic RWG in 2007. The goal of this study was to obtain required DO, pH, and turbidity information for the Wells Dam Forebay and lower Okanogan River, both above and within the Wells Project Boundary. The information gathered from these monitoring efforts demonstrated that the Project, as proposed to be operated under the new license, will meet the numeric criteria for WQS (Parametrix, Inc. 2009*a*), with the possible exception of turbidity on the Okanogan River.

DO measurements demonstrate that the Okanogan River and the forebay of Wells Dam were in compliance with WQS. Project effects on DO concentrations in the Okanogan River were not evident as incoming water quality closely resembled that of the inundated portions of the Okanogan River. Changes in background minimum DO levels at Malott (above Project Boundary) have a strong and significant linear relationship ($P < 0.0001$) with minimum values recorded within Project boundaries at both Monse and the Highway 97 Bridge. These results indicate that there is no statistically-significant difference between minimum DO measurements collected above the Project and within the Project. DO concentrations in the forebay of Wells Dam remained well above the minimum numeric water quality criterion, excluding an instrument-related malfunction observed in early October (Parametrix, Inc. 2009*a*).

Only on one occasion did pH within the Project exceed background measurements, but only by 0.06 units, well within the water quality allowance for human-caused conditions. These results indicate that pH measurements within the Project Boundary are well within the numeric criteria for WQS (Parametrix, Inc. 2009*a*).

The highest turbidity levels in the Project are typically observed in the Okanogan River arm of the Wells Reservoir. Increased river flows coincide with snowmelt and precipitation events which also cause higher turbidity levels. In 2009, Douglas PUD monitored turbidity in the Okanogan River for a second year of study due to data gaps from 2008 monitoring efforts. Results from the 2009 field season demonstrate that turbidity decreases from the background monitoring location (Malott, RM 17.0, 1.5 miles above Project Boundary), to both Monse (RM 5.0) and the Highway 97 Bridge (RM 1.3). No exceedances were observed and the data showed that the Wells Project is in compliance with the Washington State WQS for turbidity at all monitored locations (Douglas PUD and CBE 2009).

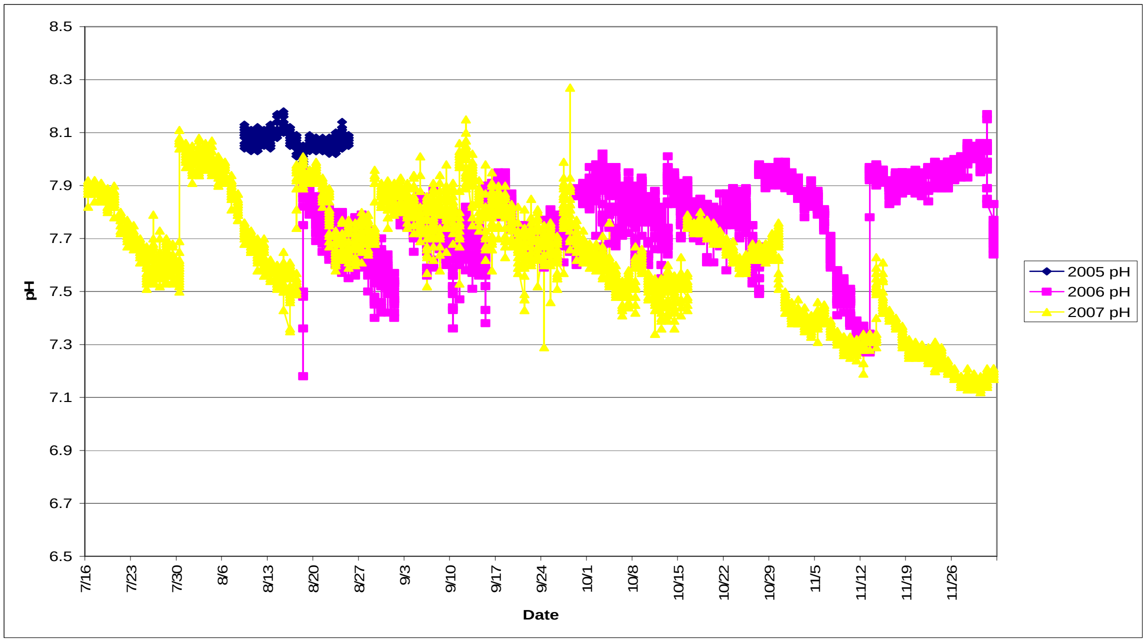

Figure 3.3.2.1-10 **pH measurements collected at the Wells Forebay TDG monitoring station (Hydrolab MiniSonde), 2005-2007.**

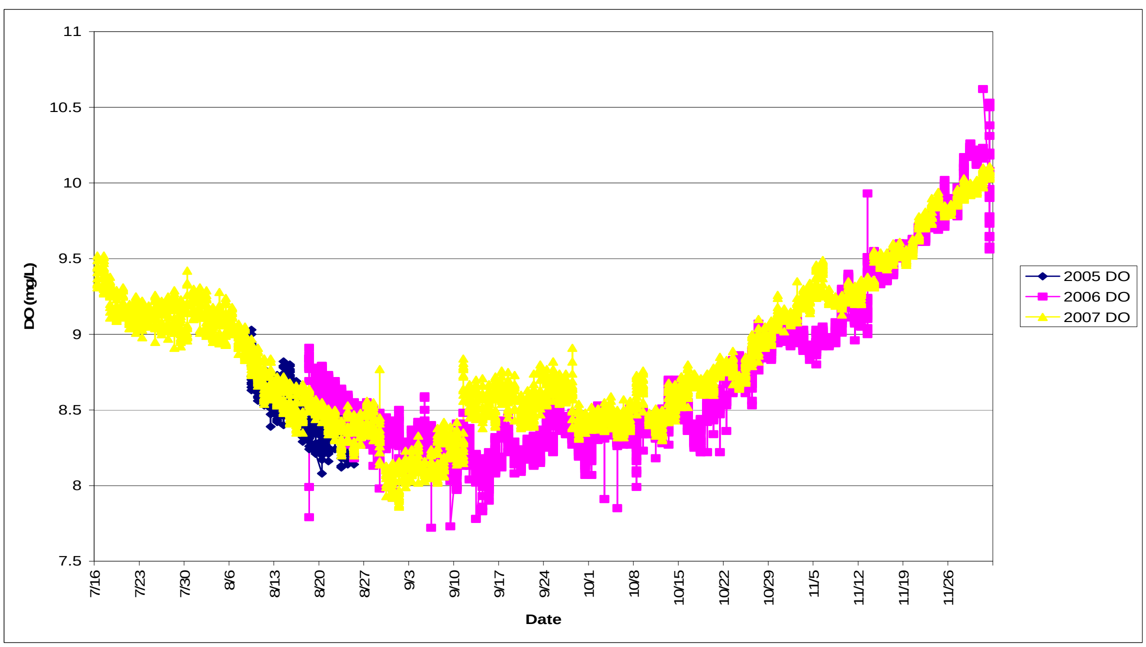

Figure 3.3.2.1-11 **DO measurements collected at the Wells Forebay TDG monitoring station (Hydrolab MiniSonde), 2005-2007.**

Toxins Study Results

In 2008, a toxins study (Parametrix, Inc. 2008) was conducted in the Okanogan River as part of the relicensing of the Wells Project. The objective of the study was to determine the concentration of the persistent bioaccumulative pollutants DDT and PCBs in recreational fish species and in swimming area sediments of the lower Okanogan River (up to RM 15.5) within the Wells Project Boundary. This study augmented previous information collected by Ecology during the development of the Lower Okanogan River Basin DDT and PCBs TMDL report, and assisted in further documenting DDT and PCBs concentrations in the sediment and fish tissues in the Okanogan River.

Fish species targeted for analyses were common carp (*Cyprinus carpio*), mountain whitefish (*Prosopium williamsoni*), and smallmouth bass (*Micropterus dolomieui*). These are three common resident fish species in the Okanogan River and represent different feeding behaviors and habitat uses.

Sediment sampling locations were selected during a site reconnaissance targeting accessible recreation sites along the lower Okanogan River within the Wells Project Boundary (RM 15.5 to RM 0.0).

PCBs were undetected in all sediment samples at the 3.9 to 4.0 microgram per kilogram (µg/kg) reporting limits. Results were more than one order of magnitude below the 60 µg/kg sediment quality standard value proposed by Michelsen (2003). DDT analogs were not detected in samples from the SED4 and SED5 sampling sites. Total DDT results were similar to the range of 8.3 to 23 µg/kg detected in the upper 32 centimeter (cm) of a 2001 sediment core collected for the TMDL study, where total concentrations were 8.8 µg/kg in the upper 2 cm and increased to 23 µg/kg in sediments from 30 to 32 cm deep (Parametrix, Inc. 2008). Sample concentrations from both studies were below the lowest apparent effects thresholds for aquatic life (DDD 96 µg/kg, DDE 21 µg/kg, and DDT 19 µg/kg) (Michelsen 2003).

The lipids content of lower Okanogan River carp collected for this study were greater than in carp collected for the TMDL technical assessment (Serdar 2003). The carp sampled in this study were also much larger and presumably older than fish sampled for the TMDL. The larger and older fish used in this study had correspondingly higher concentrations of DDT than reported in the TMDL assessment. Total DDT ranged from 120 to 25,726 µg/kg in carp from the current study compared to 236 to 434 µg/kg in carp from the TMDL study (Parametrix, Inc. 2008).

Higher PCBs concentrations were associated with larger, older-aged carp with higher lipids content. Similar correlations between total PCBs and lipids content, mean weight, and mean length were not significant for smallmouth bass tissue samples. Total PCBs concentrations ranged from 8.8 to 246 µg/kg in carp and <4 to 79 µg/kg in smallmouth bass. These concentrations were lower than fish tissue concentrations in mountain whitefish from the Wenatchee River and in carp from the Walla Walla River that have led to fish consumption advisories (Washington Department of Health [WDOH] 2008).

Sediment Accumulation Results

In 2006, Douglas PUD conducted an analysis to assess sediment accumulation within the Project portion of the Okanogan River (lower 15.5 miles). Douglas PUD collected bathymetric information at nine transects (RM 0.8, 1.3, 2.7, 4.9, 8.2, 10.5, 14.4, 16.6, and 19.0) in 1997 and in 2006 both within and above the Project portion of the Okanogan River. A comparison of the bathymetric data for all nine transects between 1997 and 2006 indicated that sediment is not accumulating in the Project portion of the Okanogan River. It was concluded that with regard to sediment loading, the Okanogan River is exhibiting natural riverine processes and is not affected by Project operations (Exhibit E; Appendix E-2).

Oil and Hazardous Spills

Design considerations within the Wells Project have been instituted to minimize potential releases of petroleum products that are necessary to its operation. SPCC plans for the Wells Project have been prepared, and approved by EPA and Ecology in accordance with 40 CFR 112, and implemented (Jacobs 2007). The SPCC plan details the management practices used to prevent and contain spills, reporting requirements, and a schedule for periodic review and revision, if necessary.

The SPCC plan fulfills the requirements of 40 CFR 112, EPA Oil Pollution Prevention Regulations. This plan is referenced in Douglas PUD's proposed WQMP (Exhibit E; Appendix E-2) incorporated into the Water Quality Comprehensive Plan and will be referenced in Ecology's 401 WQC. Therefore, no additional requirements for oil and hazardous spill prevention are necessary.

Environmental Effects

Summary of Compliance with WQS

Based on the Initial and Updated Study Reports, required by the FERC's Integrated Licensing Process, the Aquatic SWG was able to determine that waters within the Wells Project currently meet state numeric criteria of WQS as defined in Chapter 173-201A WAC. Table 3.3.2.1-11 presents supporting studies, by standard.

Table 3.3.2.1-11 Summary of compliance with WQS based on the initial and updated study reports. Waters within the Wells Project currently meet state numeric criteria of WQS as defined in Chapter 173-201A WAC.

Standard	Studies	Result(s)	Continued Monitoring
TDG	Politano et al. 2008, 2009*a*, 2009*b*	Compliance met under preferred operating conditions and standard compliance scenario	Yes
Temperature	West Consultants, Inc. 2008	Compliance met, zero exceedances. Potential future TMDL	Yes
DO	Parametrix, Inc. 2009*a*	Compliance met, zero exceedances	No
pH	Parametrix, Inc. 2009*a*	Compliance met, zero exceedances	No
Turbidity	Parametrix, Inc. 2009*a*; Douglas PUD and CBE 2009	Compliance met, zero exceedances	No

Total Dissolved Gas

The operation of spillways at Wells Dam influences TDG concentrations in the Wells Tailrace and Rocky Reach Forebay. Recent studies and modeling results conducted by Douglas PUD demonstrate that the existing spillway operations can be modified to meet the WQS TDG numeric criteria. Analyses also demonstrated compliance with two other requirements of the state WQS: (1) the ability to meet 115 percent in the forebay of Rocky Reach Dam during fish spill; and (2) the ability to maintain 110 percent in the tailrace during non-fish spill periods (Table 3.3.2.1-11) (Politano et al. 2009*b*).

Temperature

The Wells Project has no adverse effect on water temperatures (West Consulting, Inc. 2008). Modeling demonstrated that temperature effects of the Wells Project in the Project Boundary of the Columbia, Okanogan, and Methow rivers were within the allowable 0.3°C compared to ambient ("without Project") anywhere in the Wells Reservoir as identified within the WQS numeric criteria for temperature. Additionally, the analyses demonstrated that the backwater from Wells Dam serves to moderate both high-summer and low-winter water temperatures relative to the free-flowing Okanogan and Methow rivers (West Consulting, Inc. 2008).

Based upon the existing information, the Wells Project will remain in compliance with the WQS temperature numeric criteria, and therefore avoid adverse impacts to fish and aquatic resources as a result of elevated temperatures (Table 3.3.2.1-11).

DO, pH, Turbidity

The limnology study conducted in 2006 concluded that Wells Project waters remained unstratified throughout the study period and were vertically homogenous for DO. All surface water measurements had DO values greater than 8.0 mg/L, which are the WQS numeric criteria (EES Consulting 2006). Additional sampling between 2005 and 2007 in the Wells Project forebay during TDG compliance monitoring also observed DO values in compliance with the WQS numeric criteria. Project effects on DO concentrations in the Okanogan River were not evident as incoming DO concentrations resemble those within the inundated portions of the Okanogan River (Parametrix, Inc. 2009*a*).

The 2006 limnology study observed no pH exceedances in Wells Project waters (EES Consulting 2006). Additional sampling between 2005 and 2007 in the Wells Project indicate that pH measurements within the Project Boundary are well within the numeric criteria for WQS (Parametrix, Inc. 2009*a*; Table 3.3.2.1-11).

Low turbidity is generally observed in the Wells Reservoir, likely due to the large upstream storage reservoir capacity that allows fines to settle out. Turbidity in the Okanogan River is consistently higher than in the Wells Reservoir. Elevated turbidity coincides with increasing snowmelt and precipitation causing increased river flow as opposed to effects of the Wells Project (Parametrix, Inc. 2009*a*). Continued monitoring supports the finding that turbidity levels upstream from Project boundaries are substantially greater than levels measured within the Project (Douglas PUD and CBE 2009).

Based upon the existing information, the Wells Project will remain in compliance with the WQS DO, pH, and turbidity numeric criteria, and therefore will not adversely affect fish and aquatic resources (Table 3.3.2.1-11).

Sediment Loading and Toxins

A comparison of the bathymetric data for nine Okanogan River transects taken in 1997 and 2006 indicated that the Wells Project was not causing sediment accumulation in the Wells Project portion of the Okanogan River. The 2003 technical assessment (Serdar 2003) conducted by Ecology as required by a TMDL, identified re-suspended Osoyoos Lake sediments (located in Canada upstream of the Wells Project) as the origin for nearly all of the DDT loads in the Okanogan River. Concentrations of DDT and PCBs observed in the lower Okanogan River were below thresholds for acute toxicity (Serdar 2003). A toxins study conducted in 2008 found that levels of DDT and PCB in fish and sediments from the Okanogan River were consistent with previous findings in that toxins are present, though not Project-related (Parametrix, Inc. 2009*a*).

Information indicates that the Okanogan River is exhibiting natural riverine processes (transporting sediment loads during high spring flows) and that the input, movement, accumulation, and retention of toxins originating in the Okanogan River subbasin are not caused by the operation of the Wells Project (Douglas PUD and CBE 2009).

Reservoir Water Quality

Results from the numerous studies conducted of the Wells Reservoir indicate that the water quality, turbidity, flow, and nutrient levels are at levels that will readily support healthy populations of aquatic species and provide numerous water uses that include salmonid spawning, rearing and migration, recreation (primary contact), water supply uses (domestic, industrial, agricultural, and stock watering) and miscellaneous uses such as wildlife habitat, harvesting, commerce/navigation, boating, and aesthetics (Douglas PUD 2006; Ecology 2008*a*). Limnological, macrophyte, and aquatic macroinvertebrate studies of the reservoir support these findings (BioAnalysts, Inc. 2006; Douglas PUD 2006; EES Consulting, Inc. [EES] 2006; Le and Kreiter 2005). Water quality studies have demonstrated compliance with all Washington State numeric criteria for water quality standards associated with TDG, DO, pH, turbidity, water temperature, and toxins (Politano et al. 2008, 2009*a*, 2009*b*; West Consultants, Inc. 2008; Parametrix, Inc. 2009*a*; Douglas PUD and CBE 2009). These studies indicate that Wells Reservoir is a healthy water body with no thermal or chemical stratification; that the reservoir ecosystem is dominated by native fish, macrophyte, and benthic invertebrate communities; and that the reservoir supports healthy populations of numerous other native wildlife species.

Proposed Environmental Measures

Douglas PUD has executed an ASA (Exhibit E; Appendix E-2) with federal, state, and tribal entities, to address all remaining aquatic resource issues related to the relicensing of the Wells Project, including impacts to water quality.

The Wells Project can have an adverse effect on water quality. The planned implementation of the WQMP, during the term of the new license, is expected to fully address any measureable adverse effects.

Water Quality Management Plan

Water quality studies have determined that the Wells Project does not have an adverse effect on temperature, DO, pH, and turbidity. These studies demonstrated that the Project is in compliance with the WQS numeric criteria and can achieve compliance with the TDG numeric criteria through modifications to spill operations at Wells Dam. To ensure that the Wells Project remains in compliance with the WQS over the length of the new license term, Douglas PUD proposes the implementation of a WQMP. The implementation measures outlined in the WQMP are intended to be consistent with the conditions of Ecology's WQC.

The WQMP was developed by Douglas PUD and the federal, state and tribal entities who are parties to the Aquatic Settlement Agreement. The goal of the WQMP is to protect the quality of the surface waters affected by the Wells Project. Reasonable and feasible measures will be implemented in order to comply with the numeric criteria of the state WQS, Chapter 173-201A WAC. Objectives of the WQMP are as follows:

Objective 1: Maintain compliance with state WQS for TDG. If non-compliance is observed, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD.

Objective 2: Maintain compliance with state WQS for water temperature. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD.

Objective 3: Maintain compliance with state WQS for other numeric criteria. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD. Also, Douglas PUD will demonstrate whether it is in compliance with turbidity on the Okanogan River, and if not in compliance, work with the Aquatic SWG to identify appropriate implementation measures.

Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill.

Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin.

Measures contained within the WQMP include continued monitoring of a variety of water quality parameters to ensure that the Wells Project remains in compliance with the WQS over the new license term. Douglas PUD plans to continue to operate the juvenile bypass system for anadromous salmonids as required by the Wells HCP. Operating the JBS and spilling water in excess of project generation requirements can results in elevated levels of TDG requiring an Ecology-approved GAP. Continued TDG monitoring is proposed at the Project in support of the GAP. Continued temperature monitoring within the Wells Project including in Wells Dam fishways are also proposed. Douglas PUD plans to operate the Wells Project in a manner that will minimize spill of hazardous materials, implement effective countermeasures in the event of a hazardous materials spill, and comply with and update the SPCC as required. Participation in regional water quality forums such as the CSR-SRI and the development and implementation of the Columbia River temperature TMDL are also proposed.

Cumulative Effects

The operation of the Wells Project and other mainstem Columbia River dams can influence water quality conditions in the mid-Columbia River. During periods of high flows, spillway releases at these dams can increase TDG levels throughout the river. Additionally, impoundment of water behind the dams and fluctuating reservoir levels and Project releases may influence water temperatures, DO levels, pH, and turbidity within the reservoirs and downstream.

The occurrence of TDG supersaturation in the Columbia River system is well documented and has been linked to mortalities and migration delays of salmon and steelhead. High TDG values at both Wells Dam and the downstream Rocky Reach Dam are influenced by various factors including high spring flows and operations at upstream federal dams (e.g., flow augmentation), which results in water entering the Wells Project with relatively high TDG levels. During these time periods, river conditions in the mid-Columbia River system may lead to exceedances of the TDG criteria. The effects of the Wells Project on TDG depend on the TDG levels in water reaching the Wells Dam Forebay and the extent and configuration of spills at the Project. The operation of spillways at Wells Dam has been documented to influence TDG concentrations in the Wells Tailrace and Rocky Reach Forebay. Studies and modeling performed as part of relicensing demonstrate that the existing spillway operations can be modified to meet the TDG numeric WQS. Analyses also demonstrated the Wells Project can meet the TDG compliance requirements of the State WQS in the forebay of Rocky Reach Dam during fish spill and in the Wells Tailrace during non-fish spill periods.

The Columbia River historically exceeded the EPA's 18°C temperature criteria prior to development of many of the hydroelectric projects that exist today (FERC 2006). Ecology and EPA are currently developing a TMDL for temperature for the Columbia River basin. In association with development of the temperature TMDL, EPA conducted modeling which indicated that generally the Columbia River temperatures increase during spring and summer at about the same rate as they did before construction of the hydroelectric dams. The model predicted that without reservoirs the river had much lower flows in late summer, and water temperature was much more variable in response to changes in climatic conditions. Peak water temperatures during hot weather were often higher than those that currently occur, but on average the river exceeded 18°C less of the time before the hydroelectric project dams were constructed (EPA 2002). EPA data has also shown that most of the temperature changes due to human effects are the result of large storage reservoirs. The smaller run-of-river projects, including the Wells Project, have much less effect on water temperatures (FERC 2006). Douglas PUD's water temperature monitoring in the Wells Reservoir has documented that the temperature is primarily governed by the temperature of inflowing water at Chief Joseph Dam, with little warming occurring as water traverses the Wells Reservoir's length. Modeling has demonstrated that temperature effects of the Wells Project in the Project Boundary of the Columbia, Okanogan, and Methow rivers were within the allowable WQS throughout the Wells Reservoir. Additionally, the analyses demonstrated that the backwater from Wells Dam serves to moderate both high summer and low winter water temperatures relative to the free-flowing Okanogan River.

Water quality studies have determined that the Wells Project does not have an adverse effect on temperature, DO, pH or turbidity; and that TDG can be addressed through modifications to spillway operations. To ensure that the Wells Project remains in compliance with WQS throughout the new license term, Douglas PUD will implement the WQMP. The WQMP will provide for ongoing monitoring and evaluation, and includes the flexibility to adjust the program over the term of the new license as new information is gathered.

Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on water quality.

3.3.2.2 Aquatic Plants

Affected Environment

Background Biology

Aquatic plants (macrophytes) are an integral component of the aquatic ecosystems in which they occur. Macrophytes act as major structural components of littoral habitats, functioning as shelter, nesting, and feeding grounds for a wide variety of micro-organisms, fish, and waterfowl (Hudon et al. 2000). The nature of these plant communities has been shown to affect light, temperature, turbulence, water and sediment chemistry, and the abundance and composition of other biotic assemblages from epiphytes to phytoplankton (Johnson and Ostrofsky 2004).

Aquatic plant communities in river and reservoir systems can be characterized by distinct zones of vegetation that are influenced by a set of complex environmental variables such as water, depth, exposure, turbidity, salinity, and soil characteristics (NMFS 2002*a*). Within the mid-Columbia River, healthy and productive native aquatic plant communities are integral to the viability of many fish and wildlife populations. Aquatic plant communities create structural complexity resulting in high-quality rearing habitat for juvenile fish, a stable prey base of forage fish for larger predators, increased lower-level trophic production, increased nutrient cycling, and benefits to water quality (Hudon et al. 2000).

Limited information exists to describe aquatic macrophyte communities in the mid-Columbia River region. Vegetation mapping in and around the Rocky Reach Reservoir (RM 473.6 to 515.5) identified 979 acres of aquatic macrophytes out of a total surface area of 8,167 acres (Duke 2000). Non-native Eurasian watermilfoil represented 34 percent of the biomass in the samples collected (Duke 2001). In the Priest Rapids and Wanapum reservoirs, the composition of Eurasian watermilfoil in the aquatic macrophyte community was higher at 42 percent of littoral plant biomass (Normandeau 2000).

In 2005, Douglas PUD conducted an aquatic macrophyte baseline study to determine the species composition, relative abundance, and spatial distribution of macrophyte beds within the waters of the Wells Project (Lê and Kreiter 2005). The study used high-resolution orthophotography, detailed bathymetric data, and extensive in-water sampling to determine presence or absence of macrophyte beds. Species composition of macrophyte beds was verified during more intensive surveys. Composition data were categorized into several aquatic plant community types and then integrated into a final continuous macrophyte map layer (Lê and Kreiter 2005).

Nine aquatic plant species were documented in the Wells Project (Lê and Kreiter 2005). Seven of these species are native to the mid-Columbia River basin, and two species are non-native (Eurasian watermilfoil and curly leaf pondweed, *Potamogeton crispus*). Table 3.3.2.2-1 presents the percentage of samples in which each of the identified aquatic plant species was categorized as the dominant species (consisting of >60 percent of the sample composition). The two most common dominant species in samples collected were common waterweed (*Elodea canadensis*) and leafy pondweed (*Potamogeton foliosus*) at 24.7 and 16.7 percent, respectively. Both of these species are native. Native aquatic plants were the dominant species in over 89 percent of the macrophytes beds sampled. Eurasian watermilfoil was dominant in only 6.3 percent of samples taken (Table 3.3.2.2-1); all of these samples were taken at depths between 4 and 15 feet. Samples in which no plants were observed occurred 41.7 percent of the time, indicating that macrophyte communities maintain a patchy distribution within the Wells Project (Lê and Kreiter 2005).

Table 3.3.2.2-1 Aquatic macrophyte species identified and the frequency with which each was the dominant species (consisting of >60 percent of the total sample) during the Macrophyte Identification and Distribution Study, 2005.

Scientific Name	Common Name	Percentage of Samples in Which Dominant
Chara spp.	Muskgrass	0.3% (1/396)
Elodea canadensis	Common waterweed	24.7% (98/396)
*Myriophyllum spicatum**	Eurasian watermilfoil	6.3% (25/396)
*Potamogeton crispus**	Curly leaf pondweed	4.3% (17/396)
Potamogeton foliosus	Leafy pondweed	16.7% (66/396)
Potamogeton nodosus	American pondweed	1.3% (5/396)
Potamogeton pectinatus	Sago pondweed	0.8% (3/396)
Potamogeton zosteriformis	Flat-stemmed or eelgrass pondweed	2.3% (9/396)
Absent		41.7% (165/396)

*Non-native species.
Source: Lê and Kreiter 2005.

Macrophyte communities in the Wells Project were distributed by various depth ranges. In general, macrophyte communities did not recruit to depths of less than 4 feet. Depths between 5 and 15 feet were characterized by a native dominant species composition. If Eurasian watermilfoil was present at these depths, it was generally sub-dominant or at low densities (<10 percent of sample). From depths of 15 to 24 feet, species composition consisted of exclusively native species. From 24 feet to 30 feet, macrophyte communities were absent, presumably due to the limited light at these depths (Lê and Kreiter 2005).

Despite the general depth-related trend, there were some areas where macrophyte presence was not observed. Macrophytes did not establish below 10 feet in areas downstream of Chief Joseph Dam as steep shoreline slopes promoted areas of high flow near shore. Between Park Island and Brewster Bridge, depths below 20 feet were located in the middle of the Columbia River channel where high river velocity was not conducive to macrophyte colonization or persistence. In the inundated Okanogan River, limited light due to the naturally more turbid conditions appeared to exclude macrophytes from depths greater than 8 feet (Douglas PUD 2006).

The aquatic macrophyte habitats in the Wells Project are dominated by native species assemblages. Non-native Eurasian watermilfoil, although present in the Wells Project, was not observed at levels found in studies conducted in downstream mid-Columbia River reservoirs. In the Rocky Reach Reservoir, Eurasian watermilfoil was found to be the most abundant species (Duke 2000). In the Priest Rapids and Wanapum reservoirs, Eurasian watermilfoil comprised the highest percent composition across all samples (Normandeau et al. 2000). In the Wells Project, only 6.3 percent of samples collected were dominated by Eurasian watermilfoil (Lê and Kreiter 2005).

Environmental Effects

Daily water fluctuations are not restricting macrophyte distributions (DTA 2006*b*). Data collected at Wells indicated that few macrophytes occur at depths of less than 4 feet in the Wells Project (Lê and Kreiter 2005), suggesting that normal daily fluctuations (1 to 2 feet) of the reservoir, associated with Project operations, probably do not impact existing aquatic macrophyte communities.

Although under some circumstances reservoir fluctuations appear to support exotic species to the detriment of natives (e.g., Hudon 1997), macrophyte beds in the Wells Project are primarily composed of native species, which were dominant in over 89 percent of samples taken in 2005 (Lê and Kreiter 2005). Eurasian watermilfoil and curly leaf pondweed were the only non-native species found and were typically sub-dominant to several native species collected in study samples. Under some circumstances, moderate environmental variability, such as episodes of low water levels (Keddy and Reznicek 1986) or local ice-scour (Shipley et al. 1990) contribute to species diversity by destabilizing well-established, low-diversity plant communities.

Unlike typical daily reservoir water fluctuations related to Wells Project operations, infrequent reservoir operations (defined as a change of more than 4 feet in a 24-hour period) may have a greater effect on the distribution of aquatic macrophytes. However, aquatic macrophytes are generally considered to be well-adapted to short-term dewatering lasting hours or days (Cooke 1980), and the median duration of infrequent reservoir operations at the Project was three hours (DTA 2006*a*). Based upon the frequency at which these types of operations occur (0.8 percent of the time from 1990 to 2005) and the typical duration of such operations, infrequent reservoir operations of these types are expected to have minimal impacts on the overall native aquatic macrophyte community at the Wells Project. Douglas PUD is not proposing any changes to Project operations, therefore the current healthy macrophyte community in the Wells Reservoir is likely to be sustained over the long term.

Proposed Environmental Measures

Aquatic Nuisance Species Management Plan

As part of the ASA, Douglas PUD is proposing to implement an ANSMP (Exhibit E; Appendix E-2) to protect the current native-dominant macrophyte communities. The goal of the ANSMP is to prevent the introduction and/or spread of aquatic nuisance species in Wells Project waters. Objectives of the ANSMP include:

Objective 1: Implement best management practices to prevent Eurasian watermilfoil proliferation during in-water (i.e., construction, maintenance and recreation improvements) improvement activities in the Project.

Objective 2: Continue participation in regional and state efforts to prevent the introduction and spread of aquatic nuisance species. Activities include continued monitoring for the presence of ANS, monitoring bycatch data collected during other aquatic management plan activities and conducting education outreach within the Project.

Objective 3: In response to proposed changes in the Project requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, with respect to the introduction or proliferation of aquatic nuisance species in the Project to inform management decisions to support success of the ANSMP and will implement reasonable and appropriate measures to address any potential effects.

The ANSMP is intended to be compatible with other aquatic nuisance species management plans in the Columbia River mainstem.

Aquatic macrophyte communities at the Wells Project are characterized by a native-dominant species assemblage. Implementation of the ANSMP identified above is intended to maintain this assemblage through information and education outreach and best management practices during in-water construction activities. Douglas PUD also proposes to continue participating in state and regional coordination efforts to prevent the introduction and spread of aquatic invasive species that may threaten the diversity or abundance of native species, aquatic habitat, and ecological stability in the Wells Project area.

Land Use Policy

In addition to the ANSMP, Douglas PUD has developed and currently implements a Land Use Policy as described in section 3.3.5.2 of this EA (Exhibit E; Appendix E-13). Although land use and shoreline enhancement activities relate directly to Wells Project land use, these management efforts are likely to benefit various aquatic resources, including the Project macrophyte community, by minimizing impact in littoral and adjacent shoreline areas within the Wells Project. Douglas PUD is proposing to continue implementation of its Land Use Policy during the new license term.

Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on aquatic plants.

3.3.2.3 Aquatic Macroinvertebrates

Affected Environment

Regulatory Status

Studies found no federally-listed threatened, endangered, or candidate species of aquatic macroinvertebrates at the Wells Project. Two species were found—the Giant Columbia River limpet (*Fisherola nuttalli*) and ashy pebblesnail (*Fluminicola fuscus*)—that are identified as species of concern by Washington State. The ashy pebblesnail is also a federal species of concern.

Life History

Aquatic macroinvertebrates are visible without magnification and include aquatic insects, worms, mollusks, crustaceans, and other animals without backbones. Aquatic macroinvertebrates inhabit a diverse array of habitats including streams, wetlands, springs, lakes, and reservoirs. The abundance and diversity of aquatic macroinvertebrates have been used as indicators of ecosystem health and local biodiversity (Plotnikoff and Ehinger 1997).

In the fall of 2005, Douglas PUD conducted an aquatic macroinvertebrate inventory and assessment of the presence of RTE aquatic invertebrates within the Wells Project. The primary study objective was to document the distribution, habitat associations, and relative abundance of the current aquatic invertebrate assemblage in the Wells Project. Additionally, an RTE assessment was conducted to document the possible presence of several species of mollusks that have been listed as species of concern in Washington State. These are the giant Columbia River limpet, the ashy (Columbia) pebblesnail (*Fluminicola fuscus columbianus*), and the California floater mussel (*Anodonta californiensis*). The ashy pebblesnail and California floater are also federal species of concern.

Macroinvertebrate samples were collected within representative habitats throughout the Wells Project. The abundance and richness of the aquatic macroinvertebrate fauna varied according to habitat. Eighty-eight different taxa were observed in the study with the most abundant and diverse taxa observed in littoral areas of fast and slow water habitats (BioAnalysts, Inc. 2006). In littoral areas, chironomids (Diptera) were consistently one of the most dominant taxa but other important taxa included gastropods, annelids, crustaceans, and trichopterans. Fast water habitat had greater abundance but similar taxa richness as slow water habitat. Abundance at deepwater sites was generally lower than littoral sites; dominant taxa observed were chironomids, bivalves, annelids, and trichopterans. Similar taxa were observed in the Methow River and Okanogan River sampling sites.

Seventeen mollusk species were identified in the Wells Project (Table 3.3.2.3-1) as part of the RTE assessment portion of the study. Nine were gastropods (snails) and eight were bivalves (clams and mussels). The gastropods included eight native species and one non-native snail (*Radix auricularia*). The bivalves included seven native species and one non-native clam (*Corbicula fluminea*). Observations in littoral areas of slow water habitat with diverse substrate showed considerable evidence of mollusks at Columbia River sampling sites. Although similar in habitat, the two Methow River sampling sites yielded communities that were very different. It is likely that the mollusk communities at these two sites were shaped by both drift of dead shells from upstream areas and habitat conditions at the sites (BioAnalysts, Inc. 2006). Much of the Okanogan River within the Wells Project Boundary is dominated by sand and silt. Water velocity and depth appeared to be fairly uniform in the inundated portion of the river. Thus, stations selected were much less based on substrate or velocity but more on direct observations of live specimens (BioAnalysts, Inc. 2006).

Two Washington State candidate species, the ashy pebblesnail and giant Columbia River limpet, were found in the Methow River in relatively clean and complex substrate. The ashy pebblesnail was also found in the Okanogan River in areas that appeared to be transitional riffle habitat. At these locations, the water was approximately 2-meters deep, and the substrate was mostly sand with fines, gravel, and cobble. These mollusks were not abundant at either site, and in most instances, were identified from shell fragments. No federal ESA-listed or candidate species of macroinvertebrates or mollusks were found in the Wells Project during the study (BioAnalysts, Inc. 2006).

In 2006, Douglas PUD, in coordination with the Aquatic Nuisance Species Section of the WDFW, began monitoring for zebra mussels (*Dreissena polymorpha*) and quagga mussels (*Dreissena rostriformis bugensis*) in Wells Project waters. Activities consisted of monthly plankton tows to target mussel veligers at sites downstream of boat launches within the Wells Reservoir. Sampling activities were conducted during the summer and early fall when recreational boating activity is at a peak. Sampling protocols were provided by WDFW. All samples were sent back to WDFW for analysis. To date, none of the samples collected within the Wells Project have contained any signs of zebra or quagga mussels.

In 2007, Douglas PUD, in coordination with the Center for Lakes and Reservoirs at Portland State University, installed a permanent substrate sampler in the Wells Dam forebay to monitor for zebra and quagga mussel colonization within the Wells Project. Douglas PUD staff checks the substrate sampler monthly throughout the year as specified by the monitoring protocol. To date, no signs of zebra or quagga mussel presence have been detected.

Both of these monitoring activities are ongoing.

Table 3.3.2.3-1 Mollusks collected from sampling stations on the Methow, Okanogan, and Columbia rivers during the 2005 Wells Project Aquatic Macroinvertebrate Inventory.

Location	Common Name	Taxon
Methow River		
	Western pearlshell	*Margaritinopsis falcata*
	Striate fingernail clam	*Sphaerium striatinum*
	Ridgebeak peaclam	*Pisidium compressum*
	Western lake fingernail clam	*Musculium raymondi*
	Giant Columbia River limpet**	*Fisherola nuttalli*
	Ashy pebblesnail**	*Fluminicola fuscus*
	Western floater	*Anodonta kennerlyi*
	Ubiquitous peaclam	*Pisidium casertanum*
	Big-ear radix*	*Radix auricularia*
	Golden fossaria	*Fossaria obrussa*
	Prairie fossaria	*Fossaria (Bakerilymnaea) bulimoides*
	Ash gyro	*Gyraulus parvus*
		Corbicula sp.
Okanogan River		
	Western ridgemussel	*Gonidea angulata*
	Striate fingernail clam	*Sphaerium striatinum*
	Ridgebeak peaclam	*Pisidium compressum*
	Ubiquitous peaclam	*Pisidium casertanum*
	Asian clam*	*Corbicula fluminea*
	Ashy pebblesnail**	*Fluminicola fuscus*
	Fragile ancylid	*Ferrissia californica*
	Ash gyro	*Gyraulus parvus*
	Western lake fingernail clam	*Musculium raymondi*
		Physella sp.
		Anodonta sp.
Columbia River		
	Western floater	*Anodonta kennnerlyi*
	Asian clam*	*Corbicula fluminea*
	Ridgebeak peaclam	*Pisidium compressum*
	Three ridge valvata	*Valvata tricarinata*
	Rocky Mountain physa	*Physella propinqua propinqua*
	Ash gyro	*Gyraulus parvus*
	Golden fossaria	*Fossaria (F.) obrussa*
	Prairie fossaria	*Fossaria (Bakerilymnaea) bulimoides*
	Big-ear radix*	*Radix auricularia*

*Introduced (non-native) taxon. **State species of concern.

Environmental Effects

Reservoir fluctuations that result from Wells Project operations may affect aquatic macroinvertebrates in the Wells Project. Results of the aquatic macroinvertebrate inventory indicate that chironomids, gastropods, trichopterans, crustaceans, and annelids are the most abundant taxa in the Wells Project (BioAnalysts, Inc. 2006). Mollusks in the Wells Project were more diverse than areas studies in downstream reservoirs (Duke Engineering & Services, Inc. and RL and L Environmental Services, Ltd 2000). This outcome appears to be linked to greater habitat complexity found within the Wells Reservoir. Observations suggested that taxa richness appeared to increase with habitat complexity (BioAnalysts, Inc. 2006).

Macroinvertebrate taxa associated with aquatic vegetation and detritus are often the most numerous organisms in littoral areas affected by water fluctuations (Oak Ridge National Laboratory 1980; BIO-WEST 2002). Aquatic macroinvertebrate biomass and density is typically much reduced in these zones with fluctuating water levels (Oak Ridge National Laboratory 1980; BIO-WEST 2002; Furey et al. 2006), whereas the area just below the lowest pool elevation is typically the most productive for aquatic macroinvertebrates in these regulated reservoirs. Although Furey et al. (2006) found no overall difference in benthic density and biomass between a regulated and unregulated lake system, some differences in community structure were evident (DTA 2006*a*).

It is reasonable to suggest that aquatic macroinvertebrates are scarcer within shallow water areas of the Wells Project where daily fluctuations (1 to 2 feet) occur (DTA 2006*a*). Infrequent reservoir operations, which are defined as changes in water elevation which exceed twice the normal daily operational fluctuations (i.e., a change of more than 4 feet in a 24-hour period), may reduce or modify the composition of macroinvertebrate communities. However, because infrequent reservoir operations are uncommon and typically of short-duration, they are unlikely to permanently affect macroinvertebrates (particularly taxa with short generation times and those that occur in adjacent unaffected areas), because many aquatic macroinvertebrates have structural and/or behavioral mechanisms to survive short-duration emersion, and there would be no impediment to recolonization (DTA 2006*a*).

Freshwater mussels and other bivalves, such as sphaeriid clams, can respond to progressively-drying conditions by burrowing into the substrate, movement in search of more suitable conditions, or tightly closing shells to reduce loss of water (DTA 2006*a*). However, not all mollusks are able to move to deeper water and may be stranded as water levels recede. Under conditions of stress resulting from lack of oxygen, as would occur during periods of emersion, some mussels will exhibit mantle edge exposure as they attempt to maximize oxygen exchange (DTA 2006*a*). Tolerance to emersion and desiccation appear to be highly variable, depending on the species. Mortality can result from desiccation or thermal stress as the temperature buffering capacity of the water is reduced in shallower pools (Vaughn 2005). Indirect effects of emersion might also include increased predation.

The mollusk community found within the shallow-water littoral zone of the Wells Project appears to be well adapted to daily reservoir fluctuations characterized by current operations but may be affected by infrequent reservoir operations, depending on their timing, magnitude, and duration as well as the species present within exposed littoral areas (DTA 2006*a*). The Wells Project aquatic macroinvertebrate community is generally characterized by a diverse assemblage dominated by native species, suggesting Project operations have been compatible with the persistence of native aquatic macroinvertebrate populations. Douglas PUD is not proposing any change to Project operations; therefore, this diverse assemblage is likely to be sustained under future Project conditions.

Proposed Environmental Measures

Aquatic Nuisance Species Management Plan

As part of the ASA, Douglas PUD is proposing to implement an ANSMP (Exhibit E; Appendix E-2) to protect the current native-dominant macroinverterbrate communities. The goal of the ANSMP is to prevent the introduction and/or spread of aquatic nuisance species in Wells Project waters. Objectives of the ANSMP are as follows:

Objective 1: Implement best management practices to prevent Eurasian watermilfoil proliferation during in-water (i.e., construction, maintenance, and recreation improvements) improvement activities in the Project.

Objective 2: Continue participation in regional and state efforts to prevent the introduction and spread of aquatic nuisance species. Activities include continued monitoring for the presence of ANS, monitoring bycatch data collected during other aquatic management plan activities, and conducting education outreach within the Project.

Objective 3: In response to proposed changes in the Project requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, with respect to the introduction or proliferation of aquatic nuisance species in the Project to inform management decisions to support success of the ANSMP and will implement reasonable and appropriate measures to address any potential effects.

The ANSMP is intended to be compatible with other aquatic nuisance species management plans in the Columbia River mainstem. In addition to protecting macroinvertebrate habitat and preventing the introduction of deleterious exotic species, the ANSMP will also maintain the existing native assemblages by providing information and educational outreach to the public and through the monitoring of all bycatch collected during other aquatic management plan activities. Douglas PUD will continue participating in state and regional coordination efforts to prevent the introduction and spread of aquatic invasive species that may threaten the diversity or abundance of native species, aquatic habitat, and the ecological stability in the Wells Project.

Land Use Policy

In addition to the ANSMP, Douglas PUD has developed and currently implements a Land Use Policy as described in Section 3.3.5.2, of this EA (Exhibit E; Appendix E-13). Continued management efforts of land use and shoreline enhancement activities within the Wells Project will provide additional protection of Wells Project aquatic macroinvertebrate species through minimizing impacts to littoral areas. Douglas PUD is proposing to continue the implementation of its Land Use Policy during the new license term.

Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on aquatic macroinvertebrates.

3.3.2.4 Salmon and Steelhead

Affected Environment

Five species of anadromous salmonids are found in the Wells Reservoir. These salmonids include the UCR spring-run Chinook salmon (spring Chinook), UCR summer/fall-run Chinook salmon (summer/fall Chinook), Okanogan River sockeye salmon (sockeye), UCR steelhead (steelhead), and hatchery origin coho salmon (coho). The timing of adult migration, spawning, incubation, hatching emergence, juvenile rearing, smolt outmigration, and ocean residence periods differs among salmonid species and some of these differences have been used to separate several species into different races/demes (NMFS 2002*a*).

With the exception of the summer/fall Chinook, anadromous salmonids utilize Wells Reservoir primarily as a migratory corridor; this differs considerably from some resident species that may depend upon the habitats in the Wells Project for all their life history needs. Summer/fall Chinook are known to extensively utilize the Wells Reservoir for rearing as well as migration (Chapman et al. 1994*a*). All of these species are native to the Columbia River basin and are considered game fish species. As discussed in the Biological Assessment (Exhibit E; Appendix E-7), based on results from previous studies, the reservoir does not provide suitable spawning habitat for any of the anadromous fish species (Beak Consultants, Inc. and Rensel Associates 1999; Douglas PUD 2009*a*).

In 2004, Douglas PUD entered into a long-term agreement to resolve all Project-related impacts to anadromous salmonids. The Wells HCP contains measures to protect all five species of anadromous salmonids found at the Wells Project. The objective of the Wells HCP is to achieve NNI for each Plan Species. The Wells HCP outlines a schedule for meeting and maintaining NNI throughout the 50-year term of the agreement. NNI consists of two components including: (1) a 91 percent combined adult and juvenile Wells Project survival standard achieved by Wells Project improvement measures implemented within the geographic area of the Wells Project, and (2) up to 9 percent compensation for unavoidable Wells Project-related mortalities. Compensation to meet NNI is provided through a hatchery and a tributary program under which 7 percent compensation is provided through hatchery production and 2 percent compensation is provided through the funding of enhancements to tributary habitats that support Plan Species.

The Wells HCP was designed to address Douglas PUD requirements for relicensing and, as such, included all of the parties' terms, conditions and recommended measures related to regulatory requirements to conserve, protect and mitigate effects on Plan Species pursuant to ESA, the FPA, the Fish and Wildlife Coordination Act, the EFH provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Pacific Northwest Electric Power Planning and Conservation Act and Title 77 RCW. The Wells HCP also obligates the parties to work together to address water quality issues.

The Wells HCP was signed in 2002 by NMFS, USFWS, CCT, WDFW, Douglas PUD, and the Wells Project power purchasers (Puget Sound Energy, Portland General Electric, PacifiCorp, and Avista Corporation). In 2005, the Wells HCP was signed by the YN. In late 2003, NMFS issued Douglas PUD a new ESA Section 10 ITP (ITP No. 1391) for steelhead, spring Chinook, summer/fall Chinook, and sockeye for the operation and maintenance of the Wells Project. The Wells HCP was approved by the FERC on June 21, 2004, and made part of the Wells Project license. Following the FERC's approval, Douglas PUD implemented the Wells HCP as part of the measures developed for the relicensing of the Wells Project.

Concurrent with the issuance of ITP No. 1391, NMFS also issued Douglas PUD three separate ESA Section 10 ITPs (ITP No. 1395, 1347, and 1196) for salmon and steelhead associated with the operation of Douglas PUD's hatchery programs. These hatchery programs are central to Douglas PUD's fulfillment of the hatchery mitigation requirements of the Wells HCP and Wells Project license. Permit Nos. 1196 and 1365 are for incidental take of ESA-listed salmon and steelhead in association with the operation of Douglas PUD's spring Chinook and steelhead hatchery programs, respectively. Permit No. 1347 is for incidental take of ESA-listed salmon and steelhead in association with the operation of Douglas PUD's hatchery programs for non-ESA-listed salmon.

The Wells HCP also requires the formation of four committees that are used to implement, monitor, and administer the agreement; namely, the Policy, Coordinating, Hatchery, and Tributary committees. The Wells HCP contains several plans and programs for implementing the components of the agreement. These plans include the Passage Survival Plan (HCP section 4), Wells Dam Juvenile Dam Passage Survival Plan (HCP section 4.3), Tributary Conservation Plan (HCP section 7), Hatchery Compensation Plan (HCP section 8), Adult Passage Plan (HCP section 4.4 and HCP Appendix A), and a Predator Control Program (HCP section 4.3.3) (Douglas PUD 2002*b*).

In 2007, in response to a request from NMFS, the FERC determined that the Wells HCP qualifies as a comprehensive plan under FPA Section 10(a)(2)(A). (Letter of October 16, 2007 from Mark Pawlowski [FERC] to Keith Kirkendall [NMFS])

A new element of the Wells HCP is NMFS' ESA requirement to develop new HGMPs, in order to ensure that the NNI hatchery programs continue to be operated in a manner that ensures the conservation and recovery of ESA-listed salmon and steelhead populations. In 2010, a UCR spring Chinook HGMP (Exhibit E; Appendix E-9) was developed and approved by the HCP Hatchery Committee. A draft HGMP for UCR steelhead is also under development within the HCP Hatchery Committee. HGMPs will significantly affect implementation of hatchery-based measures of the Wells HCP during the term of the new license. It is anticipated that the HGMPs will be implemented under the term of the new license.

Annual fish counts at the Wells Project of all anadromous salmonids for the period of 1998 through 2007, when consistent ladder counting methodology was adopted at the Wells Project (24-hours per day), are provided in Table 3.3.2.4-1.

Table 3.3.2.4-1 Annual anadromous fish counts from 1998-2007 and 10-year averages.

Year	Spring Chinook	Summer Chinook	Fall Chinook	Steelhead**	Coho	Sockeye
1998	363*	4,108	1,200	3,444	0	4,669
1999	345	7,787	2,548	3,920	224	12,388
2000	2,587	10,156	3,418	6,649	0	59,944
2001	10,871	38,126	9,591	18,920	612	74,490
2002	7,626	62,623	6,472	9,851	132	10,768
2003	4,702	46,391	8,253	10,337	168	28,977
2004	4,793	32,847	5,777	9,769	291	78,053
2005	4,996	31,763	3,461	7,620	348	55,559
2006	4,376	27,196	5,043	7,042	409	22,075
2007	2,793	16,817	2,670	7,879	2,432	22,273
Average	**4,345**	**27,781**	**4,843**	**8,143**	**462**	**36,920**

*All spring Chinook captured in this year were taken for broodstock.
**Steelhead counts include up to 400 steelhead trapped annually from the Wells fish ladders for broodstock.

UCR Spring-Run Chinook

Regulatory Status

The ESU for UCR spring-run Chinook includes all naturally reproducing populations in all river reaches accessible to Chinook salmon in the mid-Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam, excluding the Okanogan River. NMFS has initially identified three important spawning populations within this ESU: the Wenatchee, Entiat, and Methow river populations (NMFS 2002*a*). These populations are genetically and ecologically separate from the summer/fall run populations in the lower parts of many of the same river systems. Hatchery-reared Chinook (and their progeny) from the following stocks are considered part of the listed ESU: Chiwawa River, Methow River, Twisp River, Chewuch River, White River, and Nason Creek.

The NMFS final determination to list the UCR spring-run Chinook salmon as an endangered species under the federal ESA was issued on March 24, 1999 (64 FR 14308); endangered status was reaffirmed on June 28, 2005 (70 FR 37160). The ESU includes all naturally-spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington (excluding the Okanogan River), as well as six artificial propagation programs: the Twisp River, Chewuch River, Methow Composite, Winthrop National Fish Hatchery (NFH), Chiwawa River, and White River spring-run Chinook hatchery programs (NMFS 2009).

NMFS adopted the Upper Columbia Salmon Recovery Board (UCSRB) Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan as its final recovery plan for upper Columbia spring Chinook and steelhead (UCSRB 2007). This plan defined abundance recovery targets for each spawning aggregation in this ESU. These numbers are intended to represent the number and productivity of naturally-produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self sustaining in its natural ecosystem. For spring Chinook salmon, recovery levels are 2,000 spawners in the Wenatchee River, 500 spawners in the Entiat River, and 2,000 spawners in the Methow River (UCSRB 2007).

Critical Habitat Designation for Spring Chinook

The mainstem Columbia River from the Wells Tailrace to the confluence of the Columbia and Methow rivers, along with the accessible portions of the Methow River basin, are included in the critical habitat listed for spring Chinook in the Wells Project area (70 FR 52731).

Life History

Methow River basin (Chewuch, Methow, and Twisp rivers) spring Chinook exhibit classic stream-type life history strategies, emigrating from freshwater as yearling smolts and undertaking extensive offshore ocean migrations. The majority of these fish mature at 4 years of age and return to the Columbia River from March through mid-May. In the mid-Columbia River basin, Chinook passing Wells Dam before June 28 are considered spring Chinook (NMFS 2002*a*).

After entering the Methow River, adult spring Chinook hold in the deeper pools and under cover until the onset of spawning. They may spawn near their holding areas or move upstream into smaller tributaries. Spawning generally occurs from late July through September and typically peaks in late August, although the peaks vary among tributaries (Chapman et al. 1995). Spring Chinook eggs hatch in late winter and the fry emerge from gravel in April and May (Chapman et al. 1995). Most of these juveniles (73 to 193 mm in size) rear in tributary headwater streams for 1 year before migrating to the ocean, typically during the months of April, May, and June (Douglas PUD 2002*a*). Spring Chinook utilize the mainstem Columbia River primarily as a migration corridor, and as a result, they spend little time rearing in Wells Reservoir (NMFS 2002*a*).

The primary spawning areas for Methow spring Chinook are the mainstem Methow River upstream of the Chewuch River confluence, the Twisp, Chewuch and Lost rivers, and Thirtymile and Lake creeks. Spawning is observed occasionally in the Methow Hatchery outfall and Foghorn Ditch as well, but it is likely that the fish spawning here are of hatchery origin. A very limited amount of spawning has also been reported in Early

Winters, Wolf, and Gold Creeks (NMFS 2002*a*). Documented spawning sites for spring Chinook in the Methow drainage are located 40 miles upstream of the Wells Project Boundary which extends up to RM 1.5 on the Methow River. Between the years of 1998 and 2007, the number of spring Chinook migrating upstream of Wells Dam annually has averaged 4,345 adults and ranged from 363 adults in 1998 to 10,871 adults in 2001 (Table 3.3.2.4-1).

Spring Chinook Study Results

Following approval of the Wells HCP in 2004, spring Chinook studies have been conducted in close coordination with the parties to the Wells HCP including active involvement in the development of study plans, study implementation, and peer review of final reports by the Policy, Coordinating, Hatchery, and Tributary committees. The results of these numerous studies are detailed within the Wells HCP Annual Reports to the FERC (Anchor and Douglas PUD 2005, 2006, 2007, 2008, 2009, 2010).

Prior to the FERC's approval of the Wells HCP in 2004, spring Chinook studies, dating back to 1990, were conducted in close coordination with the parties to the Long Term Settlement Agreement for Anadromous Fish (Douglas PUD 1990). The results of these numerous studies can be found in the annual reports submitted to the FERC outlining compliance with the terms of the FERC license and associated settlement agreement (FERC Project 2149, Docket E-9569; Douglas PUD 1991, 1992*a*, 1993, 1994, 1995, 1996, 1997*a*, 1998, 1999, 2000, 2001, 2002*c*, 2003, 2004*b*).

UCR Steelhead

Regulatory Status

The UCR steelhead was listed under the federal ESA as endangered on August 18, 1997 (62 FR 43937). NMFS considers all UCR steelhead returning to tributary streams upstream of the confluence of the Yakima River and the Columbia River as belonging to the UCR distinct population segment (DPS) (NMFS 2008). The status of ESA-listed UCR steelhead was changed to threatened on January 5, 2006 (71 FR 834). This listing was reinstated to endangered status per U.S. District Court decision in June 2007 (NMFS 2008). In March 2009, the Ninth Circuit upheld NMFS' decision to list UCR steelhead as threatened and not endangered, overturning the June 2007 District Court decision.

On April 4, 2002, NMFS defined interim abundance recovery targets for each spawning aggregation in this ESU. These numbers are intended to represent the number and productivity of naturally-produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR summer run steelhead, the interim recovery levels are 1,000 spawners in the Methow River, 1,000 spawners in the Wenatchee River, and 500 spawners in the Entiat River (UCSRB 2007). Only the Methow River spawners pass through the Wells Project.

The majority of the UCR steelhead are of hatchery origin (Chapman et al. 1994*b*). Steelhead hatchery programs covered under the listing determination include the Wells and Eastbank fish hatcheries. These programs release listed steelhead into the Okanogan, Similkameen, Methow, and Wenatchee rivers.

Critical Habitat Designations

Critical habitat was designated for the UCR steelhead DPS by NMFS on September 2, 2005 (70 FR 52630). Critical habitat does occur in the Wells Project area and includes: (1) the mainstem Columbia River from the Wells tailrace to the confluence of the Columbia and Okanogan rivers; (2) the accessible portions of the Methow River basin; and (3) the accessible portions of the Okanogan River basin, excluding the Colville Reservation and Salmon Creek (NMFS 2006).

Life History

Steelhead are an anadromous salmonid that spawn in tributaries and migrate through the Columbia River to the ocean. Adult steelhead rear one to two years in the ocean before returning to the Columbia River between March and October. Returning adults typically pass Wells Dam from June through October. The adult migration is protracted over a relatively long period. Further, spawning does not occur until the following March through July (Peven 1992). Unlike other anadromous salmonids, some steelhead adults (kelts) return to the ocean after spawning and may spawn more than once during their lifetime; however, repeat spawners in the mid-Columbia River region represent only 2.1 percent of the population (Brown 1995).

Steelhead eggs incubate from late March through June, and fry emerge from late spring to August. Their use of tributaries for rearing is variable, depending upon population size, and both weather and flow at any given time. Generally, juveniles rear in tributaries for two to three years (range from one to seven years) before migrating downstream as smolts. Fry and smolts disperse downstream through the Wells Project in late April through June. Some steelhead are thought to residualize and live their entire lives in freshwater (Peven et al. 1994). As a result of their varied length of freshwater residence, their variable ocean residence, and their spatial and temporal spawning distribution within a watershed, steelhead exhibit an extremely complex mosaic of life history types. Such life history diversity is an effective strategy for ensuring the long-term viability of populations (NMFS 2002*a*).

The majority of naturally- and hatchery-produced steelhead that are present in the Wells Project spawn in the Methow River watershed, with a small population spawning and rearing in the Okanogan River watershed. Although steelhead typically feed during their seaward migration, mid-Columbia reservoirs, such as Wells, serve primarily as migration corridors rather than as rearing habitat (Chapman et al. 1994*b*). Between the years of 1998 and 2007 the number of steelhead migrating upstream of Wells Dam annually has averaged 8,143 adults and ranged from 3,444 adults in 1998 to 18,920 adults in 2001 (Table 3.3.2.4-1).

Steelhead use spawning habitat in the mainstem Methow River and 11 of its tributaries located in the mid and upper reaches of the drainage (NMFS 2002*a*). Documented spawning sites for steelhead in the Methow drainage are located upstream of the Wells Project Boundary. A small number of steelhead return to spawn on the lower Similkameen River, a tributary to the Okanogan River near the U.S.-Canada border (NMFS 2002*a*). Documented spawning sites for steelhead in the Okanogan drainage are located upstream of the Wells Project Boundary.

Steelhead Study Results

Following approval of the Wells HCP in 2004, all steelhead studies have been conducted in close coordination with the parties to the Wells HCP, including active involvement in the development of study plans, study implementation, and peer review of final reports by the Policy, Coordinating, Hatchery, and Tributary committees. The results of these numerous studies are detailed within the Wells HCP Annual Reports to the FERC (Anchor and Douglas PUD 2005, 2006, 2007, 2008, 2009, 2010).

Prior to the FERC's approval of the Wells HCP in 2004, steelhead studies, dating back to 1990, were conducted in close coordination with the parties to the Long Term Settlement Agreement for Anadromous Fish (Douglas PUD 1990). The results of these numerous studies can be found in the annual reports submitted to the FERC outlining compliance with the terms of the FERC license and associated settlement agreement (Project 2149, Docket E-9569; Douglas PUD 1991, 1992*a*, 1993, 1994, 1995, 1996, 1997*a*, 1998, 1999, 2000, 2001, 2002*c*, 2003, 2004*b*).

Summer/Fall Chinook

Regulatory Status

The summer/fall Chinook ESU includes all naturally-spawned summer/fall Chinook populations found in the Columbia River and its tributaries from the confluence of the Snake and Columbia rivers upstream to Chief Joseph Dam. Although summer/fall Chinook are considered part of the same ESU and are characterized as ocean-type fish, they spawn in different areas of the basin (Waknitz et al. 1995). On March 9, 1998, NMFS determined that UCR summer/fall Chinook were not at a level of extinction risk that warranted listing under the ESA (63 FR 11482).

Life History

Summer/fall Chinook spawn in the Okanogan River downstream of Osoyoos Lake and in the Similkameen, Methow, Wenatchee, and Entiat rivers during late September through November with peak activity in October (NMFS, 2002*a*). The spawning distribution of summer/fall Chinook overlap in the lower reaches of mid-Columbia tributary streams (Okanogan, Methow, and Wenatchee rivers) and in the tailraces of the mainstem mid-Columbia River dams. Hatcheries that raise and release summer/fall Chinook include the Wells, Eastbank, Turtle Rock, and Priest Rapids Hatcheries. These programs release fish into the Okanogan, Similkameen, Methow, Wenatchee, and mainstem Columbia rivers (NMFS 2002*a*). The CCT have received approval for a new hatchery near Chief Joseph Dam (Chief Joseph Hatchery) that will produce summer/fall Chinook intended to enhance populations in the Okanogan and Columbia rivers (NWPPC 2009).

Most adult summer/fall Chinook enter the Columbia River from late May to early September and pass the mid-Columbia River dams from late June through October, after spending three or four years in the ocean (Chapman et al. 1994*a*). In the mid-Columbia Basin, summer Chinook pass Wells Dam between June 29 and August 28 and fall Chinook pass Wells Dam from August 29 through the end of the counting season in mid-November (NMFS 2002*a*). Between the years of 1998 and 2007 the number of adult summer/fall Chinook migrating over Wells Dam annually averaged 32,624 fish (see Table 3.3.2.4-1 above).

Naturally-produced juvenile summer/fall Chinook emerge in April and May and move downstream within a few days to a few weeks (Chapman et al. 1994*a*). Ocean-type fish (summer/fall Chinook) generally migrate to the ocean as age-0 subyearlings in late summer and early fall months, passing mid-Columbia River dams between June and August (Chapman et al. 1994*a*). Summer/fall Chinook leave the Methow and Okanogan rivers in summer (Snow et al. 2008). These fish may rear in the mainstem Columbia River for extended periods (Chapman et al. 1994*a*). This phenomenon may also occur in other tributaries to the mid-Columbia River including the Okanogan and Similkameen rivers, suggesting that mainstem reservoirs largely influence the success of summer/fall Chinook (NMFS 2002*a*).

Summer/Fall Chinook Study Results

Following approval of the Wells HCP in 2004, all of the summer/fall Chinook studies have been conducted in close coordination with the parties to the Wells HCP including active involvement in the development of study plans, study implementation, and peer review of final reports by the Policy, Coordinating, Hatchery, and Tributary committees.

The results of these numerous studies are detailed within the Wells HCP Annual Reports to the FERC (Anchor and Douglas PUD 2005, 2006, 2007, 2008, 2009, 2010).

Prior to the FERC's approval of the Wells HCP in 2004, summer/fall Chinook studies, dating back to 1990, were conducted in close coordination with the parties to the Long Term Settlement Agreement for Anadromous Fish (Douglas PUD 1990). The results of these numerous studies can be found in the annual reports submitted to the FERC outlining compliance with the terms of the FERC license and associated settlement agreement (Project 2149, Docket E-9569; Douglas PUD 1991, 1992*a*, 1993, 1994, 1995, 1996, 1997*a*, 1998, 1999, 2000, 2001, 2002*c*, 2003, 2004*b*).

Okanogan River Sockeye Salmon

Regulatory Status

This ESU includes all naturally-reproducing sockeye that spawn in, upstream, or downstream of Osoyoos Lake, or in the Similkameen River (a tributary of the Okanogan River). Spawning and primary rearing habitat of this ESU is located in British Columbia, while the migration corridor for both juveniles and adults includes the Wells Reservoir. This population is genetically distinct from the Lake Wenatchee sockeye populations as determined by both spatial distribution and genetic differences (63 FR 16955). On March 10, 1998, NMFS determined that Okanogan River sockeye salmon were not at a level of extinction risk that warranted listing under the ESA (63 FR 11749).

Life History

Adult sockeye begin entering the Columbia River in May and pass the mid-Columbia River dams between late May and mid-August (BPA et al. 1994) with the majority of the fish passing over Wells Dam during July. Between 1998 and 2007, the number of adult sockeye migrating over Wells Dam annually has averaged 36,920, ranging from 4,669 (1998) to 78,053 (2004) (Table 3.3.2.4-1). In 2008, the largest ever escapement of Okanogan sockeye was counted at Wells Dam with 165,334 adults counted.

The timing of the adult sockeye migration to Osoyoos Lake is affected by temperatures in the Okanogan River. Once these fish reach Osoyoos Lake, the adults hold in the north basin of the lake until spawning maturation is achieved. Spawning generally occurs from late September to early November (Hyatt and Rankin 1999).

Sockeye fry emerge in March and April and move into Osoyoos Lake to rear for one to three years before migrating downstream to the ocean. Sockeye smolts typically pass the Wells Dam between mid-April and late May during their outmigration (Chapman et al. 1995).

Sockeye Study Results

Following approval of the Wells HCP in 2004, all of the sockeye studies have been conducted in close coordination with the parties to the Wells HCP, including active involvement in the development of study plans, study implementation, and peer review of final reports by the Policy, Coordinating, Hatchery, and Tributary committees. The results of these numerous studies are detailed within the Wells HCP Annual Reports to the FERC (Anchor and Douglas PUD 2005, 2006, 2007, 2008, 2009, 2010).

Prior to the FERC's approval of the Wells HCP in 2004, sockeye studies, dating back to 1990, were conducted in close coordination with the parties to the Long Term Settlement Agreement for Anadromous Fish (Douglas PUD 1990). The results of these numerous studies can be found in the annual reports submitted to the FERC outlining compliance with the terms of the FERC license and associated settlement agreement (Project 2149, Docket E-9569; Douglas PUD 1991, 1992*a*, 1993, 1994, 1995, 1996, 1997*a*, 1998, 1999, 2000, 2001, 2002*c*, 2003, 2004*d*).

Coho Salmon

Regulatory Status

Historically, coho were distributed throughout the Columbia and Snake river basins. By the early 1900s, populations of mid-Columbia River coho were extirpated (BPA 1999).

Life History

Prior to 1910, irrigation, livestock grazing, and mining were major contributors to the decline of coho; later, timber harvest, fire management, and irrigation impacts were the major causes of coho stock decline. Within the Wells Project, the Methow River drainage once supported a large population of coho salmon, but indigenous coho were extirpated upstream from Rock Island Dam by the mid-1940s.

Due to the fact that coho salmon stocks were locally extirpated early in the 1900s, most life history information is derived from affidavits from older residents (NMFS 2002*a*). These accounts support the belief that coho salmon probably returned to mid-Columbia River tributaries in September, October, and November. This has been consistent with the timing of hatchery coho salmon that have been reintroduced to the mid-Columbia basin in recent years (NMFS 2002*a*). In the Lower Columbia River tributaries, coho salmon spawn from October to mid-December. Juveniles typically spend one year in freshwater before outmigrating as yearling smolts in April and May (Snow et al. 2008). Coho salmon typically spend about 18 months at sea before returning to spawn (NMFS 2002*a*).

Efforts are currently underway to reintroduce coho to the Methow River basin (Columbia Basin Fish and Wildlife Authority [CBFWA] 2006). Between the years of 1998 and 2007, the number of recently-reintroduced coho adults migrating over Wells Dam annually averaged 462, ranging from zero (1998, 2000) to 2,432 (2007) (Table 3.3.2.4-1).

Coho Study Results

Following approval of the Wells HCP in 2004, coho studies have been conducted in close coordination with the parties to the Wells HCP, including active involvement in the development of study plans, study implementation, and peer review of final reports by the Policy, Coordinating, Hatchery, and Tributary committees. The results of these studies are detailed within the Wells HCP Annual Reports to the FERC (Anchor and Douglas PUD 2005, 2006, 2007, 2008, 2009, 2010).

Prior to the FERC's approval of the Wells HCP in 2004, there were few studies conducted on coho due to the extirpated status of the species.

Environmental Effects

Through the implementation of the Wells HCP, all Project-related effects to anadromous salmonids have been fully mitigated through the achievement of NNI. A major feature of the Wells HCP is what is termed a "phased implementation plan" to achieve the survival standards. The Wells HCP has three phases within the phased implementation plan. Under Phase I, Douglas PUD implemented: (1) juvenile and adult operating plans and criteria to meet the survival standards; and (2) a monitoring and evaluation program to determine compliance with the NNI standards. Following the completion of the three-year monitoring and evaluation program in Phase I (Bickford et al. 1999, 2000, 2001), the Wells HCP Coordinating Committee determined that the pertinent survival standards had been achieved (Anchor and Douglas PUD 2006, 2007, 2008).

Having achieved the survival standards during Phase I, the Wells Project proceeded directly to Phase III (Anchor and Douglas PUD 2006, 2007, 2008, 2009, 2010). In short, the achievement of Phase III indicates that the appropriate standard has either been achieved or is likely to have been achieved and provides additional or periodic monitoring to ensure that survival of the Plan Species remains in compliance with the survival standards for the term of the Wells HCP. In Phase III, there are three separate sub-phases: Phase III (Standards Achieved), Phase III (Provisional Review), and Phase III (Additional Juvenile Studies) (Douglas PUD 2002*b*).

In February 2005, the Wells HCP Coordinating Committee determined that the Wells Project had achieved Phase III (Standard Achieved) for spring Chinook and steelhead, and Phase III (Additional Juvenile Studies) for summer/fall Chinook and sockeye (Anchor and Douglas PUD 2006). In December 2007, the Wells HCP Coordinating

Committee determined that the Wells Project had achieved Phase III (Additional Juvenile Studies) for coho (Anchor and Douglas PUD 2008) (Table 3.3.2.4-2).

Table 3.3.2.4-2 Phase designations for the Wells Project under the Wells HCP.

Plan Species	Phase Designation	Date
UCR steelhead	Phase III (Standard Achieved)	February 22, 2005
UCR yearling spring Chinook	Phase III (Standard Achieved)	February 22, 2005
UCR subyearling summer/fall Chinook	Phase III (Additional Juvenile Studies)	February 22, 2005
Okanogan River sockeye	Phase III (Additional Juvenile Studies)	February 22, 2005
Methow River Coho	Phase III (Additional Juvenile Studies)	December 12, 2007

Sources: Anchor and Douglas PUD 2006, 2008.

In addition to the achievement of Phase III under the terms of the Wells HCP, a draft BA was prepared as part of relicensing for the two ESA-listed anadromous species for the purpose of ESA Section 7 consultation with NMFS. This analysis determined that the relicensing of the Wells Project may effect, but is not likely to adversely affect, spring Chinook and steelhead and is not likely to adversely modify or destroy designated critical habitat for either species. The BA can be found in Appendix E-7.

Proposed Environmental Measures

The Wells HCP is a comprehensive and long-term management plan for the Plan Species affected by the Wells Project. The Wells HCP represents a settlement of issues related to salmon and steelhead among all of the signatory Parties to the agreement and an ESA Section 10 HCP between Douglas PUD and NMFS. The Wells HCP was approved by the FERC and adopted as an amendment of the current license in 2004 (107 FERC ¶ 61,280). In response to a request from NMFS, the FERC determined in 2007 that the Wells HCP qualifies as a comprehensive plan under FPA Section 10(a)(2)(A). (Letter of October 16, 2007 from Mark Pawlowski [FERC] to Keith Kirkendall [NMFS]).

The Wells HCP commits Douglas PUD to a 50-year program to ensure that the Wells Project has achieved and maintained NNI for Plan Species. The Wells HCP requires that this be accomplished through a combination of juvenile and adult fish passage measures at the dam, off-site hatchery programs and evaluations, and habitat restoration work conducted in tributary streams upstream of the Wells Dam. The Wells HCP outlines a schedule for meeting and maintaining NNI throughout the 50-year term of the agreement. NNI consists of two components: (1) a 91 percent combined adult and juvenile Wells Project survival standard achieved by improvement measures implemented within the geographic area of the Wells Project; and (2) up to 9 percent compensation for unavoidable Wells Project-related mortalities. Compensation to meet NNI is provided through hatchery and tributary programs under which 7 percent compensation is provided through hatchery production and 2 percent compensation is provided through the funding of enhancements to tributary habitats that support Plan Species.

The Wells HCP contains several plans and programs for implementing the components of the agreement. These plans include the Passage Survival Plan (HCP section 4), Wells Dam Juvenile Dam Passage Survival Plan (HCP section 4.3), Tributary Conservation Plan (HCP section 7), Hatchery Compensation Plan (HCP section 8), Adult Passage Plan (HCP section 4.4 and HCP Appendix A), and a Predator Control Program (HCP section 4.3.3) (Douglas PUD 2002*b*).

Passage Survival Plan

The Passage Survival Plan contained within section 4 of the Wells HCP provides specific detail regarding the implementation and measurement of unavoidable juvenile and adult losses for each of the Plan Species passing through Wells Dam. The plan identifies the methodologies for measuring survival rates and the decision process that will be followed depending on whether the applicable survival standards are achieved or not. This section of the plan also details the specific survival standards that must be achieved within defined time frames in order for the licensee to be considered in compliance with the terms of the Wells HCP (Douglas PUD 2002*b*).

Wells Dam Juvenile Dam Passage Survival Plan

In addition to the specific details describing the conduct and evaluation of survival studies for achievement of NNI, the Wells HCP also contains specific criteria for the operation of the Wells juvenile fish bypass system. This section of the Wells HCP outlines specific bypass operational criteria, operational timing, and evaluation protocols to ensure that at least 95 percent of the juvenile Plan Species passing through Wells Dam are provided a safe, non-turbine passage route around the dam. The operational dates for the bypass are set annually by unanimous agreement of the parties to the Wells HCP.

Tributary Conservation Plan

The Tributary Conservation Plan within section 7 of the Wells HCP guides the funding for and allocation of dollars from the Plan Species Account. The Plan Species Account provides funding for tributary habitat protection and restoration projects within the Wells Project Boundary and within the portions of the Methow and Okanogan rivers that are accessible to Plan Species, in order to compensate for up to 2 percent unavoidable adult and/or juvenile mortality for HCP Plan Species passing through Wells Dam. The Tributary Committee will select projects according to guidelines established in

Supporting Document D, with a high priority given to the acquisition of land or interests in land such as conservation easements or water rights.

Hatchery Compensation Plan

The Hatchery Compensation Plan, as described in section 8 of the Wells HCP, was established to provide hatchery compensation for up to 7 percent unavoidable juvenile passage losses of Plan Species passing through Wells Dam (Douglas PUD 2002*b*). The goal of the program is to utilize hatchery-produced fish to replace unavoidable losses in such a manner that the hatchery fish produced contribute to the rebuilding and recovery of naturally-reproducing populations of Plan Species, in their native habitats, while maintaining the genetic and ecological integrity of each stock of Plan Species. Supporting harvest, where appropriate, is also a goal of the Hatchery Compensation Plan.

Adult Passage Plan

The Adult Passage Plan, as contained within section 4.4 and Appendix A of the Wells HCP, is intended to ensure safe and rapid passage for adult Plan Species as they pass through the fish ladders at Wells Dam. The plan contains specific operating and maintenance criteria for the two adult fish ladders and the two adult fish ladder traps, and provides details regarding the implementation of passage studies on adult Plan Species including studies related to passage success, timing, and rates of fallback.

Predator Control Program

Section 4.3.3 of the Wells HCP includes the requirement that Douglas PUD implement a northern Pikeminnow (*Ptychocheilus oregonensis*), piscivorous bird, and piscivorous mammal harassment and control program to reduce the level of predation upon anadromous salmonids migrating through Wells Dam. The northern pikeminnow removal program may include a northern pikeminnow bounty program, fishing derbies and tournaments, and the use of longline fishing and trapping.

The other component of the predator control program is the implementation of control measures for piscivorous birds and mammals. The focus of these programs is not removal but hazing and access deterrents. Hazing includes propane cannons, pyrotechnics, and the physical presence of hazing staff. Access deterrents include steel wires across the hatchery ponds and tailrace, fencing, covers for hatchery ponds and electric fencing.

Hatchery Genetic Management Plans

HGMPs are used to address the take of ESA-listed species that may occur as a result of artificial propagation activities. The primary goal of an HGMP is to devise biologically-based artificial propagation management strategies that ensure the conservation and recovery of listed ESUs. Information from HGMPs is used to evaluate impacts on ESA-listed anadromous salmon and steelhead, and inform issuance of ESA Section 10 ITPs for artificial propagation activities.

The Wells HCP, together with issued ITPs and HCP Hatchery Committee-approved HGMPs, will form the basis for the NNI hatchery programs for the Wells Project. New HGMPs for ESA-listed Upper Columbia River spring Chinook salmon and Upper Columbia River steelhead are currently being developed in close consultation with NMFS and the HCP Hatchery Committee. The new HGMPs, when final, are expected to result in substantial modifications to the facilities and operations at the Methow and Wells fish hatcheries during the term of the new license. Appendix E-9 provides a detailed assessment of the potential effects associated with the implementation of the spring Chinook HGMP.

Cumulative Effects

Salmonid species populations and their habitat have historically been affected by human activities on the Columbia River, including habitat alteration in tributaries; predation by introduced species; irrigation diversions; sport, tribal, and commercial fisheries; illegal harvest; and hydropower and non-hydropower dams. Parsing out the effects of each of these sources of impact is problematic.

The harvest of Plan Species takes place in commercial, recreational and tribal fisheries. The management of these fisheries is a complex process resulting from the highly migratory behavior of the species. Harvest management in the Pacific Northwest is a cooperative process involving federal, state, tribal and Canadian representatives.

Adult Chinook, coho, and sockeye returning to Washington migrate through both U.S. and Canadian waters and are harvested by fishermen from both countries. The Pacific Salmon Treaty, developed through cooperation by the U.S. and Canadian federal governments, tribes, state governments, and sport and commercial fishing groups, helps fulfill conservation goals and the right of each country to reap the benefits of its own fisheries enhancement efforts. The treaty is implemented by the eight-member bilateral Pacific Salmon Commission (PSC), which includes representatives of federal, state and tribal governments.

In addition to being managed within the Pacific Salmon Treaty, ocean fisheries are also managed by the Pacific Fishery Management Council (PFMC) that sets annual fisheries in federal waters from three to 200 miles off the coasts of Washington, Oregon and California. The annual North of Falcon process sets salmon fishing seasons in waters such as Puget Sound, Willapa Bay, Grays Harbor and Washington State rivers. The states of Oregon, Idaho and Washington manage inland fisheries that take place within state boundaries, including those extending out three miles from the coasts.

Within the Columbia River and its tributaries, salmon and steelhead fisheries are co-managed by the states of Washington, Oregon and Idaho, four treaty tribes and other tribes that traditionally have fished in those waters. A federal court continues to oversee Columbia River harvest management through the U.S. v. Oregon proceedings.

Hydropower development on the Columbia River has affected upstream and downstream migrations and altered habitat for numerous species of salmonids. Five species of anadromous salmonids are found in the Wells Reservoir, including spring Chinook, summer/fall Chinook, sockeye salmon, steelhead, and coho. The spring Chinook are listed under the ESA as endangered. Steelhead are listed under the ESA as threatened. Federal, tribal, state and local salmonid recovery programs, and Project-specific HCPs or BOs for the Columbia River projects, have been developed to guide species recovery activities. Many of these plans include both the listed and non-listed species that are found at the Wells Project.

The Hanford Reach Fall Chinook Protection Program Agreement (which replaced the 1988 Vernita Bar Settlement Agreement) protects and enhances fall Chinook salmon in the Hanford Reach during the spawning, pre-hatch, post-hatch, and emergence periods. The agreement provides for minimum flows and regulation of flow fluctuations in the Hanford Reach to reduce the cumulative effects of hydropower operations on fall Chinook salmon eggs and fry. The Hanford Reach Agreement also established reservoir operating procedures to be followed by Chelan PUD and Douglas PUD during the rearing period to assist Grant PUD in reducing the effects of flow fluctuations in the Hanford Reach on fall Chinook salmon, thereby reducing the cumulative effect on this species within the Columbia River basin.

Douglas PUD's Wells HCP, including the new HGMPs, addresses a wide range of issues affecting salmon and steelhead populations at the Project and in the basin. Implementation of the Wells HCP, in addition to the federal, tribal, state and local salmonid recovery programs, is expected to increase wild fish populations in the Columbia River. Through the implementation of the strategies outlined in the Wells HCP, all Project-related effects to each of the five anadromous salmonids found at the Project have been fully mitigated through the achievement of NNI. Measures contained in the Wells HCP will continue to support hatcheries for salmon and steelhead recovery efforts on the Columbia River, improve passage efficiency, enhance habitat, and provide for increasing populations. The Wells HCP also provides for ongoing monitoring and evaluation, and includes the flexibility to adjust the program over the term of the new license as new information is gathered. The Wells HCP and associated HGMPs reduce direct and indirect Project-related effects on Plan Species, thereby reducing the cumulative effects on these species within the Columbia River basin.

Unavoidable Adverse Effects

Some individual anadromous salmonids will continue to experience migratory delays, injury or mortality associated with the operation of the Project. The Wells HCP is intended to fully mitigate for population level effects of the Wells Project on anadromous salmonids.

3.3.2.5 Bull Trout

Affected Environment

Regulatory Status

On June 10, 1998, the USFWS listed bull trout within the Columbia River basin as threatened under the ESA (63 FR 31647). Later (November 1, 1999), the USFWS listed bull trout within the coterminous U.S. as threatened under the ESA (64 FR 58910). The USFWS identified habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, and grazing; blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species as major factors affecting the distribution and abundance of bull trout. They noted that dams (and natural barriers) have isolated population segments resulting in a loss of genetic exchange among these segments (64 FR 58910). The USFWS believes many populations are now isolated and disjunct. In October 2002, the USFWS completed the first draft of a bull trout recovery plan intended to provide information and guidance that will lead to recovery of the species, including its habitat (USFWS 2002). Threatened bull trout population segments are widely distributed over a large area and because population segments were subject to listing at different times, the USFWS adopted a two-tiered approach to develop the draft recovery plan for bull trout (USFWS 2002).

In April 2008, the USFWS completed the five-year status review for Columbia River bull trout with two recommendations: maintain "threatened" status for the species, and determine if multiple distinct population segments exist within the Columbia River and if present, determine whether distinct populations merit specific protection under the ESA. The recommendations intend to facilitate analysis of Project effects over more specific and biologically-appropriate areas, ultimately allowing a greater focus of regulatory protection and recovery resources (USFWS 2008). The review also identified specific issues that limit the overall ability to accurately and quantitatively evaluate the current status of bull trout. Seven recommendations were made to improve future evaluation and management decisions, all of which are largely based on improvement and standardization of monitoring and evaluation techniques, better delineation and agreement of core areas and Recovery Units, and multi-agency cooperation and management (USFWS 2008).

The Wells Project is situated within the Upper Columbia River Recovery Unit and the USFWS has identified the Wenatchee, Entiat, and Methow rivers as its core areas. A core area represents the closest approximation of a biologically functioning unit for bull trout. A core area functions as a metapopulation for bull trout. Not all core areas are equal and each has specific functions that are unique. For example, the Entiat Core Area depends heavily on the mainstem Columbia River to provide overwinter, migration, and forage habitats. The Wenatchee Core Area has populations using lake and riverine (both the Wenatchee and Columbia rivers) habitat for overwintering, migration, and foraging. Within a core area, many local populations may exist. A local population is assumed to be the smallest group of fish that is known to represent an interacting reproductive unit. Nineteen local populations have been identified in the Wenatchee (seven), Entiat (two), and Methow (10) core areas (USFWS 2002).

On December 10, 2003, the USFWS received a request from the FERC for formal consultation to determine whether the proposed incorporation of the Wells HCP into the FERC license for operation of the Project was likely to jeopardize the continued existence of the Columbia River DPS of ESA-listed bull trout, or destroy or adversely modify proposed bull trout critical habitat. In response to the FERC request and based upon the results of the 2001 to 2003 study, which suggested that continued operations are not likely to jeopardize bull trout, the USFWS filed the BO and ITS with the FERC. On June 21, 2004, the FERC issued an order incorporating the Wells HCP and the terms and conditions of the ITS into the FERC license for the Project.

In 2004, Douglas PUD in consultation with the USFWS, and as required under the Wells HCP BO, developed the BTMMP. The goal of the BTMMP is to continue monitoring and evaluating bull trout in the Project to quantify and address, to the extent feasible, potential Project impacts on bull trout. Implementation of BTMMP measures specifically include: (1) address on-going Project impacts through the life of the existing operating license; (2) provide consistency with recovery actions as outlined in the USFWS bull trout recovery plan; and (3) monitor and minimize the extent of incidental take of bull trout, if any, consistent with Section 7 of the ESA. BTMMP implementation started in 2005 and continued through the spring of 2008. Objectives of the plan include identifying Project impacts, if any, on upstream and downstream passage of adult and sub-adult bull trout through Wells Dam, investigating the potential for sub-adult entrapment or stranding in off-channel or backwater areas of Wells Reservoir, and identifying the Core Areas and Local Populations, as defined in the USFWS' Bull Trout Recovery Plan, of bull trout that utilize the Project.

Life History

Bull trout are members of the char group within the family Salmonidae. Bull trout closely resemble Dolly Varden (*Salvelinus malma*), a related species. Genetic analyses indicate, however, that bull trout are more closely related to an Asian char (*Salvelinus leucomaenis*) than to Dolly Varden (Pleyte et al. 1992).

Bull trout are believed to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993). Growth, survival, and long-term persistence are dependent upon habitat characteristics such as cold water, complex instream habitat, a stable substrate with a low percentage of fine sediments, high channel stability, and stream/population connectivity. Stream temperature and substrate type, in particular, are critical factors for the sustained long-term persistence of bull trout. Spawning is often associated with the coldest, cleanest, and most complex stream reaches within basins. Bull trout may exhibit a patchy distribution, even in pristine habitats, and should not be expected to occupy all available habitats at the same time (Rieman and McIntyre 1995; Rieman et al. 1997).

Bull trout exhibit four distinct life history types: resident, fluvial, adfluvial, and anadromous. All life history types spawn in headwater streams outside the Wells Project Boundary. Resident bull trout populations are generally found in small headwater streams where fish remain their entire lives. The majority of growth and maturation for adfluvial bull trout occurs in lakes or reservoirs, and fluvial bull trout in large river systems. The fluvial, adfluvial, and resident forms exist throughout the range of bull trout (Rieman and McIntyre 1993). These forms spend their entire life in freshwater. The anadromous life history form is currently only known to occur in the Coastal-Puget Sound region within the coterminous U.S. (Volk 2000). Multiple life history types may be expressed in the same population, and this diversity of life history types is considered important to the stability and viability of bull trout populations (Rieman and McIntyre 1993). To date, only adfluvial bull trout have been documented within Wells Reservoir.

For migratory life history types, juveniles tend to rear in tributary streams for one to four years before migrating downstream into a larger river or lake to mature (Rieman and McIntyre 1993). Juvenile and adult bull trout in streams frequently inhabit side channels, stream margins and pools with suitable cover (Sexauer and James 1993), and areas with cold hyporheic zones or groundwater upwelling (Baxter and Hauer 2000). The timing and extent of movements and spawning migrations varies substantially among populations of bull trout.

Critical Habitat Designations

On September 26, 2005, the USFWS designated critical habitat for the Columbia River distinct population segment of bull trout. None of the designated critical habitat occurs in or near the Wells Project. On January 14, 2010, the USFWS proposed new critical habitat designations for bull trout (75 FR 2270). Within the Wells Project, the proposal includes 31 miles of the mainstem Columbia River downstream from Chief Joseph Dam, and 1.5 miles of the Methow River. The deadline for the USFWS submittal of a final bull trout critical habitat designation to the federal register is September 30, 2010.

Bull Trout Study Results

Two sets of studies have provided the majority of the information on bull trout migratory behavior at the Wells Project. The first study was the 2001 to 2004 mid-Columbia radio telemetry study undertaken jointly by the three mid-Columbia PUDs (Chelan, Grant, and Douglas PUDs) to evaluate the movement and status of bull trout in their respective project areas at the request of the USFWS (BioAnalysts, Inc. 2004). The goal of the study was to monitor the movements and migration patterns of adult bull trout in the mid-Columbia River using radio telemetry. From 2001 to 2003, bull trout were collected from the Wells, Rocky Reach, and Rock Island dams, radio-tagged, and monitored through 2004. Study activities included quantifying incidental take for migratory and sub-adult bull trout passing through the Wells Project.

In total, 79 bull trout were tagged during the study with 19 bull trout tagged at Wells Dam. Between 2001 and 2003, a total of 10 (two tagged at Rock Island, four at Rocky Reach, four at Wells), 11 (five Rocky Reach, four Wells, two from 2001), and one (one Wells) tagged bull trout were detected moving upstream through the ladders of Wells Dam, respectively (BioAnalysts, Inc. 2004). Median travel times (tailrace detection to ladder exit detection) during the telemetry study at Wells Dam in 2001 to 2003 were 8.87, 7.60, and 1.16 days, respectively. Median ladder passage times (entrance detection to ladder exit detection) during the telemetry study at Wells in 2001 to 2003 were 5.70, 0.23, and 0.16 days, respectively (BioAnalysts, Inc. 2004). Adult bull trout migrating upstream of Wells Dam appear to be destined for the Methow River. During the 2001 to 2003 study, no bull trout selected the Okanogan River system. In the Wells Reservoir, migratory bull trout have entered the Methow River by the end of June and spawning is typically complete by late October with some fish returning to the Wells Reservoir by mid-December. It appears that no radio-tagged bull trout were injured at the dams or in the reservoirs due to Project effects during telemetry monitoring in 2001, 2002, and 2003 (BioAnalysts, Inc. 2004).

The second series of studies took place during 2005 to 2008 and were associated with the implementation of the BTMMP. The goals of the BTMMP were to identify, develop, and implement measures to monitor and address potential Wells Project-related impacts on bull trout associated with the operations of the Wells Project and associated facilities (BioAnalysts, Inc. 2004). The BTMMP has four objectives, addressed by implementing various field study components from 2004 to 2008 at the Wells Project.

The first objective was to identify potential Project-related impacts on upstream and downstream passage of adult bull trout (fish ≥ 400 mm in length) through Wells Dam and reservoir, and implement appropriate measures to monitor any incidental take of adult bull trout. To meet the first objective, radio telemetry was used to monitor upstream and downstream passage, and off-season video counting was done in the Wells Project fishways during the winter. Between 2005 and 2008, 26 adult bull trout were trapped at Wells Dam and radio-tagged. Concurrent with the implementation of the BTMMP, the USFWS and Chelan PUD radio-tagged and released 136 adult bull trout at other mid-Columbia River basin locations including the Methow River, and Rock Island and Rocky Reach dams (50 USFWS tags 2006-2008, 86 Chelan PUD tags 2005-2007).

From 2005 to 2008, 25 downstream passage events and 52 upstream passage events by 40 individual bull trout were recorded at Wells Dam. Of these, 17 downstream and 41 upstream passage events occurred within one year of tagging and release. Of all tags released from 2001 to 2004, there were two downstream passage events and 41 upstream passage events. Of these, two downstream and 38 upstream passage events occurred within one year of release. The take estimates for the Wells Project were based upon the number of unique upstream and downstream passage events that took place within one year of each bull trout being tagged and released. During the six-year study and eight years of monitoring, 19 downstream and 79 upstream passage events took place at Wells Dam by radio-tagged bull trout within one year of release. Radio-tagged bull trout passed downstream through the turbines or spillways as no downstream passage events were recorded via the fishways. Out of the 19 downstream passage events that occurred within one year of tagging, zero bull trout injury or mortality was observed at the Wells Project. Out of the 79 upstream passage events that occurred within one year of tagging, zero bull trout injury or mortality was observed at the Wells Project (LGL and Douglas PUD 2008*a*).

Upstream passage of adult bull trout through the fish ladders at Wells Dam has historically occurred between early May and late October, with peak passage typically occurring in May and June. During the 2005 to 2008 study, 214 adult bull trout were counted passing upstream through Wells Dam. The proportion of the bull trout population at Wells Dam that was radio tagged was 24 percent (52/214 = 0.24). Project operations did not appear to influence the movements of adult bull trout. Instead, adult bull trout passage events appeared to be more closely associated with water temperature, photoperiod, and time of year with rather predictable patterns of upstream and downstream movement (LGL and Douglas PUD 2008*a*). Because no take (injury or mortality) was observed during the study, there was no need to investigate how Project operations affected take at Wells Dam. During the 2005 to 2008 monitoring period, no adult bull trout were counted during the 24-hour off-season fishway counting period (November 16 to April 30). No upstream or downstream passage problems were identified during this study. Passage times upstream through the fishway appeared reasonable relative to the species migration and spawn timing. Because no passage problems were identified during the study, there was no need to develop recommendations to change or modify the fishway operations at Wells Dam (LGL and Douglas PUD 2008*a*).

The third objective was to investigate the potential for sub-adult entrapment or stranding in off channel or backwater areas of Wells Reservoir. Douglas PUD contracted with GeoEngineers in March 2005 to develop detailed bathymetric maps of the Wells Project. The maps were produced at a 1-foot contour interval and were combined with Wells Dam operational data to assess potential areas of bull trout entrapment or stranding. The analysis identified several locations where stranding or entrapment of bull trout could potentially occur, including the Methow River mouth, the Okanogan River mouth, the Kirk Islands, the shallow water habitat in the Columbia River directly across from the mouth of the Okanogan River, Schluneger Flats, and the off-channel areas of the Bridgeport Bar Islands.

On May 18, 2006, Douglas PUD field crews surveyed five reservoir sites during operational and environmental conditions that could potentially result in bull trout stranding or entrapment (LGL and Douglas PUD 2008*a*). Boat and foot surveys were conducted and included a combination of shoreline transects and inspection of isolated sanctuary pools at all sites to visually identify entrapped or stranded bull trout. On November 5, 2008, an additional stranding survey was conducted at three of the five sites and one new site identified as having the highest probability of stranding during the 2006 study. No bull trout were observed during any of the stranding surveys.

The fourth objective was to identify the core areas and local populations of bull trout that utilize the Wells Project. Douglas PUD funded the collection of genetic samples from 22, 20, and 24 bull trout in 2005, 2006 and 2007, respectively (LGL and Douglas PUD 2008*a*). In 2005, six samples were collected at Wells Dam and 16 were collected at off-Project operations (Methow and Twisp river screw traps). In 2006, 10 samples were collected at Wells Dam and 10 samples were collected at off-Project operations. In 2007, 10 samples were collected at Wells Dam and 14 samples were collected at off-Project operations. All genetic samples were provided to the USFWS for analysis.

The majority of radio-tagged bull trout movements from the Wells Dam were to the Methow River and associated tributaries (e.g., Twisp River) located upstream of Wells Dam; only four detections (12 percent of 34 total detections) were of movement into the Entiat River, located downstream of Wells Dam (LGL and Douglas PUD 2008*a*). Most of the radio-tagged bull trout passed Wells Dam during the months of May and June (BioAnalysts, Inc. 2004). Adults generally exited presumed spawning locations in the Methow by late October; some bull trout were observed returning to Wells Reservoir by mid-December. Bull trout did not select the Okanogan River system in either telemetry study (one trout entered the Okanogan for a short period before leaving to enter the Methow system).

In addition to telemetric assessments, bull trout have been observed and counted during upstream passage at Wells Dam since 1998 (Columbia Basin Fisheries Agencies and Tribes [CBFAT] 2008). Bull trout upstream passage in Wells Project fish ladders is monitored from May 1 through November 15. In recent years, Douglas PUD has initiated an experimental winter count for bull trout (November 16 through April 30). To date, no bull trout have been observed in the fish ladders during the experimental winter monitoring period. Counts of bull trout from 2000 through 2008 are presented below for the Wells Project and two additional downstream projects (Table 3.3.2.5-1). The table shows the relatively small number of bull trout passing over Wells Dam as compared to the counts at Rocky Reach Dam.

Table 3.3.2.5-1 Tabulated summary of bull trout passage up adult fish ladders at three mid-Columbia projects.

Project	Year											Total	Average
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008		
Rocky Reach	831	1,281	2,161	204	194	246	161	155	142	77	100	5,552	505
Rock Island	67	61	87	82	84	102	114	69	35	46	36	783	71
Wells	17	49	93	108	76	53	47	49	100	65	43	700	64

[1] Unpublished data (Chelan PUD 2003)
Source: CBFAT 2008.

Environmental Effects

Through the implementation of the strategies outlined in the BTMMP, six years of tagging and eight years of monitoring, no Project-related effects to adult or sub-adult bull trout from passage through the Wells Project have been identified. No sub-adult bull trout have been detected at the Wells Project. Studies implemented as part of the BTMMP also determined that there is no correlation between Project operations and downstream passage events, and that there is no upstream movement of adult bull trout through the Wells Dam fishways during the off-season period of November 16 through April 30. Bull trout captured and tagged at Wells Dam were radio-tracked to the Methow and Entiat core areas during spawning periods, and have also demonstrated movement between these systems by successfully passing upstream or downstream through Wells Dam (LGL and Douglas PUD 2008*a*).

A draft BA, prepared for the purpose of ESA Section 7 consultation with the USFWS, determined that the relicensing of the Wells Project is likely to adversely affect bull trout. The BA can be found in Exhibit E; Appendix E-7.

Proposed Environmental Measures

Douglas PUD has conducted extensive studies of the aquatic resources associated with the Wells Project dating back to before 1990. Early studies were focused on the status and condition of anadromous salmonids, but also included resident fish in the Wells

Reservoir. Studies associated with the 2004 Wells HCP and with Project relicensing have added significantly to the accumulated knowledge and understanding of all aquatic resources associated with the Project. Douglas PUD collaborated with a voluntarily-established Aquatic RWG to develop and review agreed-upon study plans and studies as part of the relicensing process. This Aquatic RWG subsequently developed an ASA to address all remaining aquatic resources issues related to relicensing of the Wells Project. The ASA contains six individual resource management plans for protecting aquatic resources. The BTMP (Exhibit E; Appendix E-2) is one of these resource protection plans.

The draft BA prepared for the Wells Project concluded that the Wells Project is likely to adversely affect bull trout. The planned implementation of the BTMP, during the term of the new license, is expected to fully address any measureable adverse effects.

The BTMP was developed by Douglas PUD and the federal, state and tribal entities who are parties to the ASA. The goal of the BTMP is to identify, monitor, and address impacts, if any, on bull trout resulting from the Project in a manner consistent with the USFWS Bull Trout Recovery Plan and the terms of the Section 7 ITS. This BTMP is intended to continue the implementation of management activities to protect bull trout during the new license term in a manner consistent with the original BTMMP (Douglas PUD 2004). The 2004 BTMMP was developed in coordination with the USFWS, as required by the USFWS Bull Trout Section 7 BO in association with the FERC's approval of the Wells HCP. The PM&E measures presented within the BTMP are designed to meet the following objectives:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP.

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage.

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate the effectiveness of these measures.

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations.

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan including information exchange and genetic analysis. Should bull trout be delisted, the Aquatic SWG will re-evaluate the needs and objectives of the BTMP.

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult bull trout.

This BTMP is intended to be compatible with other bull trout management plans and the UCSRP in the Columbia River mainstem. Furthermore, this management plan is intended to be compatible with other management strategies of federal, state, and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington State WQS. The USFWS anticipates that the measures contained within the BTMP, together with the measures contained within the Wells HCP, will be adequate to satisfy ESA responsibilities for aquatic species under the jurisdiction of the USFWS (Exhibit E; Appendix E-2).

Cumulative Effects

Bull trout are listed as a threatened species under the ESA. The USFWS has identified habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, and grazing; blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species as major factors affecting the distribution and abundance of bull trout. They noted that dams (and natural barriers) may have isolated population segments resulting in a loss of genetic exchange among these segments. The USFWS's Bull Trout Recovery Plan and project-specific BOs for the Columbia River projects have been developed to guide species recovery activities.

Through the implementation of the strategies outlined in the Wells HCP and BTMMP, successful passage of bull trout upstream and downstream through Wells Dam has been shown, and over the course of eight years of monitoring, there have been no documented Project-related effects on adult or sub-adult bull trout from passage through the Wells Project. Measures contained in the BTMP would improve passage for bull trout and provide for increasing the population. The BTMP will also provide for ongoing monitoring and evaluation, and includes the flexibility to adjust the program over the term of the new license as new information is gathered. Implementation of Douglas PUD's BTMP will reduce cumulative effects on bull trout.

Unavoidable Adverse Effects

The Wells Project has no documented adverse effects on adult bull trout, however it is reasonable to assume that passage delays and injury and mortality occur at a level similar to that seen for adult anadromous salmonids.

3.3.2.6 White Sturgeon

White sturgeon are the largest of all North American freshwater fish. They are found in marine waters and freshwaters of rivers along the Pacific coast from Monterey, California to Cook Inlet in northwestern Alaska (Wydoski and Whitney 2003). Significant populations off the Pacific Coast appear to be restricted to three locations: the Sacramento, Fraser, and Columbia rivers (Lane 1991). White sturgeon are distributed throughout the U.S. portion of the Columbia River and in many of its larger tributaries.

Columbia River white sturgeon are reported to have declined in numbers because of numerous factors, including obstruction of migration by mainstem hydroelectric dams, altered stream flows, altered hydrologic regimes, altered temperature regimes, reduced spawning habitat, and over harvest (van der Leeuw et al. 2006; Wydoski and Whitney 2003). Variations in population characteristics also have been attributed to differences in exploitation rates and recruitment success, access to marine food resources, and suitability of hydrologic conditions and available habitats (Devore et al. 1995).

Affected Environment

Regulatory Status

White sturgeon are not a federally-listed species, nor are they contained within Washington State's list of rare or sensitive species. However, in 2002, WDFW closed fishing for white sturgeon in the upper Columbia River above Chief Joseph Dam. There is no legal harvest of sturgeon in the mid-Columbia River from Priest Rapids upstream to Chief Joseph Dam; however, it is a year-round catch-and-release fishery.

Life History

White sturgeon are a long-lived, primitive fish species that forage primarily along the bottom of large river systems in the Pacific Northwest. Native anadromous white sturgeon migrate downstream to feed in the rich estuary or marine areas before migrating back upstream to spawn. The construction of hydroelectric dams on the mainstem Columbia River has restricted this anadromous life history in the upper river because sturgeon do not readily pass through fish ladders. It is suspected that the creation of reservoirs on the Columbia River has resulted in the fragmentation of the white sturgeon population into a number of small populations, which may or may not be isolated. White sturgeon are currently found throughout the Columbia River basin and are successfully reproducing in some of the reservoirs (Brannon and Setter 1992). However, the population dynamics and factors regulating white sturgeon production within these reservoirs are poorly understood. Overfishing and loss of important habitats has further impacted these populations to the point where harvest fisheries are only allowed in the Columbia River downstream from Priest Rapids Dam (FERC 2004).

Male sturgeon may mature at 10 to 12 years of age, while females may not mature until 15 to 32 years of age. Spawning occurs between February and July, depending on water temperature; most spawning occurs when water temperatures are 50° to 63°F (10° to 17°C) (Pacific States Marine Fisheries Commission [PSMFC] 1992). Sturgeon spawn in swift currents (2 to 9 feet per second over cobble, boulder, and bedrock substrates) (Parsley and Beckman 1994), similar to those occurring in the tailrace areas throughout the mid-Columbia River. Eggs and sperm are broadcast in fast-moving water, allowing the adhesive eggs to disperse before settling to the bottom.

Incubation occurs in 7 to 14 days, depending on water temperature. The hatched larvae are planktonic and drift downstream. Sturgeon are opportunistic feeders that prey on benthic organisms as juveniles, and a variety of benthic-oriented prey as adults (including fish).

White Sturgeon Study Results

To gather additional information on white sturgeon populations in the Wells Reservoir, Douglas PUD completed a sturgeon population assessment and behavior study during 2001, 2002, and 2003 (Jerald 2007). The study utilized setlines for the collection and tagging of sturgeon greater than 50 cm in total length. Fish captured on setlines were measured and marked with PIT-tags and with scute markings. Some of the fish were also radio-tagged and had pectoral fin rays removed for age analysis. Setline sampling took place over a two-year timeframe with a total of 129 setlines deployed and retrieved from throughout the Wells Reservoir (Douglas PUD 2006).

During the study, 13 individual sturgeon were captured, with the majority captured in the Columbia River within 5 miles of the mouth of the Okanogan River (Jerald 2007). Results of the two-year mark-recapture portion of the study indicated that the sturgeon population in Wells Reservoir is small with a population estimate that ranged from 13 to 217 adult fish with a point estimate of 31 fish over 50 cm in length (Skalski and Townsend 2005).

The length of the fish captured and tagged ranged from 60 to 202 cm. Eleven of the 13 fish were determined to be between six and 30 years of age demonstrating that all of these fish recruited to the Wells Reservoir after Wells Dam was completed in 1967 with strong year class recruitment between the years 1972 to 1978 and again between 1988 to 1996 (Douglas PUD 2006).

Radio-tags were applied to six of the 13 sturgeon captured during 2001 and 2002. None of the six fish were detected downstream of Brewster or upstream of Park Island. One of the five mature fish radio-tagged made upstream migrations into the Okanogan River during the spring of 2002 and two different radio-tagged mature-sized sturgeon made migrations into the Okanogan River during 2003 (Jerald 2007).

The presence of sub-adult and adult white sturgeon younger than the Project suggests that successful rearing does take place within the Wells Reservoir. It is unknown whether the white sturgeon population in the Wells Reservoir is a result of natural recruitment by the existing adult population or from immigration of juveniles outside of the Wells Project. If spawning is occurring in Wells Reservoir, it is likely taking place in the tailrace of Chief Joseph Dam (Douglas PUD 2006).

Environmental Effects

Similar to Priest Rapids, Wanapum, Rock Island and Rocky Reach, the Wells Project impacts white sturgeon by blocking upstream passage. Based upon the population assessment completed at the Wells Project, some recruitment is occurring although abundance of individuals is low. It is unknown what effects the Wells Project has on the population or what size population the Wells Reservoir is capable of sustaining. Furthermore, the source of recruitment (immigration or spawning in the Wells Reservoir) is unclear and may be insufficient to maintain populations.

Proposed Environmental Measures

Douglas PUD has executed an ASA with federal, state and tribal entities to address all of the remaining aquatic resources issues related to the relicensing of the Wells Project, including impacts on white sturgeon. The Wells Project may have an adverse effect on white sturgeon. The planned implementation of the WSMP (Exhibit E; Appendix E-2), during the term of the new license, is expected to fully address any measureable adverse effects.

The WSMP was developed by Douglas PUD and the federal, state and tribal entities who are parties to the ASA. The goal of the WSMP is to increase the white sturgeon population in the Wells Reservoir to a level that can be supported by the available habitat and characterized by a diverse age structure consisting of multiple cohorts (juvenile and adult). In addition, the WSMP is intended to support spawning, rearing and migration as identified by the aquatic life designated use under WAC 173-201A in the Washington State WQS. Based upon the available information, the Aquatic SWG determined that an assessment of Wells Project effects on white sturgeon was not practical given sturgeon life history characteristics and the limited number of fish estimated to exist in the Wells Project. Therefore, the Aquatic SWG concluded that resource measures related to white sturgeon should focus on population protection and enhancement by means of supplementation as an initial step in order to increase sturgeon numbers within the Wells Reservoir. In addition to the initial supplementation activities, implementation of a monitoring and evaluation program shall be conducted to assess natural recruitment, juvenile habitat use, emigration rates, Wells Project carrying capacity, and the potential for natural reproduction in order to inform the scope of a future, longer-term strategy. All objectives listed below were developed in order to meet the WSMP goal.

Objective 1: Supplement the white sturgeon population in order to address Wells Project effects, including impediments to migration and associated bottlenecks in spawning and recruitment.

Objective 2: Determine the effectiveness of the supplementation activities through a monitoring and evaluation program.

Objective 3: Determine the potential for natural reproduction in the Wells Reservoir in order to appropriately inform the scope of future supplementation activities.

Objective 4: Adaptively manage the supplementation program as warranted by the monitoring results.

Objective 5: Evaluate whether there is biological merit to providing safe and efficient adult upstream passage.

Objective 6: Identify white sturgeon educational opportunities that coincide with WSMP activities.

This WSMP is intended to be compatible with other white sturgeon management plans in the Columbia River mainstem. The implementation measures identified within the WSMP are designed for implementation in two phases based upon a 50-year license term. Phase I of the PM&Es will be implemented during the first 10 years of the new license and consist of supplementation and monitoring and evaluation activities. Results of Phase I PM&Es will be used to inform the scope of continued PM&Es during Phase II, which will be implemented for the remainder of the new license (Exhibit E; Appendix E-2).

Cumulative Effects

Columbia River white sturgeon are reported to have declined in numbers because of numerous factors, including obstruction of migration by mainstem hydroelectric dams, altered stream flows, altered hydrologic regimes, altered temperature regimes, reduced spawning habitat, and over harvest (van der Leeuw et al. 2006; Wydoski and Whitney 2003). Variations in population characteristics also have been attributed to differences in exploitation rates and recruitment success, access to marine food resources, and suitability of hydrologic conditions and available habitats (Devore et al. 1995).

Similar to Priest Rapids, Wanapum, Rock Island and Rocky Reach, the Wells Project impacts white sturgeon by blocking upstream passage. The presence of juvenile white sturgeon suggests that successful rearing does take place within the Wells Reservoir. It is unknown to what degree the white sturgeon population in the Wells Reservoir is a result of recruitment from spawning within the Project or from immigration of juveniles from outside of the Wells Project. Recruitment is occurring although abundance of individuals is low. It is unknown what population size the Wells Reservoir is capable of sustaining. Furthermore, the source of recruitment (immigration or spawning in the Wells Reservoir) is unclear and may be insufficient to maintain populations.

Measures contained in the WSMP would provide for increasing the population. The WSMP will also provide for ongoing monitoring and evaluation, and includes the flexibility to adjust the program over the term of the new license as new information is gathered. Implementation of Douglas PUD's WSMP will reduce any potential cumulative effects on white sturgeon.

Unavoidable Adverse Effects

The Wells Project will continue to block upstream passage of adult white sturgeon.

3.3.2.7 Pacific Lamprey

Affected Environment

Regulatory Status

In January 2003, the USFWS received a petition from 11 environmental groups seeking the listing of four lamprey species: Pacific lamprey, river lamprey (*Lampetra ayresi*), western brook lamprey (*Lampetra richardsoni*), and Kern brook lamprey (*Lampetra hubbsi*). The petition cited population declines and said lampreys are threatened by artificial barriers to upstream and downstream migration, de-watering, and habitat degradation among other threats. In response to the petition, the USFWS conducted an initial review to determine whether an emergency listing was warranted and decided in March 2003 that such a situation did not exist.

In an agreement stemming from a lawsuit filed by the petitioners in response to the initial finding, the USFWS committed to the issuance of a 90-day finding on the petition by December 20, 2004. Again, the USFWS announced that the petition seeking a listing of the four lamprey species did not contain enough information to warrant further review, and the agency was not going to place the lamprey species on the Endangered Species list. For Pacific lamprey, the petitioners provided information showing a drop in range and numbers, but did not provide information describing how the regional portion of the species' petitioned range, or any smaller portion, is appropriate for listing under the ESA.

The agency did, however, decide that it will continue to work with others on efforts to gather information related to the conservation of lamprey and their habitats and is currently leading the development of a Pacific Lamprey Conservation Initiative.

Life History

Pacific lamprey is a native species present in tributaries of the Columbia River and in the mainstem Columbia River during their migration stages. Native Americans have historically harvested them for subsistence, ceremonial, and medicinal purposes (Close et al. 2002). Little specific information is available on the life history or status of lamprey in the mid-Columbia River watersheds. They are known to occur in the Methow, Wenatchee, and Entiat rivers (NMFS 2002*a*) and recently have been captured during juvenile salmon and steelhead trapping operations in the Okanogan River (personal communication between B. Le, Senior Aquatic Resource Biologist, Douglas PUD and M. Rayton, Fisheries Biologist, CCT 2007).

In general, adults are parasitic on fish in the Pacific Ocean while ammocoetes (larvae) are filter feeders that inhabit the fine silt deposits in backwaters and quiet eddies of streams (Wydoski and Whitney 2003). Adults generally spawn in low-gradient stream reaches in the tail areas of pools and in riffles, over gravel substrates (Jackson et al. 1997). Adults die after spawning. After hatching, the ammocoetes burrow into soft substrate for an extended larval period filtering particulate matter from the water column (Meeuwig et al. 2002). The ammocoetes undergo a metamorphosis into macrophthalmia (outmigrating juvenile lamprey), between three and seven years after hatching (NMFS 2002*a*). Within the Wells Project, from April to June juvenile lamprey initiate migration from their natal streams (Douglas PUD and LGL 2008).

Pacific lamprey populations of the Columbia River have been highly variable over the past eight years (roughly one generation; Close et al. 2002) when consistent annual lamprey counts were established at dams on the Columbia and Snake rivers (LGL and Douglas PUD 2008*b*) (Table 3.3.2.7-1).

Table 3.3.2.7-1 Pacific lamprey counts at Columbia River mainstem dams, by dam and year, 1997-2007.

Year	Bonneville	The Dalles	John Day	McNary	Priest Rapids	Rock Island	Rocky Reach	Wells
1997	20,891	6,066	9,237	-	-	-	-	-
1998	-	-	-	-	-	-	-	343
1999	-	-	-	-	-	-	-	73
2000	19,002	8,050	5,844	1,281	.	822	767	155
2001	27,947	9,061	4,005	2,539	1,624	1,460	805	262
2002	100,476	23,417	26,821	11,282	4,007	4,878	1,842	342
2003	117,035	28,995	20,922	13,325	4,340	5,000	2,521	1,410
2004	61,780	14,873	11,663	5,888	2,647	2,362	1,043	647
2005	26,667	8,361	8,312	4,158	2,598	2,267	404	214
2006	38,941	6,894	9,600	2,459	4,383	1,326	370	21
2007	19,304	6,083	5,753	3,454	6,593	1,300	696	35

Total	432,043	111,800	102,157	44,386	26,192	19,415	8,448	3,502
Average	48,005	12,422	11,351	5,548	3,742	2,427	1,056	350

At Wells Dam, returning adult Pacific lamprey have been counted since 1998. Over the last 10 years, the number of lamprey passing Wells Dam annually has averaged 350 fish and ranged from 21 fish in 2006 to 1,410 fish in 2003 (Tables 3.3.2.7-1 and 3.3.2.7-2). In addition to the basin-wide decline of Pacific lamprey, the relatively small number of adults observed at Wells Dam may be attributed to the species' lack of home stream fidelity, predation on adults, and bioenergetic expenditure of traveling 500 miles upstream and through eight other hydro projects (Keefer et al. 2009*b*; Tackley et al. 2008; Robichaud et al. 2009).

Table 3.3.2.7-2 Adult Pacific lamprey counts at Wells Dam for east and west fish ladders, 1998-2007.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
East	174	47	96	153	226	724	263	151	13	17
West	169	26	59	106	117	694	140	64	8	18
Total	343	73	155	259	343	1,418	403	215	21	35

Adult lamprey pass Wells Dam from early July until late November with peak passage typically occurring between mid-August and late October (LGL and Douglas PUD 2008*b*) (Table 3.3.2.7-3). In all years since counting was initiated, Pacific lamprey counts at the east fish ladder were greater than at the west fish ladder except for 2007. Adult fishway facilities at Wells Dam were designed specifically for passage of salmonids. Recent research has identified areas such as picketed lead structures downstream of fish count windows that adult lamprey may access to bypass count stations and avoid being enumerated (LGL and Douglas PUD 2008*b*).

Table 3.3.2.7-3 Run timing of Pacific lamprey at Wells Dam, by year, distribution of run, total lamprey observed, length of migration, and fish per day, 1998-2007. Descriptive statistics are listed at bottom of table.

Year	Start Date	25%	50%	75%	Finish date	Total lamprey	Length of run	Average fish/day
1998	30-Jun	27-Aug	5-Sep	14-Sep	30-Sep	343	92	3.7
1999	31-May	1-Sep	9-Sep	12-Sep	11-Oct	73	133	0.5
2000	22-Jul	25-Aug	2-Sep	16-Sep	20-Oct	155	90	1.7
2001	4-Jul	26-Aug	16-Sep	24-Sep	11-Nov	262	130	2.0
2002	31-May	2-Sep	9-Sep	19-Sep	8-Nov	342	161	2.1
2003	27-Jun	6-Sep	7-Oct	28-Oct	15-Nov	1,410	141	10.0
2004	4-May	19-Aug	12-Sep	11-Oct	14-Nov	647	194	3.3
2005	28-Apr	22-Aug	6-Sep	27-Sep	3-Nov	214	189	1.1
2006	4-May	19-May	15-Aug	20-Sep	29-Sep	21	148	0.1
2007	12-Aug	27-Aug	7-Sep	14-Sep	23-Sep	35	42	0.8
Min	28-Apr	19-May	15-Aug	12-Sep	23-Sep	21	42	0.1
Max	12-Aug	6-Sep	7-Oct	28-Oct	15-Nov	1,410	194	10.0
Median	13-Jun	26-Aug	8-Sep	19-Sep	27-Oct	238	137	1.9

Adult Pacific lamprey returning to the Columbia River basin overwinter prior to spawning the following spring and summer. A majority of the mainstem mid-Columbia River is characterized by a series of reservoirs, and it is likely that returning adult lamprey utilize Wells Reservoir primarily for overwintering and as a migratory corridor through which they travel destined for the middle and upper reaches of tributary streams outside of the Wells Project Boundary where habitat conditions are more suitable for spawning.

Lamprey Study Results

The study of adult Pacific lamprey migration patterns past dams and through reservoirs in the lower Columbia River has provided the first data sets on lamprey passage timing, travel times, and passage success at hydroelectric projects. At Bonneville Dam in 2007, 2008 and 2009 the overall passage rates were 31 percent, 32 percent and 28 percent, respectively (Keefer et al., 2009*a* draft).

Similar collection and passage efficiency results were observed at Rocky Reach, Wanapum, and Priest Rapids dams during tagging studies conducted at those projects (Nass et al. 2003; Stevenson et al. 2005).

Of the 125 radio-tagged lampreys released approximately 7 kilometers downstream of Rocky Reach Dam, 93.6 percent were detected at the project, and of those fish, 94.0 percent entered the fishway. Of the fish that entered the Rocky Reach fishway, 55.5 percent exited the ladder (Stevenson et al. 2005).

During studies at Wanapum and Priest Rapids dams, a total of 51 and 74 lampreys were radio-tagged and released downstream of Priest Rapid Dam in 2001 and 2002, respectively. Over the two years of study, the proportion of fish that approached the fishway that exited the ladders was 30 percent and 70 percent at Priest Rapids and 100 percent and 51percent at Wanapum Dam in 2001 and 2002, respectively (Nass et al. 2003).

In 2004, Douglas PUD contracted with LGL to conduct a lamprey radio-telemetry study at Wells Dam in coordination with Chelan PUD, which was conducting a similar study at Rocky Reach Dam. A total of 150 lampreys were radio-tagged and released at or below Rocky Reach Dam. The radio tags used in this study had an expected operational life of 45 days (Nass et al. 2005). It is important to note that as a result of the lamprey release site being located over 50 miles downstream of Wells Dam, the value of the study results for the Project was limited by the relatively small numbers of tagged fish that approached Wells Dam (n=18), and the fact that many of the radio tags detected at Wells Dam were within days of exceeding their expected battery life.

The 2004 study at Wells Dam was implemented through a combination of fixed-station monitoring at the dam and fixed stations at tributary mouths. Collectively, these monitoring sites were used to determine migration and passage characteristics of lamprey entering the Wells Project. Of the 150 adult lampreys released at or below Rocky Reach in 2004, 18 were detected in the vicinity of the Wells Project and 10 detected at fishway entrances prior to tags expiring. A total of three radio-tagged lampreys passed Wells Dam prior to expiration of the tags, resulting in a fishway efficiency estimate of 30 percent (three of 10) for the study period. A single lamprey was detected upstream of Wells Dam at the mouth of the Methow River (Nass et al. 2005).

Although the 2004 study at Wells Dam provided preliminary passage and behavioral information for migrating adult lamprey, the limited observations due to the small sample size (n=10) were insufficient in addressing the objectives of the 2004 study. For lamprey that passed the dam, median travel time required to pass through the fishway was 0.3 d (Nass et al. 2005).

In 2007, Douglas contracted with LGL to conduct a second lamprey radio-telemetry study at Wells Dam. The study was scheduled to occur from early August through November and utilized tags that had 87 days of battery life. A total of 21 adult lamprey were tagged and released for the purpose of this study (six from Wells Dam and 15 from Rocky Reach Dam). The small sample size for this study can be attributed to the very low adult lamprey returns to the Columbia River in 2007 (35 adults counted at Wells in 2007). The study was continued in 2008 in order to increase total sample size and in order to obtain additional passage information.

A comprehensive report was produced in February of 2009 concluding the two-year radio-telemetry behavior studies (Robichaud et al. 2009). Results indicated the following:

- Over both years of study, 59 adult lampreys were radio-tagged and released at Wells Dam (19 more than the target sample size in the FERC-approved study plan). Twenty-two lampreys were tracked near fishway entrances, and 15 were tracked within the upper fishways.
- Median passage times through the fishways were fast, especially when excluding daylight hours during which the nocturnal lamprey are less active. The only lower fishway ascent in 2007 took 6.1 hours (LGL and Douglas PUD 2008b), and, though lower fishway ascents were hindered by trapping in 2008, the median time from the collection gallery pier to the "below trap" zone was 3.2 hours. Median upper fishway passage times were 6.7 hours for both years (5.2 hours when excluding daylight hours).
- Lamprey in the tailrace made multiple approaches to fishway entrances both years, indicating that tailrace conditions and ability to locate the fishways were not a limiting factor to passage success. However, entrance efficiencies averaged 27 percent over the two-year study indicating lamprey have difficulty negotiating the fishway entrance.
- Trapping operations in 2008 negatively affected passage ability of radio-tagged lamprey. Twelve of the 14 lampreys (86 percent) that encountered the trapping area were ultimately blocked, and 50 percent of all upstream-moving detection sequences that ended in a drop back did so below the trap. Adult lamprey traps and perforated plates in weir orifices to increase trapping efficiency were subsequently removed.
- Upper fishway passage success was 100 percent for the second consecutive year, and no drop back was observed in this part of the fishway (two-year total = 15 fish). This suggests lamprey are capable of negotiating the upper fishway with a high level of success.
- During the 2008 study, up to half of the radio-tagged lamprey displayed uncharacteristic behaviors indicative of death, tag shed, or abandonment of migration. Decreasing water temperatures may have also contributed to the abandonment of migration as lamprey approach Wells Dam near the known overwintering period. These effects, plus latent tagging effects as described by Moser et al. (2007), may have impacted the performance of the 29 radio-tagged lamprey that were included in calculation of passage metrics, thus biasing results to underestimate passage success and to overestimate passage impediments.

Passage efficiency from this study was comparable or superior to results from other radio-telemetry studies conducted in the Columbia River during 2008. Entrance efficiencies of radio-tagged lamprey at Bonneville Dam ranged from 6 percent to

32 percent, compared to 33 percent at Wells Dam. Fallback at Bonneville Dam was 19 percent compared to no documented fall-back events at Wells Dam. Median project passage times at Bonneville Dam exceeded 180 hours compared to Wells Dam where lower fishway passage time was 6.1 hours, upper fishway passage time was 5.9 hours, and time spent in or at the trap was 20 hours (32 hours total). Robichaud et al. 2009 recommended the following measures to improve entrance efficiencies:

- Implement a reduction in fishway head differential to reduce entrance velocities to levels within the swimming capabilities of Pacific lamprey (0.8 to 2.1 m/s). These proposed flow reductions should be restricted to hours of peak lamprey activity (i.e., nighttime) and within their primary migratory period at Wells Dam (August to September).
- Remove perforated plates from orifice floors at the current trapping locations and discontinue trapping efforts at Wells Dam.
- Consider using monitoring tools that are less intrusive and that do not require the collection of fish from the ladders at Wells Dam and minimize the surgical implantation of tags in fish that are nearing their physiological and energetic limits.

In response to these recommendations, Douglas PUD, in consultation with the Aquatic SWG, prepared and implemented a study in the fall of 2009 to evaluate methods for improving passage of adult Pacific lamprey at Wells Dam. These measures were designed to assess the effects of temporary velocity reductions at fishway entrances on the attraction and relative entrance success of adult lamprey at Wells Dam.

In 2009, Dual-frequency Identification Sonar (DIDSON) was used to passively assess adult Pacific lamprey passage behavior in response to operational modifications to enhance lamprey passage at the Wells Dam fishway entrances. Three alternative entrance flow velocities (i.e., existing high, moderate, and low) were assessed using DIDSON in a randomized block design during the fall of 2009. Five behavioral sequences of adult lampreys approaching the fishway entrances were observed. Three of the five fish detected were able to complete entry. Two of the three successful entrances occurred under reduced velocity levels and were completed in a fraction of time compared to the successful entrance under the existing high velocity condition. Observations where fish attached to the sill occurred during both a high and low treatment period, though efforts to maintain position at the sill appeared more difficult under the high velocity condition.

The diminutive lamprey run over Bonneville Dam in 2009 resulted in few fish observed at Wells Dam, precluding statistical evaluation of the fishway entrance velocity reductions. Fishway operational modifications investigated in 2009 suggest that reduced nighttime operations have promise as an operational measure to facilitate passage of adult lampreys at Wells Dam. Pooling observations that occurred during reduced treatments shows a 34 to 50 percent increase in entrance efficiency compared to observations under current operations. Douglas PUD plans on continuing to investigate the benefits of velocity reductions on adult lamprey entrance efficiency at Wells Dam.

In addition to adult passage studies, Douglas PUD conducted an assessment of lamprey spawning. The goal of the 2008 lamprey spawning study was to assess the level of spawning activity by adult Pacific lamprey in the Wells Project and determine whether the operations of the Wells Project were affecting this activity (Le and Kreiter 2008). Specific objectives of the study included: (1) identifying areas within the Wells Project where suitable spawning habitat may exist for adult Pacific lamprey; (2) surveying these areas of spawning habitat for use by lamprey to confirm suitability; and (3) if spawning was observed, assess whether the operations of Wells Dam were having adverse effects on these spawning areas (i.e., dewatering, flow alterations, scour, etc.).

Wells Project bathymetry and high-resolution orthophotography were spatially analyzed using a Geographic Information System (GIS). Review of the available data indicated little suitable spawning habitat within the Wells Project Boundary based upon existing literature (Mattson 1949; Close et al. 1995; Jackson et al. 1997; Kan 1975; Pletcher 1963). Four reaches were concluded to have potential suitable spawning habitat for Pacific lamprey; two in the Columbia River, one in the Methow River, and one in the Okanogan River.

A total of 14 field visits were conducted between April 25 and August 5, 2008. Surveys were conducted over a wide range of water temperatures (8.5 to 21.5°C) and flows (0.001 to 19.5 kcfs). During the study, no Pacific lamprey or signs of Pacific lamprey spawning (fish, nest construction activity, test digs, or nests) were observed. Field reconnaissance confirmed that potential spawning areas identified with GIS were of marginal quality. The evidence indicates that the Wells Project is not an important spawning area for Pacific lamprey.

In addition to studies of adult lamprey, Douglas PUD has undertaken juvenile lamprey studies. In 2008, a juvenile Pacific lamprey survival and predation study was conducted at the Wells Project (Douglas PUD and LGL 2008). The goal of the study was to collect current information on the survival and predation of juvenile Pacific lamprey macrophthalmia migrating through Columbia River hydroelectric projects and to collect site and species-specific information on juvenile lamprey predation in the waters immediately upstream and downstream of Wells Dam.

The literature review confirmed that information on the juvenile Pacific lamprey outmigration in the Columbia River is scarce and the lack of conclusive data is largely due to the absence of technology to meet research needs. No studies currently document the level of survival attributed to a project's operations, nor does an accepted technology currently exist that would achieve this level of assessment for juvenile lamprey. The literature indicates that a lack of monitoring, trapping, and tagging technology required to produce reliable survival estimates will continue to limit the ability to measure the impact of hydroelectric operations on lamprey populations in the Columbia River.

The field study collected over 1,000 piscivorous fishes in the forebay and tailrace of Wells Dam for stomach analysis during spring and early summer of 2008. Eleven birds provided by the U.S. Department of Agriculture (USDA) were also examined. Seven lampreys were collected from five predators, including three northern pikeminnow of 1,022 sampled (<1 percent); one double-crested cormorant (*Phalacrocorax auritus*) of five sampled; and one ring-billed gull (*Larus delawarensis*) of three sampled. No lamprey were collected from smallmouth bass, walleye (*Stizostedion vitreum*), Caspian tern (*Hydroprogne caspia*), or California gull (*Larus californicus*).

These results suggest that predation of juvenile lamprey by northern pikeminnow in the Project is likely not substantial and that a difference in predation rates of juvenile lamprey between the Wells Forebay and Wells Tailrace was not detectable. Predation of juvenile lamprey by walleye and smallmouth bass in the study area is likely not substantial given the relatively small numbers of bass and walleye present during the peak of the macrophthalmia outmigration and the absence of juvenile lamprey within the stomachs of the fishes sampled. Avian predation of juvenile lamprey in the study area may be somewhat larger than that observed for predatory fishes; however, the sample size for avian predators was too small to be conclusive.

In 2006, Douglas PUD conducted a review of existing information to address the effects of water level fluctuations on natural resources within the Wells Project (DTA 2006*a*). The objective of the study was to describe the effects of Wells Project operations on aquatic resources, including Pacific lamprey. The review found that typical operations within the Wells Project lead to daily reservoir fluctuations of 1 to 2 feet, which has no affect on Pacific lamprey. Infrequent reservoir operations, resulting in fluctuations greater than 4 feet, can occur due to unscheduled discharges from upstream federal projects or extreme runoff events from the Methow or Okanogan rivers. These infrequent operations occurred only 1.1 percent of the time between 1990 and 2005 (DTA 2006*a*).

Environmental Effects

Issue scoping for the Wells Project relicensing identified four specific areas of potential Project effects on Pacific lamprey. These are: (1) adult passage; (2) juvenile passage and survival; (3) reservoir fluctuations; and (4) spawning habitat.

Based on scoping, four lamprey studies were conducted including a spawning assessment (Le and Kreiter 2008), a juvenile lamprey predation study (Douglas PUD and LGL 2008), and three consecutive adult passage and behavior studies (LGL and Douglas PUD 2008*b*; Robichaud et al. 2009; Johnson et al. 2010).

The radio-telemetry studies provided substantial insight to adult lamprey passage at Wells Dam. Passage success through unobstructed (i.e., no trapping) portions of the ladder were shown to be 100 percent, fall back after exiting the ladders was not observed in three years of study (0 percent), and total fishway passage times (as little as four hours) are on the order of hours rather than days as observed at other downstream dams (Nass et al. 2005; Robichaud et al. 2009). These relatively high rates of in-ladder passage efficiency are likely due to the lack of sills in submerged orifices and a lack of diffuser gratings on the pool floors, offering a smooth wall-to-wall environment known to assist lamprey passage. Only two of the 73 pools within each fishway have a floor-oriented auxiliary water supply, both of which do not interfere with the orifice and only cover a portion of the pool floor. This allows for adequate attachment and resting surfaces as lampreys travel through the fishways utilizing burst-and-attach movements.

Despite effective in-ladder passage at Wells Dam, radio-telemetry data collected in 2007 and 2008 indicate that adult lamprey are having difficulty negotiating water velocities produced by head differentials at fishway entrances. Head differentials at Wells Dam—at 25 to 36 percent greater than median values recorded at neighboring Rocky Reach and Rock Island dams—were increased above the original 1.0-foot requirement to serve as enhanced attraction flow for adult salmon. The resulting velocities and entrance environment has been cited as the "greatest impediment to successful passage of adult lamprey at Wells Dam" (Robichaud et al. 2009). An equally significant impediment to successful passage of adult lamprey at Wells Dam in 2008 was the installation of perforated plates on the floor of the weir orifices in an effort to increase trapping efficiency for the 2008 study.

Passage efficiency from this study was comparable or superior to results from other radio-telemetry studies conducted in the Columbia River during 2008. Entrance efficiencies of radio-tagged lamprey at Bonneville Dam ranged from 6 percent to 32 percent, compared to 33 percent at Wells Dam. Fallback at Bonneville Dam was 19 percent compared to no documented fall-back events at Wells Dam. Median project passage times at Bonneville Dam exceeded 180 hours compared to Wells Dam where lower fishway passage time was 6.1 hours, upper fishway passage time was 5.9 hours, and time spent in or at the trap was 20 hours (32 hours total). Robichaud et al. 2009 recommended the following measures to improve entrance efficiencies:

- Implement a reduction in fishway head differential to reduce entrance velocities to levels within the swimming capabilities of Pacific lamprey (0.8 to 2.1 m/s). These proposed flow reductions should be restricted to hours of peak lamprey activity (i.e., nighttime) and within their primary migratory period at Wells Dam (August to September).
- Remove perforated plates from orifice floors at the current trapping locations and discontinue trapping efforts at Wells Dam.

- Consider using monitoring tools that are less intrusive and that do not require the collection of fish from the ladders at Wells Dam and minimize the surgical implantation of tags in fish that are nearing their physiological and energetic limits.

Fishway operational modifications studied during the 2009 DIDSON investigation suggest that reduced nighttime operations have potential to facilitate efficient passage of adult lampreys at Wells Dam. Pooling observations that occurred during reduced treatments shows a 34 to 50 percent increase in entrance efficiency compared to observations under current operations.

Results of the juvenile predation field study conducted in 2008 indicated that predation of juvenile lamprey by predatory fish (northern pikeminnow, smallmouth bass, walleye) in the study area is not substantial and that a difference in predation rates of juvenile lamprey between the Wells Forebay and Tailrace was not detectable. Avian predation of juvenile lamprey in the study area may exceed that observed for predatory fish, though these observations are not conclusive due to the limited sample size of avian predators (Douglas PUD and LGL 2008). Further, this study determined that there is currently a lack of monitoring, trapping, and tagging technology necessary to produce reliable juvenile lamprey survival estimates. The literature indicates that these limitations will continue to limit the ability to measure the impact of hydroelectric operations on lamprey populations in the Columbia River.

Douglas PUD conducted a review of the effects of reservoir fluctuations on Pacific lamprey. Ammocoetes are the only Pacific lamprey life stage that use littoral habitat. The nature of infrequent reservoir operations at the Wells Project likely limits the potential for stranding and associated impacts to the Pacific lamprey population (DTA 2006*a*). The Project is operated within 4 feet of the normal maximum pool elevation 98% of the time. Therefore, Project effects on Pacific lamprey due to reservoir fluctuations are expected to be negligible, although a small portion of less mobile ammocoete larvae may occasionally have a risk of stranding and entrapment (DTA 2006a).

The 2008 lamprey spawning assessment found no Pacific lamprey or signs of Pacific lamprey spawning (fish, nest construction activity, test digs, or nests) within the Project. The evidence indicates that the Project is not an important spawning area for Pacific lamprey; therefore, the Project does not adversely affect lamprey spawning.

Proposed Environmental Measures

Douglas PUD executed an ASA with federal, state and tribal entities to address all of the aquatic resource issues related to the relicensing of the Wells Project, including impacts on Pacific lamprey.

The Wells Project may adversely affect Pacific lamprey. The planned implementation of the PLMP (Exhibit E; Appendix E-2), during the term of the new license, is expected to fully address any measureable adverse effects.

The PLMP was developed by Douglas PUD and the federal, state and tribal entities who are parties to the ASA. The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Project during the term of the new license. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several Pacific lamprey PM&Es in support of the PLMP. The PM&Es presented within the PLMP are designed to meet the following objectives:

Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific lamprey.

Objective 2: Identify and address any Project-related impacts on downstream passage and survival and rearing of juvenile Pacific lamprey.

Objective 3: Participate in the development of regional Pacific lamprey conservation activities.

The PLMP is intended to be compatible with other Pacific lamprey management plans in the Columbia River mainstem. Furthermore, the PLMP is intended to be supportive of the Wells HCP, the critical research needs identified by the Columbia River Basin Technical Working Group, RFMP, BTMP, and WSMP by continuing to monitor and address on-going impacts, if any, on Pacific lamprey resulting from Project operations. The PLMP is intended to be compatible with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under Washington state water quality standards found at WAC 173-201A.

Cumulative Effects

Following a 560 percent increase in adult Pacific lamprey passing Bonneville Dam between the resumption of lamprey enumeration in 1997 and the migration of 2003 (counts at Bonneville were halted between 1970 and 1996), the number of adults returning to the mid-Columbia River has decreased. Potential causes may be degraded habitats, poor ocean conditions, poor passage at hydropower dams, or food availability (Close et al. 2002; DART 2008.

Adult lamprey use the fish ladder at the Wells Project for upstream passage to spawning grounds. Studies conducted as part of relicensing indicate that in-ladder passage efficiency at the Wells Project is among the best in the Columbia River (Robichaud et al. 2009). However, adult radio-tagged lamprey have difficulty negotiating the water velocities produced by head differentials at fishway entrances, which are maintained for salmon and steelhead passage. Juveniles migrate downstream to the ocean and pass through the juvenile bypass system, through the turbines, or in spill. Specific mortality rates for lamprey from Columbia River projects are not yet known. It is likely that there is a loss of juveniles at hydro dams at turbine intakes. Cumulative mortality in passing through many turbine intakes may affect species abundance.

Measures contained in the PLMP would provide for improved upstream passage for Pacific lamprey at the Wells Project. The PLMP will also provide for ongoing monitoring and evaluation, and includes the flexibility to adjust the program over the term of the new license as new information is gathered. Implementation of Douglas PUD's PLMP will reduce cumulative effects on Pacific lamprey, as well as continued implementation of the Wells HCP measures related to juvenile salmonids bypass, habitat improvements, and fish ladder operations.

Unavoidable Adverse Effects

Some individual Pacific lamprey may continue to experience migratory delays, injury or mortality associated with the operation of the Project. Implementation of the PLMP is intended to determine if there are adverse effects on Pacific lamprey, and to reduce those effects. Currently, no validated technology exists to determine Project effects on Pacific lamprey.

3.3.2.8 Resident Fish

The resident fish assemblage present in the Wells Reservoir is composed of a diverse community of native and introduced, warm and coldwater, and recreational and non-recreational fish species. Since the construction of Wells Dam, several assessments have either directly (McGee 1979; Beak 1999) or indirectly (Dell et al. 1975; Burley and Poe 1994) studied the resident fish assemblage in the Wells Reservoir.

Affected Environment

Several assessments have been conducted over the last 35 years documenting the species composition within the Wells Project. Dell et al. (1975) observed that the most abundant resident fish species in the Wells Reservoir were northern pikeminnow, threespine stickleback (*Gasterosteus aculeatus*), and suckers (*Catostomus* spp.). They also determined that mountain whitefish and pumpkinseed (*Lepomis gibbosus*) were the most abundant resident game fish, although these two species accounted for less than two percent of the total 32,289 fish sampled. Overall, 27 species of resident and migratory fish were identified in the study area (Table 3.3.2.8-1).

McGee (1979) noted that chiselmouth (*Acrocheilus alutaceus*), red-sided shiners (*Richardsonius balteatus*), and largescale suckers (*Catostomus macrocheilus*) were the most abundant non-game fish captured during Wells Reservoir surveys while pumpkinseed were the most abundant recreational fish caught. Similar sampling design and methodology were employed in order to ensure that results of the study were comparable with past observations. In total, 2,480 fish were collected during the study using live traps, beach seines, and angling. Twenty of the 27 known species previously trapped in other mid-Columbia reservoirs were present in the Wells Reservoir (Dell et al. 1975).

In 1994, a one-year study was conducted to determine the relative predation by northern pikeminnow on outmigrating juvenile salmonids and to develop relative predation indices for each of the five mid-Columbia River reservoirs. During the study, incidental catch (species captured other than northern pikeminnow) was high with over 25 fish species recorded and catch dominated by catostomid (suckers) species (Burley and Poe 1994).

In 1998, Douglas PUD conducted an updated Wells Reservoir resident fish assessment (Beak 1999). An effort was made to implement a sampling design similar to the two previous studies so as to be consistent and allow comparisons with past results. In total, 22 species of fish were identified with 5,657 fish captured using beach seines and 716 fish observed via diving transects. Beak (1999) reported suckers as the most abundant resident fish captured in beach seine sampling in the Wells study area. These species represented 41 percent of the beach seining catch and 46 percent of the underwater dive survey count. Other abundant species in the beach seine catch were bluegill (*Lepomis macrochirus*) (32 percent), northern pikeminnow (10 percent), peamouth (*Mylocheilus caurinus*) (6 percent), and carp (5 percent). Fifteen other species represented the remaining 7 percent of the total catch of 3,783 fish.

Table 3.3.2.8-1 Native and non-native resident fish species that have been documented in the Wells Reservoir from past resident fish assessments, monitoring efforts, and miscellaneous studies.

Common Name	Scientific Name
Native Species	
White sturgeon*	*Acipenser transmontanus*
Chiselmouth	*Acrochelius alutaceus*
Longnose sucker	*Catostomus catostomus*
Bridgelip sucker	*Catostomus columbianus*
Largescale sucker	*Catostomus macrocheilus*
Lake whitefish	*Coregonus clupeaformis*
Prickly sculpin	*Cottus asper*
Threespine stickleback	*Gasterosteus aculeatus*
Burbot	*Lota lota*
Peamouth	*Mylocheilus caurinus*
Rainbow trout	*Oncorhynchus mykiss*
Mountain whitefish	*Prosopium williamsoni*
Northern pikeminnow	*Ptychocheilus oregonensis*
Redsided shiner	*Richardsonius balteatus*
Dace	*Rhinichthys spp.*
Bull Trout*	*Salvelinus confluentus*
Non-Native Species	
Carp	*Cyprinus carpio*
Black bullhead	*Ictalurus melas*
Brown bullhead	*Ictalurus nebulosus*
Pumpkinseed	*Lepomis gibbosus*
Bluegill	*Lepomis macrochirus*
Smallmouth bass	*Micropterus dolomieui*
Largemouth bass	*Micropterus salmoides*
Yellow Perch	*Perca flavescens*
Black crappie	*Pomoxis nigromaculatus*
Walleye	*Stizostedion vitreum*
Tench	*Tinca tinca*

*Fishes of notable management importance addressed in separate sections from resident fish.
Sources: Dell et al. 1975; McGee 1979; Burley and Poe 1994; Beak 1999; NMFS 2002*a*; BioAnalysts, Inc. 2004.

Objectives of past resident fish studies (McGee 1979; Zook 1983; Beak 1999) did not specifically address spawning habitat but rather focused on species diversity, relative abundance, and spatial distribution. Therefore, little information exists about the location and availability of spawning habitat for resident fish species in Wells Project waters. It is likely that some resident fish species (cyprinids, catostomids, cottids) that spend their entire lives in Wells Project waters utilize areas of the Wells Reservoir, tailrace, and lower tributaries (Methow and Okanogan rivers) to reproduce while other resident species, although present in the Wells Reservoir, utilize areas outside of the Wells Project Boundary. Zook (1983), in his review of resident fish in the Wells Reservoir, hypothesized that some resident species such as mountain whitefish, rainbow trout, and walleye, although present, may not be reproducing. Zook's review (1983) suggests that resident rainbow trout are primarily a product of residualism of hatchery-produced steelhead and that mountain whitefish appear to use the Wells Reservoir principally as a migration route between spawning areas in the Methow River and the Wells Tailrace. The report also suggests that walleye populations in the Wells Reservoir are recruited from the Lake Roosevelt population that was introduced in the late 1950s. The report also states that although spawning habitat appears to be available, evidence of successful walleye reproduction has not been observed (Zook 1983).

Past resident fish surveys (McGee 1979; Beak 1999) observed significant spatial trends in species distribution within the Wells Reservoir. Both McGee (1979) and Beak (1999) noted that in general, spiny ray species (centrarchids) were most abundant between RM 530 and 540 and in the lower Okanogan River. This unique area of the Wells Reservoir is shallow and broad with slower water velocities, finer substrate, relatively warmer water temperatures, and higher turbidity (Beak 1999) and is conducive to rearing spiny ray fish species while excluding more streamlined fish that prefer fast-flowing water. Both surveys also found that the more streamlined resident fish species, such as chiselmouth and red-sided shiner (cyprinids), were most abundant downstream of RM 530 where water velocities increased, turbidity decreased, and the amount of shallow littoral habitat decreased.

Environmental Effects

Chiselmouth, red-sided shiners, and largescale suckers are the most abundant non-game fish in the Wells Reservoir while pumpkinseed is the most abundant game fish. Twenty of the 27 known species previously trapped in other mid-Columbia reservoirs (Dell et al. 1975) were captured in the Wells Reservoir during the study.

There have been three resident fish assessments conducted at the Wells Project. Table 3.3.2.8-2 ranks the relative abundance of dominant native fish species in the Wells Reservoir over time. These studies have demonstrated that over time the native resident fish populations have been relatively stable.

Table 3.3.2.8-2 Ranking of relative abundance of dominant native fish species in the Wells Reservoir resident fish assessments.

Species	1974	1979	1998
Largescale sucker	1	4	1
Redside shiner	3	3	3
Northern pikeminnow	2	5	4
Chiselmouth	4	1	10

Source: Beak 1999.

The Wells HCP includes the requirement that Douglas PUD implement northern pikeminnow and piscivorous bird harassment and control programs to reduce the level of predation on anadromous salmonids in the mid-Columbia Basin. The northern pikeminnow removal program includes a northern pikeminnow bounty program, participation in fishing derbies and tournaments, and the use of long-line fishing equipment. These efforts are designed to provide an immediate and substantial reduction in the predator populations present within the waters of the Wells Project.

Since efforts were first initiated in 1995, Douglas PUD's northern pikeminnow removal program has captured over 112,000 northern pikeminnow. The continual harvest of northern pikeminnow from these waters will provide additional decreases in predator abundance.

Proposed Environmental Measures

There are no federally- or state-listed RTE resident fish species in the Wells Reservoir. Species abundance and composition has been relatively constant over time. To continue to monitor and manage residence fish, Douglas PUD has developed a RFMP as part of the Aquatic Settlement Agreement. In conjunction with the Wells HCP, the ASA was developed in collaboration with federal, state, and tribal entities to address all of the aquatic resource issues related to the relicensing of the Wells Project, including impacts on resident fish.

The Wells Project may have an adverse effect on resident fish. The planned implementation of the RFMP, during the term of the new license, is expected to fully address any measureable adverse effects.

The RFMP (Exhibit E; Appendix E-2) was developed by Douglas PUD and the federal, state and tribal Aquatic Settlement parties as part of the ASA. The goal of the RFMP is to protect and enhance native resident fish populations and habitat in the Project during the term of the new license. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several resident fish PM&Es in support of the RFMP. The PM&Es presented within the RFMP are designed to meet the following objectives:

Objective 1: Continue to provide additional benefits to resident fishery resources in the Project as a result of continued implementation of the Wells HCP, Predator Control Programs, and Land Use Policy activities.

Objective 2: In year 2 and every 10 years thereafter during the new license term, Douglas PUD will conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Project. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the white sturgeon, bull trout, Pacific lamprey, and aquatic nuisance species management plans and (2) collecting information on resident predator fish populations found within the Wells Reservoir. The results of this study may be used to inform the implementation activities of the other Wells aquatic resource management plans (aquatic nuisance species, bull trout, Pacific lamprey, and white sturgeon) plans, and Wells HCP predator control activities.

Objective 3: If any statistically-significant adverse changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through implementation of other aquatic resource management plans or activities (white sturgeon, Pacific lamprey, bull trout, aquatic nuisance species, Wells HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas PUD.

Objective 4: In response to proposed major changes in Wells Dam operations requiring FERC approval, Douglas PUD will assess the potential effects, if any, on Project habitat functionally related to spawning, rearing, and migration of native resident fish, in order to make informed management decisions towards the success of the RFMP. Douglas PUD will implement reasonable and appropriate measures to address any effects on social, economic, and culturally important native species.

This RFMP is intended to be compatible with other resident fish management plans in the Columbia River mainstem. Furthermore, the RFMP is intended to be supportive of the Wells HCP, BTMP, PLMP, and WSMP by continuing to monitor changes in the resident fish assemblage within the Project. The RFMP is intended to be compatible with other management strategies of federal, state, and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington State WQS.

Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on resident fish.

3.3.2.9 Aquatic Nuisance Species

Non-native aquatic species may be released or "introduced" into an aquatic environment intentionally or unintentionally. Most frequently, such non-native species are unable to adapt to their new environments and do not establish self-sustaining populations (Aquatic Nuisance Species Committee [ANSC] 2001). However, if an introduced species is able to persist, become established, and thrive in an aquatic environment, it has the potential to threaten the diversity or abundance of native species and habitats, and may even affect economic resources and human health. Such deleterious introduced species are considered ANS (ANSC 2001).

Affected Environment

Regulatory Status

RCW 77.60.130 defines an ANS as a "nonnative aquatic plant or animal species that threatens the diversity or abundance of native species, the ecological stability of infested waters, or commercial, agricultural, or recreational activities dependent on such waters". Since few natural controls exist in their new habitat, ANS may spread rapidly, damaging recreational opportunities, lowering property values, clogging waterways, impacting irrigation and power generation, destroying native plant and animal habitat, and sometimes destroying or endangering native species (ANSC 2001). ANS populations that are currently present in the Wells Project include Eurasian watermilfoil, carp, and tench. Two species of ANS of particular concern, but not currently found at the Wells Project, are zebra and quagga mussels.

Eurasian watermilfoil is classified as a class B noxious weed by the Washington State Noxious Weed Control Board (WNWCB 2007). Class B noxious weeds are nonnative plants whose distribution is limited within Washington State. Additionally, Eurasian watermilfoil has been identified as a nuisance species in the Washington State Aquatic Nuisance Species Management Plan (ANSC 2001). Eurasian watermilfoil can adversely impact aquatic ecosystems by forming dense canopies that often shade out native vegetation. Monospecific stands of Eurasian watermilfoil affect aquatic habitat and water quality, can impact power generation and irrigation, and interfere with recreational activities.

Zebra and quagga mussels are designated as deleterious exotic wildlife by WDFW (WAC 232-12-01701). These species are not known to occur within the state, and importation is prohibited. A volunteer monitoring program is in place along the Columbia and Snake rivers and in several lakes throughout Washington and Oregon (ANSC 2001). Of the non-native species listed above, carp and tench are considered "regulated" nuisance species or potentially-invasive species of the animal kingdom that have been classified as a regulated aquatic animal species by the ANS commission (RCW 77.08.010).

Life History

Eurasian watermilfoil is an aquatic plant native to Europe, Asia, northern Africa, and Greenland. The first documented occurrence of Eurasian watermilfoil in Washington State was in 1965. The source of introduction was most likely from sources in Canada and despite an effort to stop its spread, Eurasian watermilfoil infestations in Lake Osoyoos, British Columbia, spread down through the Okanogan Lakes and into the Okanogan River and the Columbia River in 1974 (Duke 2001).

Eurasian watermilfoil is extremely adaptable and has the ability to thrive in a variety of environmental conditions. In the spring, shoots begin to grow rapidly as water temperatures approach 15°C. When they near the surface, shoots branch profusely, forming a dense canopy (Ecology 2007). Typically, plants flower upon reaching the surface and die back to the root crowns, which sprout again in the spring. Although Eurasian watermilfoil can potentially spread by both sexual and vegetative means, vegetative spread is considered the primary mode of dispersal. During the growing season, the plant undergoes autofragmentation. The plant fragments often develop roots at the nodes before separation from the parent plants. Fragments are also produced by wind and wave action, control harvest activity and boating activities, with each plant fragment having the potential to develop into a new plant (Ecology 2007).

Zebra and quagga mussels are freshwater, bivalve mollusks that are native to Eurasia. Both were introduced into the Great Lakes as a result of ballast water discharge from transoceanic ships that were carrying veligers, juveniles, or adult mussels (USGS 2007). Zebra mussels first invaded North America in the mid-1980s and quagga mussels invaded a few years later in 1989 (USFWS, 2007*a*). These two species are closely related with subtle morphological differences. The North American distribution of these species has been concentrated in the Great Lakes region of the U.S. with the zebra mussel distribution also spanning farther into the southern U.S.

Zebra and quagga mussel size varies from microscopic to 2 inches long. Typical lifespan is up to five years. Both species are prolific reproducers. Fecundity is high with a few individuals having the capability of producing millions of eggs and sperm (USFWS 2007*a*). Both species can tolerate a wide range of water temperatures (1 to 30°C), low velocities (<2 m/sec), and prefer hard surfaces for attachment although quagga mussels can live in soft sediments (USFWS 2007*a*). Zebra mussels are typically found just below the surface to about 12 meters and quagga mussels are typically found at any depth where oxygen is available (USFWS 2007*a*).

Zebra mussels have caused major ecological and economic problems since their arrival in North America, and quagga mussels pose many of the same threats. Both species are prolific filter feeders, removing substantial amounts of phytoplankton and suspended particulates from the host water body thus impacting aquatic ecosystems by altering food webs (USGS 2007). The ability of zebra mussels and quagga mussels to rapidly colonize hard surfaces causes serious economic problems. These major bio-fouling organisms can clog water intake structures such as pipes and screens, therefore reducing capabilities for power generation and water treatment. Recreation-based industries and activities have also been heavily impacted; docks, breakwalls, buoys, boats, and beaches have all been heavily colonized (USGS 2007).

The resident fish assemblage in the Wells Project consists of native and non-native, warm, cool, and cold water species. Although significant numbers of non-native fish are present within the Wells Project, native resident fish were still dominant within samples collected during the most recent resident study (Beak and Rensel 1999). Non-native resident species that have been documented in the Wells Project include carp, black bullhead, brown bullhead, pumpkinseed, bluegill, smallmouth bass, largemouth bass, yellow perch, black crappie, walleye, and tench.

Aquatic Nuisance Species Study Results

Past aquatic studies contributing information regarding aquatic nuisance species of concern have consisted of an aquatic macrophyte species composition and mapping survey (Lê and Kreiter 2005), a resident fish assessment (Beak and Rensel 1999), and a macroinvertebrate assessment and RTE species survey (BioAnalysts, Inc. 2006). Results of these studies and other Project aquatic studies indicate that the aquatic ecosystem within the Project is composed of a diverse community of flora and fauna consisting of varied aquatic taxa such as plankton, macroinvertebrates (insects, snails and bivalves), fish, and plants. Although nonnative species are present within Wells Project waters, the aquatic community is characterized by a native species dominated assemblage.

Douglas PUD conducted an aquatic macrophyte study in the Wells Project in 2005. Study results indicate that although Eurasian watermilfoil is present in the Wells Project, it is not a dominant component of the Project aquatic plant community. During the study, EWM was often sub-dominant to several native species in samples collected. Eurasian watermilfoil was dominant in only 6.3 percent of the samples collected during the study (Table 3.3.2.2-1). The two most abundant species in samples collected were common waterweed and leafy pondweed at 24.7 and 16.7 percent, respectively (Table 3.3.2.2-1).

Both of these are native species. On average, native aquatic plants were the dominant species in over 89 percent of the macrophytes beds sampled within the Wells Project.

Douglas PUD conducted an aquatic invertebrate inventory and an assessment of the presence of RTE aquatic invertebrates within the Wells Reservoir. Similar to aquatic plant resources, the results of the aquatic macroinvertebrate assessment indicate a native species-dominated assemblage in the Wells Project. Of the 17 species of freshwater mollusks recorded, a nonnative snail (*Radix auricularia*) and a nonnative clam (*Corbicula fluminea*) were identified. Of the two non-native species identified during the inventory, the Asian clam (*C. fluminea*) has been identified by WDFW as a freshwater invasive species. However, due to their widespread occurrence in Washington State and the unlikely success of permanent eradication, no active management recommendations by WDFW are available for this species. The 2005 macroinvertebrate assessment did not discover the presence of any zebra or quagga mussels within the Wells Project, nor have these species yet been detected in waters of Washington State (WDFW 2009*a*).

In 2006, Douglas PUD, in coordination with the Aquatic Nuisance Species Division of the WDFW, began monitoring for zebra and quagga mussels during the summer and early fall when recreational boating activity is at a peak. In 2007, Douglas PUD, in coordination with the Center for Lakes and Reservoirs at Portland State University, installed a permanent substrate sampler in the Wells Dam Forebay to monitor for zebra and quagga mussel colonization. Both of these monitoring activities are ongoing, and sampling and monitoring activities have not detected the presence of zebra or quagga mussels at the Wells Project.

It is important to note the varying degree to which a nonnative species can be characterized as a "nuisance" species. RCW 77.60.130 defines the term ANS as a "nonnative aquatic plant or animal species that threatens the diversity or abundance of native species, the ecological stability of infested waters, or commercial, agricultural, or recreational activities dependent on such waters". Past resident fish surveys (McGee 1979; Beak and Rensel 1999) indicate that over the past 30 years a relatively-stable resident fish species assemblage has persisted in the Wells Project. Furthermore, no information exists to suggest that carp, tench, or any of the other non-native fish species present in the Wells Project have had a significant impact on the overall aquatic species assemblage or commercial, agricultural, and recreational activities in the area.

Environmental Effects

Past aquatic plant (Lê and Kreiter 2005), macroinvertebrate (BioAnalysts, Inc. 2006), and resident fish (McGee 1979; Beak and Rensel 1999) assessments have identified the presence of nonnative species as well as several nuisance species in the Wells Project. However, data also indicate that these species are either a sub-dominant component of the species assemblage or that these species persist at a level of abundance that suggests they are not negatively impacting native species or commercial, agricultural, or recreational activities in the area. Zebra and quagga mussels have not been documented within the Wells Project. Small populations of carp and tench in the Wells Reservoir have not had a deleterious effect on the resident fish population.

Proposed Environmental Measures

Douglas PUD has executed an ASA with federal, state, and tribal entities to address all of the aquatic resource issues related to the relicensing of the Wells Project, including the active management of aquatic nuisance species. The planned implementation of the ANSMP, during the term of the new license, is expected to fully address any measureable adverse effects related to the introduction or spread of ANS.

The ANSMP was developed by Douglas PUD and the federal, state and tribal parties to the ASA. The goal of the ANSMP is to prevent the introduction and/or spread of aquatic nuisance species in Project waters. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several PM&Es in support of the ANSMP. The PM&Es presented within the ANSMP are designed to meet the following objectives:

Objective 1: Implement best management practices to prevent Eurasian watermilfoil proliferation during in-water (i.e., construction, maintenance, and recreation improvements) improvement activities in the Project.

Objective 2: Continue participation in regional and state efforts to prevent the introduction and spread of aquatic nuisance species. Activities include continued monitoring for the presence of ANS, monitoring bycatch data collected during other aquatic management plan activities, and conducting education outreach within the Project.

Objective 3: In response to proposed changes in the Project requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, with respect to the introduction or proliferation of aquatic nuisance species in the Project to inform management decisions to support success of the ANSMP and will implement reasonable and appropriate measures to address any potential effects.

This ANSMP is intended to be compatible with other aquatic nuisance species management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be supportive of the Wells HCP, BTMP, PLMP, RFMP, WSMP, and WQMP by continuing to prevent the introduction and/or spread of aquatic nuisance species in Project waters. The ANSMP is intended to be compatible with other management strategies of federal, state, and tribal natural resource management agencies.

Douglas PUD will continue participating in state and regional coordination efforts to prevent the introduction and spread of aquatic invasive species that may threaten the diversity or abundance of native species, aquatic habitat, and the ecological stability in the Wells Project.

Unavoidable Adverse Effects

The Wells Project does not create unavoidable adverse effects that result in the spread or maintenance of ANS.

3.3.3 Terrestrial Resources

3.3.3.1 Upland Habitats

Affected Environment

The Wells Project is located within the big sagebrush/bluebunch wheatgrass vegetation zone (Daubenmire 1970; EDAW, Inc. [EDAW] 2006*a*). This ecological zone is the most widespread shrub steppe zone in Washington State and occurs in southern Idaho, central Oregon, the northern Great Basin in Utah, and parts of Montana (Cassidy 1997). The Wells Project is located near the northern limit of the central semi-arid steppe zone of Washington State. Annual precipitation ranges from 8 to 12 inches (20 to 30 cm), primarily falling as snow during the winter and rain in the early spring (Cassidy 1997).

Vegetation Cover Types

In 2005, Douglas PUD conducted a RTE plant survey, an invasive plant survey, and cover type mapping for the Wells Project reservoir lands (EDAW 2006*a*). Cover types were mapped and field verified on 2,540 acres of land within the Wells Project (excluding the 9,740-acre open-water portion of the reservoir) as identified in Table 3.3.3.1-1. Much of the land in the immediate vicinity of the reservoir is, or at one time was, cultivated for a variety of crops including wheat, alfalfa, and orchards. Based on the 2005 cover type mapping effort, agricultural areas dominated by irrigated orchards occupy 26 percent of the Wells Project reservoir lands (Table 3.3.3.1-1). The next most common cover type, shrub steppe, comprises 20 percent of Wells Project reservoir lands. Shrub steppe is designated as a state priority habitat (WDFW 2008). Riparian cover types (riparian shrub and riparian deciduous tree) and wetland cover types, respectively, comprise 18 and 13 percent of Wells Project reservoir lands. Grass (5 percent) and open weedy areas (6 percent) are also present, particularly in upland areas where ground-disturbing activities have removed shrub cover or repeated disturbance favors annual grasses. Seven percent of the upland area surveyed showed evidence of development. Partially-forested conifer cover types, such as Douglas fir and ponderosa pine, are uncommon, representing less than 1 percent of Wells Project reservoir lands. The remaining areas mapped included upland rock habitats, littoral zone, and bare-disturbed-eroded which comprised, in total, less than 5 percent of the study area (EDAW 2006*a*).

Table 3.3.3.1-1 Acreage of cover types in the reservoir lands component of the Wells Project.

Community Type	Acres	Percent of Reservoir Lands
Conifer	5	0.2
Shrub steppe	502	19.8
Open - grass	136	5.4
Open - weed	163	6.4
Rocky - upland	12	0.5
Riparian - tree	142	5.6
Riparian - shrub	314	12.5
Emergent wetland	287	11.4
Emergent wetland - pond	46	0.5
Littoral zone	61	2.4
Bare-disturbed-eroded	49	1.9
Agriculture	648	25.5
Developed	175	6.9

Source: EDAW 2006*a*.

In 2008, a plant survey and cover type mapping study was conducted for the transmission line component of lands within the Wells Project Boundary (Parametrix, Inc. 2009*b*). The study mapped approximately 1,117 acres of land in the transmission line corridor. In 2008, following the spring cover type mapping effort, several areas of the transmission line corridor were affected by the Badger Mountain Fire. The results presented herein represent the community types mapped prior to the fire.

The most common cover type observed along the transmission line was active agriculture, covering 52 percent of the corridor (Table 3.3.3.1-2). The majority of this cover type (468 acres) consists of wheat fields within the middle of the transmission line corridor. Shrub steppe was the most common native vegetation cover type, mapped on 30 percent of the corridor (Table 3.3.3.1-2). The next most abundant cover types were inactive agriculture (6 percent), cleared conifer (5 percent), and grass (2 percent). The remaining cover types were comprised of conifer, grass, wetlands, riparian, talus, and other (e.g., developed, disturbed) community types that individually accounted for less than 1 percent of the transmission corridor (Parametrix, Inc. 2009*b*).

Cover types comprising at least 5 percent of the reservoir lands component and/or the transmission line corridor are described below.

Table 3.3.3.1-2 Acreage of cover types in the transmission line component of the Wells Project.

Community Type	Acres in Transmission Line Corridor	Percent of Surveyed Area
Agricultural Lands	583	52
Idle Agricultural Land	66	6
Grass	25	2
Conifer (closed and open canopy)	13	1
Cleared Conifer	51	5
Other[1]	23	2
Riparian	12	1
Shrub Steppe	340	30
Talus	3	<1
Emergent Wetland	1	<1
Forested Wetland	<1	<1
Total	**1,117**	**100**

[1] Includes highways, gravel roads, orchards, and other non-vegetated or atypical cover types.
Source: Parametrix, Inc. 2009*b*.

Active Agricultural Cover Type

Agricultural uses are mapped on 648 acres (25.5 percent) of the area surveyed within the reservoir lands component of the Wells Project. Orchards (105 acres) are most abundant between Pateros and Bridgeport, but also occur along the Okanogan River. An additional 281 acres (11.1 percent) of Wells Project reservoir lands were used to grow alfalfa at the time mapping was conducted. Pastures (72 acres) occur primarily along the Okanogan River. Farming activities also include fallow (53 acres), unidentified crops (56 acres), and idle fields (81 acres).

Over 50 percent of the transmission line corridor also consists of the active agriculture cover type. The majority of this cover type (468 acres) consists of wheat fields located in the middle of the transmission line corridor.

Shrub Steppe Cover Type

Shrub steppe occurs on 502 acres (19.8 percent) of the total lands surveyed within the reservoir component and 340 acres (30 percent) of the transmission line of the Wells Project. Big sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), and grey rabbitbrush (*Ericameria nauseosa*) are the most dominant shrub layer species. Snow buckwheat (*Eriogonum niveum*), Gray's biscuitroot (*Lomatium grayi*), bluebunch wheatgrass (*Pseudoroegneria spicata*), cheatgrass (*Bromus tectorum*), Sandberg bluegrass (*Poa secunda*), threadleaf fleabane (*Erigeron filifolius*), and fernleaf biscuitroot (*Lomatium dissectum*) are among the more common herb layer species. Shrub steppe vegetation with sandier substrates also may support field sagewort (*Artemisia campestris var. scouleriana*), needle and thread (*Stipa comata*), bastard toadflax (*Comandra umbellata*), wingnut cryptantha (*Cryptantha pterocarya*), and pale evening primrose (*Oenothera pallida*) in the herb layer. Sites that have not been disturbed generally support a thin cryptogamic crust, which is composed of mosses, lichens, algae, and cyanobacteria.

Shrub steppe is identified as a state-priority habitat (WDFW 2008). WDFW has developed management recommendations for priority habitats to assist landowners, managers, and others in conducting land use activities in a manner that incorporates the needs of fish and wildlife.

Developed Cover Type

There are 175 acres (6.9 percent) of developed land within the reservoir lands portion of the Project. Wells Dam and associated warehouses and equipment staging areas occupy 37 acres of land, and Wells Hatchery occupies 33 acres. The remaining development mapped on Wells Project land includes: rip-rap (38 acres); landscaped areas (15 acres); recreation sites (21 acres); highways, roads, and railroads (26 acres); irrigation pumphouse structures (0.7 acre); and industrial uses (4 acres). Developed land along the transmission line corridor is included in the community type defined as “Other” which covers 23 acres (2 percent) of the transmission line corridor.

Cleared Conifer Cover Type

This community type only occurs along the transmission line corridor, and includes both cleared conifer and cleared open-conifer sub-types. These habitats represent those uplands that are capable of supporting coniferous trees (typically ponderosa pine, *Pinus ponderosa*, and Douglas fir, *Pseudotsuga menziesii*), but are periodically cleared as part of transmission line vegetation management. Cleared conifer sub-type habitat covers 4 percent (41 acres) of the transmission line corridor. Ponderosa pine and Douglas fir are commonly present as shrubs or small trees. Other species identified in this cover type include Saskatoon serviceberry (*Amelanchier alnifolia*), big sagebrush, white sagebrush (*Artemisia ludoviciana*), common snowberry (*Symphoricarpos albus*), showy milkweed (*Asclepias speciosa*), tall annual willowherb (*Epilobium brachycarpum*), gray rabbitbrush, oceanspray (*Holodiscus discolor*), and bulbous bluegrass (*Poa bulbosa*).

The cleared open-conifer sub-type occurs on 1 percent of the transmission line corridor (10 acres). This community has low canopy cover and a species composition similar to the shrub steppe cover type. Young Douglas fir and ponderosa pine are present in this community, but the spacing of these conifer trees is such that the community would have an open canopy even at maturity.

Open Grass Cover Type

Open areas of grass were mapped on 136 acres (5.4 percent) of the total lands within the reservoir lands portion of the Wells Project. These habitats are typically dominated by annual grasses such as cheatgrass, hairy brome (*Bromus ramosus*), and annual fescue (*Vulpia myuro*). However, some lands mapped as open grass are dominated by native perennial grasses, including those sites that support little bluestem (*Schizachyrium scoparium*), a state-listed RTE species. In some areas with more moist growing conditions, this cover type may also include reed canarygrass (*Phalaris arundinacea*), tall fescue (*Festuca arundinacea*), smooth brome (*Bromus inermis var. inermis*), tall wheatgrass (*Thinopyrum ponticum*), streambank wheatgrass (*Agropyron dasystachyum*) and quackgrass (*Elymus repens*), but these species are more typically mapped as emergent wetlands.

Approximately 2 percent (25 acres) of the transmission line corridor consists of the open grass cover type. The dominant species in this cover type along the transmission line corridor include bluebunch wheatgrass, basin wildrye (*Leymus cinereus*), and cheatgrass. Many of the common grass species are similar to those found in the herbaceous layer of the shrub steppe cover type.

Open Weed Cover Types

The open weed cover type was mapped on 163 acres (6.4 percent) of Wells Project reservoir lands, almost exclusively in the fields adjacent to the Okanogan River and in disturbed shrub steppe communities on Cassimer Bar. The open weed cover type was not documented within the transmission line corridor, but was included under the community type defined as "Other". This cover type typically represents land potentially supporting shrub steppe or grassland communities, but that have been subject to disturbance. As a result, these cover types are frequently dominated by non-native species or noxious weeds, including diffuse knapweed (*Centaurea diffusa*), common mullein (*Verbascum thapsus*), perennial pepperweed (*Lepidium latifolium*), yellow salsify (*Tragopogon dubius*), common St. John's-wort (*Hypericum perforatum*), smooth brome, cheatgrass, Mexican fireweed (*Kochia scoparia*), orchard grass (*Dactylis glomerata*), tall fescue, field bindweed (*Convolvulus arvensis*), prickly lettuce (*Lactuca serriola*), and hairy whitetop (*Cardaria pubescens*).

Inactive/Idle Agriculture

This community type was only mapped during surveys of the transmission line corridor, but is similar in composition and structure to the open grass and open weed cover types mapped on Wells Project reservoir lands. The inactive agriculture cover type consists of formerly cultivated lands that are no longer cultivated, and includes lands enrolled in the Conservation Reserve Program. This cover type occurs on 66 acres (6 percent) of the transmission line corridor, generally occurring in the northern sections. Many of these areas are in a transitional state, and are vegetated with a mixture of native and non-native plants. Dominant plants include crested wheatgrass (*Agropyron cristatum*), gray rabbitbrush, tarragon (*Artemisia dracunculus*), and hoary tansyaster (*Machaeranthera canescens*). Since these areas have historically been disturbed, weedy species such as diffuse knapweed and Dalmatian toadflax (*Linaria dalmatica*) occur commonly as well.

Environmental Effects

Douglas PUD is not proposing any changes to the operation of the Wells Project, other than the implementation of proposed environmental measures. Current Project operations include maintenance activities such as transmission line vegetation clearing and road maintenance, each conducted in compliance with Douglas PUD's Land Use Policy (Douglas PUD 2009*b*). In addition, Douglas PUD's proposed environmental measures include a WBMP, an APP, and a RMP. The potential effects of each of these are discussed below.

Upland habitats will continue to be protected through implementation of Douglas PUD's Land Use Policy. During scoping of issues for development of relicensing studies, the Terrestrial RWG found that Douglas PUD's fee-title ownership of Wells Project lands has produced substantial benefits for wildlife and wildlife habitats, including uplands. These environmental benefits are secured through Douglas PUD's current implementation of its Land Use Policy.

The implementation of Douglas PUD's WBMP and RMP are expected to ensure continued benefits to upland and other habitats associated with the Wells Project. Collectively, these measures protect upland habitats through the use of BMPs, noxious weed control, revegetation of areas disturbed by Project maintenance, and standards for land use and development.

Several measures included in the RMP are expected to minimally affect upland communities through temporary disturbance during construction and the permanent loss of less than 3 acres of upland habitat. These consist of: (1) a Marina Park expansion including 10 additional RV spaces, in addition to new restroom facilities, lift stations, landscaping, and access roads; (2) construction of a formal tent camping facility in the vicinity of the Okanogan River, including restroom, picnic shelter and four overnight camping sites; and (3) improvements for an informal/rustic tent camping location on the west side of the Columbia River. These measures are expected to affect no more than three total acres of upland habitat, of the 2,664 acres of land within the reservoir lands component of the Project Boundary. Each will occur on lands that are either currently disturbed, or directly adjacent to currently disturbed lands, thus representing relatively poor habitat. As a result, these measures are not expected to represent a measureable impact to upland habitats.

The NERC requires that all vegetation growing within the transmission line corridor tall enough to cause an outage be removed. Douglas PUD maintains transmission corridor vegetation below heights that might cause an outage. Transmission line maintenance activities (e.g., repair or replacement of transmission line equipment, access road maintenance, and activities associated with invasive species control and vegetation clearing) may alter the upland cover types found in the transmission line corridor. In practice, vegetation management is only required on the approximately 64 acres (6 percent of the corridor) in forested vegetation types in the transmission line corridor; the remaining vegetation is low-growing shrub or herbaceous habitat. Because these habitats are currently maintained in a cleared condition, no incremental impacts are expected to occur.

Upland habitats that support state special-status wildlife species will not be detrimentally affected by the Project. Vegetation management conducted for transmission line maintenance targets low conifers, and will not affect shrub steppe habitats or any areas not currently cleared. These habitats will continue to be protected through Douglas PUD's fee-title ownership and implementation of Douglas PUD's Land Use Policy, WBMP, and APP.

Vegetation control and other Project maintenance activities can result in temporary vegetation removal and soil disturbance from vehicles, foot traffic, or heavy equipment. Other than transmission line vegetation control efforts and the implementation of Recreation Plan projects, these maintenance activities typically disturb less than 1 acre in a given year. Douglas PUD uses BMPs and soil erosion control measures during maintenance, followed by revegetation if bare-soil areas are created.

Soil disturbance and vegetation removal can also create an environment that facilitates the growth and spread of noxious weeds. Invasive weed control measures are part of Douglas PUD's noxious weed management activities. Douglas PUD complies with state (WNWCB 2005) and county weed control rules and regulations for weed control, controls Class A and Class B-designate weeds, and maintains required records. Douglas PUD's noxious weed control procedures are formalized in the WBMP, which will be implemented during the course of a new license.

Proposed Environmental Measures

Wildlife and Botanical Management Plan

Douglas PUD, in coordination with federal, state and tribal entities, developed the WBMP to address the upland habitat concerns related to the relicensing of the Wells Project. The implementation of the WBMP during the term of a new license is expected to minimize or eliminate detrimental effects of the Project on upland habitats.

The WBMP was developed by Douglas PUD and the federal, state and tribal entities who are parties to the Aquatic Settlement Agreement. The goal of the WBMP is to protect, maintain, and enhance wildlife and habitat on Project lands commensurate with ongoing effects of operating the Wells Project. The plan is also intended to guide wildlife management activities and to protect RTE wildlife and plant species on Project lands during the term of the new license for the Wells Project. A detailed list of specific actions and schedule for implementation are included in the WBMP.

The objectives of the WBMP are:

Objective 1: Protect and enhance RTE wildlife species' habitat on Wells Project lands.

Objective 2: Protect RTE botanical species from land-disturbing activities and herbicide sprays.

Objective 3: Conserve habitat for species on Wells Project lands protected by the federal Endangered Species Act , Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act.

Objective 4: Protect native habitat on Wells Project lands.

Objective 5: Maintain productive wildlife habitat on the Cassimer Bar Wildlife Management Area.

Objective 6: Control noxious weeds on Wells Project lands.

Objective 7: Consultation.

Additionally, implementation of the Douglas PUD Land Use Policy, Off-License Settlement Agreement and proposed future monitoring activities will also serve to protect, maintain, and enhance upland habitats at and near the Wells Project.

Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on upland habitat.

3.3.3.2 Riparian and Wetland Habitats

Affected Environment

Numerous riparian and wetland plant communities adjacent to Wells Reservoir have become established since Project construction in 1967 (EDAW 2006*a*) (Tables 3.3.3.1-1 and 3.3.3.1-2). Wetland habitats now occupy 333 acres (12 percent) of Project reservoir lands and just over 1 acre (<1 percent) of the transmission line corridor (EDAW 2006*a*; Parametrix, Inc. 2009*b*). Riparian cover types comprise 456 acres (18 percent) of reservoir lands and 12 acres (one percent) of the transmission line corridor (EDAW 2006*a*; Parametrix, Inc. 2009*b*). Riparian vegetation in the Wells Project is sustained by the existence of moist soils along the shoreline above the ordinary high-water mark and extends upland until the soil moisture is no longer sufficient to support mesic species. Wetland vegetation is sustained by wet or inundated soils below the ordinary high-water mark or water table on Project lands (EDAW 2006*a*). Depending on the depth of moisture, riparian vegetation may be considered a wetland or upland habitat. Dominant riparian and wetland cover types of the Project are discussed below.

Riparian Cover Types

Riparian vegetation is found primarily on the low-gradient shorelines of the reservoir near Cassimer Bar, the Bridgeport Bar unit of the WWA, and along the Okanogan River, and can be divided into two categories: (1) stands of riparian vegetation with large deciduous trees as the overstory; and (2) stand with riparian shrubs as the main component. Covering 456 acres (18 percent) of the survey area, riparian habitat (shrub and tree combined) is the third most common cover type in reservoir lands, but is relatively uncommon along the transmission line corridor.

Riparian habitat is identified as a state priority habitat (WDFW 2008). The WDFW has developed management recommendations for riparian habitat to assist landowners, managers, and others in conducting land use activities in a manner that incorporates the needs of fish and wildlife (Knutson and Naef 1997).

Riparian - Tree

There are 142 acres of riparian vegetation with deciduous tree overstory within the reservoir lands component of the Wells Project. Forty-two acres of this habitat are found in small stands along the Columbia River, while 105 acres of riparian deciduous tree habitat are found below the Wells Project Boundary on Cassimer Bar and along the Okanogan River.

Native tree species in the riparian areas include black cottonwood (*Populus balsamifera ssp.trichocarpa*) and a few nearly tree-sized Rocky Mountain juniper (*Juniperus scopulorum*), Bebb's willow (*Salix bebbiana*), and Sitka alder (*Alnus sinuata*). However, most riparian deciduous trees are dominated by non-native species including white cottonwood (*Populus fremontii*), eastern cottonwood (*Populus deltoides*), Russian olive (*Elaeagnus angustifolia*), silver maple (*Acer saccharinum*), Siberian elm (*Ulmus pumila*), and white mulberry (*Morus alba*). Most riparian deciduous tree stands occur in proximity to reservoir and pond margins and typically have at least some common riparian shrub and emergent wetland species.

The riparian cover type was also mapped on 12 acres (1 percent) of the transmission line corridor. These riparian areas consist of deciduous forest or shrub habitat, which were not separated during the mapping effort. Typical species noted in the riparian areas of the transmission line include quaking aspen (*Populus tremuloides*), chokecherry (*Prunus virginiana*), Rocky Mountain maple (*Acer glabrum*), red-osier dogwood (*Cornus sericea*), Lewis' mock orange (*Philadelphus lewisii*), Nootka rose (*Rosa nutkana*), wax currant (*Ribes cereum*), common snowberry, western white clematis (*Clematis ligusticifolia*), field horsetail (*Equisetum arvense*), Rocky Mountain iris (*Iris missouriensis*), feathery false lily-of-the-valley (*Maianthemum racemosum*), starry false lily-of-the-valley (*Maianthemum stellatum*), American speedwell (*Veronica american)*, and basin wildrye.

Riparian - Shrub

Riparian shrub habitat covered 314 acres (12.5 percent) of reservoir lands surveyed in 2005. The riparian shrub cover type contains a high proportion of both native and non-native species. Coyote (narrowleaf) willow (*Salix exigua*), Bebb's willow, Sitka alder, and water birch (*Betula occidentalis*) are widespread native species, but only coyote willow forms dense, and sometimes large, thickets. Saplings of black cottonwood, Oregon ash (*Fraxinus latifolia*), Pacific (shining) willow (Salix *lucida*), Siberian elm, and white mulberry are common within at least some riparian shrublands. Wood rose (*Rosa woodsii*) is ubiquitous and is the co-dominant shrub in many stands. Multiflora rose (*Rosa multiflora*) and an unidentified species of exotic shrubby honeysuckle are particularly common upstream of Brewster. Russian olive shrubs are abundant at Cassimer Bar. Riparian-shrub stands along the Okanogan River are typically dominated by a diverse blend of native species, forming dense stands in many areas. The most common riparian shrubs in this area include wood rose, black hawthorn (*Crataegus douglasii*), red-osier dogwood, common snowberry, Bebb's willow, Sitka alder, coyote willow, and shining willow.

Palustrine Wetland Cover Types

Palustrine wetlands are transitional habitat located between terrestrial and freshwater aquatic systems where the water table is near the surface or covered with shallow water (Cowardin et al. 1979). Covering 333 acres (12 percent) of the survey area, palustrine wetland habitat is the fourth most common cover type in reservoir lands, but is uncommon along the transmission line corridor, where less than 1 acre of palustrine forested wetland habitat was mapped. Palustrine wetlands include 287 acres (11.4 percent) of the emergent wetland cover type around the reservoir and less than 1 acre along the transmission corridor; 46 acres (0.5 percent) of the emergent wetland-pond cover type and less than 1 acre of forested wetland along the transmission corridor.

The majority of wetland habitats associated with the Wells Project are concentrated on the low-gradient shorelines of the reservoir near Cassimer Bar, the Bridgeport Bar unit of the WWA, and along the Okanogan River. The largest individual wetlands are found on Cassimer Bar and in the Washburn Island Slough.

Emergent wetlands are common along reservoir shorelines where wetland plants typically occur at or above the littoral zone along the reservoir. Emergent wetlands are generally dominated by herbaceous vegetation, but often support some riparian shrubs and trees as well. One type of emergent wetland includes a diverse mixture of native and non-native species and is referred to as "mixed wetland." Many of the dominant species in these areas are tall, non-native species including yellow flag (*Iris pseudacorus*), purple loosestrife (*Lythrum salicaria*), reed canarygrass, tansy ragwort (*Senecio jacobaea*), St. John's-wort, white sweet clover (*Trifolium repens*), and Canada thistle (*Cirsium arvense*). Elsewhere, native wetland species are dominant, including softstem bulrush (*Schoenoplectus tabernaemontani*), narrowleaf cattail (*Typha angustifolia*), Canada goldenrod (*Solidago canadensis*), and showy milkweed (*Asclepias speciosa*). Jointleaf rush (*Juncus articulatus*) and poverty rush (*Juncus tenuis*) are ubiquitous species in all emergent wetlands. Other common species include cut-leaf water horehound (*Lycopus uniflorus*), rough bugleweed (*Lycopus asper*), Baltic rush (*Juncus balticus*), common rush (*Juncus effusus*), long-styled rush (*Juncus longistylis*), western panicgrass (*Panicum occidentale*), woolly sedge (*Carex lanuginosa*), fox sedge (*Carex vulpinoidea*), spurless touch-me-not (*Impatiens ecalcarata*), tufted loosestrife (*Lysimachia thyrsiflora*), fringed loosestrife (*Lysimachia ciliata*), bedstraw (*Galium sp*.), common horsetail (*Equisetum hymale*), marsh spikerush (*Eleocharis palustris*), and Kentucky bluegrass (*Poa pratensis*).

At Cassimer Bar, there are low-lying, swale-like areas adjacent to the wetter cattail-bulrush wetlands that have been mapped as emergent wetland-meadow. These areas are more moist than wet, yet still have a high proportion of hydrophytic species. Species common in these swales include foxtail barley (*Hordeum jubatum*), redtop (*Agrostis alba*), curly dock (*Rumex crispus*), common rush, chairmakers bulrush (*Scirpus* *americanus*), bay forget-me-not (*Myosotis laxa*), Baltic rush, and Canada thistle. Islands in the Methow River differ, with some species and species assemblages that are unique to the islands. One wetland had an extensive stand of little green sedge (*Carex oederi*), as well as the only observations of inland sedge (*Carex interior*) and golden sedge (*Carex aurea*) noted during study efforts.

Emergent wetlands occur within the transmission corridor in two small areas totaling approximately 1 acre (less than 1 percent) of the transmission line corridor. Principal species include basin wildrye, showy milkweed, and Canada thistle. Palustrine forested wetlands are defined as nontidal wetlands dominated by trees (Cowardin et al. 1979). Within the transmission corridor, one forested wetland was identified in the northern end of the corridor and was mapped on less than 1 acre (less than 1 percent) of the transmission line corridor. Principal species in this area include quaking aspen, red-osier dogwood, and Nootka rose. No forested wetlands were identified in the reservoir lands survey area, although similar habitats are found in areas mapped as the Riparian - Tree cover type.

Environmental Effects

Douglas PUD is not proposing any changes to the operation of the Wells Project, other than the implementation of proposed environmental measures. Current operations include Project maintenance activities such as transmission line vegetation clearing and road maintenance, each conducted in compliance with Douglas PUD's Land Use Policy (Douglas PUD 2009*b*). In addition, Douglas PUD's proposed environmental measures include the WBMP and RMP. The potential effects of each of these are discussed below. In addition, an assessment of the effects of reservoir water level fluctuations is provided.

During scoping of issues for development of relicensing studies, the Terrestrial RWG found that Douglas PUD's fee-title ownership of Wells Project lands has produced substantial benefits for wildlife and wildlife habitats, including riparian and wetland areas. These benefits are conferred in part through Douglas PUD's current implementation of its Land Use Policy. The additional implementation of Douglas PUD's WBMP is expected to ensure continued benefits to upland and other habitats associated with the Wells Project. Collectively, these measures protect wetland and riparian habitats through the use of BMPs, noxious weed control, revegetation of areas disturbed by Project maintenance, and restrictions on land use, development, and recreational use.

Vegetation clearing and other Project maintenance activities are not conducted in riparian or wetland habitats, and are not expected to be affected by the Project. Improvements to recreational facilities described in the Wells RMP (e.g., a Marina Park expansion including 10 additional RV spaces) are not proposed within any currently undisturbed riparian or wetland habitats. As a result, the RMP will have no effect on these habitats.

The creation of Wells Reservoir has allowed the development of a suite of wetland and riparian habitats otherwise uncommon in the semi-arid mid-Columbia region (DTA 2006*a*, EDAW 2006*a*). These habitats reflect current and recent Project operations and flow conditions, including daily fluctuations on the order of 1 to 2 feet (DTA 2006*a*). Under these conditions, the Wells Project has provided a river environment which has promoted the development of mature riparian and wetland communities, including substantial emergent and forested areas. These wetlands are composed of species requiring high and relatively consistent soil moisture during the growing season and are supported by, or can withstand, frequent water level fluctuations (DTA 2006*a*; EDAW 2006*a*). These existing wetlands and riparian areas are known to exhibit high wildlife and plant species diversity relative to other habitats (EDAW 2006*b*).

Wells Project operations also include infrequent reservoir water level fluctuations of up to 10 feet. Nationwide studies of the effects of dewatering have shown that extended dewatering (lasting months) can result in adverse impacts to some species and substantial changes in species distributions in wetland and riparian habitats. However, the reservoir water level fluctuations at the Wells Project are extremely rare (1.1percent of the time between 1990 and 2005) and generally are of short duration (DTA 2006*a*).

A 2005 assessment of Wells Project shoreline erosion found that 53 percent of the Project shorelines are stable with only 12 percent of the areas exhibiting active erosion (DTA 2006*a*). Erosion can result in the loss of shoreline habitat, potentially including riparian and wetland habitat. The study noted that Project operations may have modified the rate and location of shoreline erosion, but cannot be viewed independent of other naturally-occurring factors such as wave action, vegetation, and undermining of banks. Based on the 2005 assessment of Project operations on botanical species, it was determined that historical reservoir operations have not had significant adverse effects on wetland and riparian vegetation (DTA 2006*a*).

Proposed Environmental Measures

As previously described, Douglas PUD proposes to continue existing reservoir operations and implement the WBMP in coordination with federal, state, and tribal entities. This proposed plan, in concert with continued implementation of Douglas PUD's Land Use Policy, provides substantial protections for wetland and riparian habitats. The planned implementation of the WBMP and Land Use Policy, during the term of the new license, will provide continued protection and will minimize impacts to wetland and riparian habitats.

Additionally, the Off-License Settlement Agreement and proposed future monitoring activities will also serve to protect, maintain, and enhance wetland and riparian habitats at and near the Wells Project.

Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on wetland and riparian habitats.

3.3.3.3 Botanical Resources

Affected Environment

This section provides a summary of vascular plant species of the Project and includes discussion of RTE and invasive/noxious plant species and state-significant natural communities and areas. Federally-listed species and critical habitats protected under the ESA are discussed in section 3.3.4 - Threatened and Endangered Species and Critical Habitats.

Botanical surveys of the Wells Project were conducted in 2005 (EDAW 2006*a*) and 2008 (Parametrix, Inc. 2009*b*) and included vegetation mapping as well as surveys for special-status plants and noxious weeds. These surveys documented 323 species of plants onsite, including four state special-status botanical species and 45 non-native species, 10 Class B weeds and nine Class C weeds as discussed below. A comprehensive list of the plant species occurring in the Wells Project is provided in Appendix E-10.

State Special-Status Botanical Species

State special-status botanical species include plant species that are identified as endangered (E), threatened (T), sensitive (S), or under review for potential listing (R1 and R2) by the WDNR Natural Heritage Program ([WNHP] WNHP 2009). State and federal natural resource agencies, including the USFWS, WDFW and WNHP, were contacted beginning in August 2005 to request information regarding the presence of federal- and state-listed species as well as species and habitats of special concern in the Project area.

Based on these agency contacts, a review of species habitat requirements and distribution, and information from a rare plant survey conducted for the nearby Rocky Reach Project, 41 state-listed species (federally-listed species excluded) were identified as having the potential to occur in the vicinity of the Wells Project area and were targeted during 2005 RTE botanical survey efforts (Calypso 2000; EDAW 2006*a*; NatureServe 2008; WNHP 2005, 2009; Parametrix, Inc. 2009*b*).

Surveys of the Wells Project reservoir documented occurrences of three state-listed special-status plants: little bluestem (*Schizachyrium scoparium*) (T), chaffweed (*Centunculus minimus*) (R1), and northern sweetgrass (*Hierochloe odorata*) (R1) (EDAW 2006*a*). Brittle prickly-pear (*Opuntia fragilis*) was also identified as an R1 status species at the time of the survey, but the plant was recently removed from the list of plants tracked by the WNHP (WNHP 2009). None of these species are afforded specific regulatory protections by Washington State. Surveys of the transmission line corridor document one occurrence of Thompson's clover (*Trifolium thompsonii*) (T) (Parametrix, Inc. 2009*b*).

Little Bluestem

Little bluestem was the only state-listed threatened species observed in the reservoir study area. Typically, more common in Idaho and farther east, the population observed along Wells Reservoir is only the fourth documented record of this species in Washington State. Little bluestem is also known to occur at the upstream ends of Rocky Reach and Rock Island reservoirs. The habitat for populations along Rocky Reach, Rock Island, and Wells reservoirs is more riverine in character than the lacustrine habitat typically associated with reservoir shorelines (K. Beck, Beck Botanical Consulting, personal communication *as cited in* EDAW 2006*a*). These reaches are characterized by flowing water that is obvious during all but the highest pool levels; flows are particularly swift at lower pool levels. The little bluestem site at Wells Reservoir is further characterized by alluvial deposition (beaches and bars) along some portions of the shoreline and polished bedrock banks, indicating long-term exposure to flowing water.

Five occurrences comprising one population of little bluestem were mapped along 1,500 feet of shoreline. The granitic, coarse sandy substrate supports transitional riparian vegetation between wet shoreline emergent wetland and shrub steppe dominated uplands. The topographic position of most occurrences averages approximately 10 to 15 feet from the shoreline and 2 to 5 feet elevation above the mean water surface. Associated species include Rocky Mountain juniper, Siberian elm, white sweet clover, Gray's biscuit root, Scribner's rosette grass (*Panicum scribnerianum*), white sagebrush, and diffuse knapweed. The largest occurrence has several perennial bunchgrass associates, including needle-and-thread, sand dropseed (*Sporobolus cryptandrus*), Fendler three-awn (*Aristida longiseta*), prairie junegrass (*Koeleria cristata*), and alkali bluegrass (*Poa juncifolia*).

Chaffweed

Chaffweed is a review list 1 species previously known from seven Washington counties including Pend Oreille, Spokane, Klickitat, Whitman, Wahkiakum, Chelan, and Benton counties. Its observation during the Wells Reservoir study is the first record for Douglas County.

Four occurrences of chaffweed were observed on frequently-inundated, low-gradient mud-gravel banks with little competing vegetation. Some of the plants observed again in August had dehisced capsules, suggesting the production of mature seed. The cover and density of chaffweed in all four sites was low, consisting of only a few scattered plants. Associated plant species also occurred at low density and cover. Associated species included mudwort (*Limosella sp*.), water pygmyweed (*Crassula aquatica*), bay forget-me-not, popcornflower (*Plagiobothrys spp*.), clammy hedgehyssop (*Gratiola neglecta*), spikerush, and toad rush (*Juncus bufonius*) (EDAW 2006a).

Northern Sweetgrass

Northern sweetgrass, also commonly referred to as vanilla grass, is a review list 1 species known from 16 Washington counties, primarily in the central and eastern parts of the state. Its occurrence along Wells Reservoir during this study is the first record for Douglas County (WNHP 2005).

Sand-silt-gravel banks that are frequently inundated and also support emergent wetland vegetation are common and abundant along Wells Reservoir. Two northern sweetgrass occurrences were in these habitats, growing at the upper elevation end of low-gradient banks. These sites were inundated by approximately 6 inches of water during high pool. At one site, the associated species provided approximately 80 percent cover and included Baltic rush, coyote willow, yellow flag, woolly sedge, and fowl mannagrass (*Glyceria spp.*). The other site is located near the little bluestem population, and supports primarily Baltic rush and woolly sedge with scattered northern sweetgrass.

Thompson's Clover

This species is endemic to a narrow range consisting of lands within approximately 2.5 miles of the Columbia River between the Wenatchee and Entiat rivers (WNHP 1999). One occurrence of Thompson's clover was documented during relicensing studies, consisting of approximately 11 acres within the transmission corridor. Because the occurrence continues beyond the transmission corridor boundary, its full extent exceeds 11 acres. The population consists of several hundred to thousands of plants, representing a prominent component of the herbaceous layer.

In early summer 2008, wildfire burned all vegetation in and around this occurrence. However, Thompson's clover is known to be a fire-adapted species (Scherer et al. 1997). During an informal site visit in May 2009, Douglas PUD natural resources personnel observed large numbers of live Thompson's clover plants.

Noxious Weeds

Noxious weeds and other invasive plants can displace native plants and diminish the value of the habitat for wildlife. Noxious weeds are listed by the WNWCB, and managed by County Boards in cooperation with local landowners. Douglas PUD has worked closely with the Okanogan County Weed Board and adjacent landowners to control noxious and other invasive weeds on the Wells Project lands. The WNWCB groups weeds into the following categories: Class A weeds are non-native species whose distribution in Washington State is still limited; eradication of all Class A weeds is required by state law. Class B weeds are non-native species whose distribution is limited to portions of Washington State. Because of differences in distribution, treatment of Class B weeds is designated only in certain areas. In regions where a Class B weed is not yet widespread, prevention of new infestations is required; in these areas, the weed is a "Class B Designate," meaning it is designated for control. Class C weeds are widespread; treatment and management is not typically required but may be warranted for local management goals.

Botanical surveys of the Wells Project were conducted in 2005 on Wells Reservoir lands (EDAW 2006*a*) and 2008 in the transmission line corridor (Parametrix, Inc. 2009*b*). No Class A weeds were documented during survey efforts. Surveys of lands associated with Wells Reservoir documented 99 occurrences of four Class B-designate weed species: purple loosestrife, Dalmatian toadflax, leafy spurge (*Euphorbia esula*), and perennial pepperweed. Two Class B weeds, Russian knapweed (*Centaurea repens*) and diffuse knapweed, were common in upland or transitional upland/wetland habitats. Two Class C weeds, reed canarygrass and yellow flag, were noted as common in Project wetlands and along Wells Reservoir shorelines.

Surveys in the transmission corridor documented 48 occurrences of two Class B-Designate weed species (Dalmatian toadflax and spotted knapweed, *Centaurea stoebe*), and one other Class B weed species (diffuse knapweed). Each is widespread in pastures and rangeland in Douglas County. In addition, two Class C weeds, Canada thistle and field bindweed, were also documented in the transmission line corridor.

Douglas PUD has maintained herbicide spray records since 1990. These records show that Douglas PUD has treated Scotch thistle (*Onopordum acanthium*) (since 1990), Dalmatian toadflax (1995), leafy spurge (1990), and perennial pepperweed (2004). Biological agents are also collected and dispersed annually by Douglas PUD to manage Dalmatian toadflax. In 1989, Douglas PUD discovered and began mechanical control efforts on purple loosestrife by digging out the plants in wetlands along the Columbia River. These efforts were supplemented with herbicide use (glyphosate, a broad-spectrum herbicide, in a formulation labeled for use in wetland areas) between 1990 and 1999. Beginning in 2000, Douglas PUD replaced herbicide treatments on purple loosestrife with the use of biological control agents. Within the transmission line corridor, Douglas PUD has used herbicides to manage diffuse, Russian and spotted knapweeds, Dalmatian toadflax, and thistle species. In addition, biological control agents targeting Dalmatian toadflax have been released along the transmission line corridor annually since 2004.

Important Natural Communities, Refuges, and Management Areas

Shrub steppe and riparian and wetland habitats are identified as state priority habitats by the WDFW (WDFW 2008). These cover types are discussed in detail in section 3.3.3.1 - Upland Habitats and 3.3.3.2 - Riparian Areas and Wetlands. In addition, two wildlife management areas occur within the Project: WWA and Cassimer Bar Wildlife Management Area (Figure 3.3.3.3-1).

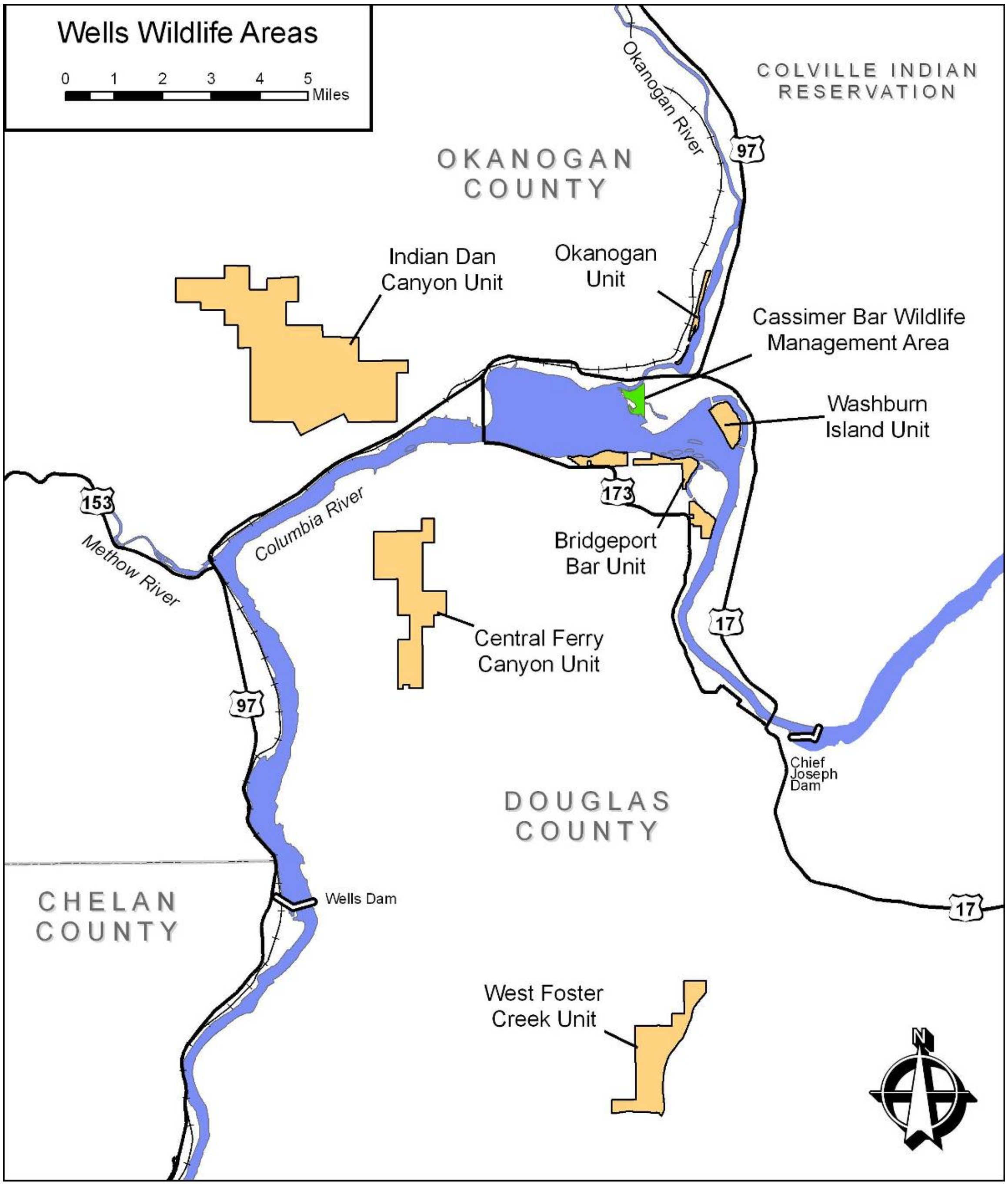

Figure 3.3.3.3-1 Wells Wildlife Area and Cassimer Bar Wildlife Management Area.

Wells Wildlife Area

The WWA, funded by Douglas PUD and managed by WDFW, is located in Douglas and Okanogan counties and consists of six units: three shoreline/ riparian units and three upland units. Bridgeport Bar (502 acres), Okanogan (100 acres), and Washburn Island (261 acres) are located along the shoreline of the Wells Reservoir, and a portion of each unit lies within the Project Boundary. West Foster Creek (1,025 acres), Central Ferry (1,602 acres), and Indian Dan Canyon (4,716 acres) are upland units that are entirely outside the Wells Project Boundary. WDFW's original management objective for the WWA was to develop habitat for game species and to release upland game birds with the goal of replacing hunting opportunities that were lost due to the original construction of the Wells Project. Since that time, WDFW's wildlife management directives have expanded, and now include protecting game and non-game species and their habitats, managing for species diversity, and providing consumptive (hunting) and non-consumptive (e.g., wildlife viewing) wildlife related recreation.

On July 15, 1974, Douglas PUD entered into a wildlife mitigation agreement with WDFW (the 1974 Agreement) to establish the WWA. Douglas PUD and WDFW entered into a subsequent MOA in which Douglas PUD began voluntarily providing supplemental funding to ensure continued operation of the WWA. In 2007, WDFW and Douglas PUD entered into an Off-License Settlement Agreement that will continue funding all six units of the WWA during the term of the next license.

Cassimer Bar Wildlife Management Area

The Cassimer Bar Wildlife Management Area (116 acres) is located in Okanogan County on the Colville Indian Reservation, and is a shoreline/riparian and wetlands unit at the Okanogan River confluence (Figure 3.3.3.3-1). The Cassimer Bar Wildlife Management Area is managed by Douglas PUD in cooperation with the CCT.

Environmental Effects

Douglas PUD is not proposing any changes to the operation of the Wells Project, other than the implementation of proposed environmental measures. Current operations include Project maintenance activities such as transmission line vegetation clearing and road maintenance, each conducted in compliance with Douglas PUD's Land Use Policy (Douglas PUD 2009*b*). In addition, Douglas PUD's proposed environmental measures for botanical resources include a WBMP and RMP. The potential effects of each of these are discussed below. In addition, an assessment of the effects of reservoir water level fluctuations on botanical resources is provided.

During scoping of issues for development of relicensing studies, the Terrestrial RWG found that Douglas PUD's fee-title ownership of Wells Project lands has produced substantial benefits for botanical resources. These benefits are conferred in part through Douglas PUD's current implementation of its Land Use Policy. The additional implementation of Douglas PUD's WBMP is expected to bring continued benefits to botanical resources associated with the Wells Project. Collectively, these measures protect botanical resources through the use of BMPs, noxious weed control, revegetation of areas disturbed by Project maintenance, and restrictions on land use, development, and recreational use.

Vegetation clearing and other Project maintenance activities are not conducted in the vicinity of special-status plant occurrences, important natural communities, or management areas. Improvements to recreational facilities described in the Wells Project RMP (e.g., a Marina Park expansion including 10 additional RV spaces) are not proposed within any currently special-status plant occurrences, important natural communities, or management areas. As a result, no effects of the Project on these resources are expected.

Northern sweetgrass and chaffweed both occur in habitats that are frequently inundated and exposed by fluctuating reservoir levels, and little bluestem was found growing approximately 2 to 5 feet above the normal pool level. Existing vegetation patterns and species composition of the Project reflect recent operating conditions, including daily fluctuations that serve to support existing wetland and riparian habitats. The current success of these species within inundated or Project-affected areas suggests that the daily fluctuations are unlikely to represent a detrimental Project effect. Infrequent reservoir operations are rare and generally are of short duration, and are similarly unlikely to detrimentally affect special-status plants (DTA 2006*a*). Occurrences of special-status plants are maintained in Douglas PUD's GIS database toward ensuring that no operations or maintenance activities affect the species.

Project operations require that some lands (e.g., the transmission line corridor and areas around Project facilities) are subject to clearing and vegetation management, creating potential habitat for noxious weeds. In addition, recreation measures included in Douglas PUD's RMP will result in short-term ground disturbance and a small (<3 acre) expansion of developed areas, potentially creating habitat for noxious weeds. Douglas PUD assertively manages noxious weed occurrences using chemical, mechanical, and biological control methods, which are formalized in Douglas PUD's WBMP. As a result, noxious weeds are not expected to expand as a consequence of the proposed action.

Proposed Environmental Measures

As previously described, Douglas PUD proposes to implement the WBMP and Land Use Policy, both developed in coordination with federal, state, and tribal entities. These plans provide substantial protection of wetland and riparian habitats. The planned implementation of the WBMP and Land Use Policy, during the term of the new license, will ensure continued protection and will minimize impacts to botanical resources.

Additionally, the Off-License Settlement Agreement and proposed future monitoring activities will also serve to protect, maintain, and enhance wetland and riparian habitats of the Wells Project.

Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on significant botanical resources or natural communities, refuges, or management areas.

3.3.3.4 Wildlife

Affected Environment

Wells Project lands provides habitat for a diverse range of wildlife. Riparian plant communities within the Wells Project support more wildlife species than any other vegetation type and provide important habitat for migratory and nesting birds, mammals, reptiles, and amphibians. Shrub steppe plant communities provide habitat for birds, reptiles, and mammals adapted to this dry, open habitat (EDAW 2006*b*).

Wildlife surveys of the Wells Project were conducted in 2005 (EDAW 2006*b*) and 2008 (Parametrix, Inc. 2009*b*). These studies documented wildlife found on Wells Project lands associated with Wells Reservoir (EDAW 2006*b*) and the Wells Project 230 kV transmission corridor (EDAW 2006*c*, Parametrix, Inc. 2009*b*). Additional surveys by Parametrix, Inc. (2009*b*) included transmission corridor raptor and corvid nesting surveys, Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) and greater sage-grouse (*Centrocercus urophasianus*) surveys, and surveys for evidence of avian collisions with the transmission line and associated structures. Survey efforts confirmed the presence of 204 wildlife species in the Wells Project, including 161 birds, five amphibians, nine reptiles, and 29 mammals (Table 3.3.3.4-1).

Aquatic Wildlife

The WDFW considers the Wells Reservoir one of the most important waterfowl wintering areas in eastern Washington (Monda, M., WDFW, personal communication, to B. Patterson, *as cited in* EDAW2006*b*). Aerial survey data from fall 2001 to spring 2005 shows a maximum of 33,912 ducks and geese during the fall migration, and a maximum of 38,909 ducks and geese wintering on the Wells Reservoir. In addition to ducks and geese, a maximum of 23,150 American coots were seen during the fall migration, and a maximum of 25,700 coots wintered on the Wells Reservoir between 2001 and 2005 (Hallet 2002, 2003, 2004, and 2005). Aquatic vegetation supported by Wells Reservoir provides food for waterfowl during the spring and fall migration and sustains them through the winter. Corn, wheat, and other grains grown on the WWA provide food for dabbling ducks and Canada geese. Common winter residents on the Wells Reservoir include American coot, greater and lesser scaup, American widgeon, ring-necked duck, and mallard. Other wintering waterfowl include gadwall, northern shoveler, bufflehead, Barrow's goldeneye, ruddy duck, common merganser, and hooded merganser. Common loons, pied-billed grebes, eared grebes, and western/Clark's grebe are all present on the Wells Reservoir throughout the year. Wintering coots and ducks provide an important food supply for bald eagles wintering within and adjacent to the Wells Reservoir.

Table 3.3.3.4-1 Wildlife species detected at the Wells Project.

Common Name	Scientific Name
Pelagic Birds and Herons	
Common Loon	*Gavia immer*
Eared Grebe	*Podiceps nigricollis*
Horned Grebe	*Podiceps auritus*
Red-necked Grebe	*Podiceps grisegena*
Western Grebe	*Aechmophorus occidentalis*
Pied-billed Grebe	*Podilymbus podiceps*
American White Pelican	*Pelecanus erythrorhynchos*
Double-crested Cormorant	*Phalacrocorax auritus*
Great Egret	*Ardea alba*
Great Blue Heron	*Ardea herodias*
Waterfowl	
Canada Goose	*Branta canadensis*
Mallard	*Anas platyrhynchos*
Gadwall	*Anas strepera*
American Wigeon	*Anas americana*
Northern Pintail	*Anas acuta*
Blue-winged Teal	*Anas discors*
Green-winged Teal	*Anas crecca*
Cinnamon Teal	*Anas cyanoptera*
Northern Shoveler	*Anas clypeata*
Ruddy Duck	*Oxyura jamaicensis*
Wood Duck	*Aix sponsa*
Redhead	*Aythya americana*
Canvasback	*Aythya valisineria*
Ring-necked Duck	*Aythya collaris*
Scaup spp.	*Aythya spp.*
Barrow's Goldeneye	*Bucephala islandica*
Common Goldeneye	*Bucephala clangula*
Bufflehead	*Bucephala albeola*
Common Merganser	*Mergus merganser*
Hooded Merganser	*Lophodytes cucullatus*
Raptors	
Turkey Vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Golden Eagle	*Aquila chrysaetos*
Bald Eagle	*Haliaeetus leucocephalus*
Red-tailed Hawk	*Buteo jamaicensis*
American Kestrel	*Falco sparverius*
Peregrine Falcon	*Falco peregrinus*

Table 3.3.3.4-1 (continued) Wildlife species detected at the Wells Project

Prairie Falcon	*Falco mexicanus*
Rough-legged Hawk	*Buteo lagopus*
Swainson's Hawk	*Buteo swainsoni*
Gamebirds	
Chukar	*Alectoris chukar*
Ring-necked Pheasant	*Phasianus colchicus*
California Quail	*Callipepla californica*
Dusky Grouse	*Dendragapus obscurus*
Gray Partridge	*Perdix perdix*
Rails, Cranes, and Shorebirds	
Virginia Rail	*Rallus limicola*
American Coot	*Fulica americana*
American Golden Plover	*Pluvialis dominica*
Killdeer	*Charadrius vociferus*
Greater Yellowlegs	*Tringa melanoleuca*
Spotted Sandpiper	*Actitis macularia*
Dowitcher spp.	*Limnodromus spp.*
Common Snipe	*Gallinago gallinago*
Wilson's Phalarope	*Phalaropus tricolor*
Gulls and Terns	
Bonaparte's Gull	*Larus philadelphia*
Ring-billed Gull	*Larus delawarensis*
California Gull	*Larus californicus*
Caspian Tern	*Sterna caspia*
Black Tern	*Chlidonias niger*
Common Tern	*Sterna hirundo*
Doves	
Rock Dove	*Columba livia*
Mourning Dove	*Zenaida macroura*
Owls and Goatsuckers	
Great Horned Owl	*Bubo virginianus*
Short-eared Owl	*Asio flammeus*
Northern Pygmy-Owl	*Glaucidium gnoma*
Common Nighthawk	*Chordeiles minor*
Common Poorwill	*Phalaenoptilus nuttallii*
Hummingbirds and Kingfishers	
Rufous Hummingbird	*Selasphorus rufus*
Black-chinned Hummingbird	*Archilochus alexandri*
Calliope Hummingbird	*Stellula calliope*
Belted Kingfisher	*Ceryle alcyon*
Woodpeckers, Nuthatches, Creepers and Flycatchers	
Northern Flicker	*Colaptes auratus*
Hairy Woodpecker	*Picoides villosus*
Downy Woodpecker	*Picoides pubescens*
Red-naped Sapsucker	*Sphyrapicus nuchalis*
Pygmy Nuthatch	*Sitta pygmaea*
Red-breasted Nuthatch	*Sitta canadensis*
Brown Creeper	*Certhia americana*
Western Wood - Pewee	*Contopus sordidulus*
Olive-sided Flycatcher	*Contopus cooperi*
Willow Flycatcher	*Empidonax traillii*
Dusky Flycatcher	*Empidonax oberholseri*
Least Flycatcher	*Empidonax minimus*
Say's Phoebe	*Sayornis saya*
Eastern Kingbird	*Tyrannus tyrannus*
Western Kingbird	*Tyrannus verticalis*

Table 3.3.3.4-1 (continued) Wildlife species detected at the Wells Project.

Corvids, Shrikes, and Swallows	
Steller's Jay	*Cyanocitta stelleri*
Clark's Nutcracker	*Nucifraga columbiana*
Black-billed Magpie	*Pica hudsonia*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
Northern Shrike	*Lanius excubitor*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta thalassina*
Cliff Swallow	*Petrochelidon pyrrhonota*
Bank Swallow	*Riparia riparia*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Barn Swallow	*Hirundo rustica*
Chickadees, Wrens, Vireos, and Kinglets	
Black-capped Chickadee	*Poecile atricapillus*
Mountain Chickadee	*Poecile gambeli*
House Wren	*Troglodytes aedon*
Canyon Wren	*Catherpes mexicanus*
Marsh Wren	*Cistothorus palustris*
Winter Wren	*Troglodytes troglodytes*
Cassin's Vireo	*Vireo cassinii*
Warbling Vireo	*Vireo gilvus*
Ruby-crowned Kinglet	*Regulus calendula*
Golden-crowned Kinglet	*Regulus satrapa*
Thrashers, Thrushes, and Starlings	
Sage Thrasher	*Oreoscoptes montanus*
Gray Catbird	*Dumetella carolinensis*
European Starling	*Sturnus vulgaris*
American Robin	*Turdus migratorius*
Hermit Thrush	*Myadestes townsendi*
American Pipit	*Anthus rubescens*
Mountain Bluebird	*Sialia currucoides*
Western Bluebird	*Sialia mexicana*
Townsend's Solitaire	*Myadestes townsendi*
Waxwings	
Cedar Waxwing	*Bombycilla cedrorum*
Warblers and Tanagers	
Magnolia Warbler	*Dendroica magnolia*
Townsend's Warbler	*Dendroica townsendi*
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Yellow-rumped Warbler	*Dendroica coronata*
Yellow Warbler	*Dendroica petechia*
MacGillivray's Warbler	*Oporornis tolmiei*
Wilson's Warbler	*Wilsonia pusilla*
Common Yellowthroat	*Geothlypis trichas*
Yellow-breasted Chat	*Icteria virens*
Western Tanager	*Piranga ludoviciana*

Table 3.3.3.4-1 (continued) Wildlife species detected at the Wells Project.

Sparrows and Icterids	
Spotted Towhee	*Pipilo maculatus*
Chipping Sparrow	*Spizella passerina*
Lark Sparrow	*Chondestes grammacus*
Grasshopper Sparrow	*Ammodramus savannarum*
Savannah Sparrow	*Passerculus sandwichensis*
Lincoln’s Sparrow	*Melospiza lincolnii*
Song Sparrow	*Melospiza melodia*
White-crowned Sparrow	*Zonotrichia leucophrys*
Golden-crowned sparrow	*Zonotrichia atrichipilla*
Vesper sparrow	*Pooecetes gramineus*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Red-winged Blackbird	*Agelaius phoeniceus*
Brewer’s Blackbird	*Euphagus cyanocephalus*
Brown-headed Cowbird	*Molothrus ater*
Bullock's Oriole	*Icterus bullockii*
Western Meadowlark	*Sturnella neglecta*
Larks, Finches, and Allies	
Horned Lark	*Eremophila alpestris*
Dark-eyed Junco	*Junco hyemalis*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Lazuli Bunting	*Passerina amoena*
House Finch	*Carpodacus mexicanus*
Cassin’s Finch	*Carpodacus cassinii*
Purple Finch	*Carpodacus purpureus*
Pine Siskin	*Carduelis pinus*
Red Crossbill	*Loxia curvirostra*
American Goldfinch	*Carduelis tristis*
Evening Grosbeak	*Coccothraustes vespertinus*
House Sparrow	*Passer domesticus*
Amphibians	
Pacific Treefrog	*Pseudacris regilla*
Great Basin Spadefoot Toad	*Spea intermontana*
Long-toed Salamander	*Ambystoma macrodactylum*
Tiger Salamander	*Ambystoma tigrinum*
Bullfrog	*Rana catesbeiana*
Reptiles	
Painted Turtle	*Chrysemys picta*
Gopher Snake	*Pituophis catenifer*
Racer	*Coluber constrictor*
Western Terrestrial Garter Snake	*Thamnophis elegans*
Common Garter Snake	*Thamnophis sirtalis*
Western Rattlesnake	*Crotalus viridis*
Sagebrush lizard	*Sceloporus graciosus*
Pygmy Short-horned Lizard	*Phrynosoma douglasii*
Western Skink	*Eumeces skiltonianus*

Table 3.3.3.4-1 (continued) Wildlife species detected at the Wells Project.

Mammals	
Deer Mouse	*Peromyscus maniculatus*
Great Basin Pocket Mouse	*Perognathus parvus*
Western Harvest Mouse	*Reithrodontomys megalotis*
Sagebrush Vole	*Lemmiscus curtatus*
Montane Vole	*Microtus montanus*
Meadow Vole	*Microtus pennsylvanicus*
Vagrant/Masked Shrew	*Sorex spp.*
Bushy-tailed Woodrat	*Neotoma cinerea*
House Mouse	*Mus musculus*
Mountain Cottontail	*Sylvilagus nuttallii*
Long-tailed Weasel	*Mustela frenata*
Porcupine	*Erethizon dorsatum*
Northern Pocket Gopher	*Thomomys talpoides*
Yellow-bellied Marmot	*Marmota flaviventris*
Chipmunk spp.	*Tamias spp.*
Douglas' squirrel	*Tamiasciurus douglasii*
Beaver	*Castor canadensis*
Muskrat	*Ondatra zibethicus*
Coyote	*Canis latrans*
Raccoon	*Procyon lotor*
Mink	*Mustela vison*
River Otter	*Lutra canadensis*
Striped Skunk	*Mephitis mephitis*
American Badger	*Taxidea taxus*
Black Bear	*Ursus americanus*
Cougar	*Puma concolor*
Bobcat	*Felis rufus*
White-tailed deer	*Odocoileus virginianus*
Mule deer	*Odocoileus hemionus*
Moose	*Alces alces*

Sources: EDAW, Inc. 2006*b*, Parametrix, Inc. 2009*b*.

Aquatic furbearers present on the Wells Reservoir include beaver, muskrat, mink, and river otter. Mink and otter are much less common on the Wells Reservoir than beaver or muskrats. River otter feed primarily on fish, amphibians, insects, crayfish, and small mammals captured from the Wells Reservoir. Mink feed on fish, amphibians, clams, crayfish, small mammals, birds, and bird eggs.

Several reptiles and amphibians are known to occur in the Project Boundary (Table 3.3.3.4-1). Evidence of amphibian breeding was found in the ponds isolated from the Wells Reservoir but not in wetlands connected to the Wells Reservoir (EDAW 2006*b*).

Riparian and Wetland Wildlife

Overall, 27 percent of all birds detected during the breeding season in the Wells Project were in riparian habitats, more than any other habitat type (EDAW 2006*b*). This number dropped to approximately 13 percent during the fall. Birds detected in wetland habitats represented 20 and 10 percent of all avian detections during the breeding season and fall migration, respectively. A total of 38 and 43 species of birds were detected in Wells Project wetlands during both breeding season and fall surveys, respectively.

Many of the reptile and mammal species documented use wetland and riparian areas for foraging, resting, and cover. Riparian trees and shrubs, especially cottonwood and willow species, provide food and lodge materials for beaver and emergent wetland plants provide food and den material for muskrat. Mule deer may rely heavily on riparian habitat during harsh winter conditions, particularly when heavy snow accumulates in the higher elevations.

Upland Wildlife

Shrub steppe habitat and agricultural fields dominate the upland areas of the Wells Project. These areas are used by species dependent on shrubby and grassy open habitats for foraging, resting, and nesting. Fifteen percent of the birds detected during breeding season surveys were found in shrub steppe habitat and 10 percent were observed during the fall migration surveys. The most common birds in shrub steppe habitat during the breeding season were species favoring relatively open areas for breeding but requiring shrubs for nest placement.

Sixteen percent of all birds detected during breeding season were detected in agricultural areas, higher than idle agriculture (2 percent) and shrub steppe, but below riparian, wetland, and open-water habitats. Bird use of agricultural areas increases to approximately 11 percent in the fall, equivalent to the use of riparian and wetland habitats (EDAW 2006*b*). The European starling, California quail, and various sparrows (e.g., white-crowned, Lincoln's, song, and savannah sparrows) were the most abundant birds detected in agricultural areas.

The shrub steppe habitat in the Wells Project and surrounding area supports most of the small mammal species identified, as well as the large to mid-size mammals such as mule deer, coyote, cottontail rabbits, marmots, gophers, squirrels, skunks, and occasionally black bear and moose. Common mammal species of more open agricultural areas include some mid-sized mammals as well as most of the small mammal species identified in (Table 3.3.3.4-1).

Raptors commonly use the open upland areas for foraging and will typically nest on elevated natural or manmade structures throughout the Project. Eleven nests of raptors or corvids were detected within or adjacent to the transmission line, including four on transmission towers. Six bird carcasses were found in the transmission corridor. No direct evidence of collision was observed (Parametrix, Inc. 2009*b*).

State Special-Status Wildlife

State special-status wildlife discussed in this section include terrestrial species that are identified as endangered (SE), threatened (ST), candidate for state listing (SC), or sensitive (SS), by the WDFW (WDFW 2009*b*). These resources are protected under Washington Statutory Authority: RCW 77.12.020. 90 - 11-066 (Order 442), § 232-12-297, filed May 15, 1990, effective June 15, 1990. For relicensing purposes, state and federal natural resource agencies (including the USFWS, WDFW and WNHP) were contacted initially in August 2005, and periodically through 2006, 2007, 2008 and 2009, to ensure that Douglas PUD was aware of all currently designated special status species and habitats potentially occurring in the Project area.

Based on review of species range and habitat requirements, agency consultation, and background data, 45 state-listed special-status wildlife species were predicted to potentially occur on Wells Project reservoir lands, and 17 were predicted to potentially occur in the transmission line corridor. Of these, five state special-status species (all birds) were detected: American white pelican, golden eagle, bald eagle, common loon, and sage thrasher (Table 3.3.3.4-2). Federally-listed species documented during survey efforts are discussed in section 3.3.3 - Threatened and Endangered Species and Critical Habitats. State special-status wildlife species documented in the Wells Project are discussed below.

Table 3.3.3.4-2 State RTE species detected at the Wells Project.

Common Name	Species Name	State Designation
American White Pelican	*Pelecanus erythrorhynchos*	Endangered
Golden Eagle	*Aquila chrysaetos*	Candidate
Bald Eagle	*Haliaeetus leucocephalus*	Sensitive
Common Loon	*Gavia immer*	Sensitive
Sage Thrasher	*Oreoscoptes montanus*	Candidate

Source: EDAW, Inc. 2006*b*; Parametrix, Inc. 2009*b*.

Sharp-tailed grouse and greater sage-grouse are known to have historically occurred in the Project vicinity (Hays et al. 1998*a*, 1998*b*; Stinson et al. 2004, 2007). These species were specifically targeted during 2008 surveys, but were not detected (EDAW 2006*b*; Parametrix, Inc 2009*b*).

Golden Eagle

Golden eagles are listed as a sensitive species in Washington (WDFW 2009*b*). The golden eagle is also protected under the Bald and Golden Eagle Protection Act of 1940 as amended (16 U.S.C. §§ 668-68d) and the Migratory Bird Treaty Act of 1918 (16 U.S.C. §§ 703-12). The golden eagle inhabits a wide range of latitudes throughout the Northern Hemisphere and uses a variety of habitats ranging from arctic to desert (NatureServe 2008). Golden eagles are most common in the western part of the United States (U.S.)

and are found near open spaces that provide hunting habitat and often near cliffs that supply nesting sites (Kochert et al. 2002). Golden eagles typically nest in mountainous canyon land, rim rock terrain of open desert and grassland areas, and forage in open habitats, such as grasslands or shrub steppe vegetation (Watson and Whalen 2004). Documented declines in this species are attributed primarily to direct mortality from humans and the loss of this eagle's traditional shrub steppe foraging habitat (Kochert et al. 2002).

Golden eagles are known to occur in the Wells Project. Single occurrences were documented in both the reservoir and transmission line studies (EDAW 2006*b*; Parametrix, Inc. 2009*b*). Although only documented on the site during the spring/summer, golden eagles are known to occur year round throughout Washington (Kochert et al. 2002).

Bald Eagle

Bald eagles are listed as a sensitive species in Washington (WDFW 2009*b*). Previously listed under the ESA, bald eagles were delisted on August 8, 2007 by an amendment to 50 CFR Part 17 (72 FR 37346, July 9, 2007). The bald eagle is also protected under the Bald and Golden Eagle Protection Act.

Bald eagles winter in the Wells Project in relatively large numbers; the maximum number observed during a single day on the Wells Reservoir was 68, observed on January 1998 (Hallet 2005). Bald eagles wintering in the Wells Project feed primarily on American coots, which comprise 64 percent of winter diets (Fielder 1982). Wintering eagles also feed on big game carrion, waterfowl, fish, and game birds. Three bald eagle communal roosts are found adjacent to the Wells Reservoir (Hallet 2003, 2004, 2005).

There are three active bald eagle nests in the vicinity of the Wells Project (Hallet 2003, 2004, 2005, 2006, 2007, 2008). One nest is at the Azwell Roost in a large ponderosa pine tree. The second nest is located above Bridgeport Bar, in a ponderosa pine tree just below the crest of the rim rock. Both of these nest sites are outside the Project Boundary. A third nest is located within the Wells Project Boundary and was discovered in 2004 in a small ponderosa pine tree across the Columbia River from Bridgeport. Two young were fledged from this nest in 2004; the site was reused in 2005; but nesting success since 2004 is unknown. Bald eagles raising young in the vicinity of the Wells Reservoir have an abundant supply of fish for a primary prey base.

Under the requirements of the 1982 Wildlife Mitigation Agreement, Douglas PUD constructed 25 perch poles in areas used by bald eagles. The perch poles have been maintained and replaced when needed. Some poles have been removed in areas where the poles are not being used by eagles but instead by piscivorous birds such as cormorants.

Douglas PUD also actively protects large riparian trees along the Wells Reservoir from beavers and damage caused by adjoining property owners. Cottonwood saplings and cuttings have been planted on the Wells Reservoir to provide future perches for bald eagles. In addition, Douglas PUD owns 33 acres of mixed conifer habitat outside of the Wells Project at the Brewster Roost that is adjacent to BLM land. Douglas PUD owns this land and has set it aside to protect the Brewster Roost from future development.

American White Pelican

American white pelicans are listed as endangered by Washington State. These pelicans are colonial nesters, breeding primarily in the western and central U.S. and Canada, and wintering along the southern coast of the U.S. and in Mexico (NatureServe 2008). American white pelicans breed mainly on isolated islands in freshwater lakes and forage on inland marshes and shallows of lakes and rivers (Knopf and Evans 2004). During the spring and fall migration, pelican are known to make frequent stops at aquatic foraging and loafing areas similar to those used during breeding season (Knopf and Evans 2004).

A non-breeding aggregation of sub-adult white pelicans spends summer and fall on the Columbia River in Chelan, Douglas, and Okanogan counties. Seventy-three white pelicans arrived on the Wells Reservoir for the first time in 1989 (Hallet 1990). White pelican numbers have fluctuated over the years with a high count of 204 in 1990 and a low count of 41 in 1992; 155 pelicans were counted on the Wells Reservoir in 2004 (EDAW 2006*b*; Hallet 1990 through 2005). White pelicans usually arrive in June and remain until October. The pelicans using the Wells Reservoir during the summer are non-breeding birds (EDAW 2006*b*; Hallet 1990 through 2005). No evidence of secondary sexual characteristics, indicating breeding-age birds, has been observed on pelicans on the Wells Reservoir (EDAW 2006*b*; Hallet 1990 through 2005). There does not appear to be suitable nesting habitat within the Wells Project. The nearest known breeding population of pelicans is located nearly 100 miles north of the Project in Canada (EDAW 2006*b*).

Common Loon

The common loon is currently listed as a sensitive species in Washington (WDFW 2009*b*). (The species was a state "proposed threatened" species in 1983, but no listing action was taken [Richardson et al. 2000].) Common loons breed on relatively-undisturbed clear, oligotrophic lakes greater than 49 acres in size that are surrounded by forest and have rocky shorelines with deep inlets and bays and numerous islands (Mcintyre and Barr 1997; Richardson et al. 2000). During early winter, loons are also found at numerous inland localities, including large lakes, rivers, and reservoirs. Common loons nest at ground level within 5 feet of water; typically along shorelines, or on small islands or floating bog mats (Mcintyre and Barr 1997). Common loon nest sites have been documented on lakes and reservoirs in Ferry, Okanogan, Douglas, and Chelan counties in eastern Washington and Whatcom and King counties in western Washington, but none have been reported in the Wells Project vicinity (Richardson et al. 2000).

Common loons are known to occur year round in the Wells Project area. Loons were observed on all lacustrine and riverine water bodies of the Project and were documented during both spring and fall survey events, but were most abundant in the Project during the fall, when 62 detections occurred.

Sage Thrasher

The sage thrasher is a candidate species for listing in Washington State (WDFW 2009*a*). Sage thrashers are typically found in shrub steppe habitat that is dominated by big sagebrush (Reynolds et al. 1999; Vander Haegen 2004). However, while considered a sagebrush obligate species, sage thrasher have been documented in bitterbrush habitat in Washington (Smith et al. 1997 *as cited in* Reynolds et al. 1999). Based on data from several sites in the Columbia Basin and north Great Basin in Washington, sage thrasher abundance is positively correlated with woody cover and bare ground and negatively correlated with grass cover (Rotenberry and Wiens 1980 *as cited in* Reynolds et al. 1999).

Seventeen observations of sage thrashers (15 of which were singing male birds, presumably occupying breeding territories) were recorded both within and adjacent to the transmission line corridor. Sage thrashers were observed in shrub steppe habitat during both the spring and fall along the transmission line corridor during 2008 field surveys. Sage thrashers were not documented during 2005 surveys of the Wells Project lands surrounding the reservoir.

Avian Use of the Transmission Line and Structures

Transmission line structures can benefit raptors by providing perch and/or nesting structures in areas where few natural perches or nest sites are available. These same structures can pose a threat to raptors and migratory birds through electrocution and collision with conductors. Avian electrocutions and collisions with power lines have been documented nearly as long as utilities have provided power to the public and industry (Avian Power Line Interaction Committee [APLIC] 1994, 1996, 2006; APLIC and USFWS 2005).

A transmission line avian effects literature review was conducted in 2005 (EDAW 2006*c*), and surveys of the Wells Project 230 kV transmission corridor were conducted in 2008 to document evidence of avian collisions with the transmission line and associated structures (Parametrix, Inc. 2009*b*). Three bird carcasses were found during focused surveys, and three other carcasses were found incidental to other survey efforts. No evidence of collision was noted from these six carcasses. Annual maintenance inspections conducted since 1968 have found no evidence of birds being electrocuted by the Wells Project transmission line. Eleven nests of raptors and corvids were detected within or adjacent to the transmission line corridor, including four on the transmission towers.

In late September 2008, Douglas PUD and WDFW conducted joint surveys for migrating raptor concentrations to determine whether a raptor migration corridor existed in the vicinity of the transmission line corridor (Parametrix, Inc. 2009*b*). Over the course of 10 surveys, only 37 observations of raptors were made, including six raptor species, and three unidentified hawks. Raptor species observed along the transmission line corridor were: northern harrier, Cooper's hawk, red-tailed hawk, golden eagle, merlin, and prairie falcon. Thirteen birds were observed crossing over or under the transmission lines and an additional 13 were seen perching on towers.

The small number of raptors observed during these surveys suggests that a raptor migration corridor does not exist along the Wells Project transmission corridor in western Douglas County. Wind conditions are more conducive for migration west of the Columbia River, in the Cascade Foothills. For comparison, late September 2008 surveys (16th to 30th) at the Chelan Ridge site, several miles west of Wells Dam, counted 662 migrating raptors, with peak passage rates in excess of eight raptors per hour (HawkWatch International, Inc. 2008).

Piscivorous Wildlife Control Program

To reduce predation at the Wells and Methow fish hatcheries, Douglas PUD implemented a predator control program that targets piscivorous birds and mammals. This predator control program is an important tool for maintaining the NNI survival goals of the Wells HCP. In 1993, Douglas PUD also contracted with the USDA Wildlife Services to reduce bird predation at Wells Tailrace. Bird species affected by the avian control program include ring-billed gull, California gull, Bonaparte's gull, Caspian tern, common tern, mallard, common and hooded merganser, great blue heron, and belted kingfisher.

Methods of controlling avian predation have changed over the years. Until the mid-1980s, Washington State hatchery policy encouraged hatchery employees to kill piscivorous birds feeding on fish reared in hatcheries along with hazing to reduce fish mortality. More recently, Washington State hatchery staff has been administratively prevented from harassing or killing piscivorous birds on hatchery grounds. Techniques employed by contracted hazing staff include pedestrian hazing, pyrotechnic shotgun shells (cracker shells), exploding rockets, and propane cannons to reduce bird predation. In 1994, bird exclusion wires were installed over the hatchery rearing ponds. Bird exclusion wires are also installed at the Wells Tailrace to limit access by piscivorous birds.

Douglas PUD's bird and mammal hazing programs were studied November 2007 through April 2008 (Douglas PUD 2008). The goal of the study was to evaluate existing practices and alternatives, and inform future management decisions related to piscivorous wildlife control measures at the Wells Project and associated hatchery facilities. The study found that the current combination of active and passive non-lethal control measures implemented at the Wells Project appear to effectively limit predation during daylight hours. The study team observed 6,839 birds utilizing the Wells Hatchery during periods when hazing did not occur, versus 2,288 bird attempts to use the Wells Hatchery when hazing was occurring. In the absence of hazing, the most frequently observed species were great blue heron, mallard, common goldeneye, American coot, and lesser scaup. The most frequently observed species during hazing were common merganser, bufflehead, great blue heron, and mallard. The most common mammals are raccoon and river otters.

Environmental Effects

Douglas PUD is not proposing any changes to the operation of the Wells Project, other than the implementation of proposed environmental measures. Current operations include Project maintenance activities such as transmission line vegetation clearing and road maintenance, each conducted in compliance with Douglas PUD's Land Use Policy (Douglas PUD 2009*b*). In addition, Douglas PUD's proposed environmental measures that are related to wildlife resources include a WBMP, APP, and RMP. The potential effects of each of these are discussed below. In addition, an assessment of the effects of reservoir water level fluctuations, Douglas PUD's piscivorous wildlife program, and transmission line is provided.

During scoping of issues for development of relicensing studies, the Terrestrial RWG found that Douglas PUD's fee-title ownership of Wells Project lands has produced substantial benefits for wildlife. These benefits are conferred in part through Douglas PUD's current implementation of its Land Use Policy. The additional implementation of Douglas PUD's WBMP, RMP, and APP are expected to bring continued benefits to wildlife resources associated with the Wells Project. Collectively, these measures protect wildlife resources through the use of BMPs, noxious weed control, revegetation of areas disturbed by Project maintenance, and restrictions on land use, development, education, and carefully-managed recreational use of wildlife lands.

Vegetation clearing and other Project maintenance activities are not conducted in the vicinity of riparian and wetland areas, which represent the most important habitats to wildlife in the Wells Project. Improvements to recreational facilities described in the Wells Project RMP will occur adjacent to or in areas that are currently disturbed, offering limited habitat for wildlife. As a result, no effects of these Project activities on wildlife resources are expected.

Water level fluctuations are unlikely to affect amphibian populations, because suitable habitat for amphibians in the Wells Project is associated with ponds and sloughs that do not have direct surface connection to Wells Reservoir. In areas without surface water connection, daily reservoir fluctuations have a negligible effect on water levels. Areas that are directly connected to Wells reservoir are generally not suitable for amphibian breeding, in part because of the presence of predatory fish (DTA 2006*a*).

Significant numbers of waterfowl are also known to use open-water areas of the Project, particularly during migrations and over winter, and may be susceptible to water level fluctuations. Reservoir fluctuations may temporarily displace some species from preferred shoreline habitats while benefiting others by making aquatic plants easier to reach, thereby, reducing energetic costs. Changes in waterfowl distribution resulting from water level fluctuations are expected to be brief in duration and are unlikely to have significant consequences for waterfowl, as evidenced by the high level of waterfowl use (DTA 2006*a*). The cultivation of annual grain crop food sources for waterfowl (funded by Douglas PUD in the Bridgeport Bar and Washburn Island Units of the WWA) provides food for waterfowl in the winter and spring months. If there are any adverse effects of water level fluctuations on waterfowl, the food plots planted annually on the WWA should mitigate for those effects.

Four state special-status wildlife species are known to use the Wells Project reservoir or transmission line corridor. Riparian and upland habitats supporting these species will not be detrimentally affected by the Project. Vegetation management conducted for transmission line maintenance targets low conifers and will not affect shrub steppe habitats, riparian and wetland habitats, or any areas not currently cleared. These habitats will continue to be protected through Douglas PUD's fee-title ownership and implementation of Douglas PUD's Land Use Policy, WBMP, and APP. Improvements to recreational facilities described in the Wells RMP are not proposed within any areas potentially supporting state special-status wildlife. As a result, no effects of the Project on these resources are expected.

Transmission lines and towers can have impacts on wildlife; potential impacts include bird collisions and raptor nesting (EDAW 2006*c*). Line-related factors influencing collision and electrocution risk include the configuration and location of the line and line placement with respect to other structures or topographic features (APLIC and USFWS 2005; APLIC 2006, EDAW 2006*c*). However, the Wells Project 230 kV corridor structural configuration (e.g., magnitude of towers and large diameter of conductors) reduces the risk for collisions by migrating birds. Due to suspension of the conductors several feet below the towers, and the wide spacing (>12') between lines, it is essentially impossible for even the largest birds to be electrocuted (Parametrix, Inc. 2009*b*).

The nearest known concentration of fall migrating raptors is at Chelan Ridge, located more than 15 miles west of Wells Dam (HawkWatch International 2008). Specific surveys for potential avian impacts found no evidence of a raptor migration corridor intersecting the transmission line corridor (Parametrix, Inc. 2009*b*). No raptor concentrations were observed along the transmission line corridor during the peak fall raptor migration period, and there was no indication of raptors avoiding or being adversely affected by transmission lines or towers (Parametrix, Inc. 2009*b*). Six bird carcasses were found during the avian transmission line collision survey, but there was no direct evidence of avian collision (Parametrix, Inc. 2009*b*). Therefore, the Wells Project is not expected to have any adverse effects related to avian interaction with the transmission line.

Grouse and other ground-nesting bird species may be affected by transmission lines via collision hazard or the indirect effects of adding perches for predatory raptors (Douglas PUD 2008). The perceived threat of predation associated with utility lines may also cause prairie grouse to avoid utility lines, effectively causing abandonment of leks, nest sites, and brood-rearing areas near utility lines (EDAW 2006*c*; Parametrix, Inc. 2009*b*). However, sage grouse and sharp-tailed grouse do not presently occur in the Wells Project, including the transmission line corridor (EDAW 2006*b*; Parametrix, Inc. 2009*b*). The nearest known sage grouse lek is approximately 5 miles east of the northern portion of the transmission line corridor (Parametrix, Inc. 2009*b*).

Eleven nests of raptors or corvids were detected within or adjacent to the study area, including four on the transmission towers. To date, no nests have been removed from Project transmission towers (Parametrix, Inc. 2009*b*). The USFWS and WDFW will be consulted prior to any nest removal activities, and active nests will not be removed from the Wells Project transmission line between February 1 and August 31 without prior approval from the USFWS and WDFW. All nest removals and other management related to avian interactions with the Wells transmission line will be managed under Douglas PUD's APP, prepared in consultation with the WDFW and USFWS.

In accordance with section 4.3.3 of the Wells HCP, Douglas PUD implements a predator control and harassment program to reduce the level of predation on anadromous fish at Douglas PUD's two salmon hatcheries and in the tailrace and reservoir surrounding Wells Dam. These control measures may cause disruption and direct mortality to some piscivorous wildlife species and may affect non-target species as well. Piscivorous species are disturbed and dispersed by ongoing non-lethal hazing activities. Despite hazing activities, individuals of these species continue to appear, suggesting effects on these species are temporary in nature. It appears that the disturbance from hazing is tolerated and does not appear to result in significant detrimental impacts to the species. Lethal measures have also been employed as part of the nuisance predator control program and have resulted in direct mortality of the target species. The number of birds killed annually between 1996 and 2007 ranges between 100 and 600 individuals. Starting in 2007, no lethal control actions have been implemented at the Wells Project (Douglas PUD 2008).

Proposed Environmental Measures

As previously described, Douglas PUD proposes to implement the WBMP that was developed in coordination with federal, state, and tribal entities. This plan provides substantial protections for wildlife in Wells Project reservoir lands and transmission line corridor. Implementation of the WBMP during the term of the new license will provide continued protection and will minimize impacts to wildlife resources. Additionally, the Off-License Settlement Agreement and Land Use Policy further serve to protect, maintain, and enhance wildlife habitats in the Wells Project.

Douglas PUD will also implement the Wells Project 230 kV Transmission Line APP to further address wildlife resource issues related to the relicensing of the Wells Project. The goal of the APP is to protect resident and migrant birds that interact with the Wells Project 230 kV transmission lines. The APP was developed to protect resident and migrant birds that interact with the Wells Project 230 kV transmission lines. Douglas PUD is committed to maintaining the reliability of the transmission lines as required by NERC and meeting the regulatory requirements to conserve migratory species, special-status wildlife, raptors, and other avian wildlife.

Douglas PUD will implement the following practices and protocols under the APP:

- **Reporting Protocol:** All avian mortalities found in the transmission line corridor will be reported to the appropriate parties.
- **Nest Management Protocol:** Douglas PUD will implement a Nest Management Protocol in compliance with federal and state bird protection laws.
- **Tree Removal Protocol:** Tree removal as part of transmission corridor maintenance will only occur between August 31 and January 31 to protect migratory birds.
- **Training Protocol:** All appropriate utility personnel will be trained to evaluate avian issues when performing maintenance on the transmission lines and corridor.

Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on wildlife.

3.3.4 Threatened and Endangered Species and Critical Habitats

3.3.4.1 Affected Environment

As the FERC's designated representative for informal ESA Section 7 consultation, Douglas PUD prepared a draft BA (Exhibit E; Appendix E-7) of the effects of the proposed relicensing of the Project on candidate, threatened, and endangered species, and proposed and designated critical habitats. Through consultation with the USFWS and NMFS (Exhibit E; Appendix E-8), 16 ESA endangered, threatened, or candidate species were identified as potentially occurring within Douglas, Okanogan, and Chelan counties (Table 3.3.4.1-1). This species list included three fishes, four birds, six mammals, and three plant species.

Table 3.3.4.1-1 ESA-listed species potentially occurring in Douglas, Okanogan, and Chelan counties.

Listed Species	Scientific Name	Listing Status	Listing Authority
Bull Trout	*Salvelinus confluentus*	Threatened	USFWS
Chinook Salmon (Upper Columbia River Spring-run ESU)	*Oncorhynchus tshawytscha*	Endangered	NMFS
Steelhead (Upper Columbia River DPS)	*Oncorhynchus mykiss*	Threatened	NMFS
Marbled Murrelet	*Brachyramphus marmoratus*	Threatened	USFWS
Greater Sage-Grouse (Columbia Basin DPS)	*Centrocercus urophasianus*	Candidate	USFWS
Fisher (West Coast DPS)	*Martes pennanti*	Candidate	USFWS
Pygmy Rabbit (Columbia Basin DPS)	*Brachylagus idahoensis*	Endangered	USFWS
Gray Wolf	*Canis lupus*	Endangered	USFWS
Grizzly Bear	*Ursus arctos horribilis*	Threatened	USFWS
Canada Lynx	*Lynx canadensis*	Threatened	USFWS
Northern Spotted Owl	*Strix occidentalis caurina*	Threatened	USFWS
Washington Ground Squirrel	*Spermophilus washingtoni*	Candidate	USFWS
Yellow-billed Cuckoo	*Coccyzus americanus*	Candidate	USFWS
Wenatchee Mountains Checkermallow	*Sidalcea oregana var. calva*	Endangered	USFWS
Showy Stickseed	*Hackelia venusta*	Endangered	USFWS
Ute Ladies'-tresses	*Spiranthes diluvialis*	Threatened	USFWS

During the completion of numerous studies, many of which were specifically designed to identify and document the presence of ESA-listed or candidate species, only three ESA-listed species have been identified within the Wells Project (McGee 1979; Zook 1983; Beak and Rensel Associates Inc. 1999; BioAnalysts, Inc. 2006; EDAW 2006*a*, 2006*b*; Lê and Kreiter 2006; Anchor and Douglas PUD 2005, 2006, 2007, 2008, 2009; Parametrix, Inc. 2009*b*). All three of these species are fish including bull trout, UCR spring-run Chinook salmon (spring Chinook), and UCR steelhead (steelhead).

In addition to assessing Project effects on bull trout, spring Chinook and steelhead, the FERC's SD2 specified that Doulas PUD's studies and license application should consider the effects of Project operations (reservoir fluctuations) and Project-related recreation on the federally-listed bald eagle. However, subsequent to issuance of SD2, the bald eagle was removed from the ESA list (USFWS 2007*b*). Therefore, the analysis in this section does not include delisted bald eagle.

The draft BA (Exhibit E; Appendix E-7) compiles and synthesizes the results of numerous studies conducted to detect the presence within the Project of RTE species (McGee 1979; Zook 1983; Beak and Rensel Associates, Inc. 1999; BioAnalysts, Inc. 2006; EDAW 2006*a*, 2006*b*; Lê and Kreiter 2006; Parametrix, Inc. 2009*b*). Except for the three listed fish species, no additional occurrences of ESA-candidate or listed species were identified within the Project Boundary.

UCR Spring-Run Chinook

The UCR spring-run Chinook was listed under the federal ESA as endangered on March 24, 1999 (64 FR 14308). The endangered status for spring Chinook was reaffirmed on June 28, 2005 (70 FR 37160). The ESU for UCR spring Chinook includes all naturally-spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington (excluding the Okanogan River). Six artificial propagation programs were included in the listing determination including the Twisp, Chewuch, Methow Composite, Winthrop NFH, Chiwawa River, and White River spring-run Chinook hatchery programs (NMFS 2009).

The regulatory status, life history, abundance, critical habitat designation, and spring Chinook study results were previously described in section 3.3.2.4 of this EA.

UCR Steelhead

The UCR steelhead was listed under the federal ESA as endangered on August 18, 1997 (62 FR 43937). NMFS considers all UCR steelhead returning to tributary streams upstream of the confluence of the Yakima River and the Columbia River as belonging to the UCR DPS (NMFS 2008). The status of ESA-listed UCR steelhead was changed to threatened on January 5, 2006 (71 FR 834). This listing was reinstated to endangered status per U.S. District Court decision in June 2007 (NMFS 2008). In March 2009, the Ninth Circuit upheld NMFS decision to list UCR steelhead as threatened and not endangered, overturning the June 2007 District Court decision.

The regulatory status, life history, abundance, critical habitat designation, and steelhead study results were previously described in section 3.3.2.4 of this EA.

Bull Trout

On June 10, 1998, the USFWS listed bull trout within the Columbia River basin as threatened under the ESA (63 FR 31647). Later (November 1, 1999), the USFWS listed bull trout within the coterminous U.S. as threatened under the ESA (64 FR 58910). Currently, there is no critical habitat for bull trout found within the Wells Project. However, the USFWS recently proposed critical habitat designation for bull trout that would include all waters within the Wells Project except the Okanogan River (75 FR 2270). The deadline for the USFWS submittal of a final bull trout critical habitat designation to the federal register is September 30, 2010.

The regulatory status, life history, and bull trout study results were previously described in section 3.3.2.5 of this EA.

Terrestrial Species

No listed, proposed, or candidate wildlife or plant species were found within the Wells Project Boundary. No designated or proposed upland critical habitats occur within the Wells Project (USFWS 2008). The closest designated critical habitat is Wenatchee Mountains' checker-mallow habitat, located in Chelan County, approximately 40 miles to the southwest of the Wells Project.

3.3.4.2 Environmental Effects

Environmental effects of the proposed action were analyzed in detail in the BA. Table 3.3.4.2-2 presents a summary of effects determinations for the 16 ESA-listed and candidate species.

Table 3.3.4.2-2 Summary of effects determination for ESA-listed and candidate species.

Listed Species	Effect Determination (Species)	Effect Determination (Critical Habitat)	Comments
Fish Species			
Bull Trout (*Salvelinus confluentus*) Threatened	May effect, likely to adversely affect	Habitat lies outside of Project area and would not be affected by Project activity, however current proposed critical habitat would include all waters within the Wells Project. Final critical habitat designation available in October, 2010.	Resident fish primarily occupy the Methow River (tributary). Passage does occur at Project facilities and some foraging occurs in the Wells Reservoir and hatchery outfalls
Upper Columbia River Spring-run Chinook (*Oncorhynchus tshawytscha*) Endangered	May effect, not likely to adversely affect	Habitat within the Project primarily serves as a migratory corridor and would not result in destruction or adverse modification of designated or proposed critical habitat	Rearing and spawning occurs in the Methow River (tributary). Lower tributary and reservoir used as a migratory corridor.
Upper Columbia River Summer-run Steelhead (*Oncorhynchus mykiss*) Threatened	May effect, not likely to adversely affect	Habitat within the Project primarily serves as a migratory corridor and would not result in destruction or adverse modification of designated or proposed critical habitat	Rearing and spawning occurs in the Methow and Okanogan rivers (tributaries). Lower tributary and reservoir used as a migratory corridor.
Wildlife Species			
Marbled Murrelet (*Brachyramphus marmoratus*) Threatened	No effect	Would not result in destruction or adverse modification of designated or proposed critical habitat	Nesting habitat within North Cascades National Park, outside of Project Area
Greater Sage-Grouse (Columbia Basin DPS) (*Centrocercus urophasianus*) Candidate	No effect	Critical habitat not designated	No documented populations within the Project Area
Fisher (West Coast DPS) (*Martes pennanti*) Candidate	No effect	Critical habitat not designated	No documented populations or suitable habitat within or near the Project Area
Pygmy Rabbit (Columbia Basin DPS) (*Brachylagus idahoensis*) Endangered	No effect	Critical habitat not designated	Project Area outside of historical range and recovery emphasis areas
Gray Wolf (*Canis lupus*) Endangered	No effect	Critical habitat not designated	No documented populations or suitable habitat within or near the Project Area

Listed Species	Effect Determination (Species)	Effect Determination (Critical Habitat)	Comments
Grizzly Bear (*Ursus arctos horribilis*) Threatened	No effect	Would not result in destruction or adverse modification of designated critical habitat	North Cascades Grizzly Bear Recovery Area includes part of Methow River upstream of Project Area
Canada Lynx (*Lynx canadensis*) Threatened	No effect	Would not result in destruction or adverse modification of designated or proposed critical habitat	Project area not located in Washington State Lynx Management Zones or designated critical habitat
Northern Spotted Owl (*Strix occidentalis caurina*) Threatened	No effect	Would not result in destruction or adverse modification of designated critical habitat	No documented populations or suitable habitat within the Project Area
Washington Ground Squirrel (*Spermophilus washingtoni*) Candidate	No effect	Critical habitat not designated	No documented populations within the Project Area
Yellow-billed Cuckoo (*Coccyzus americanus*) Candidate	No effect	Critical habitat not designated	No documented populations within or near the Project Area
Plant Species			
Wenatchee Mountains Checkermallow (*Sidalcea oregana var. calva*) Endangered	No effect	Would not result in destruction or adverse modification of designated critical habitat	No documented populations within or near the Project Area
Showy Stickseed (*Hackelia venusta*) Endangered	No effect	Critical habitat not designated	No documented populations within or near the Project Area
Ute Ladies'-tresses (*Spiranthes diluvialis*) Threatened	No effect	Critical habitat not designated	No documented populations within or near the Project Area

3.3.4.3 Unavoidable Adverse Effects

The Wells Project will continue to injure or kill individual UCR spring Chinook salmon and UCR steelhead. Population level effects to UCR spring Chinook and UCR steelhead are mitigated through the Wells HCP.

3.3.5 Recreation and Land Use

3.3.5.1 Recreation

Affected Environment

Many people take advantage of the recreation opportunities available at the Wells Project. During the spring and summer, visitors use the Wells Project for boating, fishing, bird watching, hiking, and RV camping. Sportsmen visit the area to fish and to hunt waterfowl, upland birds, and deer.

There are approximately 108 miles of publicly accessible reservoir shoreline in the Wells Project. Also within the Project Boundary are approximately 15 miles of shoreline around isolated ponds, the largest being Washburn Pond. Douglas PUD owns approximately 2,649 acres of the 2,664 acres of land adjacent to the Wells Reservoir within the Project Boundary.

The majority of land adjacent to the Wells Project Boundary is privately owned and used for agriculture, rangeland, and residences. Agricultural uses include pasture and hayfields, orchards, nurseries, and lands used to grow annual crops. Natural meadow areas and the dry shrub steppe areas are largely used as rangeland. Residential areas are found primarily around the incorporated cities of Bridgeport, Brewster, and Pateros.

Regional Resources

There are many regional recreation opportunities in the vicinity of the Wells Project (within 60 miles). Recreation resources in the region are managed by a variety of entities and provide a variety of outdoor-oriented recreation opportunities.

Several of the primary regional recreation resources are under federal or state management. The Okanogan-Wenatchee National Forest is located in the region to the north, west and south of the Wells Project and provides overnight and day-use opportunities. While these opportunities are primarily land-based, they also have some water-based opportunities. The NPS manages the Lake Roosevelt and Lake Chelan Recreation Areas which provide a large number of water-based recreation opportunities in the region. Several state parks in the region also provide both land- and water-based recreation opportunities (DTA 2008).

Many of the towns, cities, and counties in the region surrounding the Wells Project also provide important recreation opportunities for both area residents and visitors alike. U.S. Highway 97, south of the city of Pateros, is a National Scenic Byway. Some of these recreation resources also provide similar experiences and opportunities to those found in the Wells Project area; however, many are focused on more urban (e.g., city parks, ball fields, community centers, trails, etc.) and land-based activities.

There are no federal- or state-designated recreation areas within the Wells Project Boundary. Lands and waters within the Wells Project Boundary are also not located within or adjacent to any of the following: (1) a National Wild and Scenic River System or a state-protected river segment; (2) lands under study for inclusion in the National Trails System or Wilderness Area; or (3) in the vicinity of any regionally- or nationally-important recreation areas. Designated recreation areas found within 20 miles of the Wells Project Boundary include:

- **Alta Lake State Park -** A 181-acre camping park located 4 miles southwest of Pateros on Highway 153.
- **Bridgeport State Park -**A 748-acre camping park located 3 miles northeast of Bridgeport on the Columbia River (Rufus Woods Lake) directly upstream of Chief Joseph Dam.
- **Fort Okanogan State Park -** A 45-acre day-use park and interpretive center located near the mouth of the Okanogan River on a high plateau overlooking the Wells Reservoir.
- **Lake Chelan -** The Lake Chelan area is a premiere tourist destination regionally and nationally. The Lake Chelan area offers water sports, camping, hiking, and numerous wineries and dining opportunities. Winter sports include cross-country skiing, snowshoeing, and snowmobiling.

Project Resources

Douglas PUD's approach to developing and enhancing recreational access to and use of the lands and waters within the Project Boundary has been documented in its Wells Recreation Plan (1967), Wells Recreation Plan Supplement (Douglas PUD 1974), Public Use Plan (Douglas PUD 1982), and Recreation Action Plans (Douglas PUD 1987, 1992*b*, 1997*b*, 2002*a*, 2007). Douglas PUD has funded and developed 17 formal recreation facilities along the Wells Reservoir in Pateros, Brewster, and Bridgeport and along the lower reaches of the Methow and Okanogan rivers (Figure 3.3.5.1-1). The most frequent recreation activities for Wells Project visitors include relaxing, camping, fishing from a boat, speed/sport boating, fishing from shore, and swimming (DTA 2006*b*).

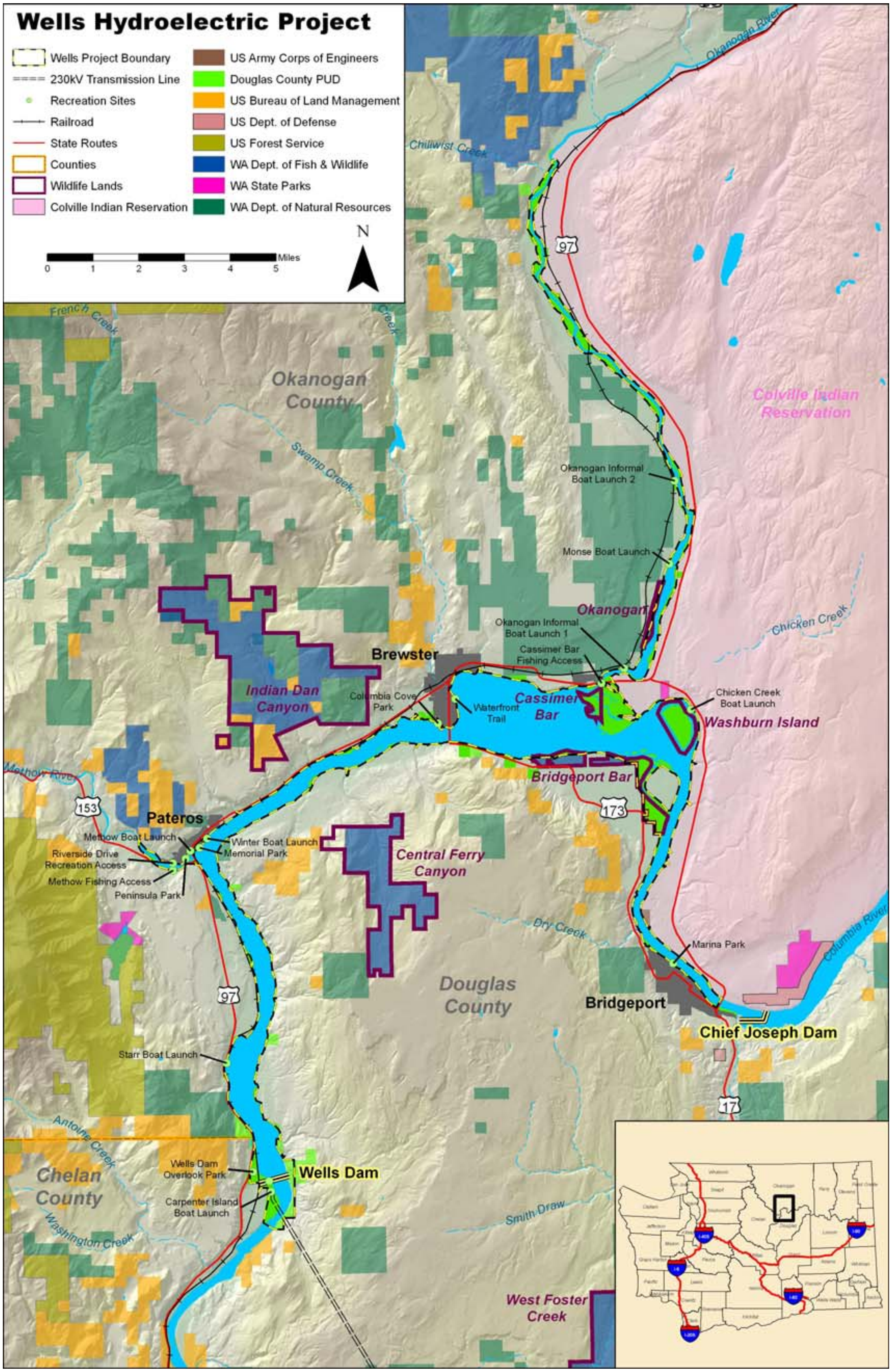

Figure 3.3.5.1-1 Wells Project recreation sites.

Project recreation facilities located within the City of Pateros include Peninsula Park, Memorial Park, Pateros Winter Boat Launch, Methow Boat Launch, and Riverside Drive Recreation Access.

- **Peninsula Park -** Peninsula Park is located near the confluence of the Methow and Columbia rivers. It includes one gazebo, paved walking path, covered picnic shelter, swimming beach, restroom facilities, playground equipment, swimming lagoon, vehicle parking, and lawn area.
- **Memorial Park -** Memorial Park is located in Pateros along the Columbia River. It includes three covered picnic shelters, fishing and ski docks, vehicle parking, interpretive displays, playground equipment, concrete water access ramp, restroom facilities, and a developed waterfront trail with park benches and lighting. The waterfront trail begins at the east end of Memorial Park near City Hall and meanders through the park, under the Highway 97 Bridge, and terminates at the Methow Boat Launch.
- **Pateros Winter Boat Launch -** The Pateros Winter Boat Launch is located in Pateros upstream of Memorial Park along the Columbia River. The site includes a concrete boat launch, dock, and parking. This boat launch provides access to the Wells Reservoir all year including the winter when the Methow Boat Launch closes due to ice on the Methow River.
- **Methow Boat Launch -** The Methow Boat Launch is located in Pateros between Peninsula Park and Memorial Park at the confluence of the Columbia and Methow rivers. The site includes a concrete boat launch and dock, parking, basketball hoops, and restrooms. The boat launch area is connected to Memorial Park via an accessible walkway underneath Highway 97 and the railroad bridge.
- **Riverside Drive Recreation Access -** The Riverside Drive Recreation Access is located along the left bank of the Methow River upstream from Peninsula Park. The site includes a gradual landscaped access to the Methow River for fishing, kayaking, or canoeing.

Project recreation facilities located within the City of Brewster include Columbia Cove Park and the Brewster Waterfront Trail.

- **Columbia Cove Park -** Columbia Cove Park includes a boat launch, boat docks, three covered picnic shelters, swimming beach, restroom facilities, playground equipment, lawn area, and vehicle parking.
- **Brewster Waterfront Trail -** The waterfront trail in Brewster is located north of the park and extends approximately ½ mile along the Brewster city waterfront and consists of compacted gravel surface. The city of Brewster developed the trail with the assistance of Douglas PUD and WDNR. The trail is generally 6 to 8 feet above the water level and 20 feet or more below adjacent streets and residential

areas. It is connected to city streets at either end by ramps and at three intermediate locations by stairs.

Project recreation facilities in the City of Bridgeport include Marina Park, which is located on lands and waters within the Wells Project Boundary. The City of Bridgeport operates an 18-site RV park within Marina Park.

- **Marina Park -** Marina Park includes a fish cleaning station, covered picnic shelters, gazebo, playground equipment, swimming lagoon with beach and dock, lawn area, restrooms, vehicle parking, asphalt pathway, a boat launch, boat dock, and an RV campground. The RV campground includes 18 full hookups and four tent sites.

In addition to the facilities in Pateros, Brewster and Bridgeport, Douglas PUD has developed additional recreation sites to provide access to all segments of Wells Reservoir. These sites are described in the following sections. There are also two informal boat launch and fishing access sites on the Okanogan River within Project Boundary.

- **Wells Dam Overlook -** A viewing area overlooking Wells Dam from the west is located off of Highway 97. The Wells Dam Overlook includes vehicle and day-use RV parking, restrooms, and a picnic shelter. Exhibits at the facility include Native American pictographs, a Wells Project information kiosk, and an original Wells Project turbine runner. The Wells Dam Overlook is accessible 24-hours a day.
- **Carpenter Island Boat Launch -** The Carpenter Island Boat Launch is a concrete plank boat launch located on the right bank of the Wells Tailrace immediately downstream of the Wells Project near RM 515.5. This boat launch is located within the Wells Project Boundary on land owned by Douglas PUD and is used primarily for fishing access. It includes a single launch lane and portable toilets. Access to this launch is provided via Azwell Road. As a recreation enhancement measure under the current license, Douglas PUD is relocating this boat launch to a more accessible location nearby. Relocating the launch is a separate action from relicensing, and is contingent upon receiving the appropriate environmental permits.
- **Starr Boat Launch -** The Starr Boat Launch is located on 2.1 acres of land on the right bank of the Wells Reservoir near RM 518. It is accessible via Highway 97. This site includes a gravel parking area, concrete boat launch, and vault toilet. Recreation users access the Wells Reservoir via the Starr Boat Launch for boating, skiing, and waterfowl hunting. A turn lane for accessing the Starr Boat Launch from Highway 97 was funded by Douglas PUD and completed in 2006.
- **Methow Fishing Access -** Methow Fishing Access was funded by Douglas PUD and is located along State Highway 153 approximately ½ mile from Highway 97

at the confluence of the Columbia and Methow rivers. The site is 2.4 acres and includes a gravel car-top boat launch, gravel parking, and two vault toilets.

- **Chicken Creek Boat Launch -** The Chicken Creek Boat Launch is located near RM 537 at Washburn Island where Chicken Creek flows into the Washburn Island Slough. The facilities at the site are owned by Douglas PUD and include a concrete plank boat launch, gravel parking lot, and vault toilet. The boat launch provides access to the Washburn Island Slough but not the Wells Reservoir.
- **Monse Bridge Boat Launch -** The Monse Bridge Boat Launch was developed by Douglas PUD and is located on the right bank of the Okanogan River at RM 4.7. Facilities at the boat launch include a concrete plank launching ramp, gravel parking, and a vault toilet.
- **Cassimer Bar Fishing Access -** The Cassimer Bar Fishing Access site was developed by Douglas PUD and is located on the left bank of the Okanogan River near RM 1. The site is close to Highway 97 near the mouth of the Okanogan River. This site includes shoreline access, gravel parking, and a vault toilet.
- **Okanogan River Informal Boat Launch and Fishing Site 1**- The Okanogan River Informal Boat Launch is located on the right bank of the Okanogan River at RM 2.5. Public access to the site is available via Monse River Road off of Highway 97. This undeveloped area serves as a boat launch primarily for fishermen and waterfowl hunters. This site also provides shoreline fishing access.
- **Okanogan River Informal Boat Launch and Fishing Site 2 -** The Okanogan River Informal Boat Launch is located on the right bank of the Okanogan River at RM 6.7. Public access to the site is available via Monse River Road. This undeveloped area serves as a boat launch for waterfowl hunters and fishermen and as a shoreline fishing location.

Recreation Studies

Douglas PUD conducted three studies during the relicensing process to identify and support future recreation needs at the Wells Project. A Recreation Visitor Use Assessment (DTA 2006*b*) was conducted in 2005 to identify recreation use and preferences related to the Wells Project. In 2007, a Recreational Needs Analysis (DTA 2008) was conducted to identify current and potential future recreation needs in the Project area over the course of the new license term. In 2008, a Public Access Study (Jacobs Engineering 2008) was conducted to identify areas of the reservoir that may be difficult to access due to reservoir operations, aquatic plant growth, or obstructions.

The primary goals of the Recreation Visitor Use Assessment (DTA 2006*b*) were to describe use levels, preferences, attitudes, and characteristics of visitors to the Wells Project recreation sites. The study concluded that respondents were satisfied with facilities, with survey respondents rating their overall experience as 8.7 on a 10-point scale. The highest levels of crowding were reported at the Bridgeport RV campgrounds and the wildlife areas. The majority of respondents did not feel more controls were needed to prevent user conflicts, or to prevent environmental damage, and that enough educational/interpretive opportunities exist (DTA 2006*b*).

The goal of the Recreation Needs Analysis (DTA 2008) study was to identify current and future recreation needs at the Wells Project. The study indicated that maintenance of facilities was good overall, with a future need to upgrade restroom and access sites to meet Americans with Disabilities Act (ADA) standards. Future recreational measures included adding additional signage in Spanish, ADA-related improvements, near-shore tent camping for water trail users, and providing education about the Wells Project (DTA 2008).

The goal of the Public Access Study (Jacobs Engineering 2008) was to evaluate whether Wells Project recreation facilities such as docks, boat launches and swimming areas can be reasonably utilized under various reservoir operating scenarios and conditions. The study determined that 15 out of 17 formal access sites were accessible greater than 95 percent of the time. The only two sites that were accessible less than 95 percent of the time were the Winter Boat Launch in Pateros (91 percent) and the Monse Boat Launch on the Okanogan River (35 percent). In 2008, the Winter Boat Launch in Pateros was repaired and extended, and is now accessible over 98 percent of the time. Swimming areas were identified as most affected by aquatic plant growth.

Environmental Effects

Douglas PUD is not proposing any changes to the operation of the Wells Project. Douglas PUD has provided major maintenance at numerous public recreation facilities along the Wells Reservoir. These facilities were developed to provide reasonable access to Project lands and waters. Access to the Project for recreation will continue to be needed under the new license. Measures may be needed during the new license term to adequately fulfill the expected future increase in recreation demand, to the extent it materializes. Any new construction or significant upgrades would comply with the then-current ADA requirements. Ongoing operation and maintenance (O&M) services will be needed to provide continued access to and use of Wells Project recreation facilities.

New recreation measures proposed in the RMP, including the Marina Park expansion and boat-in tent camping facilities, will alter small amounts of upland habitat above the ordinary high water (<5 acres, less than 0.2% of Project reservoir lands). Effects on upland habitats are expected to be minimal. The RMP also includes feasibility studies for assessing the potential for additional trails within the Project Boundary in or near population centers, and for assessing the potential for additional wildlife viewing facility enhancements. The scope of potential trail development is currently unknown. However, because the trail developments would be in or near populated areas, the effects to aquatic and terrestrial resources would likely be minimal. Wildlife viewing enhancements would be in locations with the least impact to wildlife habitat.

Proposed Environmental Measures

Douglas PUD has developed a RMP (Exhibit E; Appendix E-5) to address recreation resource issues related to the relicensing of the Wells Project. The Wells Project provides substantial recreation opportunities and recreation benefits. The planned implementation of the RMP during the term of the new license will continue these recreation benefits while also protecting wetland, riparian, and shallow-water habitats.

The goal of the RMP is to provide recreational opportunity at the Wells Project throughout the term of the new FERC license in accordance with the relevant FERC requirements and the needs of the Project. This includes providing for current recreational uses and opportunities within the Project Boundary and identifying the need for any new measures or facilities to enhance recreational opportunity at the Project over the term of the new license. This management plan provides a comprehensive list of measures to support recreation uses and opportunities at the Wells Project. This plan also serves as the roadmap for operating, maintaining, updating, and improving the existing recreation facilities and a process for meeting recreation needs as they change over time.

The goal of the RMP will be met through the implementation of two programs that encompass Douglas PUD's overall approach to managing recreation resources for the term of the new license:

- **Recreation Facility Improvement Program:** This program defines Douglas PUD's responsibilities for new Project recreation developments and capital improvements to existing facilities.
- **Recreation Facility Operation, Maintenance and Monitoring Program:** This program defines Douglas PUD's responsibilities for on-going O&M at Project recreation facilities. Guidelines are provided for each type of O&M activity. Douglas PUD's recreation use monitoring program will inform future planning related to recreation management during the term of the new license.

Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on recreational resources.

3.3.5.2 Land Use

Affected Environment

The Wells Project is located within three counties of Washington State—Douglas, Okanogan, and Chelan. The mid-channel of the Columbia River is the dividing line between Douglas County and Okanogan and Chelan counties. All lands situated south and east of the reservoir are located in Douglas County. All lands situated north and the vast majority of lands situated west of the Wells Reservoir are located in Okanogan County. Lands within the Wells Project Boundary located in Chelan County consist of a relatively small area west of Wells Dam extending one mile upstream and downstream of the dam. The Project's 230 kV transmission line originates on Wells Dam, extends a short distance downstream on the Chelan County side of the tailrace, then crosses the tailrace to Douglas County for the remainder of its 41 mile length.

There are approximately 108 miles of reservoir shoreline in the Wells Project. Also within the Project Boundary are approximately 15 miles of shoreline around isolated ponds, the largest being Washburn Pond. Douglas PUD owns over 99 percent of the shoreline within the Wells Project Boundary. Lands within the Wells Project Boundary include shrub steppe; irrigated agriculture; wildlife habitat, such as the WWA; and recreation lands, including parks in Pateros, Brewster, and Bridgeport.

Douglas PUD owns approximately 2, 649 acres of the 2,664 acres of land adjacent to the Wells Reservoir within the Project Boundary. There is no private land ownership below the Project Boundary around Wells Reservoir. There are also 1,117 acres within the 235 feet wide, 41 mile transmission line ROW, the majority of which are privately owned. There is no federal land ownership within the transmission line ROW. Total acreages of federal, state and private ownership within the Wells Project Boundary are shown in Table 3.3.5.2-1.

Table 3.3.5.2-1 Acres of federal, state and private land ownership within the Wells Project Boundary

Ownership	Acreage
Federal	15.15
State	78.52
Private	1046.14

The proposed Project Boundary shown in Exhibit G of this application contains all of the lands necessary to operate the Wells Project and to implement the proposed protection, mitigation and enhancement measures. The proposed Project Boundary for the Wells Project is slightly larger than the Project Boundary under the current license. Minor modifications in the proposed Project Boundary were necessary to address past survey errors, to include all Project-related recreation facilities within the cities of Bridgeport, Pateros and Brewster, and to address the 50-year erosion potential for the reservoir. All of these modifications are reflected in the project maps filed as Exhibit G of this application.

The majority of land outside of the Wells Project Boundary is privately owned and used for agriculture, rangeland, and residences. Agricultural uses include pasture, and growing hay, orchards, nurseries, and annual crops. Natural meadow areas and the dry shrub steppe areas are largely used as rangeland. Residential areas are found primarily around the incorporated cities of Bridgeport, Brewster, and Pateros.

Project lands have been open and available for public use as required by the original FERC License and consistent with Douglas PUD’s Land Use Policy (Exhibit E; Appendix E-13). There are locations within the Wells Project where public use is restricted, including restrictions for dam safety and cultural resource and environmental protection.

The Wells Project includes two 230 kV single-circuit transmission lines. The lines extend approximately 41 miles in length from the switchyard atop Wells Dam to the Douglas Switchyard operated by Douglas PUD. The lines run parallel to each other on 45- to 85-foot steel towers along a common 235-foot-wide right-of-way. Nearly all of the transmission line right-of-way lands are privately owned.

Non-agricultural development in the Wells Project area includes the Wells Dam complex and limited residential landscaping and municipal infrastructure in and around the cities of Pateros, Brewster, and Bridgeport. Shoreline residential and/or non-agricultural commercial uses within the Wells Project Boundary are allowed only by special permit.

Environmental Effects

Douglas PUD is not proposing any changes to the operation of the Wells Project. Wells Project lands will continue to be available for public use for recreational purposes. Private uses will continue to be allowed on Wells Project lands on a limited basis through a land use permit program under Douglas PUD’s Land Use Policy. Douglas PUD has issued 194 active land use permits for the use of lands within the Wells Project Boundary by adjacent landowners for boat docks, landscaping, and agriculture. Most of these permits are expected to be renewed during the term of the new license.

Upland habitats will continue to be protected through implementation of Douglas PUD’s Land Use Policy (Exhibit E; Appendix E-13). During the scoping of resource issues for development of relicensing studies, the Terrestrial RWG members determined that fee-title ownership of Wells Project lands has produced greater benefits for wildlife and wildlife habitat than would be provided by land leases of flowage easements only. The Terrestrial RWG agreed that Douglas PUD’s ownership of lands within the Wells Project

Boundary has produced significant benefits for wildlife and habitat protection (Douglas PUD 2006).

New recreation measures, including the Marina Park expansion and boat-in tent camping facilities, will alter small amounts of upland habitat (<5 acres, less than 0.2% of Project reservoir lands). Effects on upland habitats are expected to be minimal.

Proposed Environmental Measures

Douglas PUD will continue to implement the Land Use Policy to address land use issues under the new license. Continued implementation of the Land Use Policy is expected to address any future adverse effects.

The goal of the Douglas PUD Land Use Policy is to ensure that Project operations are in compliance with the FERC license and other federal and state regulations, including: protection of fish and wildlife habitat; protection of critical habitat for ESA-listed species; protection of significant historical, cultural and natural features; and compliance with existing settlement agreements. The Land Use Policy is Douglas PUD's decision-making process for issuing any land use permit for commercial and private use of Wells Project land and waters.

Douglas PUD's Land Use Policy requires approval of all land use activities that take place within the Project Boundary. All permit activities such as construction of boat docks, piers, and landscaping within the Project Boundary are subject to review and approval by Douglas PUD only after the applicant has received all other required regulatory permits and approvals. The purpose of the Douglas PUD review and approval process captured in the Land Use Policy is to protect habitats and species that may be affected by proposed land use activities within the Project.

Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on land use.

3.3.6 Cultural Resources

3.3.6.1 Affected Environment

The APE for the Wells Project is defined as the lands within the Project Boundary and any lands outside the Project Boundary where cultural resources may be affected by Project-related activities that are conducted in compliance with the FERC license. The Wells Project Boundary extends from the tailrace of Wells Dam (RM 514.7) upstream to the tailrace of Chief Joseph Dam (RM 544.5). The boundary also extends to RM 15.5 on the Okanogan River and RM 1.5 on the Methow River. The Wells Project includes a 41 mile 230 kV transmission Right-of-Way (ROW) which is also considered part of the APE.

Context Overview

The project area is located within the ethnographic traditional territory of the Sinkayuse or Moses Columbia, and the Sinkaietk or Southern Okanogan (Cline et al. 1938; Miller 1998; Ruby and Brown 1965, 1992; Spier 1936; Teit 1928). These Salish-speaking peoples would have utilized the full range of natural resources available in the region, fishing for salmon and other fish, gathering roots and berries, and hunting for small and large game. The particular items hunted and gathered would have varied according to the season. Settlement patterns in the region included habitation of permanent, often subterranean houses during the winter in the lower valleys near rivers to avoid severe weather conditions (Teit 1928:114). Summers were spent in temporary lodges in open prairies or highlands, near hunting and gathering sources. The introduction of the horse around the 1800s facilitated utilization of a larger geographic area for gathering, hunting and trading activities.

At the time of Euro-American contact, traditional territory of the Sinkayuse filled the Columbia Plateau south and east of the Columbia River, from the mouth of the Wenatchee River south to Priest Rapids and from the Columbia River east to the vicinity of present-day Creston (Ruby and Brown 1992:204; Spier 1936). The main Sinkayuse village was at the mouth of Rock Island Creek (Ray 1974:434). The Sinkaietk lived in the area surrounding the confluence of the Columbia and Okanogan rivers and north along the Okanogan River valley (Teit 1928:203-204) to the confluence of the Okanogan and Similkameen rivers near the U.S.-Canada border (Ruby and Brown 1992:202; Spier 1936:43). The main Sinkaietk villages were on the north bank of the Columbia River, along the lower Okanogan River, and around Lake Omak (Miller 1998:254). The Methow also had villages on the lower Okanogan River (Cline et al. 1938; Ray 1936).

River valleys, canyons, and coulees provided natural travel corridors throughout the Plateau. Fur traders followed Indian trails in their early forays into the project region, and continued to use the existing trail systems to travel between trading posts. One such route was the Cariboo Trail connecting Fort Nez Perces and Fort Okanogan, and extending northward along the east side of the Okanogan River into what is now Canada (Anglin 1995:98). In 1811, David Thompson explored the region for the North West Company, traveling down the Okanogan (Lentz and Dugas 2002:5-4). Euro-American settlement in the area began with the establishment of Fort Okanogan by David Stuart and Alexander Ross of the American Pacific Fur Company, at the mouth of the Okanogan River, just east of present-day Brewster. Fort Okanogan was established in 1811 on Cassimer Bar, on the left bank of the Okanogan River near its mouth (Brown 1838). From 1814 to 1821, the North West Company operated the fort. The Hudson's Bay Company then took possession of the fort. It was abandoned by 1860.

Archaeological Resources

The Wells Project has been subject to numerous cultural resource studies over the past 50 years (e.g., Stallard 1957; Grabert 1964, 1965a, 1965b, 1966, 1968, 1970, 1973; Grabert and Griffin 1980; Carlevato et al. 1982; Chatters 1986; Hartmann and Noll 2001; Hartmann and Gill 2004). Early investigations consisted of large-scale surveys and the excavation of Fort Okanogan. Since the early 1960s, investigations have been linked directly to the construction and operation of the Wells Project and can be characterized as survey, salvage excavation, and monitoring efforts throughout Wells Reservoir. With the exception of Fort Okanogan, archaeological research in the project area has focused on pre-contact sites. In 2006, Douglas PUD conducted a cultural resource data review to summarize information pertinent to each archeological study that had been conducted in the APE (Berger and Hartmann 2006).

In 2007 and 2008, all of the known sites on the reservoir were revisited and portions of the APE were resurveyed, resulting in the update and identification of 211 archaeological sites (Hamilton 2008). Of the 211 archaeological sites, 199 are within the Wells Project reservoir area and 12 are along the 230 kV transmission line corridor. This total includes 174 previously-recorded sites and 37 newly-identified sites, three of which are isolated finds. Seventy sites are fully inundated by the reservoir at normal pool level, and 141 sites are either partially inundated or not inundated. Site types consisted of precontact, historic, and sites containing both historic and precontact components (Table 3.3.6.1-1) (Hamilton 2008).

Table 3.3.6.1-1 Frequency of site types in the Wells Project APE.

Component	DAHP Site Type	Total
Historic		
	Isolate	3
	Historic debris scatter/concentration	9
	Historic debris scatter/concentration and historic structure unknown	2
	Historic homestead	5
	Historic maritime property	1
	Historic mining properties	1
	Historic objects	6
	Historic residential structure	2
	Historic structure unknown	2
	Historic structure unknown and historic debris scatter/concentration	1
Subtotal		*32*
Historic and Precontact		
	Historic cemetery, historic fort, precontact lithic material	1
	Historic fort and precontact camp (contact era)	1
	Historic homestead and precontact isolate	1
	Historic homestead and precontact lithic material	1
	Historic mining property, historic debris scatter/concentration, historic structure unknown, precontact feature	1
	Historic debris scatter/concentration and precontact camp	3
	Historic debris scatter/concentration and precontact lithic material	4
	Historic object, precontact shell midden, precontact camp	1
Subtotal		*13*
Precontact		
	Isolate	2
	Precontact sacred site	4
	Precontact sacred site and precontact camp	2
	Precontact sacred site and precontact house pit/depression	1

Table 3.3.6.1-1 (continued) Frequency of site types in the Wells Project APE.

Component	DAHP Site Type	Total
	Precontact sacred site, precontact camp, precontact lithic materials	1
	Precontact cairn	4
	Precontact camp	77
	Precontact camp (contact era)	1
	Precontact camp and precontact cairn	2
	Precontact camp and precontact shell midden	1
	Precontact feature	3
	Precontact house pit/depression	5
	Precontact house pit/depression (contact era)	1
	Precontact house pit/depression and precontact camp	2
	Precontact house pit/depression and precontact shell midden	1
	Precontact house pit/depression and precontact talus pit	1
	Precontact lithic material	9
	Precontact lithic material and precontact cairn	2
	Precontact lithic material and precontact talus pit sacred site	1
	Precontact petroglyph	1
	Precontact pictograph	1
	Precontact pictograph and precontact camp	2
	Precontact shell midden	25
	Precontact shell midden and precontact camp	1
	Precontact shell midden and precontact house pit/depression	1
	Precontact shell midden and precontact lithic material	2
	Precontact talus pit	2
	Precontact village	3
	Precontact village (contact era)	1
	Precontact village and precontact sacred site	1
	Submerged other (precontact feature)	3
	Submerged other (precontact house pit/depression)	2
	Submerged other (precontact village and precontact sacred site)	1
Subtotal		*166*
Total		**211**

Hamilton (2008) assessed the condition of each archaeological site in terms of its relative integrity. Sites in excellent, good, or fair condition were believed to have generally good integrity and the potential to contain significant cultural deposits and sensitive features. The subset of sites to be monitored was derived from this group. The distribution of site conditions is summarized in Table 3.3.6.1-2.

Table 3.3.6.1-2 Frequency of cultural sites by site condition.

Site Condition	Site Count	Percent
Excellent	6	3%
Fair	5	2%
Good	93	44%
Poor	19	9%
Unknown (not inundated)	21	10%
Inundated	65	31%
Unable to relocate	2	1%
Total	**211**	**100%**

Traditional Cultural Properties

A Traditional Cultural Properties (TCP) is a cultural resource that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that are rooted in that community's history, and are important in maintaining the continuing cultural identity of the community. Prior to relicensing, specific studies to identify TCPs had not been conducted for the Wells Project. Douglas PUD contracted with the CCT History/Archaeology Program to conduct a TCP study for the Wells Project. The purpose of the TCP study was to identify locations within the APE that are associated with the cultural practices or beliefs of the CCT (Finley et al. 2008). Due to sensitivity of TCP locations, results of the study are confidential.

3.3.6.2 Environmental Effects

Archaeological sites within the APE may be impacted by Project-related activities such as reservoir operations and Project-related ground disturbing activities. Other actions that may not be related to Project operation, such as vandalism, wind and water erosion, and adjacent landowner encroachment, may also impact cultural resources. The most common impact to archaeological sites identified during the 2007-2008 site inventory was erosion (Hamilton 2008). Erosion is an ongoing natural process, making the influence of the Wells Project difficult to determine. However, ongoing Wells Project operations may have modified the rate and location of shoreline erosion. Most of the shorelines along the Wells Project appear to be stable and any ongoing erosion appears to be progressing relatively slowly. Most eroding areas are gaining moderate protection from riparian vegetation and natural armoring by cobbles along the toe of eroding faces. Additionally, the relatively-stable Wells Reservoir elevation and slower velocities may reduce the erosion influences of natural run-off in the Project and of discharge from the upstream Chief Joseph Project. Other less frequent impacts included inundation/saturation, agricultural activities and recreation.

With the exception of a select group of 29 sites that have been periodically monitored under the current license (Chatters 1992, 1995, 1998; Hartmann and Noll 2002; Hartmann and Gill 2004), current assessments of ongoing Wells Project effects upon archaeological sites are based on existing knowledge and judgments not yet confirmed by systematic, long-term evaluations. Forty-four sites were identified for annual monitoring based on the potential for containing significant archaeological content, and the level of effect (e.g., erosion or other). In addition, eight sites were identified for additional testing to determine the significance of archaeological content.

3.3.6.3 Proposed Environmental Measures

In November 2005, Douglas PUD formed a Cultural RWG to begin consultation under Section 106 of the National Historic Preservation Act as part of the Wells Project relicensing process. The Cultural RWG was comprised of representatives from the CCT THPO, Washington DAHP SHPO, FERC, BLM, BIA, and Douglas PUD.

The Cultural RWG held 19 meetings during the Wells ILP. During these meetings, the Cultural RWG defined the APE, identified issues and studies, and developed an HPMP to address potential ongoing impacts of the Wells Project on historic properties. Douglas PUD proposes to continue consultation with the Cultural RWG during the term of the new license.

Following completion of studies, the Cultural RWG developed an HPMP to address potential Project-related effects to cultural resources within the APE. The purpose of the HPMP is to provide guidelines to Douglas PUD for managing historic properties affected by the operation and maintenance of the Wells Project and complying with the NHPA during the term of the new license. The HPMP includes programs for achieving NHPA compliance through monitoring and protection of historic properties, and through consultation with the SHPO, THPO and other interested parties. Table 3.3.6.3-1 summarizes implementation measures within the HPMP.

Table 3.3.6.3-1 Historic Properties Management Plan implementation measures.

Implementation Measure	Description
Designate a HPMP Coordinator	Douglas PUD will appoint a staff HPMP Coordinator responsible for implementation of the HPMP.
Consultation	Douglas PUD will manage historic properties within the Wells Project APE in consultation with the SHPO, THPO, FERC and other agencies as applicable.
Education and Interpretation Program	Douglas PUD will develop an Employee Education Program to inform appropriate staff and contractors on the relevant HPMP programs. Douglas PUD will develop a Public Education and Interpretation Program designed to provide information about historical uses of the Wells Project area.
Management Standards for Historic Properties	For projects that cause ground disturbance or that have other potential effects to cultural resources, Douglas PUD will consult with the THPO, SHPO and other interested parties prior to beginning the project.
Curation and Document Management	Archaeological collections will be curated at the Colville curation facility in Nespelem, WA. Douglas PUD will inventory and index relevant documents, data, drawings, photographs, etc., that are considered historic or of value to historic properties management.
Historic Structures Evaluation	Wells Dam and the associated facilities will be evaluated for historic architectural and engineering significance after the facility turns 50 years old (2017).
Inadvertent Discoveries and Emergencies	For inadvertent discoveries, all activities at the project site will cease and Douglas PUD will consult with the appropriate parties to identify the appropriate measures.
Site Specific Management Measures	Douglas PUD will implement the Archaeological Sites Monitoring Plan as described in Appendix G of the HPMP.
Traditional Cultural Properties	Douglas PUD will consult with the THPO and the SHPO for those activities that may have effects on TCPs, and will prepare Determinations of Eligibility for the National Register of Historic Places.

3.3.6.4 Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on cultural resources.

3.3.7 Aesthetic Resources

3.3.7.1 Affected Environment

The Wells Project is located along a rural, scenic reach of the Columbia River and the lower reach of the Okanogan River. Visual elements of the Project include the 29.5-mile-long Wells Reservoir, 4,460-foot-long Wells Dam and surrounding complex, 41 miles of transmission lines, several shoreline recreation sites, and six Wildlife Management Areas. The Wells Reservoir is a naturally-dominant visual element that contrasts with surrounding hills and mountains, semi-arid shrub steppe land, and fruit orchards.

In general, the views of the Wells Project area are scenic with the natural beauty of the water of the Columbia River in the foreground and fruit orchards and shrub steppe vegetated hills and mountains in the background. Outside of the winter months, the intermingling of green, irrigated areas of vegetation with brown, non-irrigated areas provides a visual impression of a desert and oasis condition. During the winter months, much of the Wells Project vegetation is frequently covered by snow.

Because residential and commercial development is not allowed within the Wells Project Boundary, the riparian zone along the Wells Reservoir is generally well established with areas of mature riparian and wetland habitats, sandy beaches and cobble shorelines, and undisturbed shrub steppe vegetation. For the most part, lands within the Wells Project naturally blend into the surrounding landscape.

Wells Dam is a structural element in an otherwise natural landscape and visually contrasts with the surrounding rural or natural landscape. Wells Dam consists of a west embankment (2,300 feet long), a central concrete structure (1,130 feet long), and an east embankment (1,030 feet long). The central concrete structure, referred to as the hydrocombine, includes the generating units, spillways, juvenile fish bypass system, switchyard, and adult fish ladders. The facilities are predominately grey in color, with some yellow-painted structures such as the gantry cranes atop the hydrocombine.

The two 230 kV transmission lines run 41 miles from the switchyard atop the dam to the Douglas Switchyard located near Rocky Reach Dam. The lines run parallel to each other on 45- to 85-foot steel towers along a common 235-foot-wide right-of-way. Wells Project transmission line corridor covers approximately 1,117 acres. The transmission corridor is largely rural, with dominant vegetation comprised of wheat fields and shrub steppe (Parametrix, Inc. 2009*b*).

3.3.7.2 Environmental Effects

Since construction of the Wells Project, the Columbia River shoreline between Wells Dam and Chief Joseph Dam has changed from what was largely cobble, sand, and gravel to a greener and more vegetated shoreline that is typical of more stable reservoir environments. Prior to the construction of the Wells Project, development of riparian vegetation was limited due to the arid conditions, along with scouring of the shoreline from seasonal high flows. The more stable water levels provided by Wells Reservoir have promoted the development of mature riparian plant communities. Additionally, designated wildlife areas, parks, and agriculture along the shoreline have enhanced the aesthetic conditions along portions of the shoreline.

Douglas PUD is proposing no changes to Project facilities or operations that would impact the aesthetics of the Project area.

3.3.7.3 Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on aesthetic resources.

3.3.8 Socioeconomics

3.3.8.1 Affected Environment

Wells Dam is located within Douglas and Chelan counties in north-central Washington State. The Wells Reservoir is located in Douglas, Chelan, and Okanogan counties. Approximately 2 miles of the lower Wells Reservoir is located within Chelan County, although there are no Chelan County organized communities adjacent to the Wells Project.

Irrigated agriculture is the foundation of the economy of the north-central Washington region, including Douglas, Okanogan, and Chelan counties. The area's prime sandy loam soil, climate conditions, and abundant supply of irrigation water produces substantial crops of wheat, apples, barley, forage, and sweet cherries. The low elevation areas have generally been developed as orchard land. The orchard areas produce substantial crops of apples, pears, and cherries. The three county regions of Douglas, Chelan, and Okanogan produce approximately 50 percent of the apple crop in Washington State. The plateau region of Douglas County contains wheat and other grain crops. Douglas County alone contains approximately 8 percent of the wheat acreage in the state. Okanogan County also produces a significant number of livestock. Per capita incomes reflect the significant role of agriculture in the regional economy, given that agricultural commodity prices can be highly volatile. Irrigated agriculture relies on the availability of low-cost and stable electricity rates to help control production costs.

North-central Washington is a distinctively rural environment. Population densities are low, and no large metropolitan areas are situated in the region. Wenatchee is the largest urban community. The Seattle-Tacoma coastal area is over 125 miles to the west, and Spokane lies 150 miles to the east.

Although the regional economy is predominantly agricultural-based, recreation and recreation-based tourism contribute significantly to the regional economy of this natural-resource rich region. Other significant employment opportunities include the service industry, retail and wholesale trade, and the education and medical professions.

This analysis of the effects of the Wells Project on local, tribal, and regional socioeconomics is focused on the immediate Project vicinity within Douglas, Okanogan, and Chelan counties, and the organized communities therein, including the Colville

Indian Reservation of Okanogan County. Additional data is presented for all organized communities in Douglas, Okanogan, and Chelan counties, in order to provide a regional context for the socioeconomic status of communities in the immediate vicinity of the Project.

Population

Douglas County

Douglas County is located near the geographic center of the state, and includes incorporated and unincorporated areas. The incorporated areas of Douglas County are the cities of East Wenatchee, Waterville, Bridgeport, Rock Island, Mansfield, and a portion of Coulee Dam. East Wenatchee is located 140 road miles east of Seattle and 163 miles west of Spokane. Douglas PUD's headquarters is located in East Wenatchee approximately 50 miles south of Wells Dam. The city of Bridgeport is the only community in Douglas County located along the Wells Reservoir. Bridgeport is located approximately 28 miles upstream of Wells Dam and approximately 1 mile downstream of Chief Joseph Dam (owned and operated by the COE).

Douglas County population data for 1960 through 2008, and the change in population from 1970 to 2008, are provided in Tables 3.3.8.1-1 and 3.3.8.1-2, respectively. The population of Douglas County has grown at a moderate rate since 1970 (18 to 32 percent per decade), largely due to growth in the urban incorporated area of East Wenatchee and its surrounding communities, such as Rock Island. However, the rural communities and unincorporated areas of Douglas County have experienced far less growth since 1970.

The larger and more urban communities of Douglas County have experienced relatively steady growth since 1970, while rural communities have experienced periods of negative or stagnant growth (Figure 3.3.8.1-1)

The only Douglas County community within the immediate vicinity of the Wells Project, Bridgeport, has seen moderate growth since 1970. Due to its very close proximity, COE's Chief Joseph Dam has likely had more of an influence over time on the population and economy of Bridgeport than the Wells Project.

Population growth in Douglas County between 1970 and 2008 was 120 percent. Excluding East Wenatchee and Rock Island, the population of Douglas County has grown 57 percent over the same 38-year period.

Table 3.3.8.1-1 Population of Douglas County and communities, 1960-2008.

	1960 Census	1968 Est.	1970 Census	1980 Census	1990 Census	2000 Census	2008 Est.
Douglas County	**14,890**	**16,600**	**16,787**	**22,144**	**26,205**	**32,603**	**37,000**
Unincorporated	-	*13,066*	*13,288*	*17,374*	*19,958*	*22,317*	*20,815*
Incorporated	-	*3,534*	*3,499*	*4,770*	*6,247*	*10,286*	*16,185*
Bridgeport	-	1,085	952	1,174	1,498	2,059	2,070
Coulee Dam part	-	-	249	242	218	125	175
East Wenatchee	-	830	913	1,640	2,701	5,757	11,570
Mansfield	-	350	273	315	311	319	330
Rock Island	-	264	193	491	524	863	865
Waterville	-	1,005	919	908	995	1,163	1,175

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-2 Douglas County population change, 1970-2008.

	Percent Change 1970-1980	Percent Change 1980-1990	Percent Change 1990-2000	Percent Change 2000-2008	Percent Change 1970-2008
Douglas County	**32%**	**18%**	**24%**	**13%**	**120%**
Unincorporated	*31%*	*15%*	*12%*	*-7%*	*57%*
Incorporated	*36%*	*31%*	*65%*	*57%*	*363%*
Bridgeport	23%	28%	37%	1%	117%
Coulee Dam part	-3%	-10%	-43%	40%	-30%
East Wenatchee	80%	65%	113%	101%	1167%
Mansfield	15%	-1%	3%	3%	21%
Rock Island	154%	7%	65%	0%	348%
Waterville	-1%	10%	17%	1%	28%

Source: Washington State Office of Financial Management 2009.

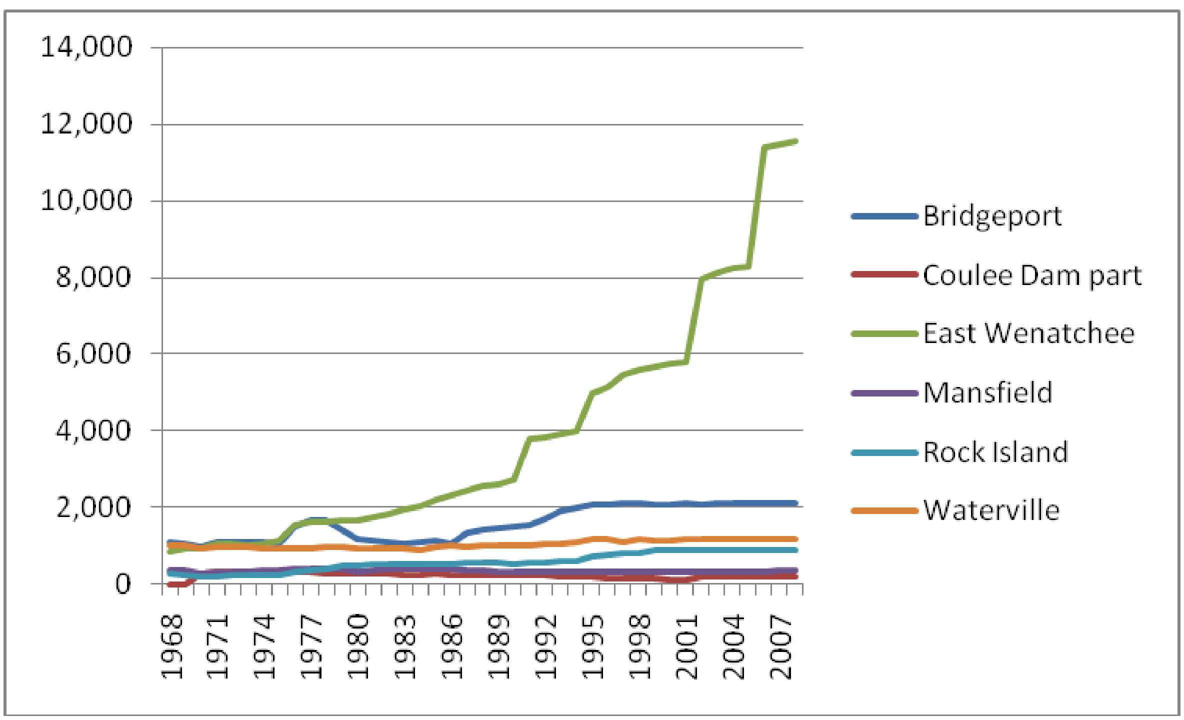

Figure 3.3.8.1-1 Population of Douglas County incorporated communities, 1968-2008.
Source: Washington State Office of Financial Management 2009.

Okanogan County

Okanogan County includes both incorporated and unincorporated areas. The incorporated areas of Okanogan County are Omak, Okanogan, Brewster, Conconully, a portion of Coulee Dam, Elmer City, Nespelem, Oroville, Pateros, Riverside, Tonasket, Twisp, and Winthrop. The cities of Pateros and Brewster are the only communities in Okanogan County located along the Wells Reservoir. Pateros is located approximately 8.3 miles upstream of Wells Dam, and Brewster is located approximately 14.5 miles upstream of Wells Dam.

Okanogan County population data for 1960 through 2008, and the change in population from 1970 to 2008, are provided in Tables 3.3.8.1-3 and 3.3.8.1-4, respectively. The population of Okanogan County has grown at a slow rate since 1970 (9 to 19 percent per decade) and a total of 55 percent over the 38-year period. The organized communities of Okanogan County are all relatively small and rural. Statewide, such communities have experienced periods of negative or stagnant growth, and lower rates of long-term growth (Figure 3.3.8.1-2).

The Okanogan County communities within the immediate Project vicinity include Brewster and Pateros. Brewster has experienced more rapid growth since 1970, at 107 percent, substantially higher than the county's overall growth. Pateros has experienced modest growth at 31 percent since 1970, which is consistent with the growth of Okanogan County overall.

Pateros recorded a census population of 802 people in 1950, which is higher than the population has been since that time. This community experienced a sharp decline in population to 672 people at the time of the 1960 census, prior to construction of the Wells Project, which began in 1962 (McHughes & Associates 2000).

Several Okanogan County communities have experienced a significant reduction in population since 1970, including Coulee Dam, Nespelem, and Elmer City. Populations in several communities (Omak, Oroville, Tonasket, and Winthrop) have varied but stayed relatively the same since 1970. Only the communities of Brewster, Conconully, Pateros, Riverside, and Twisp have experienced 30 percent or greater growth since 1970.

Table 3.3.8.1-3 Population of Okanogan County, 1960-2008.

	1960 Census	1968 Est.	1970 Census	1980 Census	1990 Census	2000 Census	2008 Est.
Okanogan County	**25,520**	**25,600**	**25,867**	**30,663**	**33,350**	**39,564**	**40,100**
Unincorporated	*-*	*11,226*	*12,326*	*16,455*	*19,294*	*23,647*	*24,545*
Incorporated	*-*	*14,374*	*13,541*	*14,208*	*14,056*	*15,917*	*15,555*
Brewster	-	1,300	1,059	1,337	1,633	2,189	2,195
Conconully	-	125	122	157	174	185	200
Coulee Dam part	-	1,472	1,201	1,195	906	915	850
Elmer City	-	341	324	312	297	267	240
Nespelem	-	330	323	284	187	212	205
Okanogan	-	2,075	2,015	2,326	2,370	2,484	2,470
Omak	-	4,200	4,164	4,007	4,117	4,721	4,750
Oroville	-	1,585	1,555	1,483	1,505	1,653	1,715
Pateros	-	546	472	555	570	643	620
Riverside	-	258	228	243	223	348	325
Tonasket	-	1,000	951	985	900	1,013	1,000
Twisp	-	766	756	911	872	938	985
Winthrop		376	371	413	302	349	400

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-4 Okanogan County population change, 1970-2008.

	Percent Change 1970-1980	Percent Change 1980-1990	Percent Change 1990-2000	Percent Change 2000-2008	Percent Change 1970-2008
Okanogan County	**19%**	**9%**	**19%**	**1%**	**55%**
Unincorporated	*33%*	*17%*	*23%*	*2%*	*96%*
Incorporated	*5%*	*-1%*	*13%*	*0%*	*18%*
Brewster	26%	22%	34%	0%	107%
Conconully	29%	11%	6%	8%	64%
Coulee Dam part	0%	-24%	1%	-7%	-29%
Elmer City	-4%	-5%	-10%	-10%	-26%
Nespelem	-12%	-34%	13%	-3%	-37%
Okanogan	15%	2%	5%	-1%	23%
Omak	-4%	3%	15%	1%	14%
Oroville	-5%	1%	10%	4%	10%
Pateros	18%	3%	13%	-4%	31%
Riverside	7%	-8%	56%	-7%	43%
Tonasket	4%	-9%	13%	-1%	5%
Twisp	21%	-4%	8%	5%	30%
Winthrop	11%	-27%	16%	15%	8%

Source: Washington State Office of Financial Management 2009.

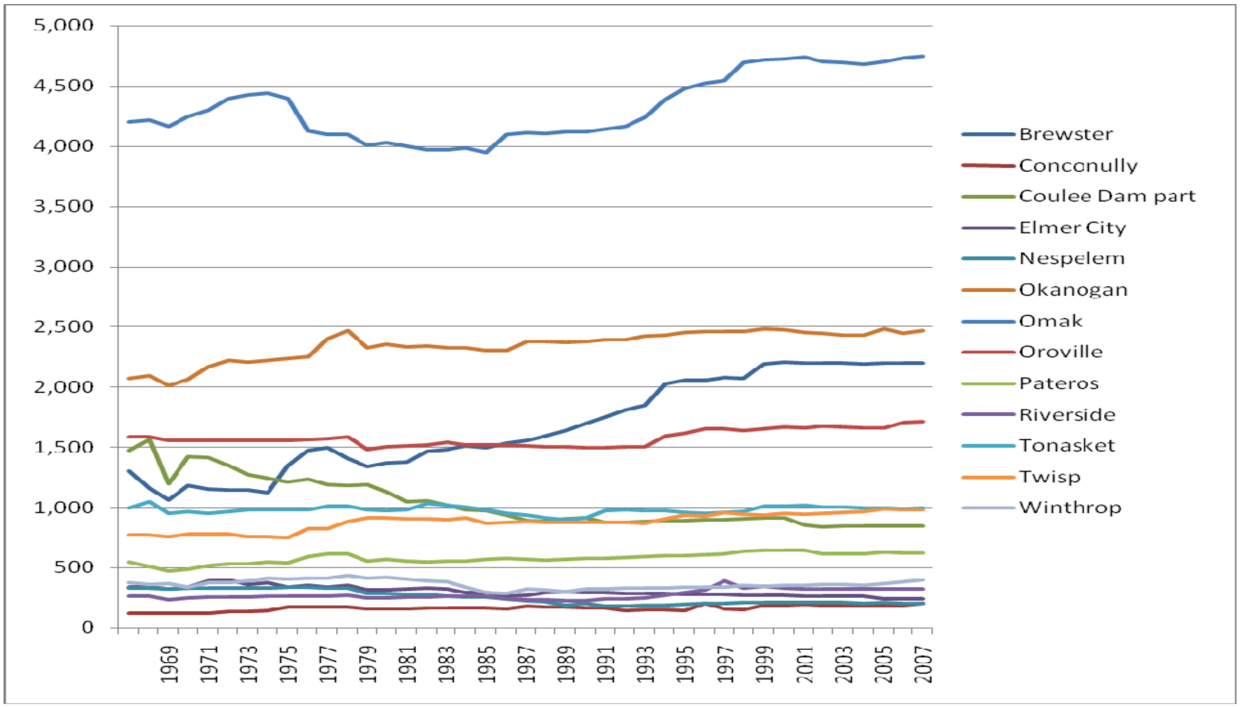

Figure 3.3.8.1-2 Population of select Okanogan County incorporated communities, 1968-2008.

Source: Washington State Office of Financial Management 2009.

Chelan County

Chelan County lies east of Douglas County and southeast of Okanogan County. Bordered on the east by King, Snohomish, and Skagit counties, Chelan County is influenced by its proximity to the major metropolitan Seattle area, more so than Douglas or Okanogan counties. Chelan County includes incorporated and unincorporated areas. The incorporated areas of Chelan County are the cities of Wenatchee, Cashmere, Chelan, Entiat, and Leavenworth.

Chelan County population data for 1960 through 2008, and the change in population from 1970 to 2008, are provided in Tables 3.3.8.1-5 and 3.3.8.1-6, respectively. The population of Chelan County has grown at a steady rate since 1970 (8 to 27 percent per decade), largely due to growth in the urban incorporated area of Wenatchee and its surrounding communities (Figure 3.3.8.1-3). However, unlike Douglas and Okanogan counties, the more rural communities and unincorporated areas of Chelan County have experienced steady growth since 1970.

Table 3.3.8.1-5 Population of Chelan County and communities, 1960-2008.

	1960 Census	1968 Est.	1970 Census	1980 Census	1990 Census	2000 Census	2008 Est.
Chelan	**40,744**	**40,600**	**41,103**	**45,061**	**52,250**	**66,616**	**72,100**
Unincorporated		*17,050*	*17,696*	*20,791*	*22,760*	*29,238*	*30,850*
Incorporated		*23,550*	*23,407*	*24,270*	*29,490*	*37,378*	*41,250*
Cashmere		1,950	1,976	2,240	2,544	2,965	2,990
Chelan		2,700	2,837	2,802	2,976	3,526	3,995
Entiat		360	360	445	449	957	1,160
Leavenworth		1,540	1,322	1,526	1,692	2,074	2,295
Wenatchee		17,000	16,912	17,257	21,829	27,856	30,810

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-6 Chelan County population change, 1970-2008.

	Percent Change 1970-1980	Percent Change 1980-1990	Percent Change 1990-2000	Percent Change 2000-2008	Percent Change 1970-2008
Chelan	**10%**	**16%**	**27%**	**8%**	**75%**
Unincorporated	*17%*	*9%*	*28%*	*6%*	*74%*
Incorporated	*4%*	*22%*	*27%*	*10%*	*76%*
Cashmere	13%	14%	17%	1%	51%
Chelan	-1%	6%	18%	13%	41%
Entiat	24%	1%	113%	21%	222%
Leavenworth	15%	11%	23%	11%	74%
Wenatchee	2%	26%	28%	11%	82%

Source: Washington State Office of Financial Management 2009.

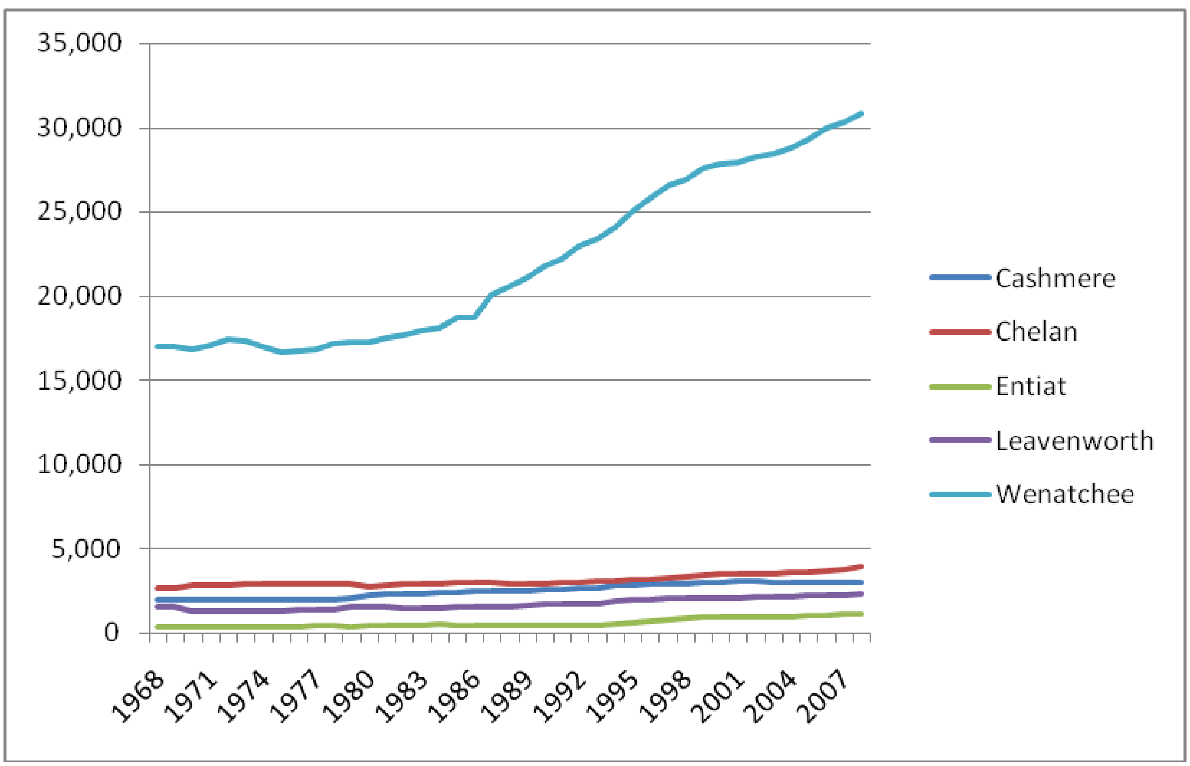

Figure 3.3.8.1-3 Population of Chelan County incorporated communities, 1968-2008.
Source: Washington State Office of Financial Management 2009.

Tribal Communities

The Colville Indian Reservation occupies 1.4 million acres (2,100 square miles) in north central Washington, primarily in Okanogan and Ferry counties. The CCT Reservation includes approximately 9,000 descendants of twelve aboriginal tribes including: the Colville, the Nespelem, the San Poil, the Lake, the Palus, the Wenatchi (Wenatchee), the Chelan, the Entiat, the Methow, the southern Okanogan, the Moses Columbia, and the Nez Perce. The Colville Indian Reservation is occupied by over 5,000 residents, both Colville tribal members and their families and other non-Colville members, living either in small communities or in rural settings. Approximately fifty percent of the tribal members live on or adjacent to the reservation (CCT 2009).

Income

Personal income, a primary measure of personal buying power, is a key indicator in assessing community economic health. Personal income can be analyzed by a number of different indicators. For this assessment, per capita income and median household income are provided and discussed.

The per capita income for Washington State and the organized communities in Douglas, Okanogan, and Chelan counties are provided in Tables 3.3.8.1-7, 3.3.8.1-8, and 3.3.8.1-9, respectively.

In 1990 and 2000 the per capita income for Washington State was $24,677 and $31,780, respectively. The per capita income for Washington State grew 29 percent between 1990 and 2000 which was lower than the rate of per capita income growth for all three of the counties surrounding the Wells Project. Per capita income grew 42, 44 and 46 percent in Douglas, Okanogan and Chelan counties, respectively.

The per capita income in Douglas County in 1990 and 2000 was $12,071 and $17,148, respectively. Within Douglas County the per capita income was highest in the community of Coulee Dam in 1990 ($15,662) and Waterville in 2000 ($18,880). The lowest per capita income in 1990 was in Rock Island ($7,754) and in 2000 was in Bridgeport ($10,302). In Bridgeport, per capita income ranged from 40 to 66 percent below the county average between 1990 and 2000, respectively.

The per capita income in Okanogan County in 1990 and 2000 was $10,346 and $14,900, respectively. Within Okanogan County the per capita income was highest in the community of Coulee Dam ($15,662 in 1990 and $18,791 in 2000), and lowest in Conconully in 1990 ($7,533), and in Brewster in 2000 ($9,555). In Brewster, per capita income ranged from 2 percent above the county average in 1990 to 56 percent below the county average in 2000. In Pateros, per capita income was only 10 percent below the county average in 1990 and 9 percent below in 2000. In 2000, the per capita income for tribal households of the CCT was $11,805.

The per capita income in Chelan County in 1990 and 2000 was $12,533 and $18,273, respectively. Per capita income was highest in the community of Chelan in 1990 ($13,384) and in Wenatchee in 2000 ($19,498). Per capita income was lowest in Entiat in both 1990 ($9,807) and 2000 ($13,529).

The median household incomes for organized communities in Douglas, Okanogan, and Chelan counties are provided in Tables 3.3.8.1-10, 3.3.8.1-11, and 3.3.8.1-12, respectively.

The median household income in Washington State between 1990 and 2000 was $31,183 and $45,776, respectively. Median household income in Washington State rose 47 percent between 1990 and 2000. In Douglas, Okanogan and Chelan counties the median household income rose 42, 46 and 53 percent, respectively. The median household income rose 25, 11 and 52 percent in Bridgeport, Brewster and Pateros, respectively.

The median household income in Douglas County between 1990 and 2000 was $27,054 and $38,464, which was 15 to 19 percent below the state averages. Incomes were highest in the community of Coulee Dam ($29,063 in 1990 and $37,291 in 2000), and lowest in Bridgeport ($20,441 and $25,531). In Bridgeport median household income ranged from 32 to 51 percent below the county average between 1990 and 2000, respectively.

The median household income in Okanogan County in 1990 and 2000 was $20,303 and $29,726, respectively, which was 54 percent below the state averages for that period. In 1990, median household income was highest in the community of Coulee Dam ($29,063) and lowest in Conconully ($14,167). In 2000, median household income was highest in the community of Coulee Dam ($37,291) and lowest in Brewster ($21,556).

In Pateros, median household incomes were 0.4 to 4 percent higher than the county average ($20,373 in 1990 and $30,938 in 2000). In Brewster, median incomes ranged from 5 to 38 percent below the county average in 1990 ($19,394) and 2000 ($21,566), respectively. In 2000, the median household income for tribal households of the CCT was $29,830 which was slightly higher than the county average.

The median household income in Chelan County in 1990 and 2000 was $24,312 and $37,316, respectively, 23 to 28 percent below the state averages. Incomes were highest in the community of Chelan in 1990 ($23,138) and in Leavenworth ($35,692) in 2000. Median household income was lowest in Cashmere in 1990 ($20,692) and in Chelan in 2000 ($28,047).

Table 3.3.8.1-7 Per Capita Income for Douglas County.

	1990	2000	Percent Change
Washington State	***24,677***	***31,780***	***29%***
Douglas County	12,071	17,148	42%
East Wenatchee	11,096	17,876	61%
Waterville	10,538	18,880	79%
Bridgeport	8,598	10,302	20%
Rock Island	7,754	14,129	82%
Mansfield	11,087	17,368	57%
Coulee Dam	15,662	18,791	20%

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-8 Per Capita Income for Okanogan County.

	1990	2000	Percent Change
Washington State	***24,677***	***31,780***	***29%***
Okanogan County	10.346	14,900	44%
Omak	11,836	13,472	14%
Okanogan	10,454	13,849	32%
Brewster	10,574	9,555	-10%
Conconully	7,533	16,168	115%
Coulee Dam	15,662	18,791	20%
Elmer City	12,007	16,366	36%
Nespelem	8,002	12,836	60%
Oroville	7,959	12,220	54%
Pateros	9,397	13,646	45%
Riverside	10,538	11,297	7%
Tonasket	8,860	13,293	50%
Twisp	10,257	16,257	58%
Winthrop	9,980	17,649	77%

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-9 Per Capita Income for Chelan County.

	1990	2000	Percent Change
Washington State	***24,677***	***31,780***	*29%*
Chelan County	12,533	18,273	46%
Cashmere	10,830	17,468	61%
Chelan	13,384	16,511	23%
Entiat	9,807	13,529	38%
Leavenworth	11,884	18,709	57%
Wenatchee	12,215	19,498	60%

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-10 Median Household Income for Douglas County.

	1990	2000	Percent Change
Washington State	***$31,183***	***$45,776***	***47%***
Douglas County	$27,054	$38,464	42%
East Wenatchee	$22,602	$34,919	54%
Waterville	$22,500	$36,458	62%
Bridgeport	$20,441	$25,531	25%
Rock Island	$21,316	$33,618	58%
Mansfield	$22,344	$28,750	29%
Coulee Dam	$29,063	$37,391	29%

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-11 Median Household Income for Okanogan County.

	1990	2000	Percent Change
Washington State	***$31,183***	***$45,776***	***47%***
Okanogan County	$20,303	$29,726	46%
Omak	$19,603	$24,089	23%
Okanogan	$19,184	$26,994	41%
Brewster	$19,394	$21,556	11%
Conconully	$14,167	$23,214	64%
Coulee Dam	$29,063	$37,391	29%
Elmer City	$28,611	$32,500	14%
Nespelem	$16,719	$30,000	79%
Oroville	$14,190	$22,301	57%
Pateros	$20,373	$30,938	52%
Riverside	$21,250	$23,125	9%
Tonasket	$16,848	$23,523	40%
Twisp	$18,819	$26,354	40%
Winthrop	$17,222	$25,417	48%

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-12 Median Household Income for Chelan County.

	1990	2000	Percent Change
Washington State	***$31,183***	***$45,776***	***47%***
Chelan County	24,312	37,316	53%
Cashmere	20,692	34,854	68%
Chelan	23,138	28,047	21%
Entiat	21,705	33,450	54%
Leavenworth	22,931	35,692	56%
Wenatchee	22,806	34,897	53%

Source: Washington State Office of Financial Management 2009.

Workforce

Workforce statistics, most commonly analyzed in terms of unemployment rates, are a prime indicator of economic conditions. Civilian workforce and unemployment data for organized communities in Douglas, Okanogan, and Chelan counties are provided in Tables 3.3.8.1-13, 3.3.8.1-14, and 3.3.8.1-15, respectively.

Table 3.3.8.1-13 Douglas County Civilian Labor Force data.

	1990				2000			
	Total Civilian Labor Force	Employed	Unemployed (#/%)		Total Civilian Labor Force	Employed	Unemployed (#/%)	
Douglas County	***12,714***	***11,664***	***1,050***	***8.3%***	***15,553***	***14,158***	***1,395***	***9.0%***
East Wenatchee	1,363	1,260	103	7.6%	2,774	2,598	176	6.3%
Waterville	367	343	24	6.5%	566	510	46	8.3%
Bridgeport	659	574	85	12.9%	847	702	145	17.1%
Rock Island	243	210	33	13.6%	442	386	56	12.7%
Mansfield	122	118	4	3.3%	136	130	6	4.4%
Coulee Dam	469	439	30	6.4%	493	447	46	9.3%

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-14 Okanogan County Civilian Labor Force data.

	1990				2000			
	Total Civilian Labor Force	Employed	Unemployed (#/%)		Total Civilian Labor Force	Employed	Unemployed (#/%)	
Okanogan County	***15,181***	***13,632***	***1549***	***10.2%***	***17,465***	***15,368***	***2,097***	***12.0%***
Omak	1,784	1,591	193	10.8%	2,065	1,713	352	17.0%
Okanogan	950	868	83	8.7%	1,112	990	122	11.0%
Brewster	696	610	86	12.4%	858	756	102	11.9%
Conconully	67	60	7	10.4%	93	84	9	9.7%
Coulee Dam	469	439	30	6.4%	493	447	46	9.3%
Elmer City	137	123	14	10.2%	123	11	12	9.8%
Nespelem	88	73	15	17.0%	77	54	23	29.9%
Oroville	667	625	42	6.3%	640	561	79	12.3%
Pateros	251	220	31	12.4%	335	305	30	9%
Riverside	100	95	5	5.0%	142	118	24	16.9%
Tonasket	390	352	38	9.7%	385	327	58	15.1%
Twisp	364	328	36	9.9%	391	356	35	9.0%
Winthrop	133	110	33	24.8%	174	159	15	8.6%

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-15 Chelan County Civilian Labor Force data.

	1990				2000			
	Total Civilian Labor Force	Employed	Unemployed (#/%)		Total Civilian Labor Force	Employed	Unemployed (#/%)	
Chelan County	***24,973***	***23,004***	***1,969***	***7.9%***	***31,818***	***28,507***	***3,311***	***10.4***
Cashmere	1,108	1,013	95	8.6%	1,396	1,238	158	11.3
Chelan	1,345	1,318	27	2.0%	1,548	1,383	165	10.7
Entiat	213	181	32	15.0%	461	434	27	5.9
Leavenworth	756	710	46	6.1%	927	902	25	2.7
Wenatchee	10,341	9,394	947	9.2%	12,980	11,498	1,482	11.4

Source: Washington State Office of Financial Management 2009.

Employment by Industry

Employment by Industry Sector (from the 2000 census) for organized communities in Douglas, Okanogan, and Chelan counties are provided in Tables 3.3.8.1-16, 3.3.8.1-17, and 3.3.8.1-18, respectively.

In Douglas County, employment is predominantly in the education, health and social services fields, followed by retail trade, agriculture, and wholesale trade. Similarly, in Okanogan County, employment is predominantly in the education, health and social services fields, followed by agriculture and retail trade. Accommodations and food service, and public administration sector jobs are also significant in Okanogan County. In Chelan County, the predominant industry is also education, health and social services, followed by retail trade and accommodations and food service. Wholesale trade, manufacturing, and construction are also major employers in Chelan County. It should be noted that many of these fields, including manufacturing, construction, wholesale and retail trade, and other service sectors are supported largely by the agricultural industry that exists in these counties.

Communities in the immediate Project vicinity, including Bridgeport, in Douglas County, and Brewster and Pateros in Okanogan County, all have similar employment industry profiles. Agricultural sector jobs lead in these communities, followed by education, health and social services, and wholesale trade.

Agriculture

The significance of agriculture to the economy of this region is evidenced by the land use patterns. As indicated in Table 3.3.8.1-19, 77 percent of Douglas County lands are used for crops, pasture, and rangeland. In Okanogan County, 26 percent of the land is used for crops, pasture, or rangeland, while another 22 percent is forestlands that support forestry-based employment, and 45 percent is federal land. Only 12 percent of lands in Chelan County are used for crops, pasture, and rangeland; however, 77 percent of land in Chelan County is federally owned.

Recreation and Tourism

Recreation and tourism are also important components of the Washington State and Wells Project area economies. Douglas, Okanogan, and Chelan counties are vacation destinations for visitors from the greater Seattle area and British Columbia, Canada. These visitors are primarily interested in outdoor recreation, such as hiking, fishing, hunting, boating, camping, snowmobiling, and snow skiing (DTA 2006*b*). Overall, active outdoor recreation in Washington State contributes over $11.7 billion to the state's yearly economy, supports 115,000 jobs, generates $650 million in annual state tax revenue, and produces $8.5 billion annually in retail sales and services (3.5 percent of the gross state product) (Southwick Associates, Inc. 2007).

Table 3.3.8.1-16 Douglas County incorporated municipality employment by industry sector.

Industry Sector	Organized Community				
	Bridgeport	E. Wenatchee	Mansfield	Rock Island	Waterville
Agriculture, Forestry, Fishing, Hunting and Mining	276	104	27	35	51
Construction	18	146	17	19	40
Manufacturing	26	294	3	53	16
Wholesale Trade	69	276	7	65	32
Retail Trade	41	371	13	72	59
Transportation/Warehousing	13	71	0	15	25
Utilities	13	40	4	0	11
Information	11	29	2	0	9
Finance, Insurance, Real Estate	15	143	4	2	30
Professional Scientific Admin & Management	24	121	3	13	9
Education, Health and Social Services	120	577	39	49	134
Arts, Entertainment, Recreation	14	77	0	3	5
Accommodations and Food Service	16	132	0	21	18
Public Administration	29	97	3	14	38
Other Services	17	120	8	25	33
Total	702	2,598	130	386	510

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-17 Okanogan County incorporated municipality employment by industry sector.

	Organized Community												
Industry Sector	Brewster	Conconully	Coulee Dam	Elmer City	Nespelem	Okanogan	Omak	Oroville	Pateros	Riverside	Tonasket	Twisp	Winthrop
Agriculture, Forestry, Fishing, Hunting and Mining	294	2	16	3	4	38	161	63	68	3	40	24	13
Construction	14	4	21	8	0	42	80	16	16	6	18	27	11
Manufacturing	18	0	0	2	2	48	189	30	6	9	15	11	3
Wholesale Trade	101	2	5	3	0	29	46	59	36	3	20	3	0
Retail Trade	64	21	44	6	2	116	213	96	23	21	47	29	38
Transportation/Warehousing	15	2	4	0	0	4	30	27	3	4	8	6	2
Utilities	6	2	23	8	0	8	0	5	10	2	0	0	4
Information	9	0	2	4	0	27	28	7	7	0	2	8	0
Finance, Insurance, Real Estate	14	3	21	2	2	27	30	21	10	4	5	21	7
Professional Scientific Admin & Management	11	0	17	2	0	56	114	17	8	4	18	15	8
Education, Health &Social Services	137	20	100	35	12	315	378	102	58	30	86	84	22
Arts, Entertainment, Recreation	7	0	49	3	11	25	56	1	1	2	0	4	2
Accommodations and Food Service	37	9	30	2	0	77	158	53	14	17	23	89	32
Public Administration	6	14	93	29	19	102	125	36	27	9	20	5	13
Other Services	23	5	22	4	2	76	105	28	18	4	25	30	4
Total	756	84	447	111	54	990	1,713	561	305	118	327	356	159

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-18 Chelan County incorporated municipality employment by industry sector.

Industry Sector	Organized Community				
	Cashmere	Chelan	Entiat	Leavenworth	Wenatchee
Agriculture, Forestry, Fishing, Hunting and Mining	63	100	35	52	603
Construction	68	107	34	53	754
Manufacturing	58	15	54	56	844
Wholesale Trade	109	85	38	45	945
Retail Trade	118	180	62	186	1,218
Transportation/Warehousing	50	22	27	31	405
Utilities	38	55	12	9	283
Information	34	44	7	0	263
Finance, Insurance, Real Estate	66	55	6	37	567
Professional Scientific Admin & Management	97	68	24	41	748
Education, Health &Social Services	311	286	63	139	2,787
Arts, Entertainment, Recreation	13	79	10	13	232
Accommodations and Food Service	125	199	26	172	799
Public Administration	49	26	22	38	417
Other Services	39	62	14	30	632
Total	1238	1383	434	902	11,497

Source: Washington State Office of Financial Management 2009.

Table 3.3.8.1-19 Land use by acreage (estimates).

	Douglas County		Okanogan County		Chelan County	
	Acres	Percent	Acres	Percent	Acres	Percent
Cropland	446,100	38	78,600	2	21,000	1
Conservation Reserve Program	150,800	13	0	0	0	0
Pastureland	15,500	1	67,800	2	7,000	0
Rangeland	443,500	38	731,000	22	209,400	11
Forested	0	0	734,700	22	115,100	6
Minor Land Uses	55,500	5	162,200	5	24,500	1
Urban	15,000	1	30,100	1	17,100	1
Water and Streams	20,700	2	33,900	1	43,500	2
Federal Lands	18,039	2	1,533,265	45	1,478,300	77
Totals	1,165,139		3,371,565		1,915,900	

Travel and tourism-related spending and tax revenue are significant in Washington State, representing $14.8 billion in spending, 149,800 jobs with $4.2 billion in earnings, and $972 million in tax revenues. Although revenues are concentrated in King County (Seattle area; 43 percent of state totals), the impact in smaller, less urban counties can be more significant. In Douglas County, travelers spent $37.4 million dollars, providing $6.6 million in earnings for 310 travel-related jobs, and $2.6 million in local and state tax revenue. In Okanogan County, travel accounted for $135.5 million in spending in 2007, generating $38.6 million in income for 1,700 jobs, and $9 million in tax revenues. In Chelan County, travel accounted for $340.1 million in spending in 2007, generating $108.8 million in income for 5,690 jobs, and $25.1 million in tax revenues (Dean Runyan Associates 2008).

The Wells Project provides many recreational opportunities for residents of its neighboring communities and for tourists to the region. Douglas PUD actively manages 17 recreation sites within the Wells Project Boundary. These sites offer boat launches, boat docks, swimming areas, and public access for fishing along the Wells Reservoir and Wells Tailrace (DTA 2008).

In 2005, a Recreation Visitor Use Survey was conducted at the Wells Project (DTA 2006*b*). Use estimates ranged from 19,258 recreation days (RDs) to a high of 44,929 RDs. For community members, fishing, swimming and picnicking facilities were most often utilized. Fishing was reported as the most common primary reason for coming to the Wells Project followed by boating (DTA 2008).

Visitors from Okanogan, King, Chelan, Snohomish, Douglas, Whatcom, and Spokane counties combined accounted for 75 percent of the overall users. The combined populations of Okanogan, King, Chelan, Snohomish, Douglas, Whatcom, and Spokane counties are expected to grow by approximately 63 percent by 2050, and roughly 10 percent by 2020. Thus, statewide population expansion is a dominant factor that will drive future use of facilities within the Wells Project. While several factors will influence future use, the use in the Wells Project by 2050 is estimated to range from 29,272 to 68,292 RDs. Fishing is expected to continue to be the primary driver for growth in recreation activity at Wells Reservoir. Motor boating activities, non-motorized water recreation such as kayaking and walking/hiking are also expected to increase in this region (DTA 2008).

Government, Retail, and Manufacturing

Although the economies of Douglas, Okanogan, and Chelan counties are based primarily on agriculture and recreation/tourism, they are also supported by government, retail, trade, manufacturing, and service industries. Major private employers in the East Wenatchee and Wenatchee urban area include Stemilt Growers, ALCOA, Pacific Aerospace & Electronics, and Tree Top, Inc.

Tribal Employment and Income

The CCT has an extensive governmental operation. The CCT's annual operating budget is financed primarily from revenues from the sale of timber products and from other sources including federal, state, and private contributions. The CCT gives preference to hiring of tribal members, although both CCT members and non-CCT members are employed throughout tribal government.

The Colville Tribal Enterprise Corporation (CTEC) was founded in 1984 to provide revenue for the CCT, and employment and training opportunities for tribal members. The company manages approximately 14 enterprises that include gaming, recreation and tourism, retail, construction, and wood products. CTEC employs 1,000 people and generates over $120 million in revenues each year. Based in Coulee Dam, CTEC is one of the largest Native American businesses in Washington State.

Current Regional Benefits of the Project

The Wells Project has significant positive effects on the local economies in Douglas, Okanogan, and Chelan counties as well as elsewhere throughout the Pacific Northwest. Project benefits include: (1) providing low-cost renewable power for citizens and industries; (2) paying local and state taxes; (3) providing access to irrigation waters that support the area's agricultural industry; (4) employment related to the operation and maintenance of the Wells Project and fish and wildlife mitigation programs; (5) supporting state and local efforts to maintain and enhance the salmon, steelhead, and trout fisheries, which supports recreation and tourism in the region; (6) supporting state and local efforts to maintain and enhance riparian habitats used by fish and wildlife, which also supports recreation and tourism in the region; and (7) providing recreation opportunities in the region, notably in communities within the immediate vicinity of the Wells Project.

Power Benefits

The Wells Project provides clean, efficient, reliable, and cost-effective hydroelectric power. The Wells Project provides electric service to over 18,000 local customer accounts in Douglas County. In addition to serving the communities surrounding the Wells Project, Project output also serves the greater Pacific Northwest region as a significant share of the Project output (62 percent) is provided to Puget Sound Energy, Inc., Portland General Electric Company, PacifiCorp and Avista Corporation.

Taxes

Douglas PUD is subject to a variety of state and city taxes, including Public Utility Tax, Sales Tax, Use Tax, Wholesaling Tax, Retailing Tax, Service and Other Taxes, Leasehold Excise Tax, and Privilege Tax. Some of these taxes apply to Douglas PUD's electric generation system, Douglas PUD's electric distribution system, or both systems. In 2007, these taxes totaled approximately $1.2 million. Taxes paid by Douglas PUD positively affect the public as state taxes are deposited into general funds which are directed, in part, back to the county and city governments.

Fisheries Benefits

Douglas PUD funds the operation, maintenance, and monitoring and evaluation of two major fish hatcheries, the Wells Fish Hatchery and the Methow Fish Hatchery, and three acclimation ponds. Together, the hatcheries produce approximately three million juvenile salmon, steelhead, and trout annually, which are released into the Methow, Okanogan, and Columbia rivers, and lakes throughout Okanogan and Douglas counties. The economic benefits of these programs include employment, taxes, and enhanced recreation and tourism associated with fishing and fish viewing.

Wildlife Habitat Benefits

Douglas PUD is a responsible steward of wildlife resources in the Project area, which provides habitat for a variety of wildlife species and which in turn support recreation and tourism in the area. Douglas PUD and the WDFW entered into an Agreement on July 15, 1974, for wildlife mitigation, which included Douglas PUD funding the acquisition and development of the WWA. The WWA consists of six Habitat Management Units totaling over 8,200 acres. Additional wildlife mitigation is provided at the Cassimer Bar Wildlife Area located within the Project Boundary on the Colville Indian Reservation. The economic benefits of these programs include employment, taxes, and enhanced recreation and tourism associated with hunting and wildlife viewing.

Recreation Benefits

Douglas PUD constructed and participates in the management of 17 recreation sites within the Wells Project Boundary. These sites offer boat launches, boat docks, swimming areas, and public access to the reservoir for fishing, power boating, water skiing and waterfowl hunting (DTA 2008). Douglas PUD also provides the Wells Dam Overlook featuring a park and educational exhibits.

Douglas PUD has developed parks and recreation facilities along the reservoir in the cities of Pateros, Brewster, and Bridgeport. Douglas PUD assisted in the funding and developing of the existing parks and recreational facilities adjacent to the Project in the city of Pateros including Peninsula Park, Memorial Park, tennis courts, two concrete boat launches, parking areas, a fish cleaning station, and restrooms. Douglas PUD also assisted in funding and developing recreational facilities in the city of Brewster, including Columbia Cove Park and a waterfront trail. Columbia Cove Park features a boat launch, boat docks, three covered picnic shelters, restroom facilities, a playground, swimming beach, lawn area, and vehicle parking. The city of Bridgeport received funding from Douglas PUD to develop Marina Park adjacent to the Wells Reservoir. Marina Park features a covered picnic shelter, gazebo, playground equipment, swimming beach, lawn area, vehicle parking, restrooms, fish cleaning station, walking pathway, two boat launches, two boat docks, and an RV campground.

The economic benefits of the recreation facilities include employment, taxes, and enhanced recreation and tourism associated with the utilization of public access to the Wells reservoir and Project lands.

Irrigation Benefits

The Wells Reservoir is a significant source of irrigation for agriculture. Orchards with apple, cherry, pear, peach, apricot and other fruit trees represent the primary agricultural activity in the Columbia River valley, and the surrounding tributary valleys. All orchards throughout the area are dependent upon a reliable source of irrigation water for their existence. The relatively-stable reservoir elevation simplifies and reduces the cost of water withdrawal compared to a free-flowing stretch of river. A total of 135 irrigation withdrawals exist on the Wells Reservoir, which provide over 53,000 ac-ft of irrigation waters.

3.3.8.2 Environmental Effects

Douglas, Okanogan, and Chelan counties are largely comprised of small rural communities, and unincorporated areas. With the exception of the more urban region around Wenatchee and East Wenatchee, and the community of Coulee Dam, the counties and most communities have experienced slow to modest population growth over the past 40 years. Douglas, Okanogan and Chelan counties have consistently lower per capita and median household incomes and higher unemployment rates than Washington State. However, for the period 1990-2000 per capita income growth was higher in Douglas (42 percent), Okanogan (44 percent) and Chelan (46 percent) counties when compared to the state average (29 percent).

The regional economy is predominantly agricultural-based, with other service industry, retail and wholesale trade, and education and medical employment opportunities, present largely as a direct result of the agricultural economy. Recreation and recreation-based tourism contribute significantly to the regional economy of this natural resources-rich region. The 17 recreation sites that Douglas PUD has constructed and actively manages within the Wells Project Boundary attract thousands of visitors to the local communities each year. This benefits local businesses, generates local and state tax revenues, and supports employment in the Project area.

The communities within the immediate Project vicinity, including Bridgeport in Douglas County and Brewster and Pateros in Okanogan County, all have demographics consistent with that of their counties and neighboring rural communities. Population growth has been slow to modest, per capita and median incomes are below state levels, but consistent with neighboring communities; employment trends are also similar. County demographics indicate that these communities are similar to other towns in the counties, and have not been adversely affected by the Project in terms of population, income, or employment opportunities. Importantly, the operation and maintenance of the Project coupled with taxes paid, low-cost energy generated, and enhancements to recreation, fisheries, and wildlife undertaken by Douglas PUD, have contributed significantly to the economic and social fabric of the immediate vicinity of the Wells Project.

3.3.8.3 Proposed Enhancement Measures

Douglas PUD operates the Wells Project to realize the beneficial uses of the available water resources for energy production, recreation, fish and wildlife, and protection of cultural resources of the Project. The Wells Project currently provides significant socioeconomic benefits for the Douglas, Okanogan, and Chelan county areas. Douglas PUD is also proposing significant additional environmental protection and recreation measures that would provide additional benefits to the socioeconomic conditions in the vicinity of the Project. Measures that are proposed for the protection and enhancement of fish, wildlife, recreation, and cultural resources would have a positive effect on local and regional socioeconomic conditions by providing jobs and increasing recreation opportunities and tourism. The cost of implementing such measures would, however, increase the cost of Project power, which would have a negative effect on socioeconomic conditions by reducing the production cost advantage of the agricultural industries that are an important part of the regional economy.

Many of Douglas PUD's proposed environmental protection measures will result in significant capital investments coupled with ongoing operation, maintenance, and evaluation costs. Costs associated with implementing Douglas PUD's proposed protection, mitigation, and enhancement measures associated with the Wells HCP (Exhibit E; Appendix E-1), ASA (Exhibit E; Appendix E-2), WBMP (Exhibit E; Appendix E-3), HPMP (Exhibit E; Appendix E-4), RMP (Exhibit E; Appendix E-5), APP (Exhibit E; Appendix E-6), and Off-License Settlement Agreement (Exhibit E; Appendix E-11), along with proposed measures contained within Douglas PUD's Land Use Policy (Exhibit E; Appendix E-13), are expected to cost in excess of $643,625,000 over the term of the new license or $12,872,000 per year, assuming a 50-year license term. Specific proposals that will have new direct and indirect socioeconomic benefits for the term of the next license are discussed below.

Fisheries Benefits

Douglas PUD has worked with federal, state and tribal entities to develop the first hydropower HCP in the nation for salmon and steelhead. The plan commits Douglas PUD to a 50-year program ensuring that the Wells Project has no net impact on salmon and steelhead runs. To accomplish this goal, a combination of juvenile and adult fish passage measures are being implemented at the dam as well as off-site hatchery programs, evaluations, and habitat restoration work in tributary streams upstream of the Wells Dam.

As part of the Wells HCP, Douglas PUD will continue to provide funding for the operation, maintenance, and evaluation of two hatcheries (the Wells Fish Hatchery and the Methow Fish Hatchery) and three acclimation ponds. The Wells HCP also requires extensive survival and passage studies, predator control programs, and contains significant investments in the enhancement of tributary habitats.

In addition, Douglas PUD has reached an Off-License Settlement with the WDFW which will ensure continued rearing and release of 20,000 pounds of rainbow trout annually, to be planted into lakes within Okanogan and Douglas counties for the enjoyment of the angling public.

Douglas PUD has executed an ASA that provides extensive protection, mitigation and enhancement measures associated with populations of white sturgeon, bull trout, Pacific lamprey, and native resident fish species. The Agreement also includes programs intended to reduce the threat of aquatic nuisance species and ensures compliance with state water quality standards.

Wildlife Benefits

The WBMP was developed in consultation with state and federal agencies. The WBMP will guide implementation of resource protection measures for wildlife and botanical resources during the term of the new license, including maintenance and enhancement of wildlife and habitat, protection for RTE wildlife and plant species, maintaining the Cassimer Bar Wildlife Management Area, and control of noxious weeds in the Project Boundary. The wildlife and botanical protection measures will enhance recreational opportunities in the Project area, including fishing, hunting, and wildlife viewing.

Douglas PUD has also developed the 230 kV Transmission Line Corridor APP, to protect resident and migrant birds that could potentially interact with the Wells 230 kV transmission lines. The APP is intended to protect both avian migrants interacting with the transmission lines crossing the Columbia River and birds nesting on the transmission line structures.

The wildlife management goals of the Off-License Settlement Agreement include creating, protecting, maintaining, and enhancing wildlife habitat within the WWA. The Off-License Settlement Agreement also provides for the protection of RTE wildlife and botanical resources, noxious weeds management, and wetland habitat protection on all six units of the WWA. Implementation of the Off-License Settlement Agreement will enhance recreational opportunities in the immediate Project vicinity related to wildlife viewing and hunting opportunities.

Habitat Benefits

Douglas PUD is responsible for land use management within the Wells Project Boundary. The waters and shoreline features of the Wells Project provide important habitat for many species of fish, wildlife, and plants. Multiple resource management plans, including the Wells HCP, WBMP, APP, HPMP, and RMP contain relevant guidance related to land use and shoreline management. Douglas PUD's Land Use Policy guides the management and protection of all Wells Project lands. The goal of Douglas PUD's Land Use Policy is to integrate the various resource concerns affecting shoreline uses including compliance with the FERC license for the Wells Project, Wells HCP, and all required permits from federal, state, and local jurisdictions. The habitat benefits of Douglas PUD's Land Use Policy enhance enjoyment of the natural character of the reservoir area. Wildlife viewing, fishing and hunting are just three of the resource values enhanced by the Land Use Policy.

Douglas PUD has reached an Off-License Settlement with the WDFW, which will ensure continued stewardship of the WWA lands during the next license term. The WWA consists of over 8,200 acres of land within six different units throughout Douglas and Okanogan counties. Douglas PUD is dedicated to stewardship of wildlife; and through this agreement and additional, voluntary supplemental funding to WDFW, has developed wildlife habitat within and adjacent to the Wells Project. These lands provide significant and diverse wildlife habitat and provide unique opportunities for public wildlife-oriented recreation.

The Wells HCP contains a Tributary Compensation Plan intended to enhance and protect large portions of salmon and steelhead habitat located in the tributaries upstream of Wells Dam.

The WBMP and Douglas PUD's Land Use Policy both provide protection for native habitats associated with the Wells Project.

Recreation Benefits

The RMP describes Douglas PUD's plans for operations and maintenance, design, and continued development of recreation facilities within the Wells Project Boundary. The goal of the RMP is to provide recreational opportunities at the Wells Project throughout the term of the new FERC license in accordance with the relevant FERC requirements and the needs of the Project. The RMP provides guidance for addressing current recreational uses and opportunities within the Wells Project and provides a process for identifying changing needs and uses over time for future enhancement of the public's use and enjoyment of the recreational resources associated with the Wells Project.

Measures proposed within the RMP are based on the recreational resources currently available at the Project as well as statewide and regional recreation use trends identified through studies conducted as part of the Wells ILP. Proposed measures are defined within four programs that would be implemented within the Wells Project Boundary. The measures included in the RMP are: (1) the Recreation Facility Capital Improvement Program; (2) the Recreation Facility Operation and Maintenance Program; (3) the

Recreation Use Monitoring Program; and (4) the Recreation Plan Update Program. The new recreation facilities will provide socioeconomic benefits to the local communities. Regular recreation use monitoring and updating of the plan will provide for future recreation needs of the communities.

The wildlife management goals of the Off-License Settlement Agreement include creating, protecting, maintaining, and enhancing wildlife habitat within the WWA, and provide for the protection of RTE wildlife and botanical resources, noxious weeds management, and wetland habitat protection on all six units of the WWA. The trout production obligations of this Agreement will provide substantial additional fishing recreation throughout Douglas and Okanogan counties.

Cultural Resource Protection Benefits

An HPMP was developed to guide Douglas PUD in protecting historic properties within the Wells Project APE during the term of the new FERC license. The HPMP was developed by Douglas PUD in consultation with the Cultural RWG which included the SHPO, THPO of the CCT, FERC, BLM, and BIA.

The purpose of the HPMP is to provide guidelines to Douglas PUD for managing historic properties affected by the operation and maintenance of the Wells Project and complying with the NHPA during the term of the new FERC license. The HPMP includes protocols for achieving NHPA compliance through monitoring and protection of historic properties, and through consultation with the SHPO, THPO, and other interested parties.

3.3.8.4 Unavoidable Adverse Effects

The Wells Project has no known unavoidable adverse effects on socioeconomic resources.

3.4 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, operation of the Wells Project would continue unchanged from existing Project operations, including current measures to address environmental issues, in accordance with the conditions of the existing license. These existing measures are described in detail in section 2.1 of this EA. Section 4.0 of this EA provides a summary of these measures.

4.0 DEVELOPMENTAL ANALYSIS

This section contains an analysis of the Wells Project's use of the water resources of the Columbia River for hydropower purposes, the economic benefits of the Project, and the cost of various environmental measures and the effects of these measures on Project operations. Douglas PUD does not propose any modifications to the Project generation facilities, but it does propose numerous environmental and recreational enhancements that would affect the cost of Project power.

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

Consistent with the FERC's approach to economic analysis, the value of the Project's power benefits is determined by estimating the cost of obtaining the same amount of energy and capacity using likely alternative resources. The analysis is based on current costs and does not consider future escalation of fuel prices in valuing the Project's power benefits[1].

The average annual net generation for the period 2003 to 2007 was 4,077,400 MWh. The nameplate capacity of the Wells Project is 774,300 kilowatts (kW), yielding a capacity factor of 60 percent using the long-term energy output. Net generation is the gross generation at the Wells Project reduced by station service and transmission losses. Douglas PUD places a high value on providing reliable, clean power to its customer-owners at a predictable price. The lowest cost alternative source of energy on any given day may be a one-day block of off-peak power purchased on the open market. However, this energy may or may not be available the following day, week, or year and does not provide Douglas PUD with a high level of financial certainty. Long-term power sales agreements provide a greater level of certainty but generally command a higher price in the marketplace. However, long-term, fixed-price agreements for a term greater than five years are not generally available in the current market.

No other energy resource can be truly equivalent to the hydropower generation provided by the Wells Project when one considers reliability, flexibility, and the ability to provide ancillary services. While not truly equivalent, Douglas PUD evaluated various alternative sources of power and developed the following generation portfolio as the most likely low-cost alternative:

- New coal-fired Integrated Gasification Combined Cycle (IGCC) plant rated at 565 MW (plant factor of 0.75), combined with
- New 375 MW wind plant (plant factor of 0.2)

[1] See Mead Corporation, Publishing Paper Division, 72 FERC ¶61,027 (July 13, 1995).

The integration of the wind plant with the IGCC plant would meet Washington State renewable energy standards. Douglas PUD prepared an analysis of the All-in-Costs (AIC) for this combination of generation facilities (see Exhibit H) and found the annual cost of the IGCC to be roughly $70 per MWh and the annual cost of the wind plant to be about $130 per MWh. Applying these costs, the annual replacement value of the power generated at the Wells Project was calculated to be $322 million, or $79/MWh, in 2008 dollars.

4.2 COMPARISON OF ALTERNATIVES

Table 4.2-1 provides a summary of the annual costs and power benefits for the two alternatives under consideration: no-action and Douglas PUD's proposal.

Table 4.2-1 Summary of annual costs and power benefits for two alternatives.

	No-Action	Douglas PUD's Proposal
Installed capacity (MW)	840	840
Annual net generation 2003-2007 (MWh)	4,077,400	4,077,400
Annual power value ($/MWh)	$79.00	$79.00
Annual cost ($/MWh)	$8.37	$16.93

4.2.1 No-action Alternative

Under the no-action alternative, the Project would continue to operate as it does now. The Project generates an average of 4,077,400 MWh of electricity annually (2003-2007). The average annual power value of the Project under the no-action alternative would be $322 million (about $79/MWh). The average annual cost of producing this power under the no action is $34.1 million ($8.37/MWh), the weighted average of the actual costs incurred during FY 2003-2007.

4.2.2 Douglas PUD Alternative

Douglas PUD is proposing to implement extensive environmental measures including the implementation of the Wells HCP, ASA, RMP, HPMP, WBMP, APP and Land Use Policy (Table 4.3-1).

New facilities described within these plans include Douglas PUD's participation in a white sturgeon hatchery and rearing facility, new visitor interpretive facility located at the Wells Dam Overlook, boat-in tent camping facilities, Marina Park expansion, substantial modifications and upgrades to the facilities and operations at the Methow and Wells fish hatcheries related to the implementation of the UCR spring Chinook and UCR steelhead HGMPs, and the construction of additional Project-related recreation facilities.

The measures proposed by the Douglas PUD would not change the Project's installed or dependable capacity or its average annual generation. The average annual power value of the Project under Douglas PUD's proposal would be $322 million (about $79/MWh). The average annual cost of producing this power would be $58.9 million ($16.93/MWh) over a 50 year license term. Over a 30 year license term, the annual cost of power would be $64.3 million ($18.49/MWh).

4.3 COST OF ENVIRONMENTAL MEASURES

Certain measures proposed by Douglas PUD would affect Project economics because they can increase the production cost by requiring new capital expenditures or additional annual costs for operations and maintenance. None of the measures would affect the Project's power production capability or average annual generation. As a municipal utility, financing for major capital expenditures is secured by the issuance of long term bonds.

Table 4.3-1 gives the cost of the environmental enhancement measures proposed for the Wells Project. All costs are annualized over the 30 years of analysis to allow for a uniform basis of comparison of the benefits of a measure against its costs.

Table 4.3-1 30-year costs of proposed and recommended environmental measures for the Wells Hydroelectric Project.

	Exhibit D PM&E	Environmental Measures	Capital Costs (2012$)	O&M Costs (2012$)	30-Years Annualized Cost
Continuation of Current Wells HCP Measures	1	Annual Debt Service Fish Facilities	$118,883,558		$3,962,785
	2	Replacement of the Wells Fish Hatchery Intake Screen	N/A[1]		N/A[1]
	3	Refurbishment of the Adult Fish Ladders	$6,263,165		$208,772
	4	Repair and Rehabilitate the JBS	$1,913,676		$63,789
	5	Repair and Rehabilitate the adult PIT-tag system	$1,860,346		$62,012
	6	Operation of Wells Fish Facilities		$8,981,751	$299,392
	7	Supervision of Fish Facilities		$16,817,529	$560,584
	8	Maintenance of Fish Facilities (adult ladder and juvenile bypass)		$2,016,615	$67,221
	9	Hatchery Operations		$24,177,058	$805,902
	10	Maintenance of Hatcheries		$19,541,076	$651,369
	11	Wells HCP Fish Study Costs		$45,697,542	$1,523,251
	12	Methow Coho Program		$2,604,485	$86,816
	13	Tributary Enhancement Fund		$8,338,257	$277,942
	14	Adult Fish Passage and Juvenile Fish Run-timing Studies[1]		$6,697,246	$223,242
	15	Passage and Survival Studies (2)		$23,738,016	$791,267
		Subtotal	*$128,920,745*	*$158,609,575*	*$9,584,344*
New Wells HCP Measures	16	Implement UCR Spring Chinook HGMP	$19,138,001		$637,933
	17	Implement UCR Steelhead HGMP	$24,804,615		$826,821
	18	Chief Joseph Hatchery Chinook Program		$2,232,415	$74,414
		Subtotal	*$43,942,616*	*$2,232,415*	*$1,539,168*
White Sturgeon Management Plan	19	Brood Stock Collection and Breeding Plan		$93,017	$3,101
	20	Brood Stock Collection		$1,700,150	$56,672
	21	Phase I Juvenile White Sturgeon Stocking (Hatchery Operations and Planting)		$2,480,461	$82,682
	22	Phase I Juvenile White Sturgeon Stocking (passive/active tagging and external marking)		$496,092	$16,536
	23	Phase I Index Monitoring and Evaluation Program		$1,550,288	$51,676
	24	Phase I Marked Fish Tracking Program		$930,173	$31,006
	25	Determining Natural Reproduction Potential		$372,069	$12,402
	26	Phase II Long-Term Juvenile White Sturgeon Stocking		$4,464,831	$148,828
	27	Phase II Supplementation Program Review		$1,488,277	$49,609
	28	Phase II Long-Term Index Monitoring Program		$818,552	$27,285
	29	Evaluation and Implementation of Adult Passage Measures		$124,023	$4,134
	30	Educational Opportunities Coinciding with Sturgeon Activities		$74,414	$2,480
	31	Annual Report (See Settlement Cost Table)		N/A[2]	N/A[2]
		Subtotal	*N/A[3]*	*$14,592,347*	*$486,412*

	Exhibit D PM&E	Environmental Measures	Capital Costs (2012$)	O&M Costs (2012$)	30-Years Annualized Cost
Bull Trout Management Plan	32	Modify Fishways and Bypass if Adverse Impacts are Identified	N/A[5]		N/A[5]
	33	Adult and sub-adult Ladder Passage		N/A[4]	N/A[4]
	34	Bull Trout Upstream Fishway Counts		N/A[4]	N/A[4]
	35	Bull Trout Fishway Operating Criteria		N/A[4]	N/A[4]
	36	Bull Trout Bypass Operations		N/A[4]	N/A[4]
	37	Adult Bull Trout Passage Evaluation		$387,572	$12,919
	38	Adult Bull Trout Passage Evaluation at (Off-Project) Collection Facilities		$318,916	$10,631
	39	Sub-Adult Bull Trout Monitoring		$186,035	$6,201
	40	Conduct Entrapment and Stranding Surveys		$124,023	$4,134
	41	Documenting Incidental Captures due to Predator Control and Other MP Activities		$186,035	$6,201
	42	Fund Collection of Tissue Samples and Genetic Analysis		$34,881	$1,163
	43	Information Exchange and Regional Monitoring Efforts		$85,576	$2,853
	44	Bull Trout Monitoring During Hatchery Activities		$74,414	$2,480
	45	Twisp Weir Monitoring for Bull Trout Delay		$124,023	$4,134
	46	Monitor and Mitigate Effects of Hatchery Program on Bull Trout		$372,069	$12,402
	47	Annual Report (See Settlement Cost Table)		N/A[2]	N/A[2]
		Subtotal	*N/A[3]*	*$1,893,544*	*$63,118*
Lamprey Management Plan	48	Fishway Modifications to Improve Upstream Passage, Including Fishway Inspections, Entrance Efficiency Plans, Transition Zone Plans, and Diffuser Grating Modifications	$1,240,231		$41,341
	49	Upstream Fishway Operating Criteria		$186,035	$6,201
	50	Salvage Activities During Ladder Dewatering and Maintenance		$74,414	$2,480
	51	Upstream Fishway Counts		$372,069	$12,402
	52	Upstream Passage Improvement Literature Review		$24,805	$827
	53	Adult Pacific Lamprey Upstream Passage Evaluation (Following Implementation of Modifications)		$372,069	$12,402
	54	Periodic Monitoring (After Passage Standard Met)		$372,069	$12,402
	55	Downstream Bypass Operating Criteria		NA[6]	NA[6]
	56	Juvenile Passage Survival Literature Review		$31,006	$1,034
	57	Juvenile Downstream Passage and Survival Evaluation		$3,720,692	$124,023
	58	Juvenile Lamprey Habitat Evaluation		$186,035	$6,201
	59	Regional Workgroup Participation		$186,035	$6,201
	60	Annual Report (See Settlement Cost Table)		N/A[2]	N/A[2]
		Subtotal	*$1,240,231*	*$5,525,229*	*$225,515*

	Exhibit D PM&E	Environmental Measures	Capital Costs (2012$)	O&M Costs (2012$)	30-Years Annualized Cost
Resident Fish Management Plan	61	Predator Control	N/A[4]		
	62	Shoreline Protection	N/A[4]		
	63	Monitor Resident Fish Assemblage within the Wells Reservoir		$1,302,242	$43,408
	64	Actions to Address Major Shifts in Native Resident Fish Assemblage		$310,058	$10,335
	65	Monitoring in Response to Proposed Changes in Project Operations		N/A[6]	N/A[6]
	66	Annual Report (See Settlement Cost Table)		N/A[2]	N/A[2]
		Subtotal	*N/A[3]*	*$1,612,300*	*$53,743*
Aquatic Nuisance Species Management Plan	67	Implement Best Management Practices during Recreation Improvement Activities		$93,017	$3,101
	68	Coordination with Regional and State Entities		$186,035	$6,201
	69	Monitor Bycatch from other Activities for ANS		$372,069	$12,402
	70	ANS Information and Education		$558,104	$18,603
	71	Monitor and Address ANS Effects to Aquatic Communities during Changes in Project Operations		N/A[6]	N/A[6]
	72	Annual Report (See Settlement Cost Table)		N/A[2]	N/A[2]
		Subtotal	*N/A[3]*	*$1,209,225*	*$40,307*
Water Quality Management Plan	73	TDG Monitoring		$2,046,381	$68,213
	74	Spill Operations Plan		$138,906	$4,630
	75	Gas Abatement Plan and TDG Exception		$372,069	$12,402
	76	Temperature Monitoring		$483,690	$16,123
	77	Participation in Temperature TMDL Development and Implementation		$186,035	$6,201
	78	Spill Prevention and Control Requirements		$310,058	$10,335
	79	Participation in Columbia and Snake River Spill Response Initiative		$372,069	$12,402
	80	Inspections		$186,035	$6,201
	81	Annual Report (See Settlement Cost Table)		N/A[2]	N/A[2]
	82	Study Plans (Quality Assurance Plans)		$1,116,208	$37,207
		Subtotal	*N/A[3]*	*$5,211,451*	*$173,714*
Settlement Work Group	83	Meeting Facilitation and Minutes		$1,339,449	$44,648
	84	Annual Report		$1,860,346	$62,012
		Subtotal	*N/A[3]*	*$3,199,795*	*$106,660*

	Exhibit D PM&E	Environmental Measures	Capital Costs (2012$)	O&M Costs (2012$)	30-Years Annualized Costs
Terrestrial Management Plans (Wildlife and Botanical, and Avian Protection)	85	Repair the Cassimer Bar Wildlife Management Area Dikes (Includes Design and Permitting).	$37,207		$1,240
	86	Install Signs at Access Sites regarding American White Pelican Avoidance.		$6,201	$207
	87	Provide Irrigation for Irrigation Dependent Riparian Vegetation at Bridgeport Bar Wildlife Unit.		$365,223	$12,174
	88	Survey and Revise Site Boundaries for RTE Plants.		$41,672	$1,389
	89	Allow No Ground Disturbing Activities or Land Use Permits Within 500 Feet of Known RTE Plants.		N/A[7]	N/A[7]
	90	Follow Specific Protocols for Weed Control on Project Lands, in the 230kV Corridor, and Near RTE Plants.		N/A[7]	N/A[7]
	91	Inventory Raptor Perch Poles and Replace as Needed.		$197,941	$6,598
	92	Remove Raptor Perch Poles at Starr Boat Launch.		$1,860	$62
	93	Conduct Monthly Bald Eagle and Perch Tree Inventories.		$78,730	$2,624
	94	Install Beaver Protection on Raptor Perch Trees.		$62,012	$2,067
	95	Inspect and Repair Beaver Protection on Raptor Perch Trees.		$93,017	$3,101
	96	Ensure Recruitment of Small Trees for Future Perch Trees.		$111,621	$3,721
	97	Plant at Least 50 Acres of Grain Crops at Bridgeport Bar Wildlife Unit.		$339,699	$11,323
	98	Conduct Twice Monthly Reservoir Monitoring of Project to Identify Unauthorized Habitat Damage.		$786,406	$26,214
	99	Repair or Replace Lost Habitat due to Unauthorized Damage.		$297,655	$9,922
	100	Manage Cassimer Bar Wildlife Management Area for Wildlife.		$186,035	$6,201
	101	Inspect Cassimer Bar Dikes and Repair as Needed.		$55,810	$1,860
	102	Control Class A and B Designate Weeds.		$1,116,208	$37,207
	103	Conduct Weed Surveys.		$372,069	$12,402
	104	Consult with Agencies as Needed.		$37,207	$1,240
	105	Install Bird Flight Diverters in the Event that the River Crossing is Reconductored.		$18,603	$620
	106	Avian Protection Plan		$111,621	$3,721
		Subtotal	*$37,207*	*$4,279,590*	*$143,893*

	Exhibit D PM&E	Environmental Measures	Capital Costs (2012$)	O&M Costs (2012$)	30-Years Annualized Costs
Historic Properties Management Plan	107	HPMP Administration		$1,116,208	$37,207
	108	Employee Education Program		$111,621	$3,721
	109	Public Education Program		$37,207	$1,240
	110	Monthly Reservoir Inspections		N/A[8]	N/A[8]
	111	Evaluate Wells Dam for Historic and Architectural Significance		$24,805	$827
	112	Document and Data Indexing/Archiving		$24,805	$827
	113	HPMP Implementation Report		$372,069	$12,402
	114	Annual Archaeological Monitoring at 44 Sites		$279,052	$9,302
	115	Erosion Monitoring at Selected Archaeological Sites		$186,035	$6,201
	116	Periodic Monitoring after 2016 and Inundated Sites Monitoring		$1,116,208	$37,207
	117	Ten Year Archaeological Monitoring		$198,437	$6,615
	118	Site Testing at 8 Sites and Periodic Site Testing Following Monitoring Efforts.		$372,069	$12,402
	119	Curation		$1,116,208	$37,207
	120	Site Protection at Selected Archaeological Sites		$372,069	$12,402
		Subtotal	*N/A*[3]	*$5,326,793*	*$177,560*
Recreation Management Plan	121	Wells Dam Overlook Interpretive Displays	$793,748		$26,458
	122	Marina Park Expansion	$706,932		$23,564
	123	Boat-in Tent Camping (formal)	$62,012		$2,067
	124	Boat-in Tent Camping (rustic) and Signage	$18,603		$620
	125	Extend Chicken Creek Boat Launch	$18,603		$620
	126	Reservoir Navigation Maps	$24,805		$827
	127	Recreation Facilities Operation and Maintenance		$8,897,084	$296,569
	128	Wildlife viewing trail development		$55,810	$1,860
	129	Promotion of Recreation Facilities		$31,006	$1,034
	130	FERC Form 80 Recreation User Counts		$62,012	$2,067
	131	Recreation Management Plan Update		$3,100,577	$103,353
	132	Recreation Use/Need Study		$186,035	$6,201
	133	Recreation Management Plan Administration		$372,069	$12,402
		Subtotal	*$1,624,703*	*$12,681,360*	*$476,869*
		TOTALS	***$175,765,502***	***$216,373,624***	***$13,071,304***

[1]This measure's costs would not be incurred during the first 30 years of the license.
[2]Annual report costs for each Aquatic Settlement Management Plan are consolidated under the Aquatic Settlement Work Group.
[3]There are no capital costs associated with this management plan.
[4]These measures are implemented through the existing measures of the Wells HCP
[5]These measures will not be implemented unless adverse impacts are identified during implementation of the management plan.
[6]These measures will not be implemented unless there is a major change in Wells Dam operations requiring FERC approval.
[7]These measures are captured in the baseline cost, i.e., continuation of historic power costs.
[8]This measure is implemented in conjunction with reservoir monitoring for the Terrestrial MP.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPARISON OF ALTERNATIVES

This section will be completed by the FERC in the Final Environmental Assessment (FEA).

5.2 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

This section will be completed by the FERC in the FEA.

5.3 UNAVOIDABLE ADVERSE IMPACTS

This section will be completed by the FERC in the FEA.

5.4 RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

This section will be completed by the FERC in the FEA.

5.5 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C. § 803(a)(2)(A), requires the FERC to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by a project. These plans and project consistency with these plans is described in Exhibit H.

Table 5.5-1 FERC comprehensive plans considered for the Wells Project.

Comprehensive Plan	Agency
Anadromous Fish Agreement and Habitat Conservation Plan: The Wells Hydroelectric Project (FERC Project No. 2149). March 26, 2002.	National Marine Fisheries Service, Washington, D.C.
Fisheries USA: The Recreational Fisheries Policy of the U.S. Fish and Wildlife Service. No date.	U.S. Fish and Wildlife Service, Washington, DC
An Assessment of Outdoor Recreation in Washington State: A State Comprehensive Outdoor Recreation Planning (SCORP) Document 2002-2007. October 2002.	Interagency Committee for Outdoor Recreation, Olympia, WA
State of Washington Outdoor Recreation and Habitat: Assessment and Policy Plan, 1995-2001. November 1995.	Interagency Committee for Outdoor Recreation, Tumwater, WA
Washington State Trails Plan: Policy and Action Document. June 1991.	Interagency Committee for Outdoor Recreation, Tumwater, WA
The Fifth Northwest Electric Power and Conservation Plan. Council Document 2005-07.	Northwest Power and Conservation Planning Council, Portland, OR
Columbia River Basin Fish & Wildlife Program. Council Document 2000-19. *As superseded by:* 2009 Columbia River Basin Fish & Wildlife Program. Council Document	Northwest Power and Conservation Planning Council, Portland, OR
Mainstem Amendments to the Columbia River Basin Fish & Wildlife Program. Council Document 2003-11.	Northwest Power and Conservation Planning Council, Portland, OR
Protected Areas Amendments and Response to Comments. Council Document 88-22.	Northwest Power and Conservation Planning Council, Portland, OR
Resource Protection Planning Process-Paleoindian Study Unit. 1987	Washington State Dept. of Community Development, Office of Archaeology and Historic Preservation, Olympia, WA
Water Resources Management Program -Methow River Basin. November 1977.	Washington Department of Ecology, Olympia, WA
Water Resources Management Program -Okanogan River Basin. February 1978.	Washington Department of Ecology, Olympia, WA
State Wetlands Integration Strategy. December 1994.	Washington Department of Ecology, Olympia, WA
Application of Shoreline Management to Hydroelectric Developments. September 1986.	Washington Department of Ecology, Olympia, WA
Hydroelectric Project Assessment Guidelines. 1987. *As superseded by:* Hydroelectric Project Assessment Guidelines. 1995	Washington Department of Fisheries, Olympia, WA
Strategies for Washington’s Wildlife. May 1987.	Washington Department of Game, Olympia, WA
State of Washington Natural Heritage Plan. 1987. *As superseded by:* State of Washington Natural Heritage Plan. 2007	Washington Department of Natural Resources, Olympia, WA
Final Habitat Conservation Plan. September 1997.	Washington Department of Natural Resources, Olympia, WA
Settlement Agreement pursuant to the September 1, 1983, Order of the U.S. District Court for the District of Oregon in Case No. 68-513. Columbia River Fish Management Plan. November 1987.	State of Washington, State of Oregon, State of Idaho, Confederated Tribes of the Warm Springs Reservation of Oregon, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, Confederated Tribes and Bands of the Yakama Indian Nation.

Comprehensive Plan	Agency
A Resource Protection Planning Process Identification Component for the Eastern Washington Protohistoric Study Unit. 1987.	Washington Dept. of Community Development, Office of Archaeology and Historic Preservation, Olympia, WA
Washington State Hydropower Development/Resource Protection Plan. December 1992.	Washington State Energy Office, Olympia, WA
North American Waterfowl Management Plan. May 1986.	U.S. Fish and Wildlife Service, Canadian Wildlife Service. U.S. Department of the Interior. Environment Canada.
National Marine Fisheries Service, Seattle, Washington. Pacific Fishery Management Council, Portland, Oregon. 1978. Fishery management plan for commercial and recreational salmon fisheries off the coasts of Washington, Oregon, and California commencing in 1978. Department of Commerce. March 1978.	National Marine Fisheries Service, Seattle Washington and Pacific Fishery Management Council, Portland, OR
Eighth Amendment to the Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and California. January 1988.	Pacific Fishery Management Council, Portland, OR
Nationwide Rivers Inventory, January 1982	Department of the Interior, National Park Service. Washington, D.C.
Statute Establishing the State Scenic River System, Chapter 79.72 RCW., 1977	State of Washington, Olympia, Washington.
Washington State Scenic River Assessment and Scenic Rivers Program Report. 1988.	Washington State Parks and Recreation Commission. Olympia, Washington.
Resource Protection Planning Process - mid-Columbia Study Unit. 1987.	Washington Department of Community Development. Office of Archaeology and Historic Preservation. Olympia, Washington.
Resource Protection Program for the Main Stem Columbia River in Washington State. 1982.	Washington Department of Ecology. Olympia, Washington.

6.0 FINDING OF NO SIGNIFICANT IMPACT

Under the no-action alternative, the Applicant would continue to operate the Wells Project as it does under the terms of the current license, resulting in no change in environmental conditions; this is the baseline condition under which this EA is framed. The Applicant's proposed measures would result in net, positive enhancements of the Project environment, above the current baseline; therefore, a finding of No Significant Impact is both logical and appropriate for this application.

On the basis of this environmental analysis, issuance of a new license for the Wells Project would not constitute a major federal action significantly affecting the quality of the human environment. Continuing to operate the Wells Project, with the proposed protection, mitigation, and enhancement measures (i.e., the Proposed Action), would continue to protect and/or enhance water quality, aquatic and terrestrial resources, maintain and/or improve public use of recreation resources, and protect historical and archaeological resources within the Project area, while continuing to provide over four million MWh annually of low-cost, non-polluting, renewable and reliable electric power.

7.0 REFERENCES

Anchor Environmental, L.L.C. and Public Utility District No. 1 of Douglas County. 2005. Annual Report - Calendar Year 2004 - of Activities Under the Anadromous Fish Agreement and Habitat Conservation Plan. Prepared for the Federal Energy Regulatory Commission, Washington, D.C.

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8.0 LIST OF PREPARERS

The FERC will identify in the final environmental document, staff and any contractors who worked on that document.

9.0 CONSULTATION DOCUMENTATION

If the FERC determines that the final environmental document requires an Environmental Impact Statement, the document will include a list of recipients on the FERC's mailing and service lists.

Appendix E-1

Habit Conservation Plan

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EXHIBIT NO. 1

Anadromous Fish Agreement and

Habitat Conservation Plan

The Wells Hydroelectric Project

FERC License No. 2149

March 26, 2002

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SECTION 13 (CONTINUED)

Supporting Document A : Aquatic Species and Habitat Assessment: Wenatchee, Entiat, Methow, and Okanogan Watersheds (1998).

Supporting Document B : Biological Assessment and Management Plan (BAMP): Mid-Columbia Hatchery Program (1998).

Supporting Document C : Briefing Paper: Estimating Survival of Anadromous Fish through the Mid-Columbia PUD Hydropower Projects (2002).

Supporting Document D : Tributary Plan, Project Selection, Implementation and Evaluation (1998).

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Anadromous Fish Agreement and Habitat Conservation Plan
Wells Hydroelectric Project, FERC License No. 2149

THIS AGREEMENT for the Wells Hydroelectric Project (Project) is entered into between the Public Utility District No. 1 of Douglas County, Washington, (District) a Washington municipal corporation; the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), the Confederated Tribes of the Umatilla Indian Reservation (Umatilla) (collectively, the Joint Fisheries Parties or the JFP); and American Rivers, Inc., (American Rivers) a Washington D.C., nonprofit corporation (the JFP and American Rivers, are referred to as the Fisheries Parties (FP); and the Power Purchasers which shall be represented through a single non-voting representative whom they will designate from time to time. All entities, who have executed this agreement, are collectively referred to as the Parties.

INTRODUCTION

A. The site of the Project is habitat for Plan Species. Prior to this Agreement the needs of the Plan Species and their habitat have been addressed through litigation and agreement. This Agreement is intended to constitute a comprehensive and long-term adaptive management plan for Plan Species and their habitat as affected by the Project.

B. The objective of this Agreement is to achieve No Net Impact (NNI) for each Plan Species affected by the Project on the schedule set out herein and to maintain the same for the duration of the Agreement. NNI consists of two components: (1) 91% Combined Adult and Juvenile Project Survival achieved by project improvement Measures implemented within the geographic area of the Project (2) 9% compensation for Unavoidable Project Mortality provided through hatchery and tributary programs, with 7% compensation provided through hatchery programs and 2% compensation provided through tributary programs. The Parties intend these actions to contribute to the rebuilding of tributary habitat production capacity and basic productivity and numerical abundance of Plan Species.

C. The District will receive a Permit for Permit Species upon this Agreement becoming effective. If the District carries out its responsibilities for fish protection and mitigation Measures set out in this Agreement, and provide the necessary monitoring and evaluation, all according to the time frames set out for each Measure, the Permit shall continue for the full term of this

Agreement subject to Section 2 (Termination) and Section 10 (Endangered Species Act Compliance). The Parties shall take the actions set out in this Agreement in support of the District before the Federal Energy Regulatory Commission (FERC) and in other forums.

D. Capitalized terms used in this Agreement are defined in Section 13 (Definitions).

NOW, THEREFORE, IN CONSIDERATION of the mutual promises and conditions set forth herein, the Parties agree as follows:

SECTION 1
TERM OF AGREEMENT

1.1 Term. Unless terminated early according to Section 2 (Termination), this Agreement shall become effective on the date this Agreement is approved by FERC and shall remain in full force and effect for a period of fifty (50) years from that date. From the date this Agreement becomes effective, it shall prospectively supersede the Wells Settlement Agreement dated October 1, 1990.

SECTION 2
TERMINATION

2.1 Automatic Termination Events. This Agreement shall terminate automatically: (1) at the end of the term of the Agreement as set forth in Section 1 (Term of Agreement), (2) in the event the FERC issues the District a non-power license for the Project, (3) in the event the FERC orders removal of the Project, (4) in the event the FERC orders drawdown of the Project or (5) the District withdraws from this Agreement based on sub-Section 2.2 (Elective Withdrawal Events). The District's obligations under this Agreement shall terminate in the event its FERC license is terminated or transferred to another entity. The Parties agree that the terms of this Agreement shall be binding on their respective successors and assigns.

2.2 Elective Withdrawal Events.

2.2.1 Enough Already.

2.2.1.1 A Party may withdraw from this Agreement when at least twenty (20) years has elapsed from March 1, 1998, subject to the following conditions: (1) No Net Impact (NNI) has not been achieved or has been achieved but has not been maintained, or (2) the Project has achieved and maintained NNI but the Plan Species are not rebuilding and the Project is a significant factor in the failure to rebuild.

2.2.1.2 If NMFS and the District are in agreement as to specific Measures to remedy the District's failure to achieve or maintain NNI and the District promptly implements agreed Measures that are applicable to the District, NMFS will refrain from suspending or revoking the Permit. In the event that NNI has not been achieved or has been achieved but has not been maintained by March 1, 2018, but the District is otherwise performing all obligations assigned to it in the Permit, and is otherwise in full compliance with all terms and conditions of this Agreement and the Permit, NMFS and USFWS will not exercise their right to withdraw from this Agreement or revoke the Permit unless such withdrawal is explicitly to seek drawdown, dam removal, and/or non-power operations, or actions for achievement of NNI. Should the District, NMFS, and USFWS agree under these circumstances, such actions may be pursued without withdrawing from the Agreement or suspension or revocation of the Permit.

2.2.2 Non-Compliance. A Party may elect at any time to withdraw from the Agreement based on non-compliance of another Party with the provisions of the Agreement, but only subject to the following procedures: (1) a Party asserts that another Party is not complying with the terms of the Agreement, (2) the Party documents and presents evidence supporting assertion of non-compliance in writing (3) the issue of non-compliance is taken to Dispute Resolution, Section 11 (Dispute Resolution), unless waived. Following Dispute Resolution, a Party choosing to withdraw, shall provide all other Parties with notice of withdrawal. The notice shall be in writing and either served in person or provided by U. S. Mail return receipt requested. The right to withdraw shall be waived if not exercised within 60 Days of Dispute Resolution being completed. Sub-Section 2.2.6 (Withdrawal of Another Party) applies to a Party's receipt of notice provided for in this sub-Section.

2.2.3 Governmental Action. A Party may elect to withdraw from this Agreement, pursuant to 9.3.2, in the event that an entity with regulatory authority takes action that (1) is detrimental to the achievement of the obligations set forth in this Agreement and (2) that materially alters or is contrary to one or more terms set forth in this Agreement.

2.2.4 Impossibility. A Party may elect to withdraw from the Agreement in the event the Parties agree in writing that the obligations imposed by this Agreement are impossible to achieve.

2.2.5 Revocation of Permit. A Party may elect to withdraw from the Agreement if the NMFS revokes the Permit.

2.2.6 Withdrawal of Another Party. Upon receipt of a Party's notice of intent to withdraw, any other Party shall have 120 Days from the date of such notice to provide notice to all Parties of its intent to withdraw from this Agreement, or this right to withdraw shall be waived.

2.3 Conditions Precedent to Withdrawal. Two conditions must be satisfied before a Party can withdraw from the Agreement pursuant to sub-Section 2.2.3 (Governmental Action), 2.2.4 (Impossibility), sub-Section 2.2.5 (Revocation of Permit) or sub-Section 2.2.6 (Withdrawl of Another Party). First, the Party desiring to withdraw from the Agreement shall provide written notice to all other Parties of its intent to withdraw. The notice shall be in writing and either served in person or provided by U. S. Mail return receipt requested. The notice shall state the date upon which the Party's withdrawal shall become effective. The date upon which the Party's withdrawal becomes effective shall be no less than sixty (60) Days from the date the notice was provided to all other Parties. Second, prior to the date upon which the Party's withdrawal becomes effective the withdrawing Party (Parties) must make itself (themselves) available for at least one policy meeting to allow remaining Parties to attempt to persuade the withdrawing Party (Parties) not to withdraw. The policy meeting must take place within the sixty (60) Day period or it is waived.

2.4 Effect of Withdrawal. Except as set forth in sub-Section 2.5 (Effect of Termination), sub-Sections 9.4.1 and 9.4.3, and sub-Sections 10.5 (Permit Suspension, Revocation and Re-Instatement) and 10.6 (Early Termination Mitigation), in the event a Party withdraws from this Agreement, this Agreement places no constraints on the withdrawing Party, shall not thereafter be binding on the withdrawing Party, and the withdrawing Party may exercise all rights and remedies that the Party would otherwise have.

2.5 Effect of Termination. Except as set forth in sub-Section 7.3.7.6 (Account Status upon Termination), sub-Sections 9.4.1 and 9.4.3 and sub-Sections 10.5 (Permit Suspension, Revocation and Re-Instatement) and 10.6 (Early Termination Mitigation), upon expiration of this Agreement, or in the event this Agreement is terminated, voided or determined for any reason to be unenforceable before the end of its term, then: (1) the District shall continue to implement the last agreed to Measures until the FERC orders otherwise, and (2) the Parties are not restrained in any manner from advocating to the FERC Measures to replace the Agreement.

SECTION 3
SURVIVAL STANDARDS AND ALLOCATION OF RESPONSIBILITY FOR NO NET IMPACT

3.1 No Net Impact (NNI) shall be achieved on the schedule set out herein, and maintained for the duration of the Agreement for each Plan Species affected by the Project. NNI consists of two components: (1) 91% Combined Adult and Juvenile Project Survival achieved by project improvement Measures implemented within the geographic area of the Project, (2) 9% compensation for Unavoidable Project Mortality provided through hatchery and tributary programs, with 7% compensation provided through hatchery programs and 2% compensation provided through tributary programs. Measures and Survival Standards, as provided in Section 4 (Passage Survival Plan), Section 7 (Tributary Conservation Plan) and Section 8 (Hatchery Compensation Plan), shall be evaluated as provided in sub-Sections 6.9 (Progress Reports) and achieved no later than March 2013). The inability to measure a standard due to limitations of technology shall not be construed as a success or a failure to achieve NNI as further explained in sub-Section 4.1.1. (91% Combined Adult and Juvenile Survival) and sub-Section 4.1.2 (93% Juvenile Project Survival and 95% Juvenile Dam Passage Survival).

Based upon the best available information the District will achieve NNI within a few years time, well before the 2013 date. The District has achieved the 93% Juvenile Project Survival goal for yearling chinook and steelhead (See sub-Section 4.2.1 Phase I (1998-2002)) and Parties believe that the calculated Juvenile Dam Passage Survival for sockeye and sub-yearling chinook is probably greater than 95%. Adult survival cannot be conclusively measured at this time, as indicated in sub-Section 4.1.1 (91% Combined Adult and Juvenile Survival) and 4.1.3 (Adult Survival Assumptions). The Plan Species Account will be established upon FERC approval and will be used to fully compensate for adult mortality until an adult survival study can be conducted. The District has provided or is in the process of providing the 7% hatchery commitments or equivalent (in the case of sockeye). Achievement of the NNI goal by 2013 does not affect or diminish the provisions of sub-Section 2.2.1 (Enough Already) and sub-Section 9.5 (Re-Licensing).

3.2 To ensure NNI is achieved and maintained, the Coordinating Committee shall: (1) oversee monitoring and evaluation, and (2) periodically adjust the Measures to address actual project survival and Unavoidable Project Mortality as provided herein; provided that no more than 9% Unavoidable Project Mortality shall be made up through hatchery and tributary compensation without concurrence of the Coordinating Committee. Initially, adult survival estimates will be used to adjust the Plan Species Account contribution and Juvenile Project Survival estimates will be used to adjust hatchery based compensation programs (See Section 7: Example 1 and See Section 8: Example 2).

However, should adult survival rates fall below 98%, but the Combined Adult and Juvenile survival rate be maintained above 91%, additional hatchery compensation for that portion of adult losses that exceeds 2%, toward a maximum contribution of 7% hatchery funding and 2% tributary funding, would be utilized to satisfy the NNI compensation requirements for each Plan Species. Hatchery compensation shall not exceed 7% and tributary funding shall not exceed 2% unless agreed to by the Coordinating Committee.

3.3 The District shall be responsible for achieving the pertinent survival standard as provided in Section 3 (Survival Standards and Allocation of Responsibility for No Net Impact) and 4 (Passage Survival Plan) for each Plan Species affected by the Project through project improvement Measures (including adult, juvenile, and reservoir Measures). The District shall also be responsible for (1) funding the Tributary Conservation Plan as provided in Section 7; (2) providing the capacity and funding for the 7% Hatchery Compensation Plan as provided in Section 8; and (3) making capacity and funding adjustments to the Hatchery Compensation Plan to reflect and fully compensate for future increases in the run size of each Plan Species as provided in sub-Section 8.4.5 (Adjustment of Hatchery Compensation – Population Dynamics) and further adjustments to the Hatchery Compensation Plan to reflect the results of survival studies as provided in Section 8.4.4 (Adjustment of Hatchery Compensation – Survival Studies). If the District is unable to achieve the pertinent survival standard, then the District shall consult with the Parties through the Coordinating Committee to jointly seek a solution. If a solution cannot be identified to achieve the survival standards identified herein, any Party may take action under sub-Section 2.2.4 (Impossibility), or other provisions of this Agreement.

3.4 The Tributary Committee and Hatchery Committee shall develop plans and programs, which must include evaluation procedures, necessary to implement the Tributary Conservation Plan and the Hatchery Compensation Plan, respectively to compensate for Unavoidable Project Mortality. If Unavoidable Project Mortality is not compensated for through the Hatchery Compensation Plan, the Hatchery Committee may examine additional hatchery improvements to meet the Unavoidable Project Mortality hatchery obligation. If the Hatchery and Tributary Committees are unable to develop plans and programs to fully implement the Hatchery Compensation Plan and Tributary Conservation Plan, respectively, to meet compensation levels necessary to meet

NNI, then the respective committees may consult with the Coordinating Committee to jointly seek a solution.

3.5 Implementation of Measures to meet NNI shall follow the time frames set out in the Passage Survival Plan, the Tributary Conservation Plan and the Hatchery Compensation Plan. Where a deadline is not specified, implementation of Measures shall occur as soon as is reasonably possible.

SECTION 4
PASSAGE SURVIVAL PLAN

4.1 Survival Standards.

4.1.1 91% Combined Adult and Juvenile Survival. The District shall achieve and maintain 91% Combined Adult and Juvenile Project Survival, as required in sub-Section 3.3, which means that 91% of each Plan Species, juvenile and adult combined, survive Project effects. As of 2002, the Parties agree that adult fish survival cannot be conclusively measured for each Plan Species. Until technology is available to accurately determine Project effects, the District will implement the adult Measures as identified in sub-Section 4.4 (Adult Passage Plan). Given the present inability to differentiate between the sources of adult mortality, initial compliance with the Combined Adult and Juvenile Survival standard will be based upon the measurement of juvenile survival as provided in Section 4.1.2, (93% Juvenile Project Survival and 95% Juvenile Dam Passage Survival) below. It is anticipated that the District shall implement the measurement of adult survival at some time in the future should adult survival study methodologies and study plans be agreed to by the Coordinating Committee. Mitigation Measures will be adjusted at that time, if necessary, to address the new information.

4.1.2 93% Juvenile Project Survival and 95% Juvenile Dam Passage Survival. Limitations associated with the best available technology have required the development of three standards for assessing juvenile fish survival at the project. In order of priority they are: 1) Measured Juvenile Project Survival; 2) Measured Juvenile Dam Passage Survival; and 3) Calculated Juvenile Dam Passage Survival. The survival of each Plan Species shall be determined by using one of these standards, with subsequent evaluations implemented as appropriate, per the following guidelines. If the Combined Adult and Juvenile Project Survival cannot be measured, then Juvenile Project Survival shall be measured as the next best alternative until measurement is possible (See Section 13, "Juvenile Project Survival").

If Juvenile Project Survival for each Plan Species is measured to be greater than or equal to 93%, then the District will be assigned to Phase III (Standards Achieved). If Juvenile Project Survival is measured at less than 93% but greater than or equal to 91%, then the District will be assigned to Phase III (Provisional Review). If Juvenile Project Survival is measured at less than 91%, then the District will be assigned to Phase II (Interim Tools) (See Section 14, Figure 1. Wells HCP Survival Standard Decision Matrix).

Wells HCP Survival Standard Decision Matrix. The decision making process for implementation of the survival standards explained in Sections 4.1 (Survival Standards) and 4.2 (Phased Implementation Plans) is graphically depicted in Figure 1 below and Section 14 (Figures).

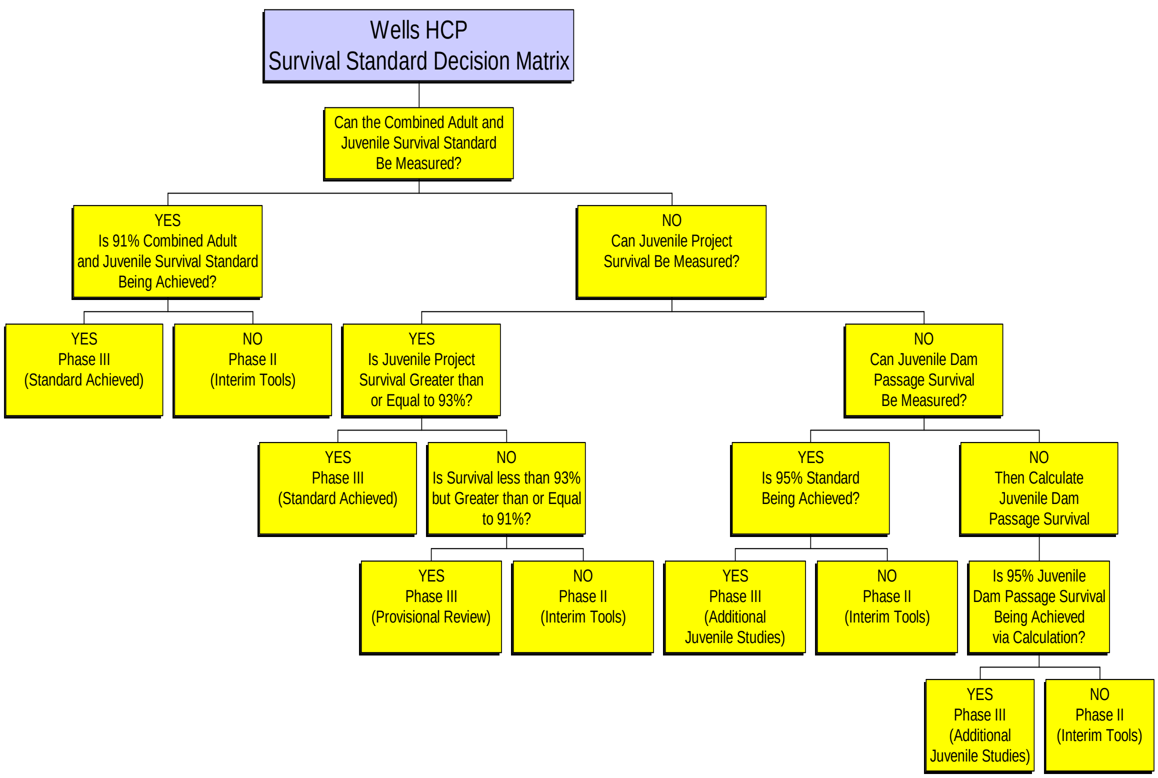


Figure 1. Wells HCP Survival Standard Decision Matrix

If Juvenile Project Survival cannot be measured, then Juvenile Dam Passage Survival shall be measured as the next best alternative until project measurement is possible (See Section 13, "Juvenile Dam Passage Survival"). The Juvenile Dam Passage Survival Standard is 95%.

For some Plan Species such as sockeye and subyearling chinook where measurement of Juvenile Project Survival and Juvenile Dam Passage Survival is not yet possible, the Juvenile Dam Passage Survival Standard will be calculated based on the best available information (including the proportion of fish utilizing specific passage routes and the use of off-site information), as determined by the Coordinating Committee. This calculation will consider the same elements as measured Juvenile Dam Passage Survival, except that off-site information may be used where site-specific information is lacking.

4.1.3 Adult Survival Assumptions. As of 2002, the Parties agree that adult fish survival cannot be conclusively measured for each Plan Species. Based on regional information, the survival of adult Plan Species is estimated to be 98-100%. Until, the Coordinating Committee approves and the District implements adult survival studies, the District will implement the adult passage Measures identified in sub-Section 4.4 (Adult Passage Plan) and provide the Tributary Conservation Plan account specified in Section 7 (Tributary Conservation Plan).

4.1.4 Methodologies. The survival standards contained within Section 4 (Passage Survival Plan) will be measured using the best available technology and study designs approved by the Coordinating Committee. Current methodologies are summarized in Supporting Document C. These methodologies are not exclusive, and may be updated based on new information or techniques. Juvenile Plan Species survival shall be measured at a ninety-five percent (95%) confidence level, with a standard error of the estimate that shall be not more than plus or minus 2.5% (i.e. 5% error). Results from a study meeting this precision level will automatically be included in the three-year average, unless the study has violated critical model assumptions or has been determined to be invalid by the Coordinating Committee. If a study meet all of the testing protocol and model assumptions and provided that the standard error around the point estimate does not exceed plus or minus 3.5%, then the Coordinating Committee, following unanimous approval, may utilize this information in the calculation of the three-year average. Point estimates of survival measured from the three years of valid studies shall be averaged (arithmetic) to compare against the pertinent Plan Species Survival Standard. The use of survival studies with standard errors between 2.5% and 3.5% shall not be subject to Dispute Resolution. If the average of the 3 years of survival measurements is no more than 0.5 percent below the survival standard, the Coordinating Committee may decide whether an additional year of study is appropriate. If an additional year of study is undertaken, the study result (if valid) will be included in the calculation of the arithmetic mean.

The testing shall reflect Representative Environmental Conditions and Representative Operational Conditions for each test, for each Plan Species and life history. Studies conducted during years where flow conditions, during the study, fall between the 10% and 90% points on the Flow Duration Curve (See Section 14, Figure 2a and 2b) shall be considered to have satisfied Representative Environmental Conditions (See Section 13, "Representative Environmental Conditions"). Should flow conditions fall outside the 10% and 90% points on the Flow Duration Curve but be between the 5% and 95% points on the Flow Duration Curve, then the Coordinating Committee, following unanimous approval, may utilize this information in the calculation of the three-year average. The use of survival studies that fall outside the 10% and 90% points on the Flow Duration Curves shall not be subject to Dispute Resolution. The Flow Duration Curves shall be subject to periodic review based upon new information.

The testing shall consider direct, indirect and delayed mortality wherever it may occur and can be measured (as it relates to the Project) given the available mark-recapture technology. The Coordinating Committee shall facilitate the availability of test fish for studies that may include rearing of additional fish beyond that required to meet NNI.

4.2 Phased Implementation Plans.

4.2.1 Phase I (1998 – 2002).

This Agreement shall be implemented in three phases. Under Phase I, the District shall implement 1) juvenile and adult operating plans and criteria to meet the Survival Standards set forth in sub-Section 4.1 (Survival Standards) and 2) a monitoring and evaluation program to determine compliance with the standards. Following the completion of the three-year monitoring and evaluation program in Phase I, the Coordinating Committee will determine whether the pertinent survival standards have been achieved. Depending on the results of this determination, the District will either proceed to Phase II (if the applicable survival standard has not been achieved) or Phase III (if the applicable survival standards has been achieved). In addition, three separate sub-phases were established within Phase III. The three sub-Phase designations are referred to as Phase III (Standards Achieved), Phase III (Provisional Review) and Phase III (Additional Juvenile Studies). The Parties to this Agreement established separate sub-phases within Phase III as a way to address existing limitations in the measurement of adult survival and Juvenile Project Survival for sockeye and subyearling chinook (See Section 14, Figure 1).

The Parties recognize that Douglas PUD has completed the three years of valid Juvenile Project Survival studies as documented in Section 15, Appendix B. The Parties further recognize that the District has achieved the 93% Juvenile Project Survival goal for yearling chinook and steelhead and that once this Agreement is implemented the District will move into Phase III (Standard Achieved) for these Plan Species. The District also recognizes that project survival information is currently limited for yearling chinook and steelhead originating from the Okanogan Basin. As a result, future Project Survival Studies (e.g. 10 year standards verification studies) shall consider and attempt to quantify the effect of the Wells reservoir on Okanogan origin yearling chinook and steelhead.

Measurement and evaluation of 91% Combined Adult and Juvenile Project Survival or 93% Juvenile Project Survival or the measurement or calculation of 95% Juvenile Dam Passage Survival will be assessed by the Coordinating Committee by 2002. Measurement of Juvenile Project Survival or Juvenile Dam Passage Survival during Phase I is expected to take three years to complete, unless additional years of study are agreed to by the Coordinating Committee.

Juvenile survival studies conducted during Phase I (See Section 15, Appendix B) may result in different phase designations for each of the Plan Species. For example, the District will move to Phase II (Interim Tools) or (Additional Tools), or to Phase III (Standard Achieved, Provisional Review or Additional Juvenile Studies) as described in Figure 1, depending on the survival results for individual Plan Species. At the conclusion of Phase I, the Coordinating Committee will determine the appropriate phase designation for each Plan Species. If the Coordinating Committee cannot agree, the Coordinating Committee may agree to require an additional year of study to resolve the disagreement, or a Party may institute Section 11 (Dispute Resolution) to address the need for additional Measures during the period of measurement and evaluation.

4.2.2 Phase II.

If the Coordinating Committee has determined, based upon Phase I monitoring and evaluation or Phase III periodic monitoring, that Juvenile Project Survival is less than 91% or Juvenile Dam Passage Survival (measured or calculated) is less than 95%, the District shall move to Phase II for that Plan Species.

4.2.3 Phase II -- (Interim Tools). If measurement and evaluation of Phase I concludes that the applicable survival standard has not been achieved, then the Wells bypass flow will be increased to 4.4 kcfs per bypass at night (1 hour before sunset to sunrise) for the period during which 80% of the Plan Species not meeting the Juvenile Dam Passage Survival Standard pass the Wells Project or for 40 days, whichever is less. The effect of increased bypass flows will be evaluated to determine if either 95% Juvenile Dam Passage Survival or the 93% Juvenile Project Survival or the 91% Combined Adult and Juvenile Project Survival levels are being attained. The Coordinating Committee will determine the number of valid studies (not to exceed three years of study) necessary to make a Phase determination following the implementation of Interim Tools. If the Combined Adult and Juvenile Survival or the Juvenile Project Survival goals are being achieved, as measured by the re-assessment studies, the District will advance to Phase III (Standards Achieved). If Juvenile Project Survival is re-evaluated and determined to be less than 93% and greater than or equal to 91%, then the Parties shall proceed to Phase III (Provisional Review). If Juvenile Dam Passage is re-evaluated and determined to be greater than or equal to 95%, then the Parties shall proceed to Phase III (Additional Juvenile Studies). If Juvenile Dam Passage Survival continues to be less than 95% and Juvenile Project Survival continues to be less than 91%, then the District shall proceed to Phase II (Additional Tools).

4.2.4 Phase II – (Additional Tools). The Coordinating Committee shall jointly decide on additional Tools, for the District to implement in order to achieve the pertinent survival standard(s) using the following criteria:

1. Likelihood of biological success;

2. Time required to implement; and

3. Cost–effectiveness of solutions, but only where two or more alternatives are comparable in their biological effectiveness.

Until the pertinent survival standard is achieved, the Parties shall continue to implement Phase II (Additional Tools) for the standard and for each Plan Species that is not meeting the pertinent survival standard, except as set forth in sub-Section 2.2.1 (Enough Already) and sub-Section 2.2.4 (Impossibility). The Coordinating Committee will determine the number of valid studies (not to exceed three years of study) necessary to make a Phase determination following the implementation of Additional Tools.

4.2.5 Phase III (Standard Achieved or Provisional Review or Additional Juvenile Studies).

The District proceeds to Phase III upon a determination by the Coordinating Committee that the District has 1) verified compliance with the Combined Adult and Juvenile Survival or measured Juvenile Project Survival (Standard Achieved), 2) has evaluated Juvenile Project Survival at less than 93% but greater than or equal to 91% (Provisional Review), or 3) has measured or calculated 95% Juvenile Dam Passage Survival (Additional Juvenile Studies). In short, Phase III indicates that the appropriate standard has either been achieved or is likely to have been achieved and provides additional or periodic monitoring to ensure that survival of the Plan Species remains in compliance with the survival standards set forth in Section 4 (Passage Survival Plan) for the term of the Agreement.

4.2.5.1 Phase III (Standard Achieved). The District shall proceed to Phase III (Standard Achieved) following measurement and evaluation that indicate that either the 91% Combined Adult and Juvenile Survival Standard or 93% Juvenile Project Survival is being achieved. In this case, the District shall re-evaluate performance under the applicable standards every 10 years. The Coordinating Committee shall pick representative species for all Plan Species. However, only one species will be utilized to represent spring migrants and one species for summer migrants. This re-evaluation will occur over one year and be included in the pertinent average for that particular species. If the survival standard is met, then Phase III (Standards Achieved) status will remain in effect. If the survival standard is not achieved, then an additional year of testing will occur. If the survival standard remains un-achieved over three years of re-evaluation, then Phase II (Interim or Additional Tools) will take affect for the species evaluated. The Coordinating Committee shall then consider re-evaluating the passage survival of other Plan Species. If the survival standards are exceeded then passage Measures at the Dam shall remain in effect, however supplementation rates may be adjusted from the 7% level based on actual project survival as described in sub-Section 8.4.4. (Adjustment of Hatchery Compensation – Survival Studies).

4.2.5.2 Phase III (Provisional Review). The District shall proceed to Phase III (Provisional Review) when Juvenile Project Survival is measured at less than 93% but greater than or equal to 91%. Provisional Review allows the District a one time (Plan Species specific) five year period to implement additional Measures or conduct additional Juvenile Dam Passage Survival Studies or Juvenile Project Survival Studies or Combined Adult and Juvenile Survival Studies. The results of the

Provisional Review Studies will be evaluated by the Coordinating Committee to more accurately determine whether the pertinent survival standard is being achieved. The Coordinating Committee will determine the number of valid studies (not to exceed three years of study) necessary to make a Phase determination following the completion of the Provisional Review survival studies. The Parties will then proceed based upon the results of these new studies. During Phase III (Provisional Review), supplementation levels shall be maximized at 7% for the affected Plan Species and 2% compensation shall be provided by the District to the Plan Species Account.

When the Provisional Review studies indicate that the Combined Adult and Juvenile Survival estimates are greater than or equal to 91% or when the Juvenile Project Survival studies indicate that survival is greater than or equal to 93% then the District shall proceed to Phase III (Standard Achieved).

If the Provisional Review studies indicate that the 95% Juvenile Dam Passage Survival standard has been achieved through direct measurement or calculation, then the District shall proceed to Phase III (Additional Juvenile Studies).

If after the one time, five-year Provisional Review period, Juvenile Project Survival is still less than 93% and greater than or equal to 91% and the Combined Adult and Juvenile Survival studies are inconclusive, then the District will revert back to Phase II (Interim Tools). If the increased bypass flows implemented under Phase II (Interim Tools) do not achieve either 95% Juvenile Dam Passage Survival or 93% Juvenile Project Survival, the District shall proceed to Phase II (Additional Tools).

4.2.5.3 <u>Phase III (Additional Juvenile Studies).</u> The District shall proceed to Phase III (Additional Juvenile Studies) when Juvenile Dam Passage Survival studies or Juvenile Dam Passage calculations indicate that Juvenile Dam Passage Survival is greater than or equal to 95%. Because measurement or calculation of Juvenile Dam Passage Survival does not address juvenile mortality in the pool or the indirect effects of juvenile project passage, the District will evaluate either the 91% Combined Adult and Juvenile Project Survival or the 93% Juvenile Project survival as determined appropriate by the Coordinating Committee. If at any time during Phase III (Additional Juvenile Studies), the Coordinating Committee approves the use of new survival methodologies, the District will have five years to conduct the appropriate evaluation(s). The Coordinating Committee will determine the number of valid studies (not to exceed three years of study) necessary to make a Phase determination under Additional Juvenile Studies. The Parties will then proceed based upon the results of these new studies. During Phase III (Additional

Juvenile Studies), supplementation levels shall be maximized at 7% for the affected Plan Species and 2% compensation shall be provided by the District to the Plan Species Account.

4.3 Wells Dam Juvenile Dam Passage Survival Plan.

4.3.1 The District will continue to implement a bypass program of controlled Spill using five (5) bypass baffles at the Wells Project to meet the criteria set out below.

(a) No turbine will be operated during the juvenile migration period unless the adjacent bypass system is operating according to the following criteria.

(b) The five (5) bypass system bays will be Nos. 2, 4, 6, 8, and 10. Operation of the turbines will be in pairs with the associated bypass system bays as follows:

Turbines Operated	Bypass Bays Operated
1 and/or 2	2
3 and/or 4	4
5 and/or 6	6
7 and/or 8	8
9 and/or 10	10

(For example, if turbines 1, 5, and 6 are operating, bypass systems 2 and 6 will be operating.)

(c) At least one bypass will be operating continuously throughout the juvenile migration period, even if no turbines are operating.

(d) The bypass systems and spillgates will be operated in configuration K of the 1987 bypass system report (bottom Spill, 1 foot spill gate opening, 2,200 cfs, vertical baffle opening) for all bypass system bays.

(e) Top Spill has been shown to be as effective as bottom Spill in bypass bays 2 and 10, therefore, top Spill will be allowed in these bays.

(f) If the Chief Joseph Dam Uncoordinated Discharge Estimate is 140,000 cubic feet per second (140 Kcfs) or greater for the following day, all five bypass systems will be operated continuously for 24 hours regardless of turbine unit operation.

(g) If the Chief Joseph Dam Uncoordinated Discharge Estimate is less than 140 Kcfs, bypass system operation will be as follows:

Number Turbines Operating	Minimum Number Bypass Systems Operating
10	5
9	5
8	4
7	4
6	3
5	3
4	2
3	2
2	1
1	1
0	1

4.3.2 The District shall operate the bypass system continuously between April 10 and August 15. Initiation of the bypass system may occur between April 1 and April 10 when it can be demonstrated that greater than 5% of the spring migration takes place prior to April 10. The basis for making this determination shall be the historical hydro-acoustic index, verified by historical species composition information. Termination of the bypass system between August 15 and August 31 will occur when it can be demonstrated that 95% of the summer migration has passed the project. The basis for making this determination shall be the historic hydro-acoustic index, verified by the historical species composition information. The bypass will not operate past August 31 unless a Party to this Agreement provides credible scientific evidence to the Coordinating Committee that the run timing is such that a significant component of a Plan Species migrates through the Forebay, Dam and Tailrace outside the usual migration period (April 1 through August 31).

Run timing information will be gathered through the 2002 migration. The Historic Hydroacoustic and Fyke Netting information (1982 – 2002) will be used to verify that 95% of the spring and 95% of the summer migrations are being protected by operating the bypass system from April 10 through August 15.

After the 2002 migration, changes to the April 10 through August 15 operation may be agreed to by the Coordinating Committee based upon historical hydroacoustic and species composition information that would provide bypass operations for 95% of the spring and 95% of the summer migration of juvenile Plan Species.

Additional hydroacoustic and species composition monitoring shall be conducted once every 10 years in order to verify that a significant component (greater than 5%) of the juvenile migration is not present outside the normal bypass operating period (April 10 through August 15) and to verify that the operations established by the Coordinating Committee are adequately protecting 95% of the spring and summer migrations of juvenile Plan Species.

4.3.3 Predator Control Measures shall be implemented by the District and will consist of both northern pikeminnow removal and piscivorous bird harassment and control Measures. The northern pikeminnow removal program may include a pikeminnow bounty program, fishing derbies and tournaments, the use of long lines and trapping. Piscivorous bird populations, which include, Caspian terns, double-crested cormorants, and various gull species will be hazed. Hazing techniques may include elaborate wire arrays in the tailrace to deter foraging, propane cannons, various pyrotechnics, and lethal control when necessary. This program will continue to run during the juvenile outmigration.

4.4 Adult Passage Plan. The District shall emphasize adult project passage Measures in order to give high priority to adult survival in the achievement of 91% Combined Adult and Juvenile Project Survival for each Plan Species. The District shall use Tools, including but not limited to the following.

4.4.1 The District shall use best efforts to maintain and operate adult passage systems at the Project according to criteria developed through the Coordinating Committee and as provided in Appendix A: Wells Hydroelectric Project, Adult Fish Passage Plan.

4.4.2 The District shall operate Spill and turbine units in a manner that provides for adult passage while meeting the pertinent juvenile survival standard.

4.4.3 Areas within the adult fish passage systems which are identified by the Coordinating Committee as either consistently out of criteria or where significant delay occurs (as it relates to the biological fitness of the adult Plan Species) shall be modified as soon as feasible.

4.4.4 The District shall use best efforts to eliminate identified sources of adult injury and mortality during adult migration through the Dam.

4.4.5 By the end of Phase I, the District shall identify adult fallback rates at the Dam. This evaluation will include the magnitude of voluntary and involuntary fallback, and will assess the effects of ladder trapping, project operations, the Wells Fish Hatchery and downstream tributaries upon observed rates of fallback. This assessment will also determine the biological significance of these fallback events on the overall fitness of adult Plan Species. If the observed rates of adult fallback and steelhead kelt loss are determined to be significant, then the Coordinating Committee shall determine the most cost effective methods to protect adult fallbacks and steelhead kelts at the Dam, and the District shall immediately implement the Measures. Reduction in fallback rates, mortalities and protection of kelts shall be factored into juvenile bypass and adult passage development and implementation and into Project operation decisions.

4.4.6 The Parties to this Agreement recognize that current technology does not allow for a precise estimate of hydroelectric project induced mortality to adult salmonids. Until adult survival studies can accurately differentiate between natural and hydro-project induced mortality, the District shall use the best available technology to conduct, on a periodic basis, adult passage verification studies toward the diagnosis of adult loss, injury and delay at Wells Dam. Prior to the completion of adult survival studies, compensation for adult mortality shall be assumed completely fulfilled by the District's contribution to the Plan Species Account. Following the completion of adult survival studies, should adult survival rates fall below 98% but the Combined Adult and Juvenile survival rate be maintained above 91%, additional hatchery compensation for that portion of adult losses that exceeds 2%, toward a maximum contribution of 7% compensation provided through hatchery programs and 2% tributary funding, would be utilized to satisfy NNI compensation requirements for each Plan Species.

4.4.7 Pursuant to the 2000 Biological Opinion (BiOp) for the Federal Columbia River Power System, the federal action agencies are required to conduct a comprehensive evaluation to assess adult survival at federal dams. The BiOp sets forth a series of evaluation methods to be employed.
The Coordinating Committee should review the information and techniques utilized in those studies and evaluate their potential for accurately measuring Combined Adult and Juvenile Project Survival. The Coordinating Committee should also evaluate technologies found at the federal dams to increase adult survival for possible implementation at the Project. Based upon those evaluations, the District shall implement as necessary, technologies appropriate for the Project.

SECTION 5
RESERVOIR AS HABITAT AND WATER QUALITY

5.1 When making land use or related permit decisions on Project owned lands that affect reservoir habitat, the District shall consider the cumulative impact effects in order to meet the conservation objectives of the Agreement, requirements of the FERC license, and other applicable laws and regulations. The District further agrees to notify and consider comments from the Parties to the Agreement regarding any land use permit application on Project owned lands.

5.2. The District shall notify all applicants for District permits to use or occupy Project lands or water that such use or occupancy may result in an incidental take of species listed as endangered or threatened under the ESA, requiring advance authorization from NMFS or USFWS.

5.3 The Parties recognize that there are potential water quality issues (temperature and dissolved gas) related to cumulative hydropower operations in the Columbia River. The Parties will work together to address water quality issues.

SECTION 6
COORDINATING COMMITTEE

6.1 Establishment of Committee. There shall be a Coordinating Committee composed of one (1) representative of each Party, provided, that the District's Power Purchasers may participate as a non-voting observer through a single representative, whom they will designate from time to time. Each representative shall have one vote. Each Party shall provide all other Parties with written notice of its designated representative to the Coordinating Committee.

6.2 Meetings. The Coordinating Committee shall meet whenever requested by any two (2) members following notice (unless waived).

6.3 Meeting Notice. The chair of the Coordinating Committee shall provide all committee members with a minimum of ten (10) Days advanced written notice of all meetings unless a member waives notice in writing or reflects the waiver in the approved meeting minutes. The notice shall contain an agenda of all matters to be addressed and voted on during the meeting.

6.4 Voting. The Coordinating Committee shall act by unanimous vote of those members present in person or by phone for the vote and shall develop its own rules of process, provided, that the chair shall ensure that all members are sent notice regarding agenda items that may be brought to a vote during the proposed Coordinating Committee meeting. Abstention does not prevent a unanimous vote. If a Party or its designated alternate cannot be present for an agenda item to be voted upon at a Coordinating Committee meeting, the Party must notify the chair of the Coordinating Committee who shall delay a vote on an agenda item for up to five business days on specified issue(s) to be addressed in a meeting and conference call scheduled with all interested Parties, or as otherwise agreed to by the Coordinating Committee. A Party may invoke this right only once per delayed item. If the Coordinating Committee cannot reach agreement, then upon request by any Party, that issue shall be referred to Dispute Resolution.

6.5 Chair of the Coordinating Committee. The Parties shall choose and the District shall fund a neutral third party to act as the chair the Coordinating Committee. The chair is expected to prepare an annual list of understandings based on the results of studies (See below sub-Section 6.7 (Authority)), prepare progress reports, prepare meeting minutes, facilitate and mediate the meetings, and assist the members of the Coordinating Committee in making decisions. At least every three years, the Coordinating Committee shall evaluate the performance of the chair of the Coordinating Committee.

6.6 Use of Coordinating Committee. The Coordinating Committee will be used as the primary means of consultation and coordination between the District and the FP in connection with the conduct of studies and implementation of the Measures set forth in this Agreement and for Dispute Resolution. Any entity not executing this Agreement shall not be a Party to this Agreement and shall not be entitled to vote on any committee established by this Agreement. However, any Committee established by this Agreement may agree to allow participation of any governmental entities not a Party to this Agreement.

6.7 Authority. The Coordinating Committee will oversee all aspects of standards, methodologies, and implementation. The Coordinating Committee shall 1) establish the protocol(s) and methodologies to determine whether or not the survival standards contained within Section 4 (Passage Survival Plan) are being achieved for each Plan Species; 2) determine whether the Parties are carrying out their responsibilities under this Agreement; 3) determine whether NNI is achieved; 4) determine the most appropriate standard in Section 4 (Passage Survival Plan) to be measured for each Plan Species; 5) approve all studies prior to implementation; and 6) review study results, determine their applicability, and develop an annual list of common understandings based on the studies; 7) periodically adjust the Measures (after Phase I) to address survival and Unavoidable Project Mortality as provided herein; provide that no more than 9% Unavoidable Project Mortality shall be replaced through hatchery and tributary compensation without concurrence of the Coordinating Committee, and hatchery compensation shall not exceed 7% and tributary funding shall not exceed 2% unless agreed to by the Coordinating Committee; 8) resolve disputes brought by the Hatchery and Tributary Committees, and (9) adjust schedules and dates for performance. If the Coordinating Committee cannot reach agreement, then these decisions shall be referred to Dispute Resolution as set forth in Section 11 (Dispute Resolution).

6.8 Studies and Reports. All studies and reports prepared under this Agreement will be available to all members of the Coordinating Committee as soon as reasonably possible. Draft reports will be circulated through the Coordinating Committee representatives for comment, which shall be due within 60 Days unless the Coordinating Committee decides otherwise, and comments will either be addressed in order or made an appendix to the final report. All reports will be kept on file with the District. All studies will be conducted following techniques and methodologies accepted by the Coordinating Committee. All studies will be based on sound biological and statistical design and analysis. The Coordinating Committee shall have the ability to select an independent, third party for the purpose of providing an independent scientific review of any disputed survival study results and/or reports.

6.9 Progress Reports: Each year, with assistance from the chair of the Coordinating Committee, the Hatchery Committee, and the Tributary Committee shall prepare an annual report to the Coordinating Committee describing their progress. Each year, the Coordinating Committee shall prepare an annual report to the Parties describing progress toward achieving the survival standards contained within Section 4 (Passage Survival Plan), and common understandings based upon studies. By March 2013, a comprehensive progress report shall be prepared by the District, at the direction of the Coordinating Committee, assessing overall status of achieving NNI. The Coordinating Committee shall direct an analysis to determine whether each Plan Species is rebuilding. Comprehensive progress reporting shall continue to occur at successive ten-year intervals.

SECTION 7
TRIBUTARY CONSERVATION PLAN

7.1 Tributary Plan. The Tributary Conservation Plan (Tributary Plan) consists of this Agreement and is supported by Supporting Document D, (Tributary Plan, Project Selection, Implementation, and Evaluation). The Tributary Plan is also supported by Supporting Document A (Aquatic Species and Habitat Assessment: Wenatchee, Entiat, Methow, and Okanogan Watersheds). The Parties recognize that Supporting Document A and D do not, by themselves, create contractual obligations.

7.2 Purpose. Under the Tributary Plan, the District shall provide a Plan Species Account to fund projects for the protection and restoration of Plan Species habitat within the Columbia River Watershed (from the Chief Joseph Tailrace to the Wells Tailrace) and the Methow, and Okanogan watersheds, in order to compensate for up to two percent Unavoidable Project Adult and/or Juvenile Mortality; provided that the Parties shall not be required to actually measure whether the Tributary Plan compensates for up to two percent Unavoidable Adult Project Mortality.

7.3 Tributary Committee.

7.3.1 Establishment of Committee. There shall be a Tributary Committee composed of one (1) representative of each Party, provided that an entity eligible to appoint a representative to the Tributary Committee is not required to appoint a representative, and further provided that, representatives from USFWS shall participate in a non-voting, ex-officio capacity unless they otherwise state in writing, and further provided that, the Power Purchasers may participate as a non-voting observer through a single representative, whom they will designate from time to time. The Tributary Committee may select other expert entities, such as land and water trusts/conservancy groups to serve as additional, non-voting members of the Tributary Committee. Each entity eligible to appoint a representative to the Tributary Committee shall provide all other eligible entities with written notice of its designated representative. The Tributary Committee is charged with the task of selecting projects and approving project budgets from the Plan Species Account for purposes of implementing the Tributary Plan.

7.3.2 Full Disclosure. After full written disclosure of any potential conflict of interest, which shall appear in the minutes of the Tributary Committee and prior to project approval, the Tributary Committee may approve a project that may benefit a person or entity related to a committee member, or an entity which appointed the committee member.

7.3.3 Meetings. The Tributary Committee shall meet not less than twice per year at times determined by the Tributary Committee. Additionally, the Tributary Committee may meet whenever requested by any two (2) members following a minimum of ten (10) Days advance written notice to all members of the Tributary Committee unless a member waives notice in writing or reflects the waiver in the approved meeting minutes. The notice shall contain an agenda of all matters to be addressed during the meeting including items that may be brought to a vote during the meeting.

7.3.4 Voting. Except as set forth in sub-Section 7.3.7.1 (Prohibited Use of Account), the Tributary Committee shall act by unanimous vote of those members present in person or by phone for the vote and shall develop its own rules of process, provided, that the chair shall ensure that all members are sent notice of all Tributary Committee meetings. Abstention does not prevent a unanimous vote. If a Party or its designated alternative cannot be present for an agenda item to be voted upon, the Party must notify the chair of the Tributary Committee who shall delay a vote on an agenda item for up to five business days on specified issue(s) to be addressed in a meeting or conference call with all interested Parties, or as otherwise agreed to by the Tributary Committee. A Party may invoke this right only once per delayed item. If the Tributary Committee cannot reach agreement, then upon request of any Party, that issue shall be referred to the Coordinating Committee.

7.3.5 Chair of the Tributary Committee. The Parties shall choose and the District shall fund a neutral third party to chair the Tributary Committee meetings. The chair of the Tributary Committee shall have the same responsibilities and authorities with regard to the Coordinating Committee. At least every three years, the Tributary Committee shall evaluate the performance of the chair of the Tributary Committee.

7.3.6 Coordination With Other Conservation Plans. Whenever feasible, projects selected by the Tributary Committee shall take into consideration and be coordinated with other conservation plans or programs. Whenever feasible, the Tributary Committee shall cost-share with other programs, seek matching funds, and "piggy-back" programs onto other habitat efforts.

7.3.7 Plan Species Account. The District shall establish a Plan Species Account in accordance with applicable provisions of Washington State law and this Agreement. Interest earned on the funds in the Plan Species Account shall remain in the Plan Species Account. The Parties to this Agreement may audit the District's records relating to the Account during normal business hours following reasonable notice. The Tributary Committee shall select projects and approve project budgets from the Plan Species Account by joint written request of all members of the Tributary Committee. The Tributary Committee shall act in strict accordance with sub-Section 7.3.7.1 (Prohibited Uses of Account).

7.3.7.1 Prohibited Uses of Account. No money from the Plan Species Account shall be used to enforce compliance with this Agreement. Members of the Tributary Committee and their expenses to attend and participate in Tributary Committee meetings shall not be compensated through the Plan Species Account. Administrative costs, staffing and consultants, reports and brochures, landowner assistance and public education costs collectively shall not exceed $80,000 (1998 dollars) in any given year without the unanimous vote of the Tributary Committee.

7.3.7.2 Financial Reports. At least annually, the District shall provide financial reports of Plan Species account activity to the Tributary Committee.

7.3.7.3 Selection of Projects and Approval of Budgets. The Tributary Committee shall select projects and approve budgets for expenditure from the Plan Species Account for the following: (1) Any action, structure, facility, program or measure (referred to herein generally as "tributary projects") intended to further the purpose of the Tributary Plan for Plan Species. Tributary Projects shall be chosen based upon the guidelines set forth in Supporting Document D, "Tributary Compensation, Project Selection, Implementation, and Evaluation" and Supporting Document A, "Aquatic Species and Habitat Assessment: Wenatchee, Entiat, Methow, and Okanogan Watersheds ". Tributary Projects shall not be implemented outside the area specified in sub-Section 7.2 (Purpose). High priority shall be given to the acquisition of land or interests in land such as conservation easements or water rights or interests in water such as dry year lease options; (2) studies, implementation, monitoring, evaluation, and legal expenses associated with any project financed from the Plan Species Account; and (3) prior approved administrative expenses associated with the Plan Species Account.

7.3.7.4 Ownership of Assets. The Tributary Committee shall make determinations regarding ownership of real and personal property purchased with funds from the Plan Species Account. Title may be held by the District, by a resource agency or tribe or by a land or water conservancy group, as determined by the Tributary Committee. Unless the Tributary Committee determines that there is a compelling reason for ownership by another entity, the District shall have the right to hold title. All real property purchased shall include permanent deed restrictions to assure protection and conservation of habitat.

7.3.7.5 Account Status Upon Termination. Upon the Agreement's termination, (1) the District's unspent advanced contributions to the Plan Species Account shall be promptly released to the District, (2) if funds remain in the Plan Species Account after the return of the District's advance contributions, then the Tributary Committee shall remain in existence and continue to operate according to the terms of this Agreement until the funds in the Plan Species Account are exhausted, and 3) all real and personal property which the District holds title shall remain its property.

7.4 Funding.

7.4.1 The District shall make an initial contribution of $1,982,000 in 1998 dollars to the Plan Species Account. Five years after the initial contribution to the Plan Species Account, the District shall do one of the following: 1) make annual payments of $176,178 (2%) in 1998 dollars as long as the Agreement is in effect; or 2) provide an up front payment of $1,761,780 (2% for 10 years) in 1998 dollars, but deducting the actual cost of bond issuance and interest.

7.4.2 The District's funding of the Plan Species Account will be considered to be full and complete compensation for adult mortality associated with the Wells Hydroelectric Project until the actual adult survival rate can be accurately determined.

7.4.3 If the adult survival rate is determine to be equal to or greater than 98% and the Juvenile Project Survival rates is determined to be greater than 93%, the Tributary Fund will be reduced to reflect the actual adult survival estimate of the four Permit Species. Adult survival estimates for each Permit Species will independently determine one quarter of the Plan Species Account (See Example 1).

7.4.4 If the Juvenile Project Survival rate for each Plan Species is less than 93% but the Combined Adult and Juvenile Project Survival rate is maintained above 91%, the Plan Species Account may be used to compensate for juvenile losses, with a maximum compensation rate of 2%.

7.4.5 The choice of annual or up front payment under sub-Sections 7.4.1 shall be made by the FP.

7.4.6 If the "up front payment option" is selected then at the end of 15 years, the Parties will determine the distribution of the remaining funds to the Plan Species Account in amounts equivalent to annual payments of $176,178.00 in 1998 dollars.

7.4.7 The first installment is due within ninety (90) Days of the effective date of the Agreement. The rest of the installments are due by the 31st day of January each year thereafter. The dollar figures shall be adjusted for inflation on the 1st day of January each year based upon the Consumer Price Index for all Urban Consumers for the Seattle/Tacoma area, published by the U.S. Department of Labor, Bureau of Labor Statistics. If said index is discontinued or becomes unavailable, a comparable index suitable to the Tributary Committee shall be substituted.

7.5 Tributary Assessment Program.

The District shall provide support for a Tributary Assessment Program separate from the Plan Species Account. The Tributary Assessment Program will be utilized to monitor and evaluate the relative performance of tributary enhancement projects approved by the Tributary Committee and directly funded by the initial contribution to the Plan Species Account (See Section 7.4.1). It is not the intent of the Tributary Assessment Program to measure whether the Plan Species Account has provided a 2% increase in survival for Plan Species. Instead, the program has been established to ensure that the dollars allocated to the Plan Species Account are utilized in an effective and efficient manner. The District shall develop, in coordination with and subject to approval by the Tributary Committee, the measurement protocols for the Tributary Assessment Program. The Tributary Committee may choose to either evaluate the relative merits of each individual tributary enhancement project or it may choose to evaluate an aggregation of projects provided that the total cost associated with the Tributary Assessment Program does not exceed $200,000 (not subject to inflation adjustment).

Example 1. Adult steelhead and spring chinook survival measured at 99% but no other adult Permit Species have been studied. Tributary funding would remain at 2% for sockeye and summer/fall chinook but would be reduced to 1% based upon the results from the adult steelhead and spring chinook survival studies. Annual Contributions to the Plan Species Account would reduce the prospective payments from a full 8/8 contribution to a 6/8 contribution.

Plan Species Account Calculations:

Before Adult Studies		**After Adult Studies**
Steelhead	(2%)	(1%)
Spring Chinook	(2%)	(1%)
Summer/Fall Chinook	(2%)	(2%)
Sockeye	(2%)	(2%)
	8/8th	6/8th

SECTION 8
HATCHERY COMPENSATION PLAN

8.1 Hatchery Objectives.

8.1.1 The District shall provide hatchery compensation for all of the Permit Species including; a) spring chinook salmon, b) summer/fall chinook salmon, c) sockeye salmon d) summer steelhead as further described in Section 8 (Hatchery Compensation Plan). The District shall also provide hatchery compensation for coho salmon should they become established under the criteria set forth in Section 8.4.5.1 (Coho).

8.1.2 The District shall implement the specific elements of the hatchery program consistent with overall objectives of rebuilding natural populations, and achieving NNI. Species specific hatchery program objectives developed by the JFP may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest. This compensation may include Measures to increase the off-site survival of naturally spawning fish or their progeny (i.e. Sockeye Enhancement Decision Tree, Section 14, Figure 3).

8.2 Hatchery Committee.

8.2.1 Establishment of the Committee. There shall be a Hatchery Committee composed of one (1) representative of each Party, provided that a Party is not required to appoint a representative and further provided that the Power Purchasers may participate as a non-voting observer through a single representative whom they will designate from time to time. A Party shall provide all other eligible Parties with written notice of its designated representative.

8.2.2 Responsibilities. The Hatchery Committee shall oversee development of recommendations for implementation of the hatchery elements of this Agreement for which the District has responsibility for funding. This includes overseeing the implementation of improvements and monitoring and evaluation relevant to the District's hatchery programs, as identified in the Hatchery Compensation Plan, the Permit and this Agreement. The Hatchery Committee shall also coordinate in-season information sharing and shall discuss unresolved issues. The Hatchery Committee decisions shall be based upon: likelihood of biological success, time required to implement, and cost-effectiveness of solutions.

8.2.3 Meeting Notice. The Hatchery Committee shall meet at least twice per year or whenever requested by any two (2) members following a minimum of ten (10) Days advance written notice to all members of the Hatchery Committee unless a member waives notice in writing or reflects the waiver in the approved meeting minutes. The notice shall contain an agenda of all matters to be addressed during the meeting including items that may be brought to a vote during the meeting.

8.2.4 Voting. The Hatchery Committee shall act by unanimous vote of those members present in person or by phone for the vote and shall develop its own rules of process, provided, that the chair shall insure that all members are sent notice of all Hatchery Committee meetings. Abstention does not prevent a unanimous vote. If a Party or its designated alternative cannot be present for an agenda item to be voted upon, then the Party must notify the chair of the Hatchery Committee who shall delay a vote on an agenda item for up to five business days on specified issue(s) to be addressed in a meeting or conference call scheduled with all interested Parties, or as otherwise agreed to by the Hatchery Committee. A Party may invoke this right only once per delayed agenda item. If the Hatchery Committee cannot reach agreement, then upon request of any Party, that issue shall be referred to the Coordinating Committee.

8.2.5 Chair of the Hatchery Committee. The Parties shall choose and the District shall fund a neutral third party to chair the Hatchery Committee meetings. The chair shall have the same responsibilities and authorities with regard to the Hatchery Committee as the chair of the Coordinating Committee has with regard to the Coordinating Committee. At least every three years, the Hatchery Committee shall evaluate the performance of the chair of the Hatchery Committee.

8.3 Hatchery Operations. The District or its designated agents shall operate the hatchery facilities according to the terms of Section 8 (Hatchery Compensation Plan), the ESA Section 10 permit(s) and in consultation with the Hatchery Committee.

8.4 Hatchery Production Commitments.

8.4.1 Hatchery Agreements. The District may enter into agreements with other entities for the rearing, release, monitoring and evaluation and research of hatchery obligations. However, it is the District's responsibility to ensure that their obligations under Section 8 (Hatchery Compensation Plan) are satisfied. The Hatchery Committee must approve any proposed agreements or trades of production.

8.4.2 Calculation of Hatchery Commitments. During Phase I, the District shall provide the funding and capacity required of the District to meet the 7% hatchery compensation level necessary to achieve NNI. Juvenile Project Survival estimates, when available, will be used to adjust hatchery based compensation programs and adult survival estimates will be used to adjust the Plan Species Account contribution. However, should adult survival rates fall below 98% but the Combined Adult and Juvenile survival rates be maintained above 91%, additional hatchery compensation for adult losses, toward a maximum contribution of 7% compensation provided through hatchery programs, would be utilized to provide compensation for Unavoidable Project Mortality. The rationale for determining the initial hatchery production commitment requirement is supported by Supporting Document B, "Biological Assessment and Management Plan: Mid-Columbia Hatchery Program". The Parties recognize that Supporting Document B is a supporting document and does not by itself create contractual obligations.

8.4.3 Phase I Production Commitment. Douglas will continue to fund the operation and maintenance of the Wells Hatchery and Methow Spring Chinook Supplementation Hatchery. The Parties agree that the Phase I production commitments to be provided by the District for juvenile passage losses are satisfied by maintaining current production commitments at existing facilities of 49,200 pounds of spring chinook at about 15 fish per pound (738,000 fish) and 30,000 pounds of summer steelhead at about 6 fish per pound (180,000 fish). Summer chinook passage losses are mitigated with 40,000 pounds of summer chinook at about 10 fish per pound (400,000 fish), currently being satisfied through the species trade with Chelan PUD (40,000 pounds of summer chinook are reared by Chelan PUD in exchange for 19,200 pounds of spring chinook reared by Douglas PUD). A portion of passage losses for sockeye (5%) are satisfied through the substitution of 15,000 pounds of spring chinook production (225,000 fish) at the Methow Hatchery as a species substitution for 9,240 pounds of sockeye (231,000 fish). After 2003 brood, NNI for sockeye will be accomplished through the implementation of a set of options identified in the Sockeye Enhancement Decision Tree (See Section 14, Figure 3). As a result of implementing the Sockeye Enhancement Decision Tree, the District's spring chinook obligation shall be reduced by 15,000 pounds starting with the 2004 brood.

8.4.4 Adjustment of Hatchery Compensation - Survival Studies. Hatchery production commitments, except for original inundation compensation, shall be adjusted based upon the results of survival studies conducted during Phase I, Phase II and Phase III (Standard Achieved, Additional Juvenile Studies, and Provisional Review). Hatchery compensation for yearling chinook and steelhead shall be adjusted based upon the results from the three years of accurate and precise Juvenile Project Survival studies completed at the Wells Hydroelectric Project. The arithmetic average of the three years of survival study indicate that the survival of yearling chinook and steelhead averages 96.2%. As a result, compensation for spring chinook, yearling summer chinook and steelhead shall be reduced to 3.8% as indicated below:

Spring Chinook: The District's commitment for Methow Basin spring chinook shall be 4,071 pounds at about 15 fish per pound (61,071 smolts). In addition, the District will provide 15,000 pounds of spring chinook at about 15 fish per pound (225,000 fish) through brood year 2003 as compensation for sockeye salmon losses.
The District will rear for Chelan PUD, through contractual agreement between the two PUDs, up to 19,200 pounds of spring chinook at about 15 fish per pound (288,000 fish).

Steelhead: The passage loss of steelhead shall be mitigated through the production of 8,143 pounds of fish at about 6 fish per pound (48,858 fish).

Sockeye: Through spring 2005 (2003 Brood), 15,000 pounds (225,000 smolts) of spring chinook salmon will be raised as species substitution for 9,240 pounds of sockeye. After 2005, NNI for sockeye will be accomplished through the implementation of a set of options identified in the Sockeye Enhancement Decision Tree (See Section 14, Figure 3).

Summer Chinook: The District's commitment for summer chinook shall be 10,857 pounds of yearling summer chinook at about 10 fish per pound (108,570 fish). Chelan PUD, through contractual agreement with Douglas PUD, will rear these fish at the Carlton Acclimation Pond.

8.4.5 Adjustment of Hatchery Compensation - Population Dynamics**.** Hatchery production commitments, except for original inundation mitigation, shall be adjusted in 2013 and every 10 years thereafter to achieve and maintain NNI as required to adjust for changes in the average adult returns of Plan Species and for changes in the adult-to-smolt survival rate and for changes to the smolt-to-adult survival rate from the hatchery production facilities, using methodologies described in Supporting Document B, "Biological Assessment and Management Plan (BAMP): Mid-Columbia Hatchery Program". However, it should be noted that Supporting Document B is a supporting document and does not by itself create contractual obligations.

Example 2: Juvenile Project Survival for steelhead measured at 96.2% with error of less than 5% at a 95% confidence interval. Hatchery supplementation commitments for steelhead would be established at 3.8% (14% compensation for steelhead under the Wells Settlement Agreement equates to 30,000 pounds of steelhead; 7% compensation for steelhead equates to 15,000 pounds). At a 3.8% compensation rate, steelhead production would be reduced to 3.8/7 of 15,000 pounds or 8,143 pounds of steelhead raised as compensation for mainstem project passage losses. This production would be in addition to the fixed inundation compensation of 50,000 pounds of steelhead. Total steelhead production would be established under Phase III (Standards Achieved) at 58,143 pounds of steelhead at 6 fish per pound.

8.4.5.1 Coho. Compensation for Methow River coho will be assessed in 2006 following the development of an anticipated long-term coho hatchery program and/or the establishment of a Threshold Population of naturally reproducing coho in the Methow Basin. The Hatchery Committee shall make a determination on whether a hatchery program and/or naturally reproducing population of coho is present in the Methow Basin (by an entity other than the District and occurring outside this Agreement). Should the Hatchery Committee determine that such a program and/or population exists, then the Hatchery Committee shall determine the most appropriate means to satisfy NNI for Methow Basin coho. Programs to meet NNI for Methow Basin coho may include but is not limited to; 1) provide operation and maintenance funding in the amount equivalent to 3.8% project passage loss or 2) provide funding for acclimation or adult collection facilities both in the amount equivalent to 3.8% juvenile passage loss at the Wells Project. The programs selected to achieve NNI for Methow Basin coho will utilize an interim value of project survival, based upon the three-year average Juvenile Project Survival estimate of 96.2%, until project survival studies can be conducted on Methow Basin coho.

8.4.5.2 Okanogan Basin Spring Chinook. Compensation for Okanogan Basin spring chinook will be assessed in 2007 following the development of a long-term spring chinook hatchery program and/or the establishment of a Threshold Population of naturally reproducing spring chinook in the Okanogan watershed (by an entity other than the District and occurring outside this Agreement). The Hatchery Committee shall make a determination on whether a hatchery program and/or naturally reproducing population of spring chinook is present in the Okanogan Basin. Should the Hatchery Committee determine that such a program and/or population exists, then the Hatchery Committee shall determine the most appropriate means to satisfy NNI for Okanogan Basin spring chinook. Programs to meet NNI for Okanogan Basin spring chinook may include but not be limited to; 1) provide O & M funding in the amount equivalent to 3.8% project passage loss or 2) replace project passage losses of hatchery spring chinook with annual releases of equivalent numbers of yearling summer chinook into the Okanogan River Basin or 3) provide funding for acclimation or provide funding for adult collection facilities in the amount equivalent to 3.8% juvenile passage loss at the Wells Project. The programs selected to achieve NNI for Okanogan Basin spring chinook will utilize an interim value of project survival based upon the three-year average Juvenile Project Survival estimate of 96.2% until project survival studies can be conducted on Okanogan Basin yearling chinook.

8.4.6 Fixed Hatchery Compensation - Inundation. Of the existing production commitment 50,000 pounds of yearling steelhead at about 6 fish per pound (300,000 fish), 32,000 pounds of yearling summer chinook at about 10 fish per pound (320,000 fish) and 24,200 pounds of subyearling summer chinook, at about 20 fish per pound (484,000 fish), is compensation for original inundation and shall not be subject to adjustment as provided in sub-Section 8.4 (Hatchery Production Commitments).

8.5 Monitoring and Evaluation.

8.5.1 The Hatchery Committee shall develop a five-year monitoring and evaluation plan for the hatchery program that is updated every five years. The first monitoring and evaluation plan shall be completed by the Hatchery Committee within one year following FERC approval of this Agreement. Existing monitoring and evaluation programs will continue until replaced by the Hatchery Committee.

8.5.2 The Parties agree that over the duration of this Agreement new information and technologies may be developed and may be considered in a comprehensive hatchery evaluation program. The District shall fund the comprehensive hatchery evaluation program consistent with the hatchery goals set forth in sub-Section 8.1.2 and 8.4 (Hatchery Production Commitments) and the monitoring and evaluation guidelines as outlined in the BAMP and as determined by the Hatchery Committee.

8.5.3 The Hatchery Committee shall plan and the District shall implement the following steelhead studies that are related to the District's production program. First, the District shall fund a study to investigate the natural spawning (reproductive) success of hatchery reared steelhead relative to wild steelhead. This study should utilize a statistically valid number of fish necessary to develop baseline DNA profiles for Methow River steelhead. This analysis should be conducted for approximately 5 brood years. The District shall also conduct an assessment of longer-term acclimation for steelhead, using small scale temporary or existing facilities. This study shall continue for approximately 3 brood years and will not compromise in any way on-going supplementation programs at existing facilities.

8.6 Program Modifications.

8.6.1 Hatchery program modifications shall make efficient use of existing facilities owned by the District or cooperating entities including adult collection, acclimation and hatchery facilities, provided that existing facility use is compatible with and does not compromise ongoing programs. The District in consultation with the Hatchery Committee shall make reasonable efforts to implement program modifications when needed to achieve overall and specific program objectives. Program modifications may include changes to facilities, release methods, and rearing strategies necessary to achieve NNI as determined by the monitoring and evaluation program. Program modifications will be made following unanimous agreement of the Hatchery Committee, as set forth in sub-Section 8.2.4 (Voting), to achieve specific program objectives as outlined in Section 8 (Hatchery Compensation Plan), including sub-Section 8.4.4 (Adjustment of Hatchery Compensation – Survival Studies) and sub-Section 8.4.5 (Adjustment of Hatchery Compensation – Population Dynamics), as determined by Section 10 Permit and as defined in monitoring and evaluation plans to be developed. The District will make reasonable efforts to complete program modifications as soon as possible, following agreement with the Hatchery Committee.

8.6.2 As of the date this Agreement is signed by the Parties, two areas have been identified for program modification and improvement. The District working with the Hatchery Committee shall assess program modification options and implement them based upon the results of the assessment, as indicated below.

1) Improve the adult trapping facility efficiency for adult spring chinook returning to the Chewuch River without undue delay in adult migration and/or displacement of natural spawners to non-target areas. In coordination with the JFP, the District will use its best effort to implement trap improvements by removal of rock debris below Fulton Dam (Chewuch River) by May 2002. The Hatchery Committee will assess whether these improvements are sufficient to achieve the trapping objective without changing adult migration/spawning behavior. If the trapping objectives are achieved, no additional improvements will be required. In the event that these repairs do not result in achievement of the trapping objective, the District, working with the Hatchery Committee, will assess the methods to improve trap efficiency including the following options; 1) additional improvements to Fulton Dam, or 2) a new trapping facility. Based on these assessments, the Hatchery Committee shall select a preferred option and an implementation plan shall be developed by the District. The District will complete

program modifications as soon as reasonably possible (possibly 2003), following agreement with the Hatchery Committee.

2) Improve the adult trapping facility efficiency for adult spring chinook returning to the Twisp River without undue delay in adult migration and/or displacement of natural spawners to non-target areas. The Hatchery Committee will assess methods to improve trap efficiency including the following two options; 1) modifying the existing trap and weir or 2) development of a new trapping facility. Based on these assessments, the Hatchery Committee shall select a preferred option and the District shall develop an implementation plan. The District will complete program modifications as soon as reasonably possible (possibly 2003), following agreement with the Hatchery Committee.

8.6.3 In addition to these program modifications and with concurrence from the Hatchery Committee, the District may pursue the development of a memorandum of understanding between parties concerning use of shared facilities, fish, and water rights.

8.6.4 During the duration of the Agreement, NMFS shall have the opportunity to seek hatchery program modifications (that do not change the 7% program levels) but are otherwise necessary to address emergency effects of a hatchery program on listed Permit Species. Such program modifications shall be supported by a minimum of two years of field data from the river or stream in question. Other information documenting a significant and adverse effect on the productivity of listed Permit Species from other rivers can be considered, but only if applicable to the listed Permit Species and stream in question. Any proposal to modify a hatchery program will be documented in a memorandum from the Regional Administrator to the Hatchery Committee summarizing the problem, and then followed by up to six months of Hatchery Committee evaluation. The Parties recognize that initially a portion of the production contemplated in this Agreement will be for purposes of supplementation of Plan Species or re-establishing runs in areas from which they have been extirpated. In the event the concerns raised in this sub-Section (8.6.4) involve the use of such a program, NMFS agrees to take the program design and intent into account in reaching any conclusion regarding the need for emergency modifications.

8.7 Changed Hatchery Policies under ESA.

8.7.1 Except in 2013 and every ten years hereafter, NMFS will refrain from applying hatchery policy decisions that would preclude the 7% hatchery levels (as adjusted) from being achieved. In 2013, and every 10 years thereafter (at the time of the program review), if NMFS proposes hatchery policy decisions that would preclude the 7% hatchery levels (as adjusted) from being achieved, NMFS will (a) propose application of the policies to the Hatchery Committee and seek agreement, (b) propose a revised hatchery program consistent with the principles of NNI and an expeditious transition plan from the existing hatchery program to the revised hatchery program, (c) if agreement is not possible, discuss the application of the policies with the Coordinating Committee and then with the Policy Committee, if necessary, and (d) if agreement is still not possible then allow the issue to be elevated to the Administrator of NMFS. Between 2013 and 2018, except as provided in sub-Section 8.4 (Program Commitments) and 8.6 (Program Modifications), if NMFS fails to allow full utilization of the District's hatchery capacity to achieve the 7% hatchery levels (as adjusted), this shall not be considered a basis for NMFS withdrawal from the Agreement or revocation of the Permit until 2018. In such a case, the District working with the Parties shall develop a transition plan between 2013 and 2018 to make up for the 7% hatchery levels (as adjusted). The transition plan may be implemented as soon as reasonably possible however the transition plan must be initiated by 2018. The Parties recognize that initially a portion of the production contemplated in this Agreement will be for purposes of supplementation of Plan Species or re-establishing runs in areas from which they have been extirpated. NMFS agrees to take the program design and intent into account in reaching any conclusion.

8.7.2 Until 2013, facility modifications are based on monitoring and evaluations and may not reflect changes in NMFS hatchery policy. During 2013 and every 10 years thereafter (at the time of the program review), facility modifications can also reflect changes in ESA policy with the understanding that a reasonable period of time will be provided to complete the modifications. The 2013 date for achievement of NNI in Section 3.1 will be adjusted if necessary to reflect the time needed to complete such modifications (as determined by the Hatchery Coordinating Committee).

8.8 Program Review. In 2003 and every ten years thereafter, the hatchery evaluations program, including natural population/hatchery interaction studies, will undergo a program review to determine whether or not the applicable hatchery program is operating in a manner that is consistent with the goals outlined in that particular facilities hatchery evaluation plan. In 2013 and every ten years thereafter, the hatchery program will undergo a program review to determine if adult-to-smolt and smolt-to-adult survival standards, hatchery program goals, and objectives as defined in the Hatchery Plan, the Section 10 Permits, and as further defined in this document have been met or sufficient progress is being made towards their achievement. This review shall include a determination of whether hatchery production objectives are being achieved. The Hatchery Committee shall be responsible for conducting the hatchery program review, developing a summary report, and in the event that program objectives, as defined in sub-Section 8.1 (Hatchery Objectives) above, are not being met, shall be responsible for establishing alternative plans to the District to achieve them. The District shall be responsible for developing and funding implementation plans.

8.9 <u>New Hatchery Facilities</u>. Before being required to construct new hatchery facilities, the Hatchery Committee shall make efficient use of existing or modified facilities owned by the District or entities consenting to the use of their facilities including adult collection, acclimation and hatchery facilities, provided that existing or modified facility use is compatible with and does not compromise ongoing programs.

SECTION 9
ASSURANCES

9.1 <u>Project License</u>. The Parties agree to join with the District's filing with FERC requesting that FERC issue appropriate orders: (1) to amend the Project's existing license to include this Agreement as a condition thereof, and (2) to terminate the Wells Settlement Agreement dated October 1, 1990.

9.2 <u>Regulatory Approval</u>.

9.2.1 The Parties shall provide reasonable efforts to expedite any NEPA, SEPA, and other regulatory processes required for this Agreement to become effective. The Parties (except the lead agency) may file comments with the lead agency. Such comments will not advocate additional Measures or processes for Plan Species. The Parties shall provide reasonable efforts to expedite the approval process of the District's incidental take permit application.

9.3 <u>Regulatory Approval Without Change.</u>

9.3.1 Except for the District's obligations in sub-Section 10.2 (Permit Issuance) and sub-Section 9.1 (Project License), the terms of this Agreement shall not take effect until the NMFS issues the District a Permit, the FERC issues the required FERC orders and the USFWS completes necessary consultations under the ESA. Provided, the Parties shall continue to conduct planning and study efforts throughout the approval process.

9.3.2 Any Party may withdraw from this Agreement within 60 Days of FERC issuing a license modification in the event that: (1) the NMFS issues the District a Permit with terms and conditions in addition to or different from those set forth in this Agreement, (2) the FERC fails to include this Agreement, in its entirety, or adds terms or conditions inconsistent with this Agreement as a license condition of the current Project license or of the first new long-term Project License approved within the term of this Agreement, or (3) a Party as a result of compliance with NEPA or SEPA requires a material change to the terms or conditions of this Agreement. In order to withdraw from this Agreement, a Party shall provide all other Parties with notice of their intent to withdraw and state in the notice their reason(s) for withdrawing from the Agreement. The ability of a Party to withdraw from this Agreement, pursuant to this paragraph, terminates if not exercised within said period. The notices required by this sub-Section shall be in writing and either served in person or provided by U.S. Mail, return receipt requested.

9.4 Release, Satisfaction and Covenant Not to Sue.

9.4.1 The Parties, within the limits of their authority, shall from the date of construction of the Project to the effective date of this Agreement, release, waive, discharge the District and the District's predecessors, commissioners, agents, representatives, employees, and signatory power purchasers from any and all claims, demands, obligations, promises, liabilities, actions, damages and causes of action of any kind concerning impacts of the Project on Plan Species except for the obligation to provide compensation for original construction impacts of the Project implemented through the hatchery component of this Agreement. This release, waiver, and discharge shall not transfer any of the above listed District liabilities or obligation to any other entity.

9.4.2 Provided that the District is in full compliance with its Permit, this Agreement, and its FERC project license provisions relating to Plan Species, each Party agrees not to institute any action under the ESA, the Federal Power Act, the Fish and Wildlife Coordination Act, the Pacific Northwest Electric Power Planning and Conservation Act and the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act against the District and its signatory Power Purchasers related to impacts of the Project on Plan Species from the date this Agreement becomes effective through the date this Agreement terminates.

9.4.3 Termination of this Agreement or withdrawal of a Party shall have no effect upon the release provided for in sub-Section 9.4.1.

9.4.4 This Agreement does not affect, limit or address the imposition of annual charges under the Federal Power Act, or the right of any party in any proceeding or forum to request annual charges.

9.5 Re-Licensing.

9.5.1 With respect to Plan Species, the Parties agree to be supportive of the District's long-term license application(s) to the FERC filed during the term of the Agreement for the time period addressed in this Agreement, provided that the District has adhered to the terms and conditions of this Agreement, the Permit, and the FERC license provisions relating to Plan Species, as well as any future terms, conditions, and obligations agreed upon by the Parties hereto or imposed upon the District by the FERC. To the extent that the District has met such terms and conditions, the Parties agree that the District is a competent license holder with respect to its obligations to Plan Species. If the fifty (50)-year term of this Agreement will expire during a long-term license, any Party may advocate license conditions that take effect after this Agreement expires.

9.5.2 This Agreement shall constitute the Parties' terms, conditions and recommendations for Plan Species under Sections 10(a), 10(j) and 18 of the Federal Power Act and the Fish and Wildlife Coordination Act, provided that NMFS and USFWS maintain the right to reserve their authorities under Section 18 of the Federal Power Act on the condition that such reserved authority may be exercised only in the event that this Agreement terminates provided further that, the Parties as part of their terms, conditions and recommendations under Section 10(a) of the Federal Power Act may request that Plan Species protection or mitigation Measures contained in a competing license application be included as a condition of the District's new long-term Project license.

9.5.3 Notwithstanding sub-Section 9.5.2 and sub-Section 9.10 (Drawdowns/Dam Removal/Non-Power Operations), this Agreement does not limit the participation of any Party in any FERC proceeding to assert: (1) any condition for resources and other aspects of the District's license other than for Plan Species, and (2) to assert conditions for Plan Species to implement this Agreement.

9.6 Limitation of Reopening. During the term of this Agreement, the Parties shall not invoke or rely on any re-opener clause set forth in any FERC license applicable to the Project for the purpose of obtaining additional Measures or changes in project structures or operations for Plan Species, except as set forth in sub-Section 9.5.2 and 9.5.3.

9.7 Additional Measures. This Agreement sets out certain actions, responsibilities, and duties with regard to Plan Species to be carried out by the District and by the JFP to satisfy the legal requirements imposed under the ESA, the Federal Power Act, the Fish and Wildlife Coordinating Act, the Pacific Northwest Electric Power Planning and Conservation Act and the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act. This Agreement is not intended to prohibit the Parties from opposing or recommending actions in reference to (1) Project modifications such as pool raises and additional power houses, and (2) activities not related to Project operations that could adversely affect Plan Species. The Parties recognize that various Parties to this Agreement have governmental rights, duties, and responsibilities as well as possible rights of action under statutes, regulations and treaties that are not covered by this Agreement. This Agreement does not limit or affect the ability or right of a Party to take any action under any such law, regulation or treaties. However, the Party shall use reasonable efforts to exercise their rights and authority under such statutes, regulations, and treaties (consistent with their duties and responsibilities under those statutes, regulations and treaties) in a manner that allows this Agreement to be fulfilled.

9.8 Title 77 RCW. Provided the District is in compliance with the Agreement, the Permit, and the FERC license provisions relating to Plan Species, WDFW shall not request additional protection or mitigation for Plan Species under Title 77 RCW as now exists or as may be amended, unless WDFW is specifically required to take such action by statute.

9.9 Cooperation in Studies/Approval/Permits. The Parties shall cooperate with the District in conducting studies and in obtaining any approvals or permits which may be required for implementation of this Agreement.

9.10 Drawdowns/Dam Removal/Non-Power Operations. With respect to Plan Species under the ESA, the Federal Power Act, the Fish and Wildlife Coordination Act, the Pacific Northwest Electric Power Planning and Conservation Act, and the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act each Party during the term of this Agreement will not advocate for or support additional or different fish protection Measures or changes in Project structures or operations other than those set forth in this Agreement. For example, the Parties will not advocate or support partial or complete drawdowns, partial or complete dam removal, and partial or complete non-power operations. However, this Agreement does not preclude: spillway or Tailrace modifications; Spill; structural modifications and concrete removal (holes in Dam) to accommodate bypass; structural modifications to accommodate adult passage facility improvements; and future consideration of additional Measures that may include reservoir elevation changes if all Parties agree. The Parties agree to work within this Agreement to address any issues that may arise in the future concerning Plan Species.

9.11 Stipulation of Plan Species. Each Party stipulates that the performance of the District's obligations under this Agreement, its Permit, and its FERC license will adequately and equitably conserve, protect, and mitigate Plan Species pursuant to the ESA, the Federal Power Act, the Fish and Wildlife Coordination Act, the Pacific Northwest Electric Power Planning and Conservation Act, and the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act as those Plan Species are affected by the Project through the term of the Agreement.

9.12 Vernita Bar. Nothing in this Agreement is intended to affect the protection of Plan Species in the Hanford Reach or the Vernita Bar Agreement, as it exists now or may be modified in the future.

9.13 Non-Plan Species. Non-Plan Species are not addressed in this Agreement.

SECTION 10
ENDANGERED SPECIES ACT COMPLIANCE

10.1. Scope. This Section 10 Endangered Species Act Compliance applies only between the NMFS and the District and does not apply to the other Parties unless specifically referenced.

10.2. Permit Issuance.

10.2.1 The District shall revise its incidental take permit applications for Permit Species based upon this Agreement and submit a directed take permit application for Hatchery Operations. This Agreement and its Figures and Appendices shall constitute the District's habitat conservation plan in support of the District's incidental take permit application. Supporting Documents A, B, C and D are to be used as supporting documents to the Agreement and as such, Supporting Documents A, B, C and D do not, by themselves, create contractual obligations under this Agreement or through the permit issued by NMFS.

10.2.2 NMFS issuance of a Permit to the District assures the District that based upon the best scientific and commercial data available and after careful consideration of all comments received, NMFS has found that with respect to all Permit Species that: (i) any take of a Permit Species by the District under this Agreement will be incidental to the carrying out of otherwise lawful activities; (ii) under this Agreement the District will, to the maximum extent practicable, minimize and mitigate any incidental take of Permit Species; (iii) the District has sufficient financial resources to adequately fund its affirmative obligations under this Agreement; (iv) as long as the actions required by this Agreement to minimize/mitigate incidental take of Permit Species are implemented, any incidental take of a Permit Species will not appreciably reduce the likelihood of the survival and recovery of such species in the wild; and (v) other Measures and assurances required by NMFS as being necessary or appropriate are included in this Agreement

10.2.3 After opportunity for public comment, compliance with NEPA and concurrent with the effective date of this Agreement, NMFS will issue a Permit to the District pursuant to Section 10(a)(1)(B) of the ESA to authorize any incidental take of listed Permit Species which may result from the District's otherwise lawful operation of the Project, conducted in accordance with this Agreement and the Permit (Hatchery permits are addressed in sub-Section 10.2.5). In addition, the Permit shall authorize any incidental take of listed Permit Species which may result from the District's otherwise lawful operation of the hatchery facilities required by this Agreement, conducted in accordance with this Agreement and the Permit. The Permit and this Agreement shall remain in full force and effect for a period of fifty (50) years from the effective date, or until revocation of the Permit under sub-Section 10.5 (Permit Suspension, Revocation and Re-Instatement), whichever occurs sooner. Amendments to the Permit or this Agreement shall remain in effect for the then-remaining term of this Agreement or until revocation under sub-Section 10.5 (Permit Suspension, Revocation and Re-Instatement), whichever occurs sooner. Withdrawal from this Agreement and revocation of the Permit as provided in Section 2 is not limited by the no surprises regulation. The Permit shall incorporate by reference the no surprises rule set forth in 50 CFR § 222.307 (g) (2001). This Agreement provides for changed circumstances and the mitigation Measures to respond to changed circumstances. Any circumstance relating to Permit Species not addressed by this Agreement is an Unforeseen Circumstance (See Section 13, "Unforeseen Circumstances").

10.2.4 The Permit shall authorize the District to incidentally take Permit Species that are listed under the ESA, to the extent that such incidental take of such species would otherwise be prohibited under Section 9 of the ESA, and its implementing regulations, or pursuant to a rule promulgated under Section 4(d) of the ESA, and to the extent that the take is incidental to the District's lawful operation of the Project, subject to the condition that the District must fully comply with all requirements of this Agreement and the Permit. The Permit will be immediately effective upon issuance for Permit Species currently listed under the ESA. The Permit will become effective for currently unlisted Permit Species upon any future listing of such species under the ESA.

10.2.5 In the event that an additional or amended Section 10 Permit is required for the implementation of any aspect of the Tributary Conservation Plan or Hatchery Compensation Plan, the NMFS shall expedite the processing of such permits or amendments. The Hatchery Permits (direct and incidental) will initially be issued to authorize take through 2013. Beginning in 2013 and every ten (10) years thereafter the District or its agent shall submit to NMFS hatchery permit applications incorporating changes in the hatchery Programs identified in ten (10) year program reviews (See Section 8.8 Program Review).

10.3. Permit Monitoring. Upon issuance of the Permit, the implementation thereof, including each of the terms of this Agreement shall be monitored and evaluated as provided for in Section 4 (Passage Survival Plan). Any reports the FERC should require regarding this Agreement shall be provided to the NMFS at the time such reports are provided to the FERC.

10.4. Permit Modification.

10.4.1 The Permit issued to the District, shall be amended in conformance with the provisions 50 CFR 222.306 (a) (2001) through 222.306 (c) (2001), provided, that if said regulations are modified the modified regulations will apply only to the extent the modifications were required by subsequent action of Congress or court order, unless the Parties otherwise agree.

10.4.2 This Agreement provides for on-going, active and adaptive management activities. Adaptive management provides for on-going modification of management practices to respond to new information and scientific development. Adaptive management will yield prescriptions that may vary over time. Such changes are provided for in this Agreement and do not require modification of the Agreement or amendment of the Permit, provided, that such changes will not result in a level of incidental take in excess of that otherwise allowed by this Agreement and the Permit.

10.5 Permit Suspension, Revocation and Re-Instatement. Except as set forth in sub-Section 2.2.1 (Enough Already), the Permit shall be suspended, revoked and reinstated in conformance with the provisions of 50 CFR 220.306 (d) (2001) and 50 CFR 222.306 (e) (2001), provided, that if said regulations are modified the modified regulations will apply only to the extent the modifications were required by subsequent action of Congress or court order, unless the Parties otherwise agree.

10.6 Early Termination Mitigation. If the Permit is terminated early and de-listing has not occurred, NMFS may require the District to mitigate for any past incidental take of Permit Species that has not been sufficiently mitigated prior to the date of termination. Such mitigation may require the District to continue relevant mitigation Measures of the Agreement for some or all of the period, which would have been covered by the Permit. NMFS agrees that the District may invoke the dispute resolution procedures of this Agreement to pursue resolution of any disagreement concerning the necessity or amount of such additional mitigation, NMFS reserves any authority it may have under the ESA or its regulations regarding additional mitigation. So long as the District meets and continues to meet the pertinent survival standards, its Tributary Plan funding obligations, and its Hatchery Plan funding and capacity obligations, early termination mitigation shall not apply to the District.

10.7 Funding. In its current financial position, the District has sufficient assets to secure funding for its affirmative obligations under the Agreement. To ensure notification of any material change in the financial position of the District during the term of the Permit, the District will provide the NMFS with a copy of its annual report each year of the Permit.

10.8 USFWS. USFWS does not exercise ESA authority over Permit Species.

SECTION 11
DISPUTE RESOLUTION

11.1 Stages of Dispute Resolution.

11.1.1 Stage 1: Coordinating Committee. Any dispute regarding this Agreement shall first be referred to the respective committee dealing with that issue (the Coordinating Committee is the default committee). That Committee shall have 20 Days within which to resolve the dispute. If at the end of 20 Days there is no resolution, any Party may request that the dispute proceed as provided in sub-Section 11.1.2 (Stage 2: Policy Committee). However, Tributary Committee and Hatchery Committee disputes must first proceed to the Coordinating Committee, before the Policy Committee is utilized to resolve the dispute.

11.1.2 Stage 2: Policy Committee. Following the completion of Stage 1, the chair of the Coordinating Committee or any Party may refer the dispute to the Policy Committee. The chair of the Coordinating Committee shall chair all meetings of the Policy Committee. The chair of the Policy Committee shall provide advanced written notice of all meetings. The Policy Committee shall have 30 Days, following the referral, to convene and consider the dispute. The notice shall contain an agenda of all matters to be addressed and voted on during the meeting.

Each Party shall designate a policy representative who shall be available to participate on the Policy Committee. Any Party that fails to name a Policy Committee representative or to have its Policy Committee representative participate in the Policy Committee shall waive that Party's right to object to the resolution of the dispute by the Policy Committee.

Agreements reached in the Policy Committee shall be based upon unanimous agreement of those Parties present in person or by phone for the vote and shall develop its own rules of process, provided, that the Policy Committee shall ensure that all Parties are sent notice of all Policy Committee meetings. Abstention from votes does not prevent a unanimous vote. If a Party or its designated representative cannot be present for an agenda item to be voted upon it must notify the chair of the Coordinating Committee who may delay a vote on the agenda item for up to five business days on specified issues to be addressed in a meeting or conference call scheduled with all interested parties. A Party may invoke this right only once per delayed agenda item.

11.1.3 Options following Stage 2. If there is no resolution of a matter following completion of Stage 1 and 2 of this Procedure, then any Party may pursue any other right that they might otherwise have. The Parties agree that the inability of the Coordinating Committee and Policy Committee to make a decision shall be considered a dispute. The Parties are encouraged to resolve disputes through alternative dispute resolution.

11.2 Implementation of Settlement Dispute. If the Procedure outlined above results in a settlement of the dispute then: (1) the Parties shall implement, consistent with the terms of the settlement, all aspects of the settlement that can lawfully be implemented without FERC approval, or the approval of another federal agency; and (2) where FERC or other federal agency approval is needed before some or all of the settlement can be implemented, all settling Parties shall jointly present the resolution of the dispute to FERC or the appropriate federal agency for approval.

11.3 No Intent to Create Jurisdiction. The Parties agree that this Agreement is not intended to create jurisdiction in any court.

SECTION 12
MISCELLANEOUS

12.1 Conflict Between Agreement and Appendix. In the event of a conflict between this Agreement and an Appendix to this Agreement, this Agreement shall control and the Parties shall cause the Appendix in conflict to be revised accordingly.

12.2 Amendment of Agreement. This Agreement may be amended or modified only with the written consent of the Parties, provided, that Parties who withdraw from the Agreement do not need to, and have no right to approve any amendments or modifications, provided further, that this Agreement provides for on-going, active and adaptive management activities. Adaptive management provides for ongoing modification of management practices to respond to new information and scientific developments. Adaptive management will yield prescriptions that may vary over time. Such changes are provided for in this Agreement and do not require modification of the Agreement or amendment of the Permit, provided that such changes will not result in a level of incidental take in excess of that otherwise allowed by this Agreement, or modify the provisions set out in Section 3 (Survival Standards and Allocation of Responsibility for No Net Impact), further provided, that unless otherwise agreed to by the Parties, NNI applies only to the identified Plan Species on the date this Agreement became effective.

12.3 Notices. Except as set forth in sub-Section 2.3 (Conditions Precedent to Withdrawal) and sub-Section 9.3 (Regulatory Approval Without Change), all written notices to be given pursuant to this Agreement shall be mailed by first-class mail, postage prepaid to each Party. Parties shall inform all Parties by written notice in the event of a change of address. Notices shall be deemed to be given three (3) Days after the date of mailing.

12.4 Waiver of Default. Any waiver at any time by any Party hereto of any right with respect to any other Party with respect to any matter arising in connection with this Agreement shall not be considered a waiver with respect to any subsequent default or matter.

12.5 Integrated Agreement. All previous communications between the Parties, either verbal or written, with reference to the subject matter of this Agreement are superseded by the terms and provisions of this Agreement, and once executed, this Agreement and Appendices (See Section 15, Appendix) shall constitute the entire Agreement between the Parties, provided, that titles to sections and sub-Sections thereof are for the assistance of the reader and are not part of the Agreement.

12.6 Benefit and Assignment. This Agreement shall be binding upon and inure to the benefit of the Parties hereto and their successors and assigns provided, no interest, right, or obligation under this Agreement shall be transferred or assigned by any Party hereto to any other Party or to any third party without the written consent of all other Parties, except by a Party: (1) to any person or entity into which or with which the Party making the assignment or transfer is merged or consolidated or to which such Party transfers substantially all of its assets, (2) to any person or entity that wholly owns, is wholly owned by, or is wholly owned in common with, the Party making the assignment or transfer, provided that, the assignee is bound by the terms of this Agreement and applies for and receives an incidental take permit for listed Plan Species.

12.7 Force Majeure. For purposes of this Agreement, a *force majeure* is defined as causes beyond the reasonable control of, and without the fault or negligence of, the District or any entity controlled by the District, including its contractors and subcontractors. Economic hardship shall not constitute, *force majeure* under this Agreement.

In the event that the District is wholly or partially prevented from performing obligations under this Agreement because of a *force majeure* event, the District shall be excused from whatever performance is affected by such *force majeure* event to the extent so affected, and such failure to perform shall not be considered a material breach. Nothing in this Section shall be deemed to authorize the District to violate the ESA or render the standards and objectives of this Agreement unobtainable. The suspension of performance shall be no greater in scope and no longer in duration than is required by the *force majeure.*

The District shall notify the other Parties to this Agreement in writing within seven calendar days after a *force majeure* event. Such notice shall: identify the event causing the delay or anticipated delay; estimate the anticipated length of delay; state the Measures taken or to be taken to minimize the delay; and estimate the timetable for implementation of the Measures. The District shall have the burden of demonstrating by a preponderance of evidence that delay is warranted by a *force majeure*.

The District shall use a good faith effort to avoid and mitigate the effects of the delay and remedy its inability to perform. A *force majeure* event may require use of the adaptive management provisions of this Agreement in remedying the effects of the *force majeure* event. When there is a delay in performance of a requirement under this Agreement that is attributable to a *force majeure*, the time period for performance of that requirement shall be reasonably extended as determined by the Coordinating Committee. When the District is able to resume performance of its obligation, the District shall give the other Parties written notice to that effect.

12.8 Appropriations. Implementation of this Agreement by the FP is subject to the availability of appropriated funds. Nothing in this Agreement will be construed by the Parties to require the obligation, appropriation, or expenditure of any money from federal, state or tribal governments. The Parties acknowledge that the FP will not be required under this Agreement to expend any of their appropriated funds unless and until an authorized official of that agency or government affirmatively acts to commit to such expenditures as evidenced in writing.

12.9 Legal Authority. Each Party to this Agreement hereby represents and acknowledges that it has legal authority to execute this Agreement and is fully bound by the terms hereof. NMFS is authorized to enter into this Agreement pursuant to the ESA, the Federal Power Act, the Fish and Wildlife Coordination Act, the Northwest Electric Power Planning and Conservation Act, and the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act.

12.10 Execution. This Agreement may be executed in counterparts. A copy with all original executed signature pages affixed shall constitute the original Agreement. The date of execution shall be the date of the final Party's signature. Upon execution of this Agreement by the Parties, this Agreement shall be submitted to the Secretary of the Interior, or her designee, for any approval to the extent required by 25 U.S.C. § 81.

12.11 Indian Tribal Treaty or Reserved Rights. Nothing in this Agreement is intended to nor shall it in any way abridge, limit, diminish, abrogate, adjudicate, or resolve any Indian right reserved or protected in any treaty, executive order, statute or court decree. This sub-Section shall be deemed to modify each and every Section and sub-Section of this Agreement as if it is set out separately in each Section.

12.12 U.S. v Oregon. Nothing in this Agreement is intended by the signatories who are parties to the continuing jurisdiction case of U.S. v Oregon 302 F. Supp. 899 (D. OR 1969), to change the jurisdiction of that court or their participation there in.

12.13 No Precedent/Compromise of Disputed Claims. The conditions described and measures proposed to rectify the issues set forth in this Agreement are fact specific and uniquely tied to the circumstances currently existing at the Wells Project. The Parties agree that the conditions existing here and the proposed actions to deal with them are not intended to in any way establish a precedent or be interpreted as the position of any Party in any proceeding not dealing specifically with the terms of this Agreement. Further, the Parties acknowledge that this Agreement is a compromise of disputed claims for which each Party provided consideration to the other as contemplated under Federal Rule of Evidence 408, and will not be used by any Party in a manner inconsistent with the provisions of Federal Rules of Evidence 408.

SECTION 13
DEFINITIONS

Capitalized terms are defined as follows:

13.1 "Agreement" means this document, figures and Appendix A - B. This Agreement is supported by Supporting Documents A through D but does not incorporate these documents.

13.2 "BAMP" means Supporting Document B "Biological Assessment and Management Plan (BAMP): Mid-Columbia Hatchery Program".

13.3 "Combined Adult and Juvenile Project Survival" means that 91% of each Plan Species (juvenile and adult combined) survival Project effects when migrating through the Project's reservoir, Forebay, Dam and Tailrace including direct, indirect, and delayed mortality wherever it may occur and can be measured (as it relates to the Project) given the available mark-recapture technology.

13.4 "Dam" means the concrete structure impounding the Columbia River.

13.5 "Day" is defined by the Federal Rules of Civil Procedure.

13.6 "ESA" means the Endangered Species Act, 16 U.S.C. ss 1531 through 1543, as amended, and it's implementing regulations.

13.7 "Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act" means the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. § 1801 et seq., as amended by the Sustainable Fisheries Act and as may be amended, and its implementing regulations.

13.8 "Federal Power Act" means the Federal Power Act, 16 U.S.C. §§ 791a - 828c, as amended, and its implementing regulations.

13.9 "FERC" means the Federal Energy Regulatory Commission or its successor.

13.10 "Fish and Wildlife Coordination Act" means the Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661-668c, as amended, and its implementing regulations.

13.11 “Forebay” means the body of water from the Dam face upstream approximately 500 feet.

13.12 “Historic Hydroacoustic and Fyke Netting” refers to the use of the 20-year record (1982-2002) of available hydroacoustic and species composition information collected at the Wells Project, as it relates to the passage of juvenile spring and summer migrants.

13.13 “Juvenile Dam Passage Survival” means that 95% of each juvenile Plan Species over 95% of each species migration survive Projects effects when migrating through the Project’s Forebay, Dam and Tailrace including direct, indirect and delayed mortality wherever it may occur and can be measured (as it relates to the Project), given the available mark-recapture technology.

13.14 “Juvenile Project Survival” refers to the measurement of survival for juvenile Plan Species over 95% of each species migrating from tributary mouths and through the Project’s reservoir, Forebay, Dam and Tailrace including direct, indirect and delayed mortality, wherever it may occur and can be measured (as it relates to the Project) given the available mark-recapture technology.

13.15 “Juvenile Project Survival Standard” refers to a surrogate measurement of the Combined Adult and Juvenile Survival Standard. If Juvenile Project Survival for each Plan Species is measured to be greater than or equal to 93%, then the District will be assigned to Phase III (Standards Achieved). If Juvenile Project Survival is measured at less than 93% but greater than or equal to 91%, then the District will be assigned to Phase III (Provisional Review). If Juvenile Project Survival is measured at less than 91%, then the District will be assigned to Phase II (Interim Tools).

13.16 “Measures” means any action, structure, facility, or program (on-site or off-site) intended to improve the survival of Plan Species, except those prohibited in sub-Section 9.10 (Drawdowns/Dam Removal/Non-Power Operation). Measures do not include fish transportation unless otherwise agreed by the Coordinating Committee.

13.17 “Pacific Northwest Electric Power Planning and Conservation Act” means the Pacific Northwest Electric Power Planning and Conservation Act, 16 U.S.C. §§ 839 - 839h, 16 U.S.C. §§ 839 - 839h, as amended, and its implementing regulations.

13.18 “Permit” shall mean permit(s) issued to the District by NMFS pursuant to Section 10 of the ESA to authorize take of Permit Species which may result from the District’s or its agent’s implementation of this Agreement.

13.19 "Permit Species" means all Plan Species except coho salmon (*Onocorhynchus kisutch*). Permit Species do not include coho salmon (*O. kisutch*) since wild coho salmon are extirpated from the Mid-Columbia Region and therefore not protected by the ESA.

13.20 "Plan Species" means spring, summer/fall Chinook salmon (*Onocorhynchus tshawytscha*), sockeye salmon (*O. nerka*), coho salmon (*O. kisutch*), and steelhead (*O. mykiss*).

13.21 "Power Purchasers" refers to entities that have executed long-term power sales contracts specifically Puget Sound Energy, Inc., Portland General Electric, PacifiCorp., and Avista Corp.

13.22 "Project" means the Wells Hydroelectric Project owned and operated by Public Utility District No. 1 of Douglas County, Washington pursuant to FERC Project Number 2149. The geographic boundaries of the Project including the reservoir, Forebay, Dam and Tailrace are defined in Exhibit K of the Project's FERC License.

13.23 "Representative Environmental Conditions" means river flows between the 10% and 90% points on the Flow Duration Curve, as calculated using the best available information on historical average river flow (1929-1978, 1993-2001HydroSim) as measured at the Tailrace of Grand Coulee Dam.

13.24 "Representative Operational Conditions" means normative plant operations at Wells Dam that have and are expected to take place during future outmigrations (e.g. normal bypass, fishway and turbine operations).

13.25 "Spill" means the passage of water through spill gates.

13.26 "TDG" means total dissolved gas.

13.27 "Tailrace" means the body of water from the base of the Dam to a point approximately 1000 feet downstream.

13.28 "Threshold Population" refers to a naturally reproducing population that contains a five-year average of greater than 500 adults as assessed at Wells Dam and is composed of a population that is reproductively isolated from other populations of the same species.

13.29 “Tools” means any action, structure, facility or program (on-site only) at the Project, except those prohibited in sub-Section 9.10 (Drawdowns/Dam Removal/Non-Power Operation) that are intended to improve the survival of Plan Species migrating through the Project. Tools do not include fish transportation unless otherwise agreed by the Coordinating Committee. This term is a sub-set of Measures.

13.30 “Unavoidable Project Mortality” refers to the assumed 9% mortality caused by the Project to Plan Species that is compensated through the tributary and hatchery programs.

13.31 “Unforeseen Circumstance” is defined by 50 CFR 222.102 (2001), and implemented according to 50 CFR 222.307(g) (2001). If these regulations are modified, the modified regulations will apply only to the extent the modifications were required by subsequent action of Congress or court order, unless the Parties otherwise agree.

IN WITNESS WHEREOF, the Parties hereto execute this Agreement as of the date last signed below.

Dated MAY 28, 2002

PUBLIC UTILITY DISTRICT NO. 1 OF
DOUGLAS COUNTY, WASHINGTON

By Lynn M. Heminger
Commissioner

Michael Doneen
Commissioner

T. James Davis
Commissioner

Address for Notice:

Public Utility District No. 1 of
Douglas County, Washington
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4497

Attn: Chief Executive Officer/Manager

Dated 4/5/02

NATIONAL MARINE FISHERIES SERVICE,

By D Robert Lohn

Regional Administrator

~~Director~~, Northwest Region

Address for Notice:

7600 Sandpoint Way, NE

Bin C15700, Bldg 1

Seattle WA 98115-0070

Dated 4/10/2002

UNITED STATES FISH AND WILDLIFE SERVICE,

By Rowan W Gould

Deputy Regional Director

(Title)

Address for Notice:

Project Leader

US Fish and Wildlife Service

Eastern Washington Ecological Services

Office

32 C Street NW

P.O. Box 848

Ephrata, WA 98823

Dated 4/2/2012

Washington Department of Fish and Wildlife

By ______________________
Dr. Jeffrey P. Koenings
(Title) Director

Address for Notice:
Washington Department of Fish & Wildlife
600 Capitol Way North
Olympia, WA 98501-1091

Dated April 4, 2002

CONFEDERATED TRIBES OF
THE COLVILLE RESERVATION

By Colleen F. Cawston
Chair, Colville Business Council
(Title)

Address for Notice:
P.O. Box 852
Nespelem, WA 99155

Dated 3-24-05

CONFEDERATED TRIBES AND BANDS OF
THE YAKAMA INDIAN NATION

By ______________________
Tribal Council Chairman
(Title)

Address for Notice:
P. O. Box 151
Toppenish WA 98948

Dated ____________________________

CONFEDERATED TRIBES OF THE
UMATILLA INDIAN RESERVATION

By ________________________________

____
(Title)

Address for Notice:
____
____
____
____
____

Dated ____________________________

AMERICAN RIVERS, INC., a Washington
D.C., nonprofit corporation

By ________________________________

____
(Title)

Address for Notice:
____
____
____
____
____

Dated May 8, 2002

PUGET SOUND ENERGY

By

CEO

(Title)

Address for Notice:

Mail: P.O. Box 97034 OBC-15

Bellevue, WA 98009-9734

location: One Bellevue Center Bldg.

411 108th Ave N.E. 15th Floor

Bellevue, WA 98009-5515

Dated May 7, 2002

PORTLAND GENERAL ELECTRIC

By ______________
Vice President
(Title)

Address for Notice:
121 SW Salmon, 3WTCB06
Portland, OR 97204

PGE Approved By:	
Business Terms	BN
Legal	LM
Credit	NA

Dated 5/10/02

PACIFICORP

By [signature]

Vice President
(Title)

Address for Notice:
Director, Contract Administration
PacifiCorp
825 NE Multnomah, Suite 600
Portland, OR 97232

Dated April 3, 2002

AVISTA CORPORATION

Lloyd H. Meyers

By Lloyd H. Meyers

Vice President, Power Supply

(Title)

Address for Notice:

Avista Corporation

1411 East Mission Avenue

P.O. Box 3727

Spokane, WA 99220-3727

SECTION 14
FIGURES

Figure 1. Wells HCP Survival Standard Decision Matrix.

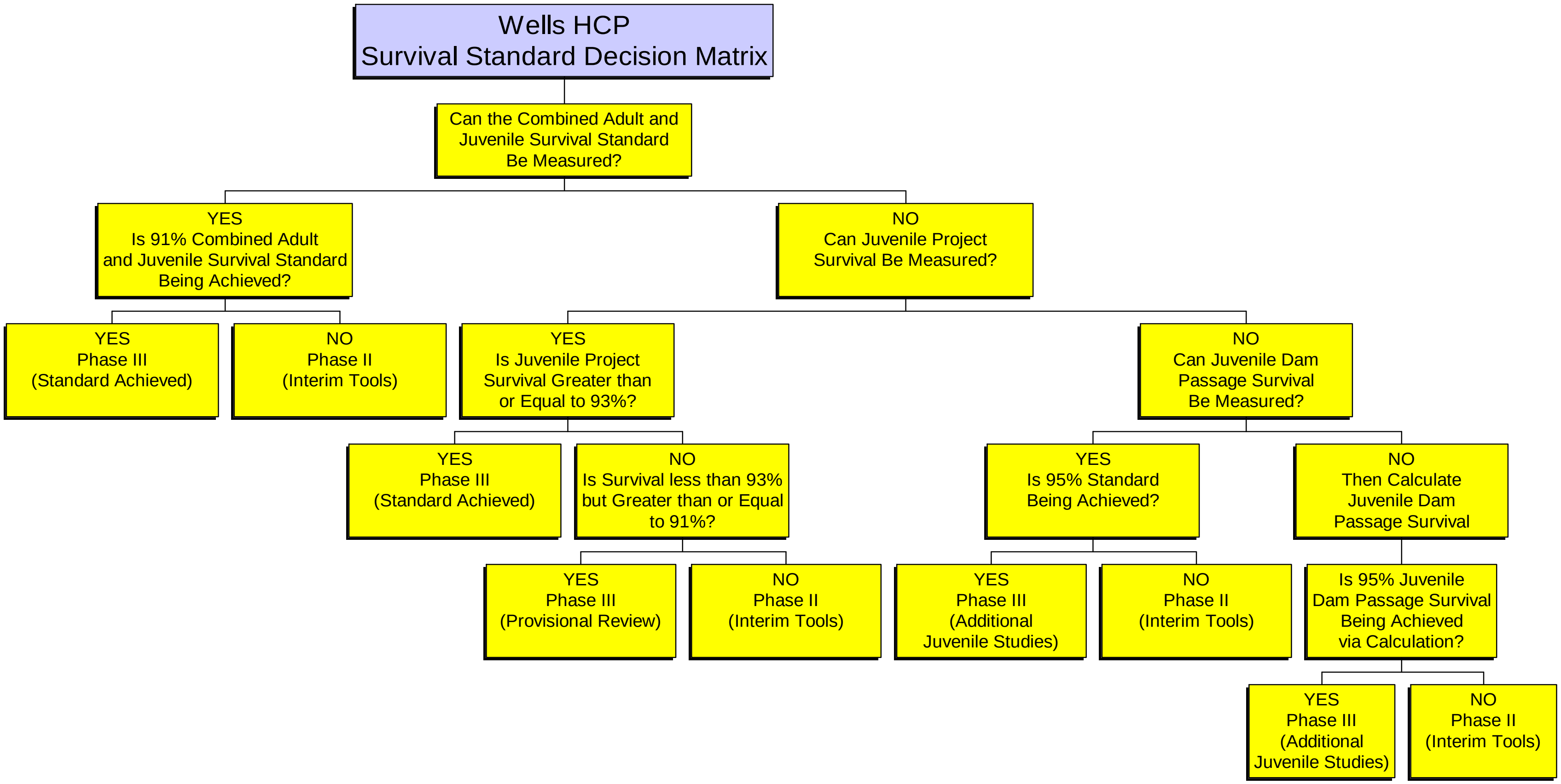


Figure 2a. Spring Flow Duration Curve

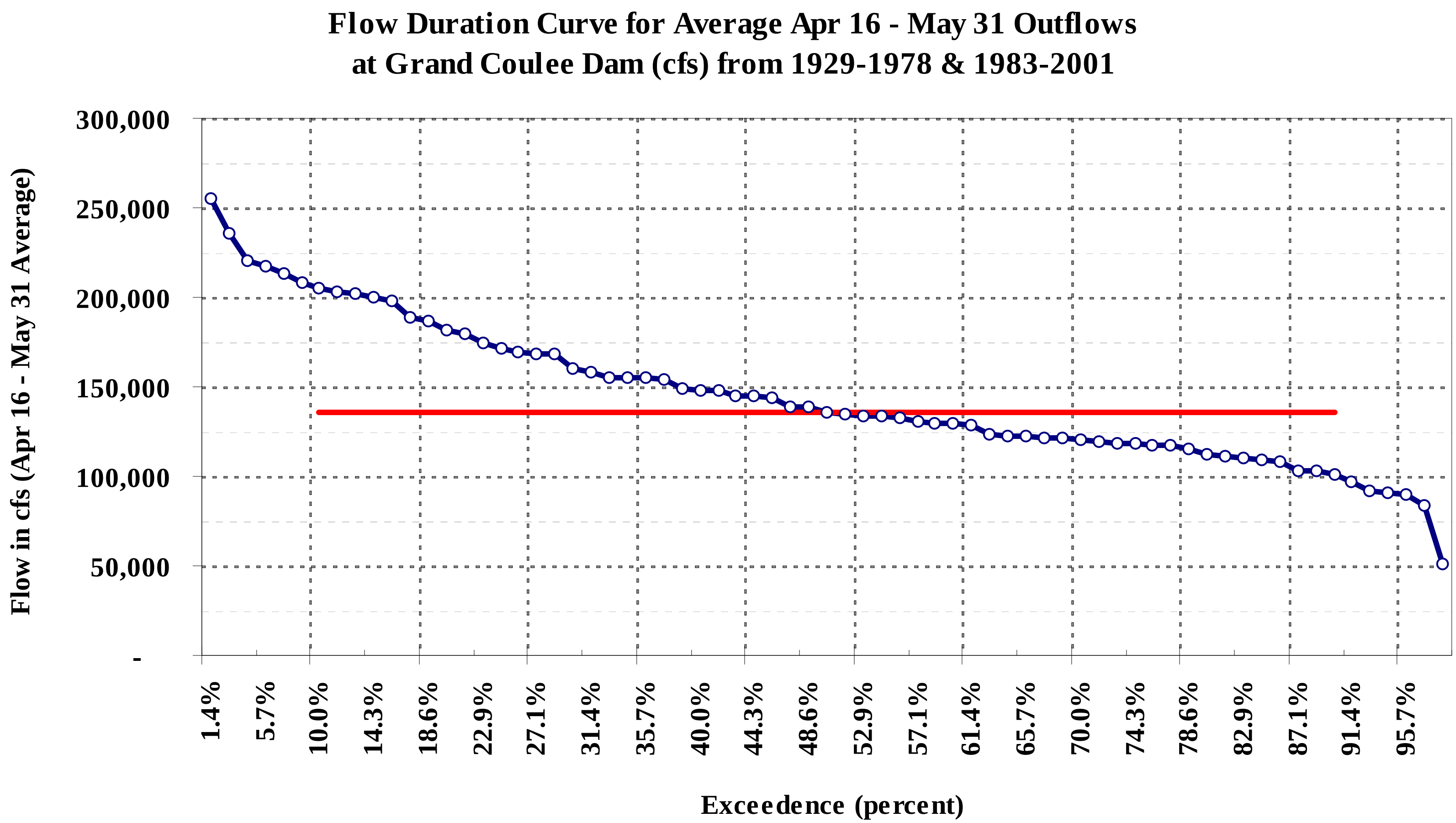


Figure 2b. Summer Flow Duration Curve

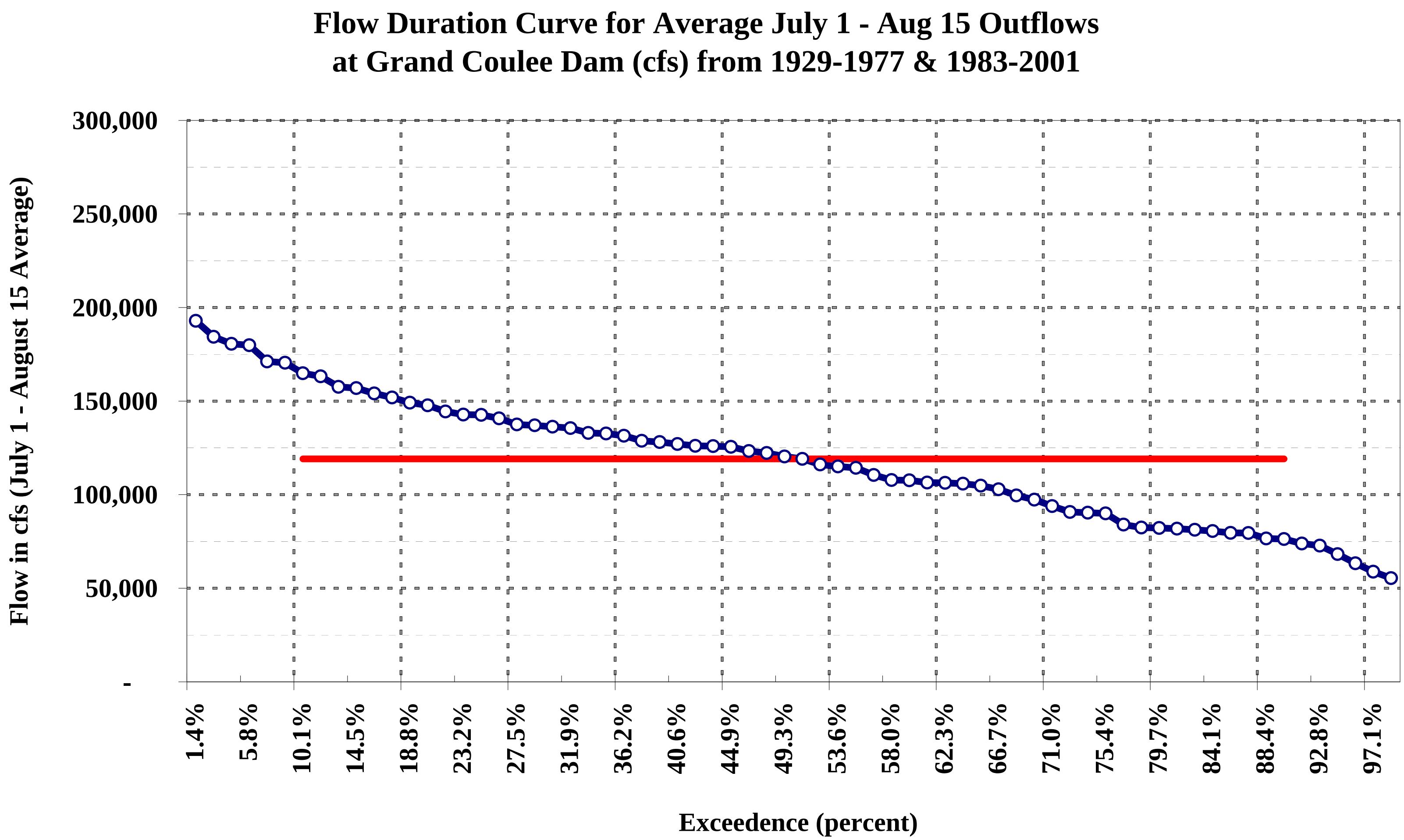
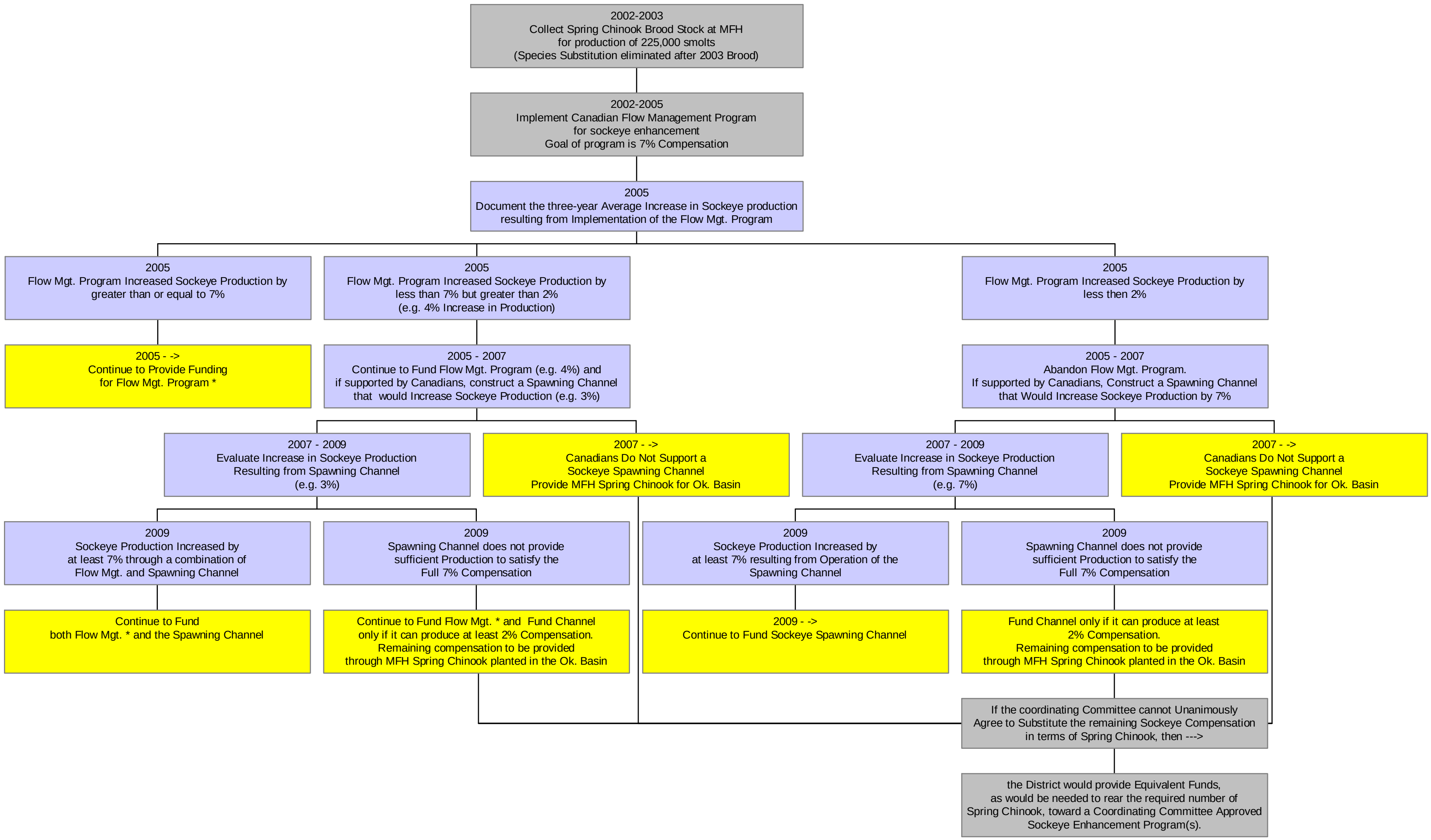


Figure 3. Sockeye Enhancement Decision Tree



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SECTION 15
APPENDIX

Appendix A: Wells Hydroelectric Project, Adult Fish Passage Plan.

Adult Passage Plan

Adult passage at Wells Dam was addressed under the project's FERC license (Project No. 2149). Minor modifications to the FERC fish passage conditions were made during negotiations of the Settlement Agreement. Fishway operations are coordinated with the Fish Passage Center. Changes in operating criteria require unanimous support of the Coordinating Committee including approval by NMFS Hydro Program.

Wells Dam was constructed with two fish ladders. Since 1967, an average of 50,000 adult salmon and steelhead have ascended Wells Dam on their way to spawning grounds above the dam.

The two fish ladders at Wells Dam are conventional staircase type fish ladders with 73 pools. The ladders are located at the east and west ends of the dam. The lower 56 pools discharge a constant 48 cfs of water. At each pool, the water drops approximately one foot until this water reaches the tailwater level in the collection gallery. Supplemental water can be added at each inundated pool at the upper end of the collection gallery. The upper pools in the adult fishway, pools 73 - 56, discharge water from one pool to another through fishway weirs. Each weir in the upper portion of the adult fishways contains two orifice openings. These orifices are located one foot from the base of the weir. This design provides a sanctuary pool between each of the upper fishway weirs. From pool 56 downstream to the collection gallery, each fishway weir is designed to operate with 48 cfs of water. The water passes from one weir to the next via a seven foot wide overflow section between pools and through two 18 inch by 15 inch submerged orifices.

To accommodate 10 feet of reservoir drawdown, the drop between the upper 17 pools varies from one foot at full reservoir to six inches during a 10 foot reservoir drawdown. The flow through the upper 17 ladder pools consequently varies from 44 cfs at full reservoir to about 31 cfs at maximum reservoir drawdown. To increase the flow to the 48 cfs required in the lower ladder pools, supplementary water is introduced into Pool No. 56 through a pipeline from the reservoir.

Pool No. 64 of both fishway ladders contains facilities for counting fish. The main features of the counting facility include a counting room, an observation window into the fish ladder, a telescoping gate to guide the fish closer to the observation window, a light panel and a bypass gate to control the flow and velocity past the observation window. Video records of fish passage are collected 24-hours per day starting on May 1 and continue through November 15. The videos are then reviewed and counts of fish by species by ladder are made available on a daily basis through coordination with the Army Corps of Engineers adult fish counting program.

At Pool No. 40, each of the two fish ladders has provisions for sorting and trapping various species of fish. The west ladder sorting facility allows for selected fish to travel through a flume to a holding pond at the Wells Hatchery. The east ladder sorting facility allows for fish to travel to a holding container where they are anesthetized, netted and placed in transportation containers to be moved across the dam to appropriate hatchery facilities. The fisheries agencies and tribes currently develop species-specific broodstock collection protocols at the beginning of each season. Broodstock presently collected at Wells Dam includes spring and summer chinook and summer steelhead. Broodstock collection protocols are developed by the WDFW and are annually submitted to the Wells Coordinating Committee and NMFS Hydro Program for annual approval prior to trapping at the dam. In addition to broodstock collection, the adult fish traps are occasionally used to collect information from CWT tagged steelhead, collect sockeye scales for stock identification and age analysis and collect adult bull trout, chinook, sockeye and steelhead for radio-tagging.

The 2000-2002 Wells Biological Opinion (Section 10.1.4, page 45) requires that the operation of the Wells ladder traps for the collection of broodstock or other fisheries assessment be limited to a maximum of 16-hours per day for three days per week or as approved by NMFS Hydro Program, Portland, Oregon. The Wells Biological Opinion (Section 10.1.4, page 45) requires that adult trapping facilities be manned whenever the trap is in operation and that the collection of adults from the fishway traps be discontinued whenever river water temperature exceed 69 F°. Specific operating criteria for the fish ladder traps can be found below (See: Adult Trap Operating Criteria).

At the bottom of the fish ladder, projecting downstream from the line of the hydrocombine is the portion of the endwall structure that incorporates the functions of fish attraction and collection. Two turbine pumps on each ladder deliver 800 to 2500 cfs (depending upon tailwater elevation) of fish attraction flow to the water supply chamber located immediately adjacent to the collection gallery. Supply chamber water flows into the upper sections of the collection gallery where it is used to maintain an attraction velocity of 2 feet per second; and also into the main collection gallery at the foot of the ladder through diffusion gratings. The total fishway flow from the turbine pump(s) and the 48 cfs coming down the ladder from the forebay is discharged into the tailrace through two fish entrances. Fishway entrances are operated according to hydraulic conditions as specified in the Wells settlement agreement. The specific operating conditions of the ladder are described below (See: Adult Fishway Operating

Criteria). Modification to the ladder operating criteria can only take place following approval by the Wells Coordinating Committee.

To reduce the total project passage times of adult fish, the main fishway entrances will be operated at an 8-foot opening. To reduce the incidence of fish falling out of the collection gallery, the side gates to the collection gallery will remain closed during normal fishway operations.

Since July 1970, the ladders have been operated with a 1.5 foot differential maintained by constantly adjusting the output of the fish pumps. Under normal conditions, the fish pumps operate automatically to maintain a pre-set differential level between the water supply chamber and the main collection chamber.

Fishways are inspected daily to ensure that debris accumulations are removed, that the automated fishway instruments are calibrated properly and to ensure that lights in the fishway are maintained.

Adult Fish Ladder Operating Criteria

Water Depth Criteria

The water depth over the weirs of the adult fish ladder will be 1.0 to 1.2 feet.

Entrance Criteria

1. Head: 1.5 feet
2. Gate Settings: Main Wing Gate open 8 feet,
   Side Wing Gate closed,
   Side Gate Attraction Jets closed.

Staff Gauge and Water Level Indicator Criteria

Staff guage and water level indicators are located and maintained upstream and downstream of the Main Wing Gates and adult fishway exit trashracks. These guages should be clearly visible from a convenient location and they should be clean and readable at all water levels. Manual staff guage readings should be checked each day to ensure that consistent readings are being displayed within the control room.

Trashrack Criteria

Visible buildups of debris will be cleaned immediately from picketed leads near counting stations, and from trashracks at adult fishway exits. The staff gauges located immediately upstream and downstream of the adult fishway exit trashracks should be monitored for water surface differential, which may indicate a buildup of debris on the submerged trashracks. The trashracks will be cleaned immediately if the differential reading is greater than 1.0 foot.

Modification of Adult Passage Facilities

If adult passage studies identify biologically significant delay and/or mortality, the operating criteria described above may be changed or modified following approval of the Coordinating Committee. If changes in the operating criteria do not alleviate the problems, then structural modifications to the adult passage facilities may be required. Provided that any disagreements over the appropriateness of facility modifications of $325,000.00 or less (1988 dollars) may be taken through dispute resolution and any disagreement over the appropriateness of facility modifications of more than $325,000.00 (1988 dollars) is resolved under the FERC Rules of Practice and Procudure.

Adult Trap Operating Criteria

Startup: The adult fish traps are located on each fish ladder at Pool 40. The traps are operated by placing a barrier fence across the entire width of Pool 40. Once the barrier fence is in place, the steep-pass denil, upwelling enclosure and sorting chute jets are turned on.

Fish Sorting: Fish that swim up the denil eventually enter the upwell enclosure. Once inside the upwell enclosure, fish are attracted down the sorting chute by jets of water introduced into the upwell enclosure near the top of the sorting chute. As fish slide down the chute, they are identified and a decision is made to either shunt the fish back into the ladder immediately upstream of the barrier fence, or to retain the fish for broodstock or stock assessment. Excess water introduced into the fish ladder from the trap denil and upwell enclosure can, when necessary, be removed from the fish ladder through a piped diversion located downstream of the trap in Pool 40.

Fish Disposition: At the east ladder trap, fish retained for stock assessment are anesthetized, sampled and re-introduced back into the ladder via a recovery/re-introduction tank that is located upstream of the pool 40 barrier fence. Fish retained for broodstock are anesthetized, marked and placed into hatchery transport vehicles. On the west ladder trap, fish retained for broodstock and for stock assessment are passed into a holding pond at the Wells Fish Hatchery. Fish in the holding pond are sorted by WDFW personnel. Fish retained for broodstock are either retained in the hatchery holding pond or placed into transportation vehicles for distribution to other hatchery facilities. Fish retained for stock assessment purposes are placed into transport vehicles and released upstream of the dam.

Safety Measures: The steep-pass denil has been outfitted with two removable gates. The bottom gate prevents fish from moving into the upwell enclosure when the trap is unattended and the top gate prevents fish in the upwell enclosure from moving down the steep-pass denil. The sorting chute has also been upgraded to include a gate on the upstream end. This gate prevents fish from moving down the sorting chute once sufficient numbers of fish have already been placed in the anesthetic tank. The sorting chute has been modified to include full padding and jets of water to keep it moist and cool. Temperature monitors are deployed in the ladder at pool 40 and in the anesthetic tank to ensure compliance with the Wells 2000 BiOp trapping criteria.

Shut Down – Daily: At the end of each trapping day, the barrier fence is lifted out of the ladder, the steep-pass denil is gated first at the bottom and then at the top, the water to the upwelling enclosure is left on, the sorting chute is locked in the return to ladder direction, the sorting chute water jets are left on, the anesthetic tank is drained away from the ladder and all of the fish in the recovery tank are released back into the fish ladder.

Shut Down – Annual: At the end of the trapping season, all water is turned off, all tanks should be checked for fish and then drained. The upwell enclosure water is turned off last and all remaining fish and water should be drained directly into the fish ladder through the upwell enclosure bypass pipe.

BiOp Conditions: The 2000-2002 Wells Biological Opinion (Wells 2000 BiOp) requires that the operation of the Wells ladder traps be limited to a maximum of 16-hours per day for three days per week. To ensure adherence to this trapping schedule, the District has installed remote monitors on the fishway traps. The fish ladder trap monitors notify District personnel when the trap is in operation. The location and duration of ladder trapping is recorded daily and reviewed weekly with WDFW staff. The Wells 2000 BiOp also requires that the adult trapping facilities be manned whenever the trap is in operation and that the collection of adults from the fishway traps be discontinued whenever river water temperature exceeds 69 F°. Thermographs have been installed immediately adjacent to the traps to ensure that the temperature criteria is not exceeded during adult trapping.

Annual Meeting: District and WDFW trapping personnel meet annually to review the annual brood collection goals, assessment projects, to review current ladder trapping and operating criteria and to discuss modifications to the trap.

Adult Ladder Dewatering Plan

Stage 1 (Notification): Project personnel requiring access to the submerged portions of the adult fish ladders must contact a District Fish Biologist seven days prior to initiating any temporary or extended dewatering of either of the two fishways at Wells Dam. Emergency ladder dewatering should be coordinated with District Fish Biologists to the maximum extent practical given the extent of the emergency. Ladder dewatering to clean the visitor center and the fish counting windows is not considered an emergency. Notice is required to allow District Biologists time to ensure coordination between the scheduled dewatering event and ongoing efforts to collect broodstock for hatcheries, tag fish for stock assessment studies, coordinate fisheries passage inspections and to monitor fish behavior relative to normal project operations. In addition, due to the presence of three stocks of ESA listed fish (UCR spring chinook, UCR steelhead and Columbia River bull trout) it is important that dewatering events be coordinated with the appropriate resource agencies responsible for administering the ESA.

Stage 2 (Equipment Preparation): Once notice has been provided to all appropriate entities and resource agencies (including WFH staff), an agreed to ladder dewatering schedule and fish salvage plan should be discussed and coordinated with all affected departments. District personnel are responsible for gathering and inspecting all necessary equipment required to safely collect, hold, transfer and release adult and juvenile fish salvaged from the dewatered fishways. Equipment required for a successful salvage operation include dip nets, a block seine, waders, rain gear, ropes, two 20 foot extendable ladders, flood lights, head lamps, fish totes and fish transport vehicles. Equipment needed for salvaging fish from the dewatered ladder should be moved to the fish ladder at least one day prior to initiating Stage 5 (Exit Gate Closure).

Stage 3 (Day Prior to Dewatering): The day before a scheduled fish ladder dewatering and salvage operation, project personnel should turn off and bulk head each of the two fish pumps located within the water supply chamber. The collection gallery entrances and the ladder exit orifice gates should be operated at normal levels for the remainder of the day.

Stage 4 (Evening Prior to Dewatering): The evening prior to dewatering the fish ladder, the exit orifice gates should be partially closed to allow less than full orifice flow through each of the weirs located in the upper fishway (Weir 73 – 57). The Pool 56 supplemental water supply valve should be set to the fully open position. These settings should remain in place until Stage 7 (Fish Salvage – Upper Fishway) operations have been completed.

Stage 5 (Exit Gate Closure): On the morning of the scheduled dewatering and salvage operation, the exit orifice gates must be turned off gradually. It should require at least 2 hours to completely close off the exit orifice gates. It is important that a District Fish Biologist and appropriate WFH staff be in close proximity to the upper fishway, with equipment in place, prior to project personnel completely closing off the exit orifice gates.

Stage 6 (Supplemental Water): Once the exit orifice gates are closed, it is important to verify that sufficient supplemental water is being added into the middle fishway at Pool 56. If additional water is required, the control room should be contacted to ensure that the supplemental water supply system is being operated at maximum capacity. If the plant operators cannot provide additional water into Pool 56 via the supplemental water supply system, then the District Fish Biologist and the appropriate plant supervisor should discuss whether it is appropriate to move to Stage 7 (Fish Salvage – Upper Fishway). It may be more appropriate to re-open the exit orifice gate and attempt to fix the problem with the supplemental water supply system prior to proceeding to Stage 7. However, if a determination is made to continue to Stage 7 (Fish Salvage – Upper Fishway), then it is the responsibility of the operators to carefully add additional water into the ladder by opening the exit orifice gate until adequate amounts of water are flowing through the middle ladder. Adding supplemental water through the exit orifice gates should only be used as a last resort as this operation establishes a dangerous work environment for personnel attempting to salvage fish from the upper fishway.

Stage 7 (Fish Salvage – Upper Fishway): Provided that sufficient water exists in the middle fish ladder (below Pool 56), fish salvage operations should proceed as described below. Fish salvage operations should start at Pool 73 and move downstream until the upper fishway is free of fish. Fish found in each sanctuary pool will have to be collected with a dip net and transferred directly into the portable fish totes. The order of priority is to net and transfer ESA listed adults, ESA listed juveniles, anadromous adults, anadromous juveniles and then non-listed resident fish.

Once loaded with fish, the fish totes should be hoisted from the sanctuary pool and deposited into Pool 56. Fish collected from Pool 73 through Pool 57 are to be hoisted into Pool 56 where supplemental water has been added to carry fish downstream through the middle and lower fishway and into the collection gallery and tailrace. Once all fish have been salvaged from Pool 73 through 57 and all personnel have been evacuated from the fish ladder, the operators should be contacted to initiate a Stage 8 (Middle Fishway – Pulsed Flow Operation) as described below.

Stage 8 (Middle Fishway – Pulsed Flow Operation): In order to move fish from Pool 56 down to the tailrace of the project, the adult fishway should be partially re-watered and then dewatered several times. It may become necessary to pulse water from the exit orifice gates several times. Typically three pulses of water are required to flush fish out of the middle and lower ladder and into the tailrace. Pool 40 is a location where fish frequently become stranded during the pulsed flow operation. A hatchery tanker truck and appropriate fish salvage personnel should be stationed at Pool 40 should fish require transport back to the river. The order of priority for fish collection shall be to net and transfer ESA listed adults, ESA listed juveniles, anadromous adults, anadromous juveniles and then net and transfer non-listed resident fish.

Once the fishway has been cleared of fish, the fish being held in the tanker truck should be released back into the river and the exit orifice gates should be closed. Fish salvaged from the east ladder will be released upstream of the dam and fish salvaged from the west ladder will be released into the tailrace.

Stage 9 (Lower Fishway – Collection Gallery): The lower fishway and collection gallery can only be dewatered following the placement of bulkheads across the entrance gates. The floor of the collection gallery can be up to 40 feet below the surface of the tailrace. Therefore, the collection gallery must be dewatered with a sump pump. This operation can take several hours depending upon tailrace elevation and leakage into the collection gallery. Once the collection gallery is within one foot of becoming dry, fish salvage personnel should be hoisted with a crane down into the gallery. Once in the gallery, the fish totes should be filled with water and a seine net deployed upstream of the floor diffuser. Fish on top of the floor diffusers should be netted before the water levels drop to less than 6 inches. Once netted, fish should be placed into the fish totes. Depending upon the number and size of fish captured, the fish totes may need to be lifted out of the collection gallery before all of the fish have been collected. Once the crane has lifted the fish totes onto the deck of the dam, the fish should be placed into either a fish release container (300 gallon) or a hatchery transport truck.

Once the collection gallery has been cleared of stranded fish, the fish being held in the tanker truck will be released into either the forebay or tailrace of the dam.

Appendix B: Wells Project Survival Estimates.

Wells Project Survival Estimates

1998 WELLS SURVIVAL STUDY

The 1998 Survival Study, as described in the 1998 study plan "1998 Wells Dam Pilot Survival Study", was submitted to the WCC for review on September 2, 1997. The study plan was discussed during the September 8th and October 16th meetings of the WCC. The Study plan was modified in September 1997 to include several items requested by the WCC. The Study plan was approved during a conference call on October 16th as documented in the Wells Coordinating Committee meeting minutes (97-8). All parties to the Wells Settlement Agreement were contacted and provided unanimous support for the 1998 study.

The study was completed as directed in the study plan and draft results were presented to the WCC as documented in the 98-4, -5, -6, -8 meeting minutes. The Draft report was submitted to the WCC for review and comment on February 12, 1999. No comments were received by the end of the 60-day comment period. The comment period was extended to allow NMFS additional time for review. The comment period was closed following a 90-day review and following a call from Bob Dach (NMFS) indicating that no comments were going to be submitted by NMFS. The final report entitled: "Project Survival Estimates for Yearling Chinook Salmon Migrating through the Wells Hydroelectric Facility, 1998" was completed on May 27, 1999 and was distributed to the WCC on June 7, 1999. Results of the 1998 Survival Study using yearling Chinook indicated that project survival (Mouth of the Methow River to 1000 feet downstream of Wells Dam) was 99.7% ($S\hat{E} = 0.015$).

1999 WELLS SURVIVAL STUDY

The 1999 Survival Study, as described in the 1999 study plan "Wells Dam Steelhead Survival Study, 1999", was distributed prior to the August 12, 1998 meeting of the WCC. The study plan was discussed during the August 12th and September 22nd meetings. The study plan was revised based upon committee input in late September. The modified study plan was re-submitted to the WCC on October 2, 1998. The modified study plan was further discussed at the October 20, 1998 meetings of the WCC. The 1999 Study plan was unanimously approved during a conference call on November 2nd and reaffirmed at the next formal WCC meeting on November 12, 1998 as documented in the Wells Coordinating Committee meeting minutes (98-10, -11). All parties to the Wells Settlement Agreement were contacted and provided unanimous support for the 1999 study.

The study was completed and preliminary results were sent to the WCC on July 13, 1999. These results were formally presented to the WCC at the September 21, 1999 meeting (99-7). The Draft report was submitted to the WCC for review and comment on November 16, 1999. No comments were received by the end of the 60-day comment period. However, comments were received on February 18, 2000 from Steve Smith (NMFS) and all of Steve's comments were addressed in the final report. Steve Smith's comments and the authors response to Steve's comments can be found in the final report in Appendix C. The final report entitled: "Project Survival Estimates for Yearling Summer Steelhead Migrating through the Wells Hydroelectric Facility, 1999" was completed on March 9, 2000 and was distributed to the WCC on March 24, 2000. Results of the 1999 Survival Study using yearling summer steelhead indicated that project survival (Mouth of the Methow River to 1000 feet downstream of Wells Dam) was 94.3% ($S\hat{E}$ = 0.016).

2000 WELLS SURVIVAL STUDY

The 2000 Survival Study, as described in the 2000 study plan "Wells Dam Steelhead Survival Study, 2000", was distributed to the WCC on September 21, 1999 (99-7). The study plan was discussed during the September, October and November 1999 meetings of the WCC (99-7, -8, -9). The Study plan was modified prior to the November meeting based upon input from the WCC. The 2000 survival study plan was approved at the November 1999 meeting as documented in the Wells Coordinating Committee meeting minutes (99-9). All parties to the Wells Settlement Agreement were contacted and provided unanimous support for the 2000 study.

The study was completed and preliminary results were presented to the WCC at the September 12, 2000 meeting (00-10). The Draft report was submitted to the WCC for review and comment on November 30, 2000. No comments were received by the end of the 60-day comment period. However, comments were later received from NMFS and these comments were addressed in the final report. NMFS comments and the author's response to NMFS's comments can be found in the final report in Appendix E of the final report. The final report entitled: "Project Survival Estimates for Yearling Summer Steelhead Migrating through the Wells Hydroelectric Facility, 2000" was completed on March 23, 2001 and was distributed to the WCC on March 29, 2001. Results of the 2000 Survival Study using yearling summer steelhead indicated that project survival (Mouth of the Methow River to 1000 feet downstream of Wells Dam) was 94.6% ($S\hat{E}$ = 0.015).

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SECTION 16
LIST OF SUPPORTING DOCUMENTS

Supporting Document A: Aquatic Species and Habitat Assessment: Wenatchee, Entiat, Methow, and Okanogan Watersheds (1998).

Supporting Document B: Biological Assessment and Management Plan (BAMP): Mid-Columbia Hatchery Program (1998).

Supporting Document C: Briefing Paper: Estimating Survival of Anadromous Fish through the Mid-Columbia PUD Hydropower Projects (2002).

Supporting Document D: Tributary Plan, Project Selection, Implementation and Evaluation (1998).

To receive copies of the Supporting Documents please refer to the District's website, the National Marine Fisheries Service website or contact the District directly as indicated below.

www.douglaspud.org

www.nwr.noaa.gov/1hydrop/hydroweb/ferchcps.html

Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wentachee, WA 98802-4497
(509) 884-7191

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Appendix E-2

Aquatic Settlement Agreement

White Sturgeon Management Plan
Bull Trout Management Plan
Pacific Lamprey Management Plan
Resident Fish Management Plan
Aquatic Nuisance Species Management Plan
Water Quality Management Plan

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AQUATIC SETTLEMENT AGREEMENT

**A Settlement Agreement in Support of the
Measures identified within the:**

**White Sturgeon Management Plan
Bull Trout Management Plan
Pacific Lamprey Management Plan
Resident Fish Management Plan
Aquatic Nuisance Species Management Plan
and
Water Quality Management Plan**

**Wells Hydroelectric Project
FERC Project No. 2149**

October 2008

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AQUATIC SETTLEMENT AGREEMENT
Wells Hydroelectric Project
FERC License No. 2149

1.0 PARTIES

This Aquatic Settlement Agreement (Agreement) is entered into by and between the Public Utility District No. 1 of Douglas County, Washington (Douglas), a Washington municipal corporation, the United States Fish and Wildlife Service (USFWS), the Washington State Department of Fish and Wildlife (WDFW), the Washington State Department of Ecology (Ecology), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama), the Bureau of Indian Affairs (BIA), and the Bureau of Land Management (BLM). The above entities who have executed this Agreement, herein collectively referred to as the "Parties" and individually as "Party," have actively participated in the development of this Agreement and associated Aquatic Resource Management Plans.

This Agreement shall be binding on, and inure to the benefit of, the above-listed Parties and their successors and assigns, unless otherwise specified in this Agreement.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of this Agreement, but declined to be a signatory Party because its interests are currently satisfied by the measures within the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP). Additional entities may become Parties to this Agreement following unanimous consent of all the existing Parties to the Agreement and after executing a signature page and submitting it to Douglas and the Federal Energy Regulatory Commission (FERC).

2.0 RECITALS

2.1 The Wells Hydroelectric Project (Wells Project) is located at river mile 515.6 on the Columbia River in the State of Washington. Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, owned and operated by the United States Army Corps of Engineers, and 42 miles upstream from the Rocky Reach Hydroelectric Project, owned and operated by Chelan County Public Utility District. The nearest town is Pateros, Washington, which is located approximately 8 miles upstream from Wells Dam.

2.2 The Wells Project is the chief generating resource for Douglas. It includes ten generating units with a nameplate rating of 774,300 kilowatts (kW) and a peaking capacity of approximately 840,000 kW. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. Adult fish passage facilities reside on both sides of the hydrocombine, which is 1,130 feet long, 168 feet wide, with a crest elevation of 795 feet in height. Juvenile fish passage facilities are located across the powerhouse of the dam. The system was developed by Douglas and uses a barrier system to modify the intake velocities on spillways 2, 4, 6, 8, and 10. The Wells Project fish bypass system is the most efficient juvenile fish bypass system on the mainstem Columbia River. The bypass system on average collects and safely passes 92.0 percent of the spring migrating salmonids (yearling Chinook, steelhead, and sockeye) that arrive at Wells Dam and 96.2 percent of the summer migrating subyearling Chinook that arrive at the dam (Skalski et al., 1996).

2.3 The Wells Reservoir is approximately 30 miles long. The Methow and Okanogan rivers are tributaries of the Columbia River within the Wells Reservoir. The Wells Project boundary extends approximately 1.5 miles up the Methow River and approximately 15.5 miles up the Okanogan River. The normal maximum surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet (ac-ft) and usable storage of 97,985 ac-ft at elevation of 781 feet above mean sea level (MSL).

2.4 Douglas has various reservoir and surface water rights associated with the operation of the Wells Project including the following certificates (S3-00362, R3-00363, R4-26075, and S4-26074). These certificates provide reservoir impoundment rights for 331,200 ac-ft of water and power generation rights for 220,000 cubic feet per second (cfs) of water.

2.5 In March 1979, in response to petitions from tribes and other entities, FERC initiated a consolidated proceeding on juvenile fish protection for the Mid-Columbia hydroelectric projects, including the Wells Project.

2.6 In 1990, following the installation of 10 new high-efficiency turbine runners and the installation and preliminary testing of a new and highly effective juvenile fish bypass system, Douglas entered into a long-term fisheries settlement agreement with NMFS, USFWS, WDFW, Colville, Yakama, and Confederated Tribes of the Umatilla Indian Reservation (CTUIR).

2.7 On June 21, 2004, FERC approved the HCP. The HCP superseded the 1990 long-term fisheries settlement agreement. The HCP represents the culmination of over 10 years of negotiations between Douglas, NMFS, USFWS, WDFW, Colville, Yakama, CTUIR, and American Rivers. The HCP is the first hydropower HCP for anadromous salmon and steelhead. The HCP is a 50-year agreement included as an amendment to the Original Operating License. The HCP addresses Project related impacts to spring Chinook, summer/fall Chinook, steelhead, sockeye and coho, collectively referred to as Plan Species. With respect to Plan Species, the HCP parties have agreed to be supportive of Douglas's long-term relicensing efforts. The HCP also provides Endangered Species Act (ESA) coverage for all of the permit species (spring Chinook, summer/fall Chinook, sockeye and steelhead). The HCP also is intended to constitute the HCP participants' terms, conditions and recommendations for Plan Species under Sections 10(a), 10(j), and 18 of the Federal Power Act (FPA), the Fish and Wildlife Conservation Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Pacific Northwest Electric Power Planning and Conservation Act, and Title 77 of the Revised Code of Washington (RCW) of the State of Washington. On October 16, 2007, FERC officially recognized the HCP as a qualifying Comprehensive Plan pursuant to section 10(a)(2)(A) of the FPA.

2.8 On November 1, 2004, Douglas and Colville executed a settlement agreement to resolve all claims regarding any section 10(e) payments to Colville for the term of the original license and any new FERC license arising from the use of lands within the Wells Project Boundary. Pursuant to the settlement agreement, Douglas and Colville also executed a power sales contract and a power sales service agreement. On February 11, 2005 the FERC issued an order approving the settlement agreement and granting approval of the power sales contract under section 22 of the FPA.

2.9 The Original Operating License for the Wells Project will expire on May 31, 2012. Douglas is using the Integrated Licensing Process (ILP) as required by FERC regulations issued July 23, 2003 (18 CFR Part 5). Pursuant to the ILP regulations Douglas submitted to FERC, on December 1, 2006, a Notice of Intent to file an application for a New License and a Pre-Application Document.

2.10 In March of 2006, following two years of collaborative discussions related to relicensing studies, Douglas approached stakeholders regarding its desire to develop an Aquatic Settlement Agreement for those resources not already protected by the Original Operating License, the HCP, or other related agreements. Stakeholders active in the development of this Agreement included the USFWS, NMFS, WDFW, Ecology, Colville, and Yakama.

2.11 Douglas plans to file a Draft License Application (DLA) with FERC on or before December 31, 2009, and plans to file a Final License Application (FLA) for a New License with FERC on or before May 31, 2010. Douglas plans to include this Agreement in the DLA and FLA. It is the Parties' expectation that the Agreement will be signed prior to filing the DLA.

3.0 DEFINITIONS

3.1 "Adaptive Management" means an iterative and rigorous process used by the Aquatic Settlement Work Group (Aquatic SWG) to achieve biological goals and objectives. In the context of the relicensing of the Wells Project, this process is intended to improve the management of Aquatic Resources affected by Project operations, in order to achieve the desired goals and objectives of the Aquatic Resource Management Plans as effectively and efficiently as possible, in accordance with the provisions of this Agreement. The process used by the Aquatic SWG has many steps including the following:

a. Develop initial hypotheses regarding any potential Project impacts and potential protection or mitigation measures;

b. Complete studies to determine whether the hypothesized impacts are valid, and if valid, quantify the impact resulting from the Project;

c. If the hypothesized impact is validated and quantified, then the Aquatic SWG shall identify appropriate goals and objectives and implementing measures;

d. Implement reasonable and appropriate measures to avoid, minimize or mitigate the identified Project impact;

e. Develop monitoring and evaluation methodologies for determining whether the goals and objectives have been achieved;

f. Should the measures be successful at mitigating or minimizing Project impact(s), then periodic monitoring shall take place to confirm that such goals and objectives continue to be achieved;

g. Should the implemented measures fail to achieve the goals and objectives over a reasonable time frame, then the Aquatic SWG shall evaluate additional or revised measures, including those previously considered in the six Aquatic Resource Management Plans, and implement any additional or revised appropriate and reasonable measures, or explain why such goals and objectives cannot be achieved;

h. If such goals and objectives have not been achieved over a reasonable time frame, then the Aquatic SWG may reevaluate and revise such goals and objectives.

3.2 "Aquatic Settlement Agreement" means this document as well as Attachment A (Proposed License Articles) and Attachments B through G (Aquatic Resource Management Plans).

3.3 "Aquatic Resource Management Plans" refers to the six aquatic management plans developed in close collaboration with the Aquatic SWG. These six plans are independently known as the White Sturgeon Management Plan (WSMP), Bull Trout Management Plan (BTMP), Pacific Lamprey Management Plan (PLMP), Resident Fish Management Plan (RFMP), Aquatic Nuisance Species Management Plan (ANSMP) and Water Quality Management Plan (WQMP).

3.4 "Aquatic Resources" refers to the resources addressed by the six Aquatic Resource Management Plans contained within Attachments B through G.

3.5 "Aquatic SWG" refers to the Aquatic Settlement Work Group. The Aquatic SWG is comprised of one voting representative from each of the Parties to this Agreement. The Aquatic SWG is the group charged with the responsibility of implementing this Agreement.

3.6 "Chair" refers to a neutral third party, selected unanimously by the Parties and funded by Douglas to coordinate the Aquatic SWG meetings.

3.7 "HCP" refers to the Wells Anadromous Fish Agreement and Habitat Conservation Plan.

3.8 "Licensee" means the Public Utility District No. 1 of Douglas County or Douglas.

3.9 "New Operating License" means the first long-term operating license for Project No. 2149 to be issued by the FERC to Douglas that takes effect after the expiration of the Original Operating License and any subsequent annual licenses that take effect after expiration of the New Operating License.

3.10 "Original Operating License" means the original 50-year operating license, as amended, for Project No. 2149 issued by the FERC with an expiration date of May 31, 2012 and any subsequent annual licenses that take effect after expiration of the Original Operating License, but before the effective date of the New Operating License.

3.11 A "Party" means an entity who has executed a signature page for this Agreement, and who is identified in Section 1 (Parties) or meets the criteria in Section 1 (Parties).

3.12 "Plan Species" refers to the five anadromous fish species covered by the HCP. The five species of fish covered by the HCP are spring Chinook, summer/fall Chinook, steelhead, sockeye and coho.

3.13 "Project" means the Wells Hydroelectric Project, licensed to Douglas by the FERC as Project No. 2149.

3.14 "Proposed License Articles" means license articles proposed by the Parties to the FERC in this Agreement, and contained in Attachment A hereto.

3.15 "Unanimous" and "unanimously" mean that all of the Parties who vote or abstain at an appropriately noticed meeting pursuant to this Agreement agree or abstain on an action. An abstention does not affect or prevent a vote from being unanimous. See Section 11.5 (Voting).

4.0 THE PURPOSE OF THE AGREEMENT

The Parties agree that the purpose of this Agreement is to resolve all remaining Aquatic Resource issues related to compliance with all federal and state law applicable to the issuance of a New Operating License for the Project. Subject to the reservations of authority in Section 13 (Reservations of Authority) of this Agreement, this Agreement establishes Douglas's obligations for the protection, mitigation, and enhancement of Aquatic Resources affected by Project operations under the New Operating License and its obligations to comply with all related federal and state laws applicable to the issuance of the New Operating License for the Project. It also specifies procedures to be used by the Parties to ensure that the New Operating License is implemented consistent with this Agreement and other laws. The Parties agree that this Agreement is fair, reasonable, and in the public interest within the meaning of FERC Rule 602, 18 C.F.R. § 385.602(g)(3).

The six Aquatic Resource Management Plans contained in Attachments B through G, together with the HCP will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Project. As of the effective date of the Agreement, pursuant to Section 5 (Term of License and This Agreement), the Parties agree that the measures set forth in the Aquatic Resource Management Plans are adequate to identify and address Project impacts to Aquatic Resources and are expected to achieve the goals and objectives set forth in each of the six Aquatic Resource Management Plans. However, during the course of the New Operating License, there may be instances where the measures found in individual management plans may need to be adapted. In these instances, "Adaptive Management" will be used to achieve the biological goals and objectives.

5.0 TERM OF LICENSE AND THIS AGREEMENT

Douglas will seek a term of 50 years for the New Operating License. The Parties agree to support a 50-year term for the New Operating License. Subject to Section 7 (Effective Dates and Implementation of Attachments), this Agreement shall become effective when signed by Douglas and at least one other Party and shall remain in effect throughout the term of the New Operating License unless this Agreement is terminated sooner pursuant to Section 8 (Termination of Agreement).

6.0 TRANSFER OF LICENSE AND AGREEMENT

In the event the New Operating License is transferred in whole from Douglas to another entity and Douglas is not a co-licensee of the Project, the Parties agree that Douglas shall have no further obligations under the New Operating License or this Agreement following such transfer.

7.0 EFFECTIVE DATES AND IMPLEMENTATION OF ATTACHMENTS

The proposed measures contained within Attachment A (Proposed License Articles) and Attachments B through G (Aquatic Resource Management Plans) shall become effective upon issuance of a FERC order granting a New Operating License to Douglas, except to the extent the implementation of any such measures is prohibited, prevented, or rendered impracticable by the FERC order.

8.0 TERMINATION OF AGREEMENT

8.1 Automatic Termination Events

This Agreement shall terminate automatically: (1) at the end of the term of the Agreement as set forth in Section 5 (Term of License and This Agreement); (2) in the event the FERC does not issue a New Operating License to Douglas for the Project; (3) in the event Douglas withdraws from this Agreement based on Section 8.2 (Withdrawal Events); or (4) in the event the New Operating License is revoked.

8.2 Withdrawal Events

8.2.1 Non-Compliance

A Party may elect at any time to withdraw from the Agreement pursuant to Section 8.2.4 (Conditions Precedent to Withdrawal) based on non-compliance of another Party with the provisions of the Agreement, subject to the following procedures: (1) a Party asserts that another Party is not complying with the terms of the Agreement; (2) the Party documents and presents evidence supporting assertion of non-compliance in writing; and (3) the issue of non-compliance is taken to Dispute Resolution, Section 12 (Dispute Resolution).

8.2.2 Governmental Action

Should a government agency take an action that is materially inconsistent with the terms of this Agreement, including a material inconsistency with or modification of Attachment A (Proposed License Articles) or Attachments B through G (Aquatic Resource Management Plans), then the Parties (not including the government agency, if a Party) shall meet and consider the available actions to address the material inconsistency. Such actions may include a joint or separate request(s) for rehearing with the FERC, a joint or separate appeal(s) to the Washington State Pollution Control Hearing Board (PCHB), judicial review to remove or modify the material inconsistency, or any other action that would address the inconsistency. One or more Parties may proceed to pursue such actions even if all Parties do not wish to participate.

If the material inconsistency is sustained upon the completion of such actions, a Party may: (1) elect to withdraw from this Agreement pursuant to Section 8.2.4 (Conditions Precedent to Withdrawal); (2) agree to implement this Agreement subject to such governmental action; or (3) enter into additional discussions to determine whether an alternative agreement can be reached.

8.2.3 Impossibility

A Party may elect to withdraw from the Agreement pursuant to Section 8.2.4 (Conditions Precedent to Withdrawal) in the event the Parties agree in writing that the obligations imposed by this Agreement are impossible to achieve.

8.2.4 Conditions Precedent to Withdrawal

Two conditions must be satisfied before a Party can withdraw from the Agreement pursuant to Section 8.2.1 (Non-Compliance), Section 8.2.2 (Governmental Action), or Section 8.2.3 (Impossibility). First, the Party proposing to withdraw from the Agreement shall provide written notice to all other Parties of the substantive basis for its intent to withdraw. The notice shall include a complete statement of reasons and be served in accordance with the requirements of Section 17.2 (Special Notifications). Second, the substantive basis for the proposed withdrawal must be taken to Dispute Resolution (Section 12).

Following Dispute Resolution, a Party choosing to withdraw shall provide all other Parties with notice of withdrawal. The notice shall be in writing and served in accordance with the requirements of Section 17.2 (Special Notifications). A notice of withdrawal shall become effective sixty (60) days from the date the notice was provided to all other Parties. The right to withdraw shall be waived if not exercised within sixty (60) days of completion of Dispute Resolution.

8.2.5 Effect of Withdrawal

Except as set forth in Section 8.2.6 (Effect of Termination), in the event a Party withdraws from this Agreement, this Agreement places no constraints on the withdrawing Party, shall not thereafter be binding on the withdrawing Party, and the withdrawing Party may exercise all rights and remedies that the Party would otherwise have outside this Agreement.

8.2.6 Effect of Termination

Upon expiration of this Agreement, or in the event this Agreement is terminated, voided or determined for any reason to be unenforceable before the end of its term, then: (1) Douglas shall continue to implement the last agreed-upon measures until the FERC orders otherwise and (2) the Parties are not restrained in any manner from advocating to the FERC appropriate measures to replace this Agreement.

9.0 OBLIGATIONS OF THE PARTIES

9.1 Licensee Obligations

Douglas shall file this Agreement with the FERC as an offer of settlement pursuant to Rule 602 consisting of a fully executed copy of this Agreement and an explanatory statement. The offer of settlement related to this Agreement shall be included within both the Draft and Final License Applications, and Attachments B through G shall be identified therein as Douglas's proposed environmental measures for Aquatic Resources pursuant to 18 C.F.R. § 5.18(a)(5)(C). Douglas shall request that the FERC incorporate, without modification, the Attachments to this Agreement as conditions of the New Operating License. Douglas shall use reasonable efforts to obtain a FERC order issuing the New Operating License in a timely manner. Douglas shall also: (1) submit a statement in support of this Agreement to NMFS and USFWS, as part of any comments in the ESA Section 7 consultation process; (2) ensure that any supplemental information, comments, or responses to comments filed by Douglas with the FERC in the context of the relicensing process are consistent with this Agreement; (3) in the event of an appeal of the Project's 401 certification, submit a statement in support of this Agreement to the PCHB and any court reviewing a decision of the PCHB; and (4) actively support incorporation of the Proposed License Articles into the New Operating License in all other relevant regulatory proceedings.

9.2 Obligations of All Parties (Including Licensee)

Except as provided below and in Section 13 (Reservations of Authority), each Party shall support this Agreement by ensuring that all documents filed with the FERC or any other agency or forum, are consistent with this Agreement. Documents covered by this Section include: (1) any recommendations, conditions and/or prescriptions, or any terms and conditions related to Aquatic Resources; (2) as to Parties other than the USFWS, any ESA Section 7 consultation documents or comments on such documents; (3) as to USFWS, any ESA Section 7 consultation documents, or comments on such documents, or any biological opinions, subject to Section 13 (Reservations of Authority); and (4) any supplemental information, comments or responses to comments.

In the event that a Party receives or develops new information, data, or analyses that it intends to file with the FERC or any other agency or administrative body, such Party shall consult with the Aquatic SWG pursuant to Section 11 (Aquatic Settlement Work Group) of this Agreement, to the extent practicable, and shall notify all Parties as soon as practicable.

Except as provided in Section 13 (Reservation of Authority), if a Party proposes to submit to FERC a condition and/or prescription based upon new information, data, or analyses, the Party must comply with the procedures of Section 12 (Dispute Resolution) if the Aquatic SWG does not unanimously approve such condition or prescription.

10.0 MODIFICATION OF AGREEMENT

This Agreement may be amended or modified only in writing and with written unanimous consent of all Parties.

11.0 AQUATIC SETTLEMENT WORK GROUP

11.1 Committee Representation

There shall be an Aquatic SWG composed of one technical representative and a separate policy representative for each Party. The policy representative shall be an individual of a higher management level within each organization relative to the technical representative. Each Party shall provide all other Parties with written notice of its designated representatives and designated alternate(s) to the Aquatic SWG. Each Party with representation on the SWG shall have one vote.

Upon request by any Party, Douglas shall provide a forum for a meeting or meetings of the policy representatives. The Parties anticipate that the policy representatives will meet at least once annually during the term of the New Operating License to review progress and implementation of this Agreement.

11.2 Meetings

The Aquatic SWG shall meet as specified in the respective Aquatic Resource Management Plans or when requested by any member following notice. However, such notice may be waived by a member if done so expressly in writing to the Chair. NMFS may attend all meetings of the Aquatic SWG for coordination purposes with HCP activities and shall be provided copies of notices and agendas for Aquatic SWG meetings. Individuals representing entities that are not a Party to this Agreement may attend meetings following unanimous approval from all of the Parties. Nothing in this Agreement shall preclude any Party from having multiple non-designated representatives from their organization participate in any properly noticed Aquatic SWG meeting.

11.3 Chair of the Aquatic SWG

The Parties shall unanimously select and Douglas shall fund a neutral, non-voting Chair for the Aquatic SWG. The Chair will prepare an annual list of statements of agreement based upon the results of studies, prepare progress reports, prepare meeting minutes, facilitate and mediate the meetings, and assist the members of the Aquatic SWG in making decisions. The Aquatic SWG shall evaluate the performance of the Chair at least every three (3) years or upon request of two or more members of the Aquatic SWG.

11.4 Meeting Notice

The Chair shall provide all committee members with a minimum of ten (10) business days advanced written notice of all meetings unless a member waives notice in writing or such waiver is reflected in the approved meeting minutes. The notice shall contain an agenda of all matters to be addressed and voted on during the meeting. Means of notice will be determined by the Parties. Unless urgent action is required, to determine the date for a meeting, the Chair will poll the Parties in an effort to identify a meeting date on which all interested Parties are able to attend. If a date is not available for all Parties to meet within a reasonable time, the Chair will select the date that best accommodates the most Parties.

11.5 Voting

The Aquatic SWG shall act by unanimous vote of those present in person or by telephone. However, the Aquatic SWG may develop its own rules and procedures for voting, which may include expanding the methods of voting (e.g., proxy, writing, or other methods). The Chair shall ensure that all members are sent notices with agenda items that may be brought to a vote during the proposed Aquatic SWG meeting.

If a Party's designated representative(s) cannot be present for an agenda item scheduled for a vote, that Party may request the Chair in advance of his/her expected absence to delay a vote or determination of unanimous approval for up to five (5) business days on the subject agenda item. Alternatively, if the Parties cannot convene for a vote within five (5) business days once a vote has been delayed, the Chair shall consult with the absent Party to solicit and record that Party's vote or abstention. The Chair and Parties shall make a reasonable effort to ensure that a vote on any specified agenda item is delayed only once.

If the Aquatic SWG cannot reach unanimous consent, then upon request by any Party, that agenda item shall be referred to the dispute resolution process set forth in Section 12 (Dispute Resolution). The Parties shall negotiate in good faith and attempt to resolve issues at a technical level prior to elevating issues to Dispute Resolution.

Any entity who is not a Party to this Agreement does not have voting rights on the Aquatic SWG or any other committee established under this Agreement.

11.6 Authority and Purpose of Aquatic SWG

The Aquatic SWG will be used as the primary forum for consultation and coordination among the Parties in connection with conducting studies and implementing the measures set forth in this Agreement and as set forth in Section 12 (Dispute Resolution). Any entity not executing this Agreement shall not be a Party to this Agreement and shall not be entitled to vote on any committee established by this Agreement.

In connection with implementation of the Aquatic Resource Management Plans, the Parties agree to use Adaptive Management as defined herein. Adaptive Management involves many steps that may include forming a hypothesis regarding any potential Project related impacts, initial hypothesis development and testing, identifying potential Project related impacts, protection or mitigation measures, and the collection of data or information necessary to test the hypothesis and developing studies to determine whether the hypothesis is valid. If the hypothesized impact is validated, certain process and study steps are necessary to quantify the impact(s) resulting from the Project.

When hypothesized impacts are validated and quantified through a systematic process, the Aquatic SWG may refine management goals and objectives set forth in the affected Aquatic Resource Management Plans, or add new goals and objectives as appropriate. The next step will be to implement appropriate and reasonable measures to avoid, minimize, or mitigate the identified Project impacts. Following the implementation of appropriate and reasonable measures to avoid, minimize, or mitigate the identified Project impacts, the Aquatic SWG will develop and Douglas will implement monitoring and evaluation methods for determining whether the goals and objectives of the plan are being achieved. If those refinements are successful, then periodic monitoring shall be implemented to confirm that such goals and objectives continue to be achieved. If the implemented measures fail to achieve the refined or new goals and objectives over a reasonable time frame, then the Aquatic SWG shall: (1) evaluate additional or modified measures, including those previously considered in the six Aquatic Resource Management Plans, and implement any additional or revised appropriate and reasonable measures; or (2) explain why such goals and objectives cannot be achieved.

If after a reasonable period of time such goals and objectives have not been achieved, the Aquatic SWG will, as needed, reevaluate and further refine such goals and objectives. The Aquatic SWG may establish its own procedural guidelines for Adaptive Management decisions and related decision process steps, as necessary, to monitor and evaluate established Aquatic Resource Management Plan goals and objectives and to develop new goals and objectives, studies and mitigation measures.

The Aquatic SWG will consult on, coordinate, and oversee all aspects of implementation of the Aquatic Resource Management Plans. If the Aquatic SWG cannot reach agreement, then these decisions shall be referred to the dispute resolution process in Section 12 (Dispute Resolution).

11.7 Studies, Reports, and Meeting Minutes

The Chair will make available all study plans and reports prepared under this Agreement to all members of the Aquatic SWG as soon as reasonably possible. Draft study plans and reports will be distributed to all of the Aquatic SWG representatives for review and comment. Comments will be provided in writing to the Chair within thirty (30) days of receipt of the plan or report unless the Aquatic SWG decides otherwise. Comments will either be addressed in order within the document or made an appendix to the approved study plan or final report.

The Chair will provide draft meeting minutes, including any proposed or final statement(s) of agreements, within ten (10) days after each meeting. Statements of agreement shall be based on a unanimous vote. Minutes shall reflect all significant group discussions and decisions. All Party representatives who were present and participated in the meeting will be allowed ten (10) days to provide corrections and comments in writing to the Chair. Final meeting minutes will be provided to the members of the Aquatic SWG as soon as reasonably possible after comments have been received. If disagreements exist, as to the proposed meeting minutes, then the Chair will include all perspectives in the final minutes.

The Chair will work with Douglas to compile all relevant materials into one annual calendar-year report. The annual report shall include all final study plans, reports, meeting minutes and statements of agreements, and a list of future proposed actions as agreed to by the Aquatic SWG. The Chair will provide the annual report to Aquatic SWG members for review and approval prior to being filed with FERC. Comments on the annual report shall be provided in writing to the Chair within thirty (30) days of receipt unless the Aquatic SWG decides otherwise. Douglas PUD shall work with the Aquatic SWG to establish a central electronic database that is accessible to all of the Parties. This electronic database will contain all of the documents related to implementation of this Agreement.

12.0 DISPUTE RESOLUTION

12.1 Dispute Resolution Process

If a dispute arises out of or relates to this Agreement, the disputing Parties agree to first use their best efforts to cooperatively resolve such dispute. The disputing Parties shall use their best efforts to resolve disputes arising in the normal course of business at the technical level between each disputing Party's staff with appropriate authority to resolve such disputes.

When a dispute arises between two or more Parties and cannot be resolved in the normal course of business at the technical level, one or more of the disputing Parties shall provide written notice specifying the disputed issues to the Chair, with copies to all Parties. The notice shall describe the specific nature and background of the dispute. All notices shall be served in accordance with the requirements of Section 17.2 (Special Notifications).

Within three (3) days of receiving the notice, or as the Parties otherwise agree, the Chair shall schedule a meeting of the technical representatives of the Aquatic SWG to consider and attempt to resolve the dispute. The technical representatives of the Aquatic SWG shall meet within thirty (30) days or as the Parties otherwise agree, after receiving the notice of dispute.

If after ten (10) business days, or as otherwise agreed, the Chair determines that the Parties' technical representatives are unable to resolve the dispute then the Chair shall immediately submit the matter in writing to the policy representatives of each of the respective Parties. The policy representatives shall meet within thirty (30) days or as the Parties otherwise agree, after receiving notice from the Chair.

If after ten (10) business days, or as otherwise agreed, the Chair determines that the Parties' policy representatives are unable to resolve the dispute then the Chair shall immediately submit the matter in writing to the executive representatives of each of the respective Parties. The executive representatives shall meet within thirty (30) days or as otherwise agreed, after receiving notice from the Chair. If the executive representatives are unable to resolve the dispute within fifteen (15) business days or as otherwise agreed, then the disputing Parties may agree to submit the dispute to voluntary mediation or binding arbitration but are not obligated to do either. If the disputing Parties are unable to resolve the dispute through the above processes any Party may pursue other appropriate remedies, including withdrawal from this Agreement pursuant to Section 8.2.4 (Conditions Precedent to Withdrawal).

12.2 Arbitration and Mediation

In the event the disputing Parties agree pursuant to Section 12.1 (Dispute Resolution Process) to submit a dispute to binding arbitration or voluntary mediation, the following procedures shall apply. The dispute shall then be referred to a mutually acceptable arbitrator or mediator, or if one cannot be agreed upon, to the nearest office of Washington Arbitration & Mediation Service ("WAMS") for resolution within ninety (90) days of the agreement of the Parties to submit the dispute to arbitration or mediation. If the disputing Parties cannot agree on a mutually acceptable arbitrator or mediator within ten (10) business days of such agreement to arbitrate/mediate, the dispute will be referred to WAMS for preparation of a Strike List for arbitrator/mediator selection. Mediation may occur at any time if agreed upon by the Parties. All arbitration proceedings shall be conducted in accordance with the Rules of Arbitration of WAMS or any other mutually agreed upon arbitrator and shall include reasonable discovery provisions as may be stipulated or ordered. The arbitrator's decision shall be final and binding and judgment may be entered thereon, with all remedies otherwise available in court also available in arbitration.

The disputing Parties shall equally share in the cost of arbitration and mediation associated with this Agreement. Parties that do not have an interest in the outcome of the arbitration or mediation proceeding may elect to abstain from further participation in either arbitration or mediation. The Parties agree that the existence of a dispute notwithstanding, they will continue without delay to carry out all their respective responsibilities under this Agreement that are not affected by the dispute.

Any legal action to enforce a decision of the arbitrator shall be brought either in the United States District Court for the Eastern District of Washington or the FERC, if jurisdiction exists, otherwise such action may be brought in any court of competent jurisdiction. The Colville and Yakama hereby provide a waiver of sovereign immunity that is expressly limited to a legal action filed under this section to enforce a decision of the arbitrator.

13.0 RESERVATIONS OF AUTHORITY

The reservation of authority under Section 13.1 (Federal Power Act) of this Agreement is not intended to limit the right of any Party to seek redress with FERC with respect to an issue related to the implementation or enforcement of this Agreement.

13.1 Federal Power Act

Each Party reserves any authority it may have pursuant to the FPA in the event that: (1) this Agreement is not filed with the FERC; (2) the Party withdraws from this Agreement pursuant to the procedures set forth in Section 8.2 (Withdrawal Events); or (3) this Agreement is terminated pursuant to Section 8.1 (Automatic Termination Events).

The USFWS reserves the Secretary of the Interior's authorities pursuant to the FPA. The USFWS may exercise any reserved authority under Section 18 of the FPA regarding those species covered by this Agreement including but not limited to bull trout, white sturgeon, Pacific lamprey, and resident fish. In the event that the USFWS includes a reservation of authority in the preliminary, modified or final conditions that it submits to FERC, the inclusion of such reservation shall not be considered to be materially inconsistent with this Agreement.

The USFWS shall provide notice to the Aquatic SWG before exercising its Federal Power Act authority. Following notice, the Aquatic SWG may make recommendations to the USFWS regarding how the exercise of such authority can be accomplished in a manner that is consistent with this Agreement. In the event that the Aquatic SWG does not reach a unanimous decision regarding such recommendations, then Section 12 (Dispute Resolution) shall apply.

13.2 Clean Water Act

Ecology reserves its authority to issue a 401 certification under the Clean Water Act (CWA) for the Wells Project under such terms and conditions as it determines are necessary to comply with state and federal laws. The Parties intend that this Agreement, together with the HCP, will satisfy Ecology's requirements for the 401 certification with respect to Aquatic Resources and Plan Species affected by the Wells Project; however, this Agreement does not predetermine the outcome of the 401 certification proceeding or prevent Ecology from responding to new information or analysis or from addressing additional resources that may be affected. Section 12 (Dispute Resolution) shall not apply to the issuance of the 401 certification or a re-issuance of the 401 certification prior to the effective date of the New Operating License.

Ecology reserves all authority it may have to amend the 401 certification or to invoke a reopener clause in the 401 certification to amend the 401 certification for the New Operating License, including, but not limited to, modifying schedules and deadlines, under such terms and conditions as it determines are necessary to comply with state and federal law. Section 12 (Dispute Resolution) shall apply to the exercise of Ecology's reserved authority to amend, modify or reopen the 401 certification during the term of the New Operating License.

Ecology reserves any authority it may have to enforce the 401 certification, state water quality standards, or other appropriate requirements of state law.

13.3 Endangered Species Act

This Agreement does not affect the terms of the HCP. USFWS anticipates that the measures in this Agreement together with the measures contained within the HCP will be adequate to satisfy ESA responsibilities for aquatic species under the jurisdiction of USFWS. In addition, USFWS shall use reasonable efforts to exercise its authority under the ESA in a manner that allows this Agreement to be fulfilled. By signing this Agreement, however, the USFWS does not formally bind itself to make any specific recommendations or take any particular action with respect to ESA compliance. The USFWS expressly reserves the right, consistent with federal law, to take such future actions as it may deem necessary to meet its obligations under the ESA.

If the FERC requests draft biological opinion(s), the USFWS shall provide such documents to the FERC. If, in its consultation with the FERC pursuant to Section 7 of the ESA, the USFWS requests any measures that are materially inconsistent with the terms of this Agreement, any Party may invoke Section 12 (Dispute Resolution). The USFWS shall participate in Dispute Resolution to the extent practicable and consistent with its ESA responsibilities.

13.4 Douglas Reservation of Authority

Douglas reserves any rights it may have to contest the existence and/or exercise of any reserved authority claimed under this Agreement. In the event that a Party exercises its reserved authority and declines to participate in Dispute Resolution, then Douglas shall have the right to withdraw from the Agreement pursuant to Section 8.2.4 (Conditions Precedent to Withdrawal).

13.5 Exercise of Reserved Authority

To the extent practicable, a Party shall provide notice to the Aquatic SWG at least sixty (60) days before exercising any authority reserved under this Agreement that may be materially inconsistent with this Agreement. Following notice, the Aquatic SWG will meet to discuss and make recommendations regarding the exercise of such authority. If the Aquatic SWG does not reach a unanimous decision regarding such recommendations, then any Party may initiate Dispute Resolution (Section 12). However, if in its sole discretion a Party determines expeditious action is required to perform its statutory duties or responsibilities, such Party shall not be required to wait in exercising reserved authority until Dispute Resolution is initiated or concluded. This provision does not apply to the issuance of a 401 certification prior to the effective date of the New Operating License.

14.0 CHOICE OF LAWS

This Agreement shall be governed by, and construed, interpreted and enforced in accordance with, the substantive law of the State of Washington (without reference to any principles of conflicts of laws) and applicable federal law.

15.0 LIMITATIONS OF REOPENINGS

Except as provided in Section 13 (Reservations of Authority), the Parties shall not invoke or rely upon any reopener clause set forth in the New Operating License for the Wells Project for the purposes of obtaining additional license articles, conditions or measures or to promote changes in Project structures or operations related to the protection, mitigation and enhancement of Aquatic Resources.

16.0 FORCE MAJEURE

16.1 No Liability for Force Majeure

No Party shall be liable to any other Party for breach of this Agreement as a result of a failure to perform or for delay in performance of any provision of this Agreement if, based on evidence provided by the non-performing Party to the other Parties, such performance is delayed or prevented by Force Majeure. In the event of an enforcement action, the non-performing Party bears the burden of proving by a preponderance of the evidence the existence of Force Majeure, including the absence of negligence. The term "Force Majeure" means any cause reasonably beyond the performing Party's control, which could not be avoided with the exercise of due care, and which occurs without the fault or negligence of the Party whose performance is affected by the Force Majeure. Force Majeure events may be unforeseen, foreseen, foreseeable, or unforeseeable, including without limitation natural events; labor or civil disruption; terrorism; breakdown or failure of Project works not caused by failure to properly design, construct, operate, or maintain; new regulations or laws that are applicable to the Project; orders of any court or agency having jurisdiction over the Party's actions; delay in a FERC order becoming final; or delay in issuance of any required permit.

16.2 Notice

The Party whose performance is affected by Force Majeure shall notify the other Parties in writing within seven (7) days, or as soon thereafter as practicable, after becoming aware of any event that such Party contends constitutes Force Majeure. Such notice shall identify the event causing the delay or anticipated delay, estimate the anticipated length of delay, state the measures taken or to be taken to minimize the delay, and estimate the timetable for implementation of the measures. The affected Party shall make all reasonable efforts to promptly resume performance of this Agreement and, when able, resume performance of its obligations and give the other Parties written notice to that effect.

17.0 NOTICES

17.1 Routine Notifications

Unless this Agreement specifically requires otherwise, any routine notice, demand or request provided for in this Agreement, or served, given or made in connection with it, shall be in writing and shall be deemed properly served, given or made if delivered in person or sent by delivery, including email, or sent by mail, postage prepaid to the designated technical and policy representatives of each Party.

17.2 Special Notifications

Unless this Agreement specifically requires otherwise, special notice shall be defined as any notice related to either a withdrawal or dispute resolution notification. All special notices prepared, served, given or made in connection with either withdrawal or dispute resolution, shall be in writing and shall be deemed properly served, given or made if delivered in person or sent by acknowledged delivery, including return receipt email, or sent by registered mail return receipt requested, postage prepaid to the technical, policy and executive representatives officially designated by each Party.

18.0 MISCELLANEOUS

18.1 Further Assurances

The Parties shall use best efforts to assist each other in performing their obligations under this Agreement including providing documents and information as may reasonably be requested.

18.2 No Consequential, Incidental or Punitive Damages

There shall be no liability under this Agreement for any consequential, punitive, exemplary, incidental or indirect losses or damages.

18.3 Severability

If any provision of this Agreement is held to be illegal, invalid, or unenforceable under any present or future law, and if the rights or obligations of any Party under this Agreement will not be materially and adversely affected thereby: (1) such provision will be fully severable; (2) this Agreement shall be construed and enforced as if such illegal, invalid, or unenforceable provision had never comprised a part thereof; (3) the remaining provisions of this Agreement shall remain in full force and effect and will not be affected by the illegal, invalid or unenforceable provision or by its severance here from; and (4) in lieu of such illegal, invalid or unenforceable provision, the Parties shall, in good faith, negotiate a mutually acceptable, legal, valid and enforceable provision as similar in terms to such illegal, invalid or unenforceable provision as may be possible, and shall promptly take all actions necessary to amend the Agreement to include the mutually acceptable, legal, valid and enforceable provision.

18.4 Waivers

Except as otherwise provided herein, no provision of this Agreement may be waived except in writing. No failure by any Party to exercise, and no delay in exercising, short of the statutory period, any right, power, or remedy under this Agreement shall operate as a waiver thereof. Any waiver at any time by a Party of its right with respect to a default under this Agreement, or with respect to any other matter arising in connection therewith, shall not be deemed a waiver with respect to any subsequent default or matter.

18.5 No Third-Party Beneficiaries

None of the promises, rights, or obligations contained in this Agreement shall inure to the benefit of any person or entity not a Party to this Agreement; and no action may be commenced or prosecuted against any Party by any third party claiming to be a third-party beneficiary of this Agreement or the transactions contemplated hereby.

18.6 No Reliance

Each Party acknowledges that in entering into this Agreement, it has not relied on any statement, representation, or promise of the other Party or any other person or entity, except as expressly stated in this Agreement.

18.7 Assumption of Risk

In entering into this Agreement, each of the Parties assumes the risk of any mistake of fact or law, and if either or both of the Parties should subsequently discover that any understanding of the facts or the law was incorrect, none of the Parties shall be entitled to, nor shall attempt to, set aside this Agreement or any portion thereof. This provision does not affect the right of any Party to withdraw from this Agreement in accordance with Section 8.2 (Withdrawal Events).

18.8 Waiver of Defenses

The Parties release each other from any and all claims relating to the formation and negotiation of this Agreement, including reformation, rescission, mistake of fact, or mistake of law. The Parties further agree that they waive and will not raise in any court, administrative body or other tribunal any claim in avoidance of or defense to the enforcement of this Agreement other than the express conditions set forth in this Agreement.

18.9 Independent Counsel

The Parties acknowledge that they have been represented by independent counsel in connection with this Agreement, they fully understand the terms of this Agreement, and they voluntarily agree to those terms for the purposes of making a full compromise and settlement of the subject matter of this Agreement.

18.10 Headings

The headings used for the sections herein are for convenience and reference purposes only and shall in no way affect the meaning or interpretation of the provisions of this Agreement.

18.11 Interpretations

In this Agreement, unless a clear contrary intention appears: (1) the singular number includes the plural number and vice versa; (2) reference to any person includes such person's successors and assigns but, if applicable, only if such successors and assigns are permitted by this Agreement, and reference to a person in a particular capacity excludes such person in any other capacity; (3) reference to any gender includes each other gender; (4) reference to any agreement (including this Agreement), document or instrument means such agreement, document or instrument as amended or modified and in effect from time to time in accordance with the terms thereof and, if applicable, the terms hereof; (5) reference to any Section, Schedule, Attachment, or Exhibit means such Section, Schedule, Attachment, or Exhibit to this Agreement, and references in any Section, Schedule, Attachment, Exhibit, or definition to any clause means such clause of such Section, Schedule, Attachment, Exhibit, or definition; (6) "hereunder", "hereof", "hereto", "herein," and words of similar import are references to this Agreement as a whole and not to any particular section or other provision hereof unless specifically stated; (7) relative to the determination of any period of time, "from" means "from and including", "to" means "to but excluding" and "through" means "through and including"; (8) "including" (and with correlative meaning "include") means including without limiting the generality of any description preceding such term; and (9) reference to any law (including statutes and ordinances) means such law as amended, modified, codified or reenacted, in whole or in part, and in effect from time to time, including rules and regulations promulgated thereunder.

18.12 Venue

To the extent permitted by law, the venue for any action to enforce or interpret this Agreement involving any Federal or Tribal Parties shall be the United States District Court for the Eastern District of Washington or the FERC, and the venue for all other Parties shall be a Washington State court of competent jurisdiction or the FERC.

18.13 Legal Authority

Each Party represents and warrants to the other Parties that it has full authority and power to enter into this Agreement, that the Party's representatives who sign below are duly authorized by it to enter into this Agreement, and that nothing herein violates any law, regulation, judicial or regulatory order, or agreement applicable to such warranting Party.

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Agreement Execution

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed by their proper officers respectively being thereunto duly authorized, and their respective corporate seals to be hereto affixed, the 19 day of January, 200~~8~~9

PUBLIC UTILITY DISTRICT NO. 1 of DOUGLAS COUNTY, WASHINGTON

By: T. James Davis
T. James Davis, President

By: Lynn M. Heminger
Lynn M. Heminger, Vice President

By: Ronald E. Skagen
Ronald E. Skagen, Secretary

Address of Notice:

Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497

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UNITED STATES FISH AND WILDLIFE SERVICE

Dated: 7/31/2009

By: Ken S. Berg

Title: Project Leader

Address of Notice:

United States Fish and Wildlife Service
11103 East Montgomery Drive
Spokane, Washington 99206

United States Fish and Wildlife Service
215 Melody Lane, Suite 119
Wenatchee, WA 98801-5933

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STATE OF WASHINGTON, DEPARTMENT OF FISH & WILDLIFE

Dated: 11/20/08

By: ______________________

Title: RD Region 2

Address of Notice:

Washington State Department of Fish and Wildlife
600 Capital Way North
Olympia, Washington 98501-1091

Washington State Department of Fish and Wildlife
1540 Alder Street N.W.
Ephrata, Washington 98823-7669

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STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY

Dated: 11/18/08

By: ____________________

Title: SECTION MANAGER,
WATER QUALITY PROGRAM

Address of Notice:

Washington State Department of Ecology
15 West Yakima Avenue, Suite 200
Yakima, Washington 98902-3452

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CONFEDERATED TRIBES OF THE COLVILLE RESERVATION

Dated: 11-10-08

By: Michael Finley

Title: Vice Chairman

Address of Notice:

Confederated Tribes of the Colville Reservation
Natural Resource Committee
P.O. Box 150
Nespelem, Washington 99155

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CONFEDERATED TRIBES AND BANDS OF THE YAKAMA NATION

Dated: February 24, 2009

By: Ralph Sampson Jr.

Title: Yakama Nation Tribal Council, Chairman

Address of Notice:

Confederated Tribes and Bands of the Yakama Nation
PO Box 151
Toppenish, Washington 98948

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UNITED STATES, BUREAU OF LAND MANAGEMENT

Dated: Nov 13, 2009

By: [signature]

Title: Field Manager

Address of Notice:

Bureau of Land Management
915 North Walla Walla
Wenatchee, Washington 98801-1521

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UNITED STATES, BUREAU OF INDIAN AFFAIRS

Dated: ________________________

By: ________________________________

Title: ________________________________

Address of Notice:

Bureau of Indian Affairs
911 NE 11^{th} Avenue
Portland, OR 97232

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ATTACHMENT A: PROPOSED LICENSE ARTICLES

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ATTACHMENT A: PROPOSED LICENSE ARTICLES

Article 1. The licensee shall implement the measures set forth in section 4 of the White Sturgeon Management Plan, dated August 2008, which is incorporated herein by reference, in consultation with the Aquatic Settlement Working Group. The licensee shall obtain prior Commission approval for any substantial modification or addition to Project works or operations necessary to implement such measures. The licensee shall also submit any proposed amendment to the White Sturgeon Management Plan to add to, or modify any of, the measures or objectives set forth therein to the Commission for approval. The licensee shall file an annual report with the Commission by May 31st of each year to document all studies, measures and other activities completed in the previous year.

Article 2. The licensee shall implement the measures set forth in section 4 of the Bull Trout Management Plan, dated August 2008, which is incorporated herein by reference, in consultation with the Aquatic Settlement Working Group. The licensee shall obtain prior Commission approval for any substantial modification or addition to Project works or operations necessary to implement such measures. The licensee shall also submit any proposed amendment to the Bull Trout Management Plan to add to, or modify any of, the measures or objectives set forth therein to the Commission for approval. The licensee shall file an annual report with the Commission by May 31st of each year to document all studies, measures and other activities completed in the previous year.

Article 3. The licensee shall implement the measures set forth in section 4 of the Pacific Lamprey Management Plan, dated August 2008, which is incorporated herein by reference, in consultation with the Aquatic Settlement Working Group. The licensee shall obtain prior Commission approval for any substantial modification or addition to Project works or operations necessary to implement such measures. The licensee shall also submit any proposed amendment to the Pacific Lamprey Management Plan to add to, or modify any of, the measures or objectives set forth therein to the Commission for approval. The licensee shall file an annual report with the Commission by May 31st of each year to document all studies, measures and other activities completed in the previous year.

Article 4. The licensee shall implement the measures set forth in section 4 of the Resident Fish Management Plan, dated August 2008, which is incorporated herein by reference, in consultation with the Aquatic Settlement Working Group. The licensee shall obtain prior Commission approval for any substantial modification or addition to Project works or operations necessary to implement such measures. The licensee shall also submit any proposed amendment to the Resident Fish Management Plan to add to, or modify any of, the measures or objectives set forth therein to the Commission for approval. The licensee shall file an annual report with the Commission by May 31st of each year to document all studies, measures and other activities completed in the previous year.

Article 5. The licensee shall implement the measures set forth in section 4 of the Aquatic Nuisance Species Management Plan, dated August 2008, which is incorporated herein by reference, in consultation with the Aquatic Settlement Working Group. The licensee shall obtain prior Commission approval for any substantial modification or addition to Project works or operations necessary to implement such measures. The licensee shall also submit any proposed amendment to the Aquatic Nuisance Species Management Plan to add to, or modify any of, the measures or objectives set forth therein to the Commission for approval. The licensee shall file an annual report with the Commission by May 31st of each year to document all studies, measures and other activities completed in the previous year.

Article 6. The licensee shall implement the measures set forth in section 4 of the Water Quality Management Plan, dated October 2008, which is incorporated herein by reference, in consultation with the Aquatic Settlement Working Group. The licensee shall obtain prior Commission approval for any substantial modification or addition to Project works or operations necessary to implement such measures. The licensee shall also submit any proposed amendment to the Water Quality Management Plan to add to, or modify any of, the measures or objectives set forth therein to the Commission for approval. The licensee shall file an annual report with the Commission by May 31st of each year to document all studies, measures and other activities completed in the previous year.

ATTACHMENTS B - G: AQUATIC RESOURCE MANAGEMENT PLANS

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ATTACHMENT B: WHITE STURGEON MANAGEMENT PLAN

ATTACHMENT C: BULL TROUT MANAGEMENT PLAN

ATTACHMENT D: PACIFIC LAMPREY MANAGEMENT PLAN

ATTACHMENT E: RESIDENT FISH MANAGEMENT PLAN

ATTACHMENT F: AQUATIC NUISANCE SPECIES MANAGEMENT PLAN

ATTACHMENT G: WATER QUALITY MANAGEMENT PLAN

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ATTACHMENT B: WHITE STURGEON MANAGEMENT PLAN

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WHITE STURGEON MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

August 2008

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

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EXECUTIVE SUMMARY

The White Sturgeon Management Plan (WSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans, but declined because its interests are currently satisfied by the measures within the HCP.

The goal of the WSMP is to increase the white sturgeon (*Acipenser transmontanus*) population in the Wells Reservoir to a level that can be supported by the available habitat and characterized by a diverse age structure consisting of multiple cohorts (juvenile and adult). In addition, the WSMP is intended to support spawning, rearing and migration as identified by the aquatic life designated use under WAC 173-201A in the Washington state water quality standards. Based upon the information available as of December 2006, the Aquatic SWG determined that an assessment of Project effects on white sturgeon was not practical given sturgeon life history characteristics and the limited number of fish estimated to exist in the Project. Therefore, the Aquatic SWG concluded that resource measures related to white sturgeon should focus on population protection and enhancement by means of supplementation as an initial step in order to increase the number of fish within the Wells Reservoir. In addition to the initial supplementation activities, implementation of a monitoring and evaluation program shall be conducted to accurately assess natural recruitment, juvenile habitat use, emigration rates, carrying capacity, and the potential for natural reproduction so as to inform the scope of a future, longer-term supplementation strategy. All objectives were developed in order to meet the WSMP goal. The PMEs presented within the WSMP are designed to meet the following objectives:

Objective 1: Supplement the white sturgeon population in order to address Project effects, including impediments to migration and associated bottlenecks in spawning and recruitment;

Objective 2: Determine the effectiveness of the supplementation activities through a monitoring and evaluation program;

Objective 3: Determine the potential for natural reproduction in the Wells Reservoir in order to appropriately inform the scope of future supplementation activities;

Objective 4: Adaptively manage the supplementation program as warranted by the monitoring results;

Objective 5: Evaluate whether there is biological merit to providing safe and efficient adult upstream passage;

Objective 6: Identify white sturgeon educational opportunities that coincide with WSMP activities.

This WSMP is intended to be compatible with other white sturgeon management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies and recovery goals of federal, state and tribal natural resource management agencies. The WSMP is not intended to be a harvest management plan and does not create or supersede jurisdiction over fisheries management decisions made by the responsible fishery agencies and tribes. However, the WSMP activities are expected to ultimately support appropriate and reasonable harvest opportunities consistent with the goals of the responsible fishery agencies and tribes and designated use for harvest under WAC 173-201A identified in the Washington state water quality standards. Should the responsible fishery agencies and tribes determine that there is an ongoing harvestable surplus of sturgeon in the Wells Reservoir, then this indicates significant progress toward achievement of the goals and objectives of this plan.

1.0 INTRODUCTION

The White Sturgeon Management Plan (WSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The WSMP will direct implementation of measures to protect against and mitigate for potential Project impacts on white sturgeon (*Acipenser transmontanus*). To ensure active stakeholder involvement and support, Douglas developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management of white sturgeon in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies the goal and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for white sturgeon during the term of the new license.

2.0 BACKGROUND

2.1 White Sturgeon Biology

White sturgeon are the largest of all North American freshwater fish. They are found in marine waters and freshwaters of rivers along the Pacific coast from Monterey, California to Cook Inlet in northwestern Alaska (Wydoski and Whitney 2003). Significant populations of the Pacific Coast appear to be restricted to three locations: the Sacramento, Fraser, and Columbia rivers (Lane 1991). White sturgeon are distributed throughout the U.S. portion of the Columbia River and in many of its larger tributaries. Historically, white sturgeon migrated throughout the mainstem Columbia River from the estuary to the headwaters, although passage was probably limited at times by large rapids and falls (Brannon and Setter 1992).

White sturgeon are long-lived fish, with fin ray analysis documenting fish over 100 years in age (Beamesderfer et al. 1995). This anadromous species has been reported to reach a length of 20 feet and a weight of 1,800 pounds (Wydoski and Whitney 2003). In the Columbia River, white sturgeon spawn in the spring between April and July. Only a small percentage of adult white sturgeon in the Columbia River spawn in a given year. Intervals between spawning have been estimated to be between 3 and 11 years. White sturgeon deposit eggs through broadcast spawning at water temperatures between 10 and 18°C. Mature white sturgeon commonly produce between 100,000 and 300,000 eggs, but larger fish may produce up to 3 million eggs (Wydoski and Whitney 2003). Spawning and egg incubation in the Columbia River occur in the swiftest water available (2.6-9.2 feet per second) at depths between 13.1 and 65.6 feet over cobble, boulder, and bedrock substrates (Wydoski and Whitney 2003). In mainstem Columbia River reservoirs, spawning occurred within 5 miles downstream of the mainstem dams. Eggs hatch in approximately 7 days at 15°C.

Columbia River white sturgeon are reported to have declined in numbers because of numerous factors, including obstruction of migration by mainstem hydroelectric dams, altered stream flows, altered hydrologic regimes, altered temperature regimes, reduced spawning habitat, and over harvest (van der Leeuw et al. 2006; Wydoski and Whitney 2003). Variations in population characteristics also have been attributed to differences in exploitation rates and recruitment success, access to marine food resources, and suitability of hydrologic conditions and available habitats (Devore et al. 1995). During the 1800s, prior to construction of mainstem hydroelectric dams on the Columbia River, white sturgeon were in great demand for their caviar and smoked flesh. In 1892, during the peak of commercial harvest activities, approximately 2.5 million kilograms of white sturgeon were harvested (Wydoski and Whitney 2003). Regulations of the white sturgeon fishery began with a 4-foot minimum size limit established in 1899. Several regulations were established from 1899 to 2000 to manage the fishery in the lower Columbia River, although, effective recovery efforts did not begin until spawners were protected in the 1950s (Wydoski and Whitney 2003).

Beginning in the 1930s, with the construction of Rock Island, Grand Coulee, and Bonneville dams, migration was disrupted because white sturgeon generally do not pass upstream through fishways that were built for salmon, although they do pass downstream through dams (Lepla et al. 2001). Construction of hydroelectric projects in the mid-Columbia River Basin, such as Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells has also affected the upstream movement of white sturgeon. Current populations in the Columbia River basin can be divided into three groups: fish below the Bonneville Dam, with access to the ocean; fish isolated functionally, but not genetically, between dams; and fish in several large tributaries. However, the population dynamics and factors regulating production of white sturgeon within isolated populations in the mid-Columbia River reservoirs such as the Rocky Reach and Wells reservoirs are not well understood.

2.2 White Sturgeon Management and Recovery Efforts

Management programs to protect and restore white sturgeon in the Kootenai River and the upper Columbia River are on-going and have provided a relevant framework for the development of a white sturgeon management plan in the Wells Reservoir. The Kootenai and upper Columbia sturgeon recovery efforts have also provided a good technical framework for implementing a sturgeon management plan. The strategies and activities outlined in these aforementioned management programs have provided important information, which has been used to develop an effective WSMP.

2.2.1 Kootenai River White Sturgeon Recovery

In the early 1990s following concerns that white sturgeon populations were decreasing due to near total recruitment failure, a detailed monitoring program was instituted by the Idaho Department of Fish and Game (IDFG) to provide more information on white sturgeon species status in the Kootenai River system. In 1994, the USFWS listed the Kootenai stock of white sturgeon as an endangered species, which introduced a higher level of management and control by various authorities in the drainage and region. A Recovery Team was established to provide technical direction regarding hatchery supplementation efforts. A final Kootenai White Sturgeon Recovery Plan was signed by the USFWS in 1999.

Kootenai white sturgeon recovery efforts consist of a multi-faceted approach aimed at improving survival at various life history stages. Coordinated flow releases during spring are a major habitat restoration focus designed to increase natural recruitment, although currently it is difficult to assess the relationship between flows and recruitment success (USFWS 1999). Directed stocking programs, which address genetic concerns, stocking rates, and fish size at release, have also been implemented to boost juvenile sturgeon in the Kootenai system. The Kootenai Tribe of Idaho in collaboration with the Kootenay Trout Hatchery (KTH) in Canada are primarily responsible for producing high-quality juvenile white sturgeon for the directed stocking program. Information collected from annual monitoring activities, which assess survival, growth rates, and natural spawning success, allow for an adaptive management approach with regards to the stocking program.

2.2.2 Upper Columbia River White Sturgeon Recovery

In 2002, a bi-national Recovery Team, termed the Upper Columbia White Sturgeon Recovery Initiative (UCWSRI) finalized the Upper Columbia White Sturgeon Recovery Plan in response to concerns that the transboundary white sturgeon population residing between Hugh L. Keenleyside Dam and Grand Coulee Dam consists of an aging and declining population with extremely limited recruitment. The Recovery Team, consisting of technical representatives from Federal, Provincial, and State resource management agencies and from Canadian and U.S. tribes, directs the recovery program.

Due to near total recruitment failure over the past two decades, a decision was made early in the recovery planning process to move immediately to development of a hatchery program to produce juvenile sturgeon for stocking (UCWSRI 2002). The breeding plan (Kincaid 1993) developed for the Kootenai sturgeon program was used as a model for the upper Columbia sturgeon. Rearing of all fish for the stocking program occurs at the KTH. Similar to the Kootenai recovery strategy, a juvenile index monitoring program to assess growth, survival, health, distribution, and relative abundance of released juveniles shall provide information essential to monitoring the upper Columbia sturgeon population and the success of the hatchery stocking program.

2.2.3 Rocky Reach White Sturgeon Management Plan

The relicensing process for the Rocky Reach Hydroelectric Project brought fisheries agencies, tribes, and interested parties together in a Natural Resources Working Group (NRWG) that provided an opportunity for comprehensive review of current and future management priorities for fish resources potentially impacted by ongoing Project operations (Chelan PUD 2005). In 2004 and 2005, NRWG members collaborated on the development of goals and objectives to manage the white sturgeon population within the Rocky Reach Project boundary under the new license. Based upon the information collected from white sturgeon field studies implemented by Chelan PUD in 2001 and 2002, a white sturgeon management plan was developed to promote population growth of sturgeon to a level commensurate with the available habitat. The Rocky Reach management plan measures include the implementation of a white sturgeon supplementation program, a monitoring program to determine population characteristics, and tracking surveys to determine movements and to assess potential spawning locations.

2.2.4 Priest Rapids Project White Sturgeon Management Plan

As part of the Priest Rapids Project relicensing, white sturgeon populations were investigated in the Priest Rapids and Wanapum reservoirs from 1999 to 2003. Results of the study have assisted in identifying a framework for the future development and implementation of a Priest Rapids Project White Sturgeon Management Plan. Biological objectives associated with this management plan consist of increasing white sturgeon populations to a level commensurate with available habitat through a supplementation program and the implementation of a monitoring program to determine population characteristics such as natural recruitment, spawning, rearing, growth, survival, and rates of emigration.

2.3 Project White Sturgeon Study

Since little information existed on the status of white sturgeon populations in the mid-Columbia, Chelan, Grant, and Douglas PUDs each initiated studies of white sturgeon to support their current or upcoming relicensing processes. The information gathered from these studies was intended to provide basic white sturgeon life history information, distribution, and current population sizes in the mid-Columbia River Basin. Additionally, study results provided the foundation for the development of appropriate management goals and objectives.

From 2001-2003, Douglas implemented a study to examine the white sturgeon population within the Project. Prior to the implementation of this study, little information on white sturgeon was available for the Wells Reservoir. WDFW catch record card returns for 1993 and 1994 indicate that legal size white sturgeon were present in the Wells Reservoir (Brad James, WDFW, pers. comm.). Additionally, information from previous studies in reservoirs upstream and downstream supported the existence of a population. The primary objectives of the study were to provide basic information on the population abundance, age structure, size, and growth of Project white sturgeon; analyze movements of white sturgeon within the Reservoir; and compare the data collected during this study with data collected during assessments at other projects (Jerald 2007).

During the summers of 2001 and 2002, setlines were deployed in the Wells Reservoir. Sturgeon captured on setlines were measured, marked with passive integrated transponder (PIT) tags and with scute markings. Additionally, a select number of captured fish were fitted with radio-transmitters to track movements and had pectoral fin rays removed for age analysis using standard methodologies (Beamesderfer et al. 1989).

Setline sampling took place over a two-year timeframe with a total of 129 setlines deployed and retrieved from throughout the reservoir. In total, 13 white sturgeon were captured during the 2-year study with the majority of the fish being captured in the Columbia River within five miles of the mouth of the Okanogan River. Twelve of the captured fish were PIT tagged. Subsequently, five recapture events were recorded for a total of 18 capture events during the mark-recapture period (one fish was recaptured twice). Population abundance was estimated to be 31.35±17.51. The 95% confidence interval for sturgeon abundance was calculated to be CI (13<N<218). The results of the mark-recapture portion of the study indicated that the sturgeon population in the Wells Reservoir is small with a point estimate of 31 fish over 50 cm in length (Skalski and Townsend 2005).

The length of the 13 fish captured during the study ranged from 60-202 cm. Two of the fish were classified as juveniles (<90 cm fork length) while 11 were classified as sub-adults or adults. It is important to note that the capture methodology was not designed to provide accurate sampling of fish under 50 cm. Captured sturgeon ranged in age from 6 to 30 years old (based on 11 fish) demonstrating that all of these fish recruited to the Wells Reservoir after Wells Dam was completed in 1967 with strong year class recruitment between the years 1972 and 1978 and again between 1988 and 1996. The presence of fish within these age classes suggests that successful recruitment within or to the Wells Reservoir is occurring either through (1) spawning within the Wells Reservoir and/or (2) immigration into the Wells Reservoir from populations upstream. Two white sturgeon were captured in 2001 and subsequently recaptured in 2002 to provide limited growth rate information. One juvenile fish was measured at 65 cm (fork length) on July 11, 2001. The fish was again captured on September 26, 2002 and measured 87 cm. This represented a growth rate of 22 cm in 14 months, or 18.9 cm/year. One adult fish was captured on August 9, 2001 measuring 197 cm (fork length). The fish was subsequently captured on September 6, 2002 and measured 199 cm representing a 2 cm growth rate over approximately 13 months, or 1.85 cm/year (Jerald 2007). In October 2006, this fish was found dead along the shoreline of the Columbia River adjacent to the mouth of the Okanogan River. At that time, biologists measured the fish at 228.5 cm representing a 29.5 cm increase in length over a four year period or an average of 7.4 cm of growth per year.

A total of six white sturgeon were fitted with radio-tags and monitored throughout the study period using mobile and fixed telemetry. Telemetry data along with setline capture data verify that white sturgeon congregate in the Columbia River near the Okanogan River confluence during the summer, fall, and winter months with none of the six fish being detected downstream from Brewster (RM 530) or upstream of Park Island (RM 538). Very little movement of tagged sturgeon was observed during winter months. In the spring of 2002, one of the five mature fish radio-tagged made an upstream migration into the Okanogan River and two different radio-tagged mature sized sturgeon made movements into the Okanogan River during 2003.

In general, the results of the white sturgeon study in the Wells Reservoir were similar to the results of a study conducted in the neighboring Rocky Reach Reservoir in 2001-2002 (Chelan PUD 2005). Results indicate that the Wells Reservoir adult sturgeon population is estimated from 13-217 fish. These results are similar to the Rocky Reach assessment which estimated numbers of sturgeon from 50-115 fish. Both studies captured similar numbers of sturgeon using similar amounts of effort and similar capture techniques (Rocky Reach=18 sturgeon, Wells=13 sturgeon). Radio-telemetry data from both studies suggest that very little activity occurs during the overwintering period. Wells Reservoir sturgeon ranged in age from 6 to 30 years old while Rocky Reach sturgeon ranged in age from 7 to 50 years old. Both studies suggest that some recruitment into each population is occurring given the presence of juvenile fish in their respective reservoirs (Chelan PUD 2005; Jerald 2007).

3.0 GOAL AND OBJECTIVES

The goal of the WSMP is to increase the white sturgeon population in the Wells Reservoir to a level that can be supported by the available habitat and characterized by a diverse age structure consisting of multiple cohorts (juvenile and adult). In addition, the WSMP is intended to support spawning, rearing and migration as identified by the aquatic life designated use under WAC 173-201A in the Washington state water quality standards. Based upon the available information, the Aquatic SWG agreed that a rigorous and reliable assessment of ongoing Project effects on white sturgeon was not practical given sturgeon life history characteristics and the limited number of fish estimated to exist in the Wells Reservoir. Therefore, the Aquatic SWG concluded that efforts should focus, initially, on supplementation efforts to increase the population within the Wells Reservoir in order to address Project effects. Once the population numbers have been increased to a level that can be studied, as determined by the Aquatic SWG, Douglas shall implement a monitoring and evaluation program to accurately assess natural recruitment, juvenile habitat use, emigration rates, carrying capacity, and the potential for natural reproduction so as to inform the scope of a future, long-term supplementation strategy. The PMEs of the WSMP are designed to meet the following objectives:

Objective 1: Supplement the white sturgeon population in order to address Project effects, including impediments to migration and associated bottlenecks in spawning and recruitment;

Objective 2: Determine the effectiveness of the supplementation activities through a monitoring and evaluation program;

Objective 3: Determine the potential for natural reproduction in the Wells Reservoir in order to appropriately inform the scope of future supplementation activities;

Objective 4: Adaptively manage the supplementation program as warranted by the monitoring results and in consultation with the Aquatic SWG;

Objective 5: Evaluate whether there is biological merit to providing safe and efficient adult upstream passage;

Objective 6: Identify white sturgeon educational opportunities that coincide with WSMP activities.

This WSMP is intended to be compatible with other white sturgeon management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies and recovery goals of federal, state and tribal natural resource management agencies. The WSMP is not intended to be a harvest management plan and does not create or supersede jurisdiction over fisheries management decisions made by the responsible fishery agencies and tribes. However, the WSMP activities are expected to ultimately support appropriate and reasonable harvest opportunities consistent with the goals of the responsible fishery agencies and tribes and designated use for harvest under WAC 173-201A identified in the Washington state water quality standards. Should the responsible fishery agencies and tribes determine that there is an ongoing harvestable surplus of sturgeon in the Wells Reservoir, then this indicates significant progress toward achievement of the goals and objectives of this plan.

Douglas in consultation with the Aquatic SWG, developed the goal, objectives, and PMEs described in this section. The extent to which implementation of the proposed PMEs successfully achieve the WSMP goal and objectives identified shall be determined through the monitoring and evaluation program. Once the results of the monitoring and evaluation program have been considered, Douglas shall determine, in consultation with the Aquatic SWG, whether changes to the sturgeon stocking program are needed to meet the goals and objectives of the management plan.

The schedule for implementation of specific measures within the WSMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

In order to fulfill the goal and objectives described in Section 3.0, Douglas, in consultation with the ASWG, shall develop and implement a white sturgeon management program that includes PMEs. The Program shall be designed for implementation in two phases. Phase I of the PMEs shall be implemented during the first ten years of the new license and consist of supplementation, monitoring and evaluation activities. Results of Phase I PMEs will be used to inform the scope of continued PMEs during Phase II, which shall be implemented for the remainder of the new license.

Douglas, in consultation with the ASWG, shall initiate implementation of the following PMEs during the 50-year license term:

Phase I (Years 1-10)

- Development of a Brood Stock Collection and Breeding Plan (Year 1 and updated as determined by the Aquatic SWG, See Section 4.1.1);
- Brood Stock Collection (Years 1-4 and other years TBD by the Aquatic SWG, see Section 4.1.1);
- Juvenile Stocking (Years 2-5 and other years TBD by the Aquatic SWG, see Section 4.1.2);
- Index Monitoring Program (Years 3-5 and 2 more years prior to Year 10 TBD by the Aquatic SWG, see Section 4.2.1);
- Marked Fish Tracking (Years 3-5 and 2 more years prior to Year 10 TBD by the Aquatic SWG, see Section 4.2.2);
- Natural Reproduction Assessments (5 annual assessments over the license term, see Section 4.2.3)*;

* Natural reproduction assessments can be implemented over the term of the license (Phase I and Phase II) as determined by the Aquatic SWG.

Phase II (Years 11-50)

- Long-term juvenile stocking (stocking rate and frequency TBD by Aquatic SWG in Years 11-50, see Section 4.4.1);
- Supplementation Program Review (Years 11-50 TBD by the Aquatic SWG, see Section 4.4.2);
- Long-term Index Monitoring Program (Year 12 and once every 3-5 years thereafter TBD by the Aquatic SWG, see Section 4.4.3);
- Adult Passage Evaluation (Year 11 and once every 10 years thereafter, see Section 4.4)

As determined by the Aquatic SWG, appropriate educational opportunities coinciding with implementation of WSMP activities (Section 4.5) will be made available during the entire 50 year license term.

The following sections describe, in detail, the components, timing of implementation, and decision-making process of the PMEs to be conducted during Phase I and II of the white sturgeon management program.

4.1 Phase I Supplementation Program (Objective 1)

4.1.1 Brood Stock Collection and Breeding Plan

Due to the low numbers of sturgeon indicated by the 2001-2003 white sturgeon study and the need to increase genetic variation, there is a low probability that brood stock from only the Wells Reservoir can be utilized as the basis for supplementation activities. Consequently, other sources of fish must be considered in addition to capturing fish from Wells Reservoir to increase the white sturgeon population. Within one year of issuance of the new license Douglas shall prepare and implement a Brood Stock Collection and Breeding Plan, in consultation with the Aquatic SWG, which considers such factors as genetics and questions of imprinting, and are consistent with the goal and objectives of the WSMP and includes the level of detail provided in other existing white sturgeon breeding plans.

Following is a prioritized list of juvenile fish source options that shall be incorporated into a Brood Stock Collection and Breeding Plan:

- Brood stock collected from the Wells Reservoir;
- Brood stock collected from nearby reservoirs (Priest Rapids, Wanapum, Rocky Reach, Rock Island);
- Brood stock collected from McNary Reservoir;
- Juvenile production from the Lake Roosevelt white sturgeon recovery effort;
- Brood stock collected from below Bonneville Dam in the lower Columbia River;
- Juveniles purchased from a commercial facility.

A white sturgeon supplementation program may include, but may not be limited to, the following implementation options (Not listed in a priority order):

- Build new or retrofit existing Douglas funded hatchery facilities to accommodate white sturgeon brood stock, egg incubation, and juvenile rearing;
- Development of a mid-Columbia hatchery facility funded by the three PUDs (Douglas, Chelan, and Grant) to accommodate various phases of white sturgeon supplementation; brood stock, egg incubation, and juvenile rearing;
- Direct release into the Wells Reservoir of juveniles produced via appropriate Breeding Plan criteria and reared at a commercial facility;
- Direct release into the Wells Reservoir juveniles or adults trapped and hauled from the lower Columbia River.

The initial source of brood stock shall be determined within the first year of issuance of the new license. Collection of brood stock shall occur consistent with the brood stock collection plan in years 1-4 of the new license. Any additional years during the Phase I program (first ten years of the new license) in which brood stock collection shall occur in order to facilitate additional juvenile stocking into the Wells Reservoir (Section 4.1.2) will be determined by the Aquatic SWG. The intent of brood stock collection is to use their progeny, if feasible, for future white sturgeon stocking activities in the Wells Reservoir. The brood stock collection plan shall be updated annually, or as otherwise recommended by Douglas in consultation with the ASWG, to incorporate new and appropriate information.

4.1.2 Juvenile White Sturgeon Stocking

Within two years following issuance of the new license, Douglas shall release up to 5,000 yearling white sturgeon into the Wells Reservoir annually for four consecutive years (20,000 fish total). Additional years and numbers of juvenile sturgeon to be stocked during Phase I will be determined by the Aquatic SWG and will not exceed 15,000 juvenile sturgeon (total of 35,000 juvenile sturgeon during Phase I). In consultation with the Aquatic SWG, yearling fish for release shall be acquired through one or more of the sources listed in priority order in Section 4.1.1 above, or through other measures identified by the Aquatic SWG. If juvenile sturgeon stocking deadlines cannot be achieved, the Aquatic SWG will determine alternative implementation measures that will be undertaken by Douglas (see Table 4.7-1, footnote 2).

Douglas shall ensure that all hatchery-reared juvenile white sturgeon released into the Wells Reservoir are marked with Passive Integrated Transponder (PIT) tags and year-specific scute marks for monitoring purposes described in Section 4.2 of this plan. In order to allow for tracking of juvenile white sturgeon emigration described under Section 4.2.2, Douglas shall ensure that up to one percent (or a maximum of 50) of the juvenile white sturgeon released into the Wells Reservoir are large enough to allow implantation of an active tag prior to release. In addition, following the third year of supplementation (unless the Aquatic SWG determines more analysis is required), the Aquatic SWG may elect to release juveniles at an earlier or later life stage for the fourth year in order to compare success of fish released at varying life stages. For example, the Aquatic SWG may elect to have a proportion of the hatchery-reared juveniles released at differing size intervals (with the minimum size being that which permits PIT tagging), in order to monitor potential differences in survival and growth during future indexing periods.

4.2 Phase I Monitoring and Evaluation Program (Objective 2)

Douglas shall conduct a monitoring and evaluation program within the Wells Reservoir for the purpose of assessing the effectiveness of the supplementation activities described in Section 4.1 and outlined in Table 4.7-1. Monitoring shall include both an Index Monitoring Program (Section 4.2.1) and a Marked Fish Tracking Program (Section 4.2.2). Both of these studies will be used to collect life history and population dynamics information including rates of fish movements into and out of the Wells Reservoir and habitat use. Douglas shall also obtain updated information, when available, on other white sturgeon recovery programs (e.g., Upper Columbia River, Kootenai River, mid-Columbia PUDs), in order to improve the monitoring and evaluation program and refine its implementation. The results of this information will also inform supplementation, monitoring and evaluation activities during implementation of Phase II of the WSMP.

4.2.1 Index Monitoring Program

Within three years following issuance of the New License, Douglas shall initiate a three-year index monitoring program (Years 3-5) for juvenile and adult sturgeon in the Wells Reservoir to determine age-class structure, survival rates, abundance, density, condition factor, growth rates, and to identify distribution and habitat selection of juvenile sturgeon. The indexing methods shall include using gillnets, set lines or other appropriate recapture methods for juveniles and adults.

As a component of the Phase I indexing program, Douglas shall capture and implant active tags in a portion of the juvenile and sexually mature adult sturgeon population found in the Wells Reservoir. This tagging effort shall be used to augment broodstock collection (Section 4.1.1), population level information and juvenile habitat use (Section 4.2.2) and natural reproduction potential (Section 4.2.3).

After the initial three-year indexing period (Years 3-5), Douglas shall conduct an additional two years of index monitoring in Phase I as determined by the Aquatic SWG. After year 9, an additional year of index monitoring would take place in year 12 and then every three to five years over the term of the new license (Phase II) to assess age-class structure, survival rates, abundance, condition factor, growth rates; identify distribution and habitat selection of juvenile sturgeon; and to inform the supplementation program strategy (see Table 4.7-1).

Frequency (every 3, 4 or 5 years) of implementation of a long-term index monitoring activities (after year 12) will be determined by the Aquatic SWG. Phase II index monitoring activities will not consist of implantation of active tags in captured individuals.

4.2.2 Marked Fish Tracking Program

Beginning in year three of the new license and continuing for three years (Years 3-5), Douglas shall conduct tracking surveys of the juvenile white sturgeon that were released with active tags as part of supplementation activities. This will require one percent of each of the annual classes of juvenile sturgeon (up to a maximum of 50 fish each year) released in years 2, 3, 4, and 5 to be reared large enough to implant an active tag for tracking purposes (See Table 4.7-1). The purpose of tracking active-tagged fish is to determine juvenile white sturgeon emigration rates out of the Wells Reservoir and habitat use within the Wells Reservoir.

Douglas shall repeat the tracking survey for two additional years during Phase I (see Table 4.7-1). The additional two years of surveys shall track: 1) active tags implanted in a percentage of juvenile fish from previous years of supplementation activities (dependent upon tag life) and 2) any juvenile and adult fish implanted with active tags during the last indexing period preceding the survey. Subsequent Phase I surveys are likely to coincide with the additional Phase I index monitoring and juvenile stocking activities.

4.2.3 Determining Natural Reproduction Potential (Objective 3)

In years where environmental conditions are appropriate, Douglas shall track sexually mature adult sturgeon that were captured and implanted with active tags under Section 4.2.1 for the purpose of identifying potential spawning locations and determining natural reproduction potential. Appropriate environmental conditions may be determined by examining the following factors: water quality and quantity (i.e., flow, temperature, and turbidity), the presence of reproductively viable adults during index monitoring activities, and the status of maturity for supplemented fish. In years in which sexually mature adult sturgeon are tagged under Section 4.2.1, Douglas may also utilize egg collection mats in combination with tracking in areas of the Wells Reservoir for the purpose of identifying potential spawning locations and activity. Five surveys of natural reproduction using adult tracking and/or egg mat placement shall occur over the term of the new license. Several of these surveys are intended to be implemented during the latter part of the license in order to examine the natural reproductive potential of supplemented fish recruiting to sexually maturity. These activities will support the aquatic life designated use for spawning under WAC 173-201A in the Washington state water quality standards.

4.3 Phase II Supplementation and Monitoring Program (Objective 2 and 4)

The information collected through activities described in Section 4.1-4.3 will provide insight into the population dynamics, habitat availability, and limiting factors that affect the natural population structure of white sturgeon within the Wells Reservoir. This information will inform supplementation, monitoring and evaluation activities during implementation of Phase II supplementation and monitoring activities in the WSMP for the duration of the new license term after year 10.

4.3.1 Long-Term Juvenile White Sturgeon Stocking

The number and frequency of yearlings released in Phase II of the white sturgeon supplementation program will range from 0 to 5,000 fish. Stocking rates shall be based on the results of the Phase I Monitoring and Evaluation Program (Section 4.2) and determination of carrying capacity (Section 4.3) and shall be consistent with the goal and objectives of the WSMP. The Phase II stocking rates can also be adjusted as determined by the Aquatic SWG (also see Table 4.7-1, footnotes 2 and 3).

4.3.2 Supplementation Program Review

Douglas shall compile information on other white sturgeon supplementation programs in the Columbia River Basin in order to assess whether the white sturgeon supplementation program being implemented at the Project is: (i) consistent and comparable with the technology and methods being implemented by other supplementation programs in the region; (ii) reasonable in cost and effective to implement at the Project; and (iii) consistent with the supplementation program goals and objectives. The supplementation program review will be conducted annually in coordination with the development of the annual report (Section 4.6).

4.3.3 Long-term Index Monitoring Program

Beginning in Year Twelve of the new license and every 3 to 5 years thereafter for the duration of the new license, Douglas shall continue to conduct a Phase II Index Monitoring Study for juvenile and adult sturgeon in the Wells Reservoir. This program will be used to monitor age-class structure, survival rates, abundance, condition factor, growth rates, identify distribution and habitat selection of juvenile sturgeon, and may continue to support broodstock collection activities. The indexing methods will include using gillnets or other appropriate recapture methods for juveniles and set lines for adults and will not consist of actively tracking fish. Frequency (every 3, 4, or 5 years) of implementation of long-term index monitoring activities (after year 12) will be determined by the Aquatic SWG.

4.4 Evaluation and Implementation of Adult Passage Measures (Objective 5)

In Year Eleven of the new license and every 10 years thereafter for the duration of the new license unless otherwise determined by the Aquatic SWG, the Aquatic SWG shall evaluate the biological merit to providing upstream passage for adult white sturgeon. The assessment of biological merit shall be determined by: (i) evaluating information gathered from monitoring and evaluation activities and determining whether there is significant biological benefit and need for upstream passage; (ii) the availability of reasonable and appropriate means to provide upstream passage; and (iii) consensus from all other operators of the mid-Columbia projects to implement adult upstream passage measures[1]. If all three criteria above are met, Douglas, in consultation with the Aquatic SWG shall develop adult passage measures that are consistent with measures being implemented by other mid-Columbia project operators.

4.5 Educational Opportunities Coinciding with WSMP Activities (Objective 6)

Douglas, in consultation with the Aquatic SWG, shall identify appropriate WSMP activities as opportunities for education to local public entities such as schools, cities, fishing and recreation groups, and other interested local groups. WSMP activities that may be appropriate for public participation are hatchery tours, release of hatchery juveniles, and tagging of juveniles prior to release.

4.6 Reporting

Douglas will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the WSMP. The report will document all white sturgeon activities conducted within the Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this WSMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

[1] The intent is to provide connectivity to the Hanford Reach white sturgeon population.

4.7 Implementation Schedule

Table 4.7-1 outlines an estimated long-term schedule of the activities described in Sections 4.1-4.4.

Table 4.7-1 Project White Sturgeon Implementation Schedule

New License Year	Brood Stock Plan and Collection[1]	Release Fish into Wells Reservoir[2]	Index Monitoring[3]	Tracking Marked Fish[4]	Natural Production Assessment[5]	Adult Passage Evaluation
PHASE I						
1	X				TBD	
2	X	X				
3	X	X	X	X	TBD	
4	X	X	X	X		
5	TBD	X	X	X		
6	TBD	TBD			TBD	
7	TBD	TBD	TBD	TBD		
8	TBD	TBD				
9	TBD	TBD	TBD	TBD		
10	TBD	TBD			TBD	
PHASE II[6]						
11	Level and frequency TBD	Level and frequency TBD				X[7]
12			X			
13-50			TBD		TBD	Every ten years after Year 11

[1]Douglas brood stock plan shall be completed within one year following this issuance of the new license. Brood stock collection activities will occur at a minimum in years 1-4 during the new license term. Additional years, during Phase I, will be determined by the Aquatic SWG. In Year 11 (Phase II), level and frequency of activity will be determined by the Aquatic SWG and will be based upon the level of long-term supplementation identified from monitoring results.

[2]No more than a total of 35,000 fish will be stocked in Phase I (Years 1-10). The Phase II supplementation program will be determined by the Aquatic SWG and consistent with the goal of the WSMP.

[3] Results of the index monitoring activities will be used to determine the scope of future supplementation activities. Index monitoring activities from year 12 through the remainder of the new license term will occur at a frequency of 3-5 years as determined by the Aquatic SWG.

[4] Active-tagged juvenile and adult sturgeon will be tracked to assess emigration, habitat use, and potential spawning locations. This activity will occur in years 3, 4, and 5. Two additional years will be determined by the Aquatic SWG but will likely be consistent with years in which index monitoring activities are implemented.

[5] Tracking of reproductively viable adult sturgeon in combination with deployment of egg collection mats to identify natural production in the Wells Reservoir during 5 separate years over the term of the new license based on flow conditions or other data as determined by the Aquatic SWG.

[6] Phase II activities will consist only of brood stock plan and collection, stocking activities, index monitoring, and potentially natural reproduction assessments for the remainder of the new license.

[7] Adult Passage Evaluations will occur in Year 11 and every 10 years thereafter for the term of the new license.

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ATTACHMENT C: BULL TROUT MANAGEMENT PLAN

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BULL TROUT MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

August 2008

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

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EXECUTIVE SUMMARY

The Bull Trout Management Plan (BTMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans, but declined because its interests are currently satisfied by the measures within the HCP.

The goal of the BTMP is to identify, monitor, and address impacts, if any, on bull trout (*Salvelinus confluentus*) resulting from the Project in a manner consistent with the USFWS Bull Trout Recovery Plan and the terms of the Section 7 Incidental Take Statement (ITS). This BTMP is intended to continue the implementation of management activities to protect bull trout during the new license term in a manner consistent with the original Wells Bull Trout Monitoring and Management Plan (WBTMMP) (Douglas 2004). The 2004 WBTMMP was developed in coordination with the USFWS, as required by the USFWS Bull Trout Section 7 Biological Opinion (BO) in association with the Federal Energy Regulatory Commission’s (FERC) approval of the HCP. The PMEs presented within the BTMP are designed to meet the following objectives:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP;

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage;

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate the effectiveness of these measures;

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations;

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan including information exchange and genetic analysis. Should bull trout be delisted, the Aquatic SWG will re-evaluate the needs and objectives of the BTMP;

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult bull trout.

This BTMP is intended to be compatible with other bull trout management plans and the Upper Columbia Salmon Recovery Plan (UCSRP) in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

1.0 INTRODUCTION

The Bull Trout Management Plan (BTMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The BTMP will direct implementation of measures to mitigate project impacts, if any, on bull trout (*Salvelinus confluentus*). To ensure active stakeholder participation and support, Douglas developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan to direct the long-term management of bull trout in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and defines the relevant PMEs (Section 4) for bull trout during the term of the new license.

Additionally, this management plan is intended to continue implementation activities aimed at protecting bull trout in a manner consistent with measures specified in the original Wells Bull Trout Monitoring and Management Plan (WBTMMP) (Douglas 2004). The 2004 WBTMMP was developed in consultation with the USFWS, as required by the USFWS Bull Trout Biological Opinion (BO) in association with the implementation of the HCP.

2.0 BACKGROUND

2.1 Bull Trout Biology

Bull trout are native to northwestern North America, historically occupying a large geographic range extending from California north into the Yukon and Northwest Territories of Canada, and east to western Montana and Alberta (Cavender 1978). They are generally found in interior drainages, but also occur on the Pacific Coast in Puget Sound and in the large drainages of British Columbia.

Bull trout currently occur in lakes, rivers and tributaries in Washington, Montana, Idaho, Oregon (including the Klamath River basin), Nevada, two Canadian Provinces (British Columbia and Alberta), and several cross-boundary drainages in extreme southeast Alaska. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta, and the McKenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brewin 1997). The remaining distribution of bull trout is highly fragmented.

Bull trout are a member of the char group within the family Salmonidae. Bull trout closely resemble Dolly Varden (*Salvelinus malma*), a related species. Genetic analyses indicate, however, that bull trout are more closely related to an Asian char (*Salvelinus leucomaenis*) than to Dolly Varden (Pleyte et al. 1992). Bull trout are sympatric with Dolly Varden over part of their range, most notably in British Columbia and the Coastal-Puget Sound region of Washington State.

Bull trout are believed to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993). Growth, survival, and long-term persistence are dependent upon habitat characteristics such as clean, cold, connected, and complex instream habitat, a stable substrate with a low percentage of fine sediments, high channel stability, and stream/population connectivity (USFWS et al. 2000). Stream temperature and substrate type, in particular, are critical factors for the sustained long-term persistence of bull trout. Spawning is often associated with the coldest, cleanest, and most complex stream reaches within basins. However, bull trout may exhibit a patchy distribution, even in pristine habitats, and should not be expected to occupy all available habitats at the same time (Rieman and McIntyre 1995; Rieman et al. 1997).

Bull trout exhibit four distinct life history types: resident, fluvial, adfluvial, and anadromous. The fluvial, adfluvial, and resident forms exist throughout the range of the bull trout (Rieman and McIntyre 1993). These forms spend their entire life in freshwater. The anadromous life history form is currently known only to occur in the Coastal-Puget Sound region within the coterminous United States (Volk 2000; Kraemer 1994; Mongillo 1993). Multiple life history types may be expressed in the same population, and this diversity of life history types is considered important to the stability and viability of bull trout populations (Rieman and McIntyre 1993).

The majority of growth and maturation for anadromous bull trout occurs in estuarine and marine waters, adfluvial bull trout in lakes or reservoirs, and fluvial bull trout in large river systems.

Resident bull trout populations are generally found in small headwater streams where fish remain their entire lives.

For migratory life history types, juveniles tend to rear in tributary streams for 1 to 4 years before migrating downstream into a larger river, lake, or estuary and/or nearshore marine area to mature (Rieman and McIntyre 1993). In some lake systems, age 0+ fish (less than 1 year old) may migrate directly to lakes (Riehle et al. 1997). Juvenile and adult bull trout in streams frequently inhabit side channels, stream margins and pools with suitable cover and areas with cold hyporheic zones or groundwater upwellings (Sexauer and James 1993; Baxter and Hauer 2000).

2.2 Species Status

On June 10, 1998, the USFWS listed bull trout within the Columbia River basin as threatened under the Endangered Species Act (ESA) (FR 63(111)). Later (November 1, 1999), the USFWS listed bull trout within the coterminous United States as threatened under the ESA (FR 64(210)). The USFWS identified habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, and grazing; blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species as major factors affecting the distribution and abundance of bull trout. They noted that dams (and natural barriers) have isolated population segments resulting in a loss of genetic exchange among these segments (FR 63(111)). The USFWS believes many populations are now isolated and disjunct. In October 2002, the USFWS completed the first draft of a bull trout recovery plan intended to provide information and guidance that will lead to recovery of the species, including its habitat (USFWS 2002). Threatened bull trout population segments are widely distributed over a large area and because population segments were subject to listing at different times, the USFWS adopted a two-tiered approach to develop the draft recovery plan for bull trout (USFWS 2002). In November 2002, the USFWS published in the federal register a proposed rule for the designation of critical habitat for the Klamath River and Columbia River distinct population segments of bull trout (67 FR 71235). In October 2004 the USFWS published a final rule in the Federal Register designating critical habitat for the Klamath River and Columbia River populations of bull trout (69 FR 59995).

In April 2008, the USFWS completed the 5-year status review for Columbia River bull trout with two recommendations: maintain “threatened” status for the species, and determine if multiple distinct population segments exist within the Columbia River and merit protection under the ESA. The recommendations intend to facilitate analysis of project effects over more specific and biologically appropriate areas, ultimately allowing a greater focus of regulatory protection and recovery resources (USFWS 2008a). The review also identified specific issues that limit the overall ability to accurately and quantitatively evaluate the current status of bull trout. Seven recommendations were made to improve future evaluation and management decisions, all of which are largely based on improvement and standardization of monitoring and evaluation techniques, better delineation and agreement of core areas and Recovery Units, and multi-agency cooperation and management (USFWS 2008b).

The Wells Project is situated within the Upper Columbia River Recovery Unit and the USFWS has identified the Wenatchee, Entiat, and Methow Rivers as its core areas. A core area represents the closest approximation of a biologically functioning unit for bull trout. A core area functions as a metapopulation for bull trout. Not all core areas are equal and each has specific functions that are unique. For example, the Entiat Core Area depends heavily on the mainstem Columbia River to provide overwinter, migration, and forage habitats. The Wenatchee Core Area has populations using lake and riverine (both the Wenatchee and Columbia Rivers) habitat for overwintering, migration, and foraging. Within a core area, many local populations may exist. A local population is assumed to be the smallest group of fish that is known to represent an interacting reproductive unit. Nineteen local populations have been identified in the Wenatchee (7), Entiat (2) and Methow (10) core areas (USFWS 2002).

2.3 Project Bull Trout Studies

2.3.1 2001-2003 Project Bull Trout Study

Listed Columbia River bull trout have been observed and counted at Wells Dam since 1998. In 2000, due to the potential for operations at mid-Columbia dams to affect the movement and survival of bull trout, the USFWS requested that the three mid-Columbia PUDs (Douglas, Chelan, and Grant PUDs) evaluate the movement and status of bull trout in their respective project areas. At that time, little was known about the life-history characteristics (e.g., movements, distribution, habitat use, etc.) of bull trout in the mid-Columbia River. Therefore, in order to assess the operational effects of hydroelectric projects on bull trout within the mid-Columbia, a three PUD coordinated radio-telemetry study was implemented beginning in 2001. The goal of the study was to monitor the movements and migration patterns of adult bull trout in the mid-Columbia River using radio-telemetry (Figure 2.3-1). The number of trout to be collected and tagged at each dam (Rock Island, Rocky Reach, and Wells) was based on the proportion of fish that migrated past those dams in 2000.

From 2001-2003, bull trout were collected from the Wells, Rocky Reach, and Rock Island dams and radio-tagged. Multiple-telemetry techniques were used to assess the movement of tagged bull trout within the study area. At Wells Dam, a combination of aerial and underwater antennas was deployed. The primary purpose for this system was to document the presence of bull trout at the Project, identify passage times and determine their direction of travel (upstream/downstream). In addition to these systems, a number of telemetry systems were deployed to address specific questions posed by the USFWS and Douglas. At Wells Dam, several additional systems were installed to identify tagged bull trout that could enter, ascend, and exit specific gates and fish ladders. All possible access points to the adult fish ladders and the exits were monitored individually in 2001, 2002, and 2003, allowing the route of passage to be determined as well as the ability to establish the exact time of entrance and exit from the ladder system. English et al. (1998; 2001) provides a detailed description of the telemetry systems at each of the dams and within the tributaries.

To assess bull trout movements into and out of the Wells Reservoir, fixed-telemetry monitoring sites were established at the mouth of the Methow and Okanogan rivers and periodic aerial surveys were conducted on the reservoir and throughout both watersheds (English et al. 1998, 2001). Key findings of the multi-year study are as follows:

- Total upstream fishway counts (May 1st to November 15th) at Wells Dam from 2000 to 2003 were 90, 107, 76, and 53 bull trout, respectively.
- Adult bull trout migrate upstream through Wells Dam from May through November. Peak movement occurs in May and June with 94, 95, 92, and 89 percent of adult bull trout being detected during these months at Wells Dam for years 2000-2003, respectively.
- Tagged migratory adult bull trout successfully move both upstream and downstream past the Project (radio-telemetry). From the 79 bull trout radio-tagged in 2001 and 2002 at Rock Island, Rocky Reach, and Wells, five bull trout passed downstream through Wells Dam with no documented mortality. Twelve downstream passage events occurred at Rocky Reach (4) and Rock Island (8) through turbines from 2001 to 2003. None of the 17 (5 Wells, 4 Rocky Reach and 8 Rock Island) observed downstream passage events resulted in observed mortality of bull trout.
- Between 2001 and 2003, a total of 10 (2 tagged at Rock Island, 4 Rocky Reach, 4 Wells), 11 (4 Wells, 5 Rocky Reach, 2 from 2001), and 1 (1 Wells) tagged bull trout were detected moving upstream of the Project, respectively.
- Median tailrace times (tailrace detection to ladder entrance detection) during the telemetry study at Wells in 2001-2003 were 1.53, 7.84, and 1.00 days, respectively. Median travel times (tailrace detection to ladder exit detection) during the telemetry study at Wells in 2001-2003 were 8.87, 7.60, and 1.16 days, respectively. Median ladder passage times (entrance detection to ladder exit detection) during the telemetry study at Wells in 2001-2003 were 5.70, 0.23, and 0.16 days, respectively.
- Adult bull trout migrating upstream of Wells Dam appear to be destined for the Methow River. Between 2001 and 2003, no bull trout selected the Okanogan system (one trout moved into the Okanogan, but left shortly thereafter and moved into the Methow system).
- Median travel time from Wells Dam (detection at ladder exit) to first detection in the Methow River in 2001-2003 was 0.40, 2.78, and 1.09 days, respectively.
- All tributary entrance events (fixed station detections) into the Methow River by bull trout (28 total events, 2001-2003) occurred before June 27. An additional two bull trout, not detected by the tributary fixed station systems, were detected in the Methow River via 2002 aerial surveys. Bull trout in the Methow system selected two primary areas, the mainstem Methow River and the Twisp River.
- To date, 30% (9/30) of bull trout that entered the Methow River have been detected leaving the system. Tributary exit dates were recorded for 78% (7/9) of these emigrating bull trout and 86% (6/7) of bull trout with a recorded exit date left the Methow River system between October and December.
- Bull trout migrating upstream through Wells Dam in 2001 were 5 year old (n=2, mean fork length=55.6cm) and 6 year old (n=6, mean fork length= 54.6cm) fish as determined by scales.

- 92% (11/12) and 53% (8/15) of tagged bull trout detected in the vicinity of Wells Dam entered the Wells Hatchery Outfall in 2001 and 2002, respectively. It is possible that the bull trout frequented the outfall in search of prey. Typical operation at the hatchery is to volitionally release yearling chinook smolts between April 15 and 30, and subyearling chinook smolts in early June. Given that bull trout feed opportunistically (Goetz 1989), it is likely that the tagged bull trout were taking advantage of the large concentration of juvenile salmonids within the hatchery outfall system.

2.3.2 2005-2008 Project Bull Trout Study

On December 10, 2003, the USFWS received a request from the Federal Energy Regulatory Commission (FERC) for formal consultation to determine whether the proposed incorporation of the HCP into the FERC license for operation of the Project was likely to jeopardize the continued existence of the Columbia River distinct population segment (DPS) of ESA-listed bull trout, or destroy or adversely modify proposed bull trout critical habitat. In response to the FERC request and based upon the results of the 2001-2003 study, which suggested that continued operations are not likely to jeopardize bull trout, the USFWS filed the BO and Incidental Take Statement (ITS) with FERC. On June 21, 2004, FERC issued an order incorporating the HCP and the terms and conditions of the ITS into the FERC license for the Project.

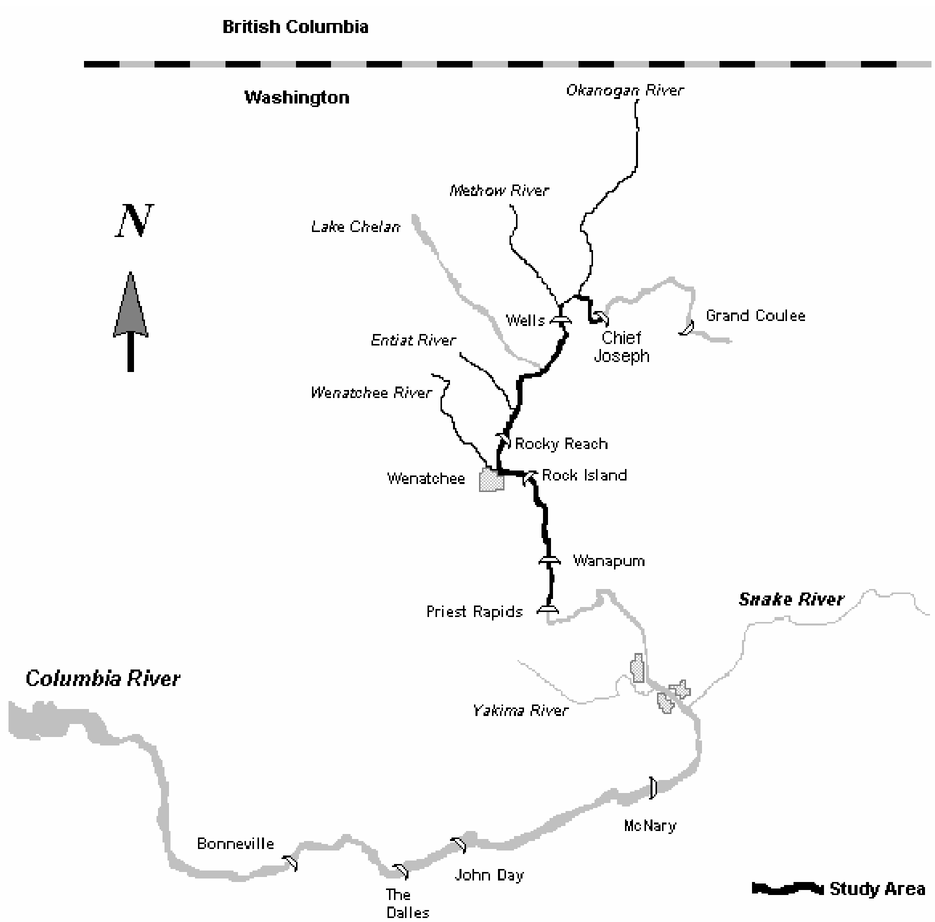

Figure 2.3-1 **Study area for assessing migration patterns of bull trout in the mid-Columbia River (2001-2003). Fixed radio-telemetry sites monitored the movement of bull trout near Priest Rapids, Wanapum, Rock Island, Rocky Reach and Wells dams. Fixed sites placed in the Wenatchee, Entiat, Methow and Okanogan rivers monitored time of entry and exodus of bull trout in large tributaries of the mid-Columbia River.**

In 2004, Douglas in consultation with the USFWS and as required under the HCP BO, developed the WBTMMP. The goal of the WBTMMP is to continue monitoring and evaluating bull trout in the Project to quantify and address, to the extent feasible, potential Project impacts on bull trout. Implementation of WBTMMP measures specifically include: (1) address ongoing Project impacts through the life of the existing operating license; (2) provide consistency with recovery actions as outlined in the USFWS bull trout recovery plan; and (3) monitor and minimize the extent of incidental take of bull trout, if any, consistent with Section 7 of the ESA. WBTMMP implementation started in 2005 and will continue through the spring of 2008. Objectives of the plan include identifying Project impacts, if any, on upstream and downstream passage of adult and sub-adult bull trout through Wells Dam, investigating the potential for sub-adult entrapment or stranding in off-channel or backwater areas of Wells Reservoir, and identifying the Core Areas and Local Populations, as defined in the USFWS Bull Trout Recovery Plan, of bull trout that utilize the Project.

To address Project impacts, if any, on upstream and downstream passage of adult bull trout, Douglas captured and radio-tagged 6, 10, and 10 adult bull trout at Wells Dam in 2005, 2006, and 2007, respectively (LGL and Douglas PUD, 2008). In 2005, all six fish traveled upstream into the Methow River and no downstream passage events were recorded. Travel time from release (after tagging) until entrance into the Methow River ranged from 7 hours to 12 days. In 2006, in addition to the 10 adult bull trout radio-tagged at Wells Dam, the USFWS radio-tagged 13 bull trout in the Methow River Core Area and Public Utility District No.1 of Chelan County (Chelan PUD) released 29 tagged bull trout from Rocky Reach and Rock Island dams. In total, 13 downstream passage events and 8 upstream passage events were recorded at Wells Dam in 2006. There were no observed instances of bull trout mortality resulting from these passage events. In 2007, 10 bull trout were tagged at Wells Dam, the USFWS tagged 5 bull trout in the Methow River Core Area, and Chelan PUD released 19 tagged bull trout from Rocky Reach and Rock Island dams. In total, 1 downstream passage event and 3 upstream passage events were recorded at Wells Dam in 2007. Similar to 2006, no instances of bull trout mortality were observed resulting from these passage events. From 2005 to 2008 (all radio-tagged fish combined), 25 downstream passage events and 52 upstream passage events by 40 individual bull trout were recorded at Wells Dam with no observances of bull trout injury or mortality (LGL and Douglas PUD, 2008). From 2005-2007, no adult or sub-adult bull trout were observed utilizing Wells Dam fishways during the winter monitoring period (typically November 16 to April 30). Monitoring of radio-tagged adult bull trout ended in June 2008.

To address potential project-related impacts on sub-adult bull trout, fish were opportunistically tagged with passive integrated transponder (PIT) tags when encountered during standard fish sampling operations at Wells Dam or during off-Project tributary smolt trapping activities. In 2005, 2006, 2007, and 2008 a total of 16, 20, 14, and 17 sub-adult bull trout were PIT tagged during tributary smolt sampling activities, respectively. No sub-adult bull trout were observed during Wells Dam fish sampling operations or by the adult PIT-tag detection system in the fishways. Over the 2005-2008 period, no sub-adult bull trout were observed utilizing Wells Dam fishways during the winter period.

In 2005, Douglas collected high resolution bathymetric information of Project waters to address the potential for entrapment or stranding of bull trout in off-channel or backwater areas of the Wells Reservoir. This data combined with Wells inflow patterns, reservoir elevations, and backwater curves would allow Douglas to begin identifying entrapment or stranding areas. In 2006, a field survey of potential bull trout stranding sites using bathymetric and operations information was conducted during a period of low reservoir elevation associated with the Methow River flood control program. Following a complete survey of the project, no stranded bull trout (sub-adult or adult) were found during the 2006 low water event. In 2007, reservoir conditions were not sufficiently low to warranted further field investigations.

In support of identifying the local populations and core areas of bull trout utilizing the Project area, Douglas funded the collection of genetic samples from 22, 20, and 24 bull trout in 2005, 2006 and 2007, respectively. In 2005, 6 samples were collected at Wells Dam and 16 were collected at off-Project operations (Methow and Twisp river screw traps). In 2006, 10 samples were collected at Wells Dam and 10 samples were collected at off-Project operations. In 2007, 10 samples were collected at Wells Dam and 14 samples were collected at off-Project operations. All genetic samples were provided to the USFWS.

3.0 GOALS AND OBJECTIVES

The goal of the BTMP is to identify, monitor and address impacts, if any, on bull trout resulting from the Project in a manner consistent with the USFWS Bull Trout Recovery Plan and the terms of the Section 7 ITS (See Section 4.7). This BTMP is intended to continue the implementation of management activities to protect bull trout during the new license term in a manner consistent with the original WBTMMP (Douglas 2004). The 2004 WBTMMP was developed in coordination with the USFWS, as required by the USFWS Bull Trout BO in association with the HCP. The PMEs presented within the BTMP are designed to meet the following objectives:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP;

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage;

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate effectiveness of these measures;

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations (similar to WBTMMP);

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan, including information exchange and genetic analysis. Should bull trout be delisted, the Aquatic SWG will re-evaluate the needs and objectives of the BTMP;

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult bull trout.

This BTMP is intended to be compatible with other bull trout management plans and the UCSRP in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

The schedule for implementation of specific measures within the BTMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

In order to fulfill the goals and objectives described in Section 3.0, Douglas, in consultation with the Aquatic SWG, will implement PMEs for Project bull trout consistent with the objectives identified in Section 3.0. The measures proposed in this section are intended to serve both as PMEs for bull trout throughout the new license term and to adequately monitor and minimize any incidental take of bull trout consistent with Section 7 of the ESA.

4.1 Operate the Upstream Fishways and Downstream Bypass Systems in a Manner Consistent with the HCP (Objective 1)

4.1.1 Provide Upstream and Downstream Passage for Adult and Sub-Adult Bull Trout

Douglas will continue to provide upstream passage for adult bull trout through the existing upstream fishways and downstream passage of adult and sub-adult bull trout through the existing downstream bypass system. Both upstream fishway facilities (located on the west and east shores) are operational year around with maintenance occurring on each fishway at different times during the winter to ensure that one upstream fishway is always operational. Maintenance activities on Wells fishways occur during the winter when bull trout have not been observed passing Wells Dam. Operation of the downstream passage facilities for bull trout will be consistent with bypass operations for Plan Species identified in the HCP. Currently the bypass system is operated from April 12 through August 26 of each year. This operating period is consistent with the period of high bull trout and anadromous fish presence at the Project.

4.1.2 Upstream Fishway Counts

Douglas shall continue to conduct video monitoring in the Wells Dam fishways from May 1st through November 15th to count and provide information on the population size of upstream moving bull trout.

4.1.3 Upstream Fishway Operations Criteria

Douglas shall continue to operate the upstream fishway at Wells Dam in accordance with criteria outlined in the HCP.

4.1.4 Bypass Operations Criteria

Douglas shall continue to operate the bypass system at Wells Dam in accordance with criteria outlined in the HCP.

4.2 Identify Any Adverse Project-related Impacts on Adult and Sub-adult Bull Trout Passage (Objective 2)

4.2.1 Adult Bull Trout Upstream and Downstream Passage Evaluation

Douglas shall continue to monitor upstream and downstream passage and incidental take of adult bull trout through Wells Dam and in the Wells Reservoir through the implementation of a radio-telemetry study. Specifically, in years 5 and 10 of the new license, and continuing every ten years thereafter during the new license term, Douglas will conduct a one-year monitoring program to determine whether Douglas remains in compliance with the ITS. The same study protocols used during past radio-telemetry assessments at Wells Dam (LGL and Douglas PUD 2007) will be employed for these monitoring studies.

If the adult bull trout counts at Wells Dam increases more than two times the existing 5-year average or if there is a significant change in the operation of the fish ladders or hydrocombine, then the Aquatic SWG will determine whether additional years of take monitoring are needed beyond those identified in this section of the BTMP. If the authorized incidental take level is exceeded during any one-year period, Douglas will conduct another monitoring study in the succeeding year. If the authorized incidental take level is exceeded in this second year, Douglas will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to exceedance of the allowable level of incidental take.

4.2.2 Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities

Douglas shall assess upstream and downstream passage and incidental take of adult, migratory bull trout at off-Project (outside of the Project boundary) adult salmon and steelhead brood stock collection facilities associated with the Wells HCP. Specifically, beginning in year one of the new license, Douglas will conduct a one-year radio-telemetry study to assess passage and incidental take at off-Project adult collection facilities (i.e., Twisp weir). Douglas will capture and tag up to 10 adult, migratory bull trout (>400mm) at adult collection facilities and use fixed receiver stations upstream and downstream of collection facilities to examine upstream and downstream passage characteristics and incidental take. Study protocols that have been used during past radio-telemetry assessments at Wells Dam (LGL 2008) will be employed for this assessment.

If negative impacts to passage associated with Off-Project collection facilities are observed or the authorized incidental take level is exceeded during any one-year period, Douglas will conduct another monitoring study in the succeeding year. If negative impacts to passage continue to be observed or the authorized incidental take level is exceeded in this second year, Douglas will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to passage impacts or the exceedance of the allowable level of incidental take.

After year one of the new license, the implementation of this sub-objective will be integrated into the one-year telemetry monitoring program that is to be conducted every ten years (beginning in year 10 of the new license) at Wells Dam as identified in Section 4.2.1. In year 10 of the new license and every 10 years thereafter, bull trout will be captured and tagged only at Wells Dam

(Section 4.2.1) since data show that bull trout passing Wells Dam are migrating back into the Methow River watershed (LGL 2008). Through the continued deployment of fixed station monitoring at off-Project adult salmon and steelhead brood stock collection facilities, these tagged bull trout will continue to provide passage and take information in support of this sub-objective throughout the term of the new license.

4.2.3 Sub-Adult Bull Trout Monitoring

While an objective of the BTMP is to identify potential Project impacts on upstream and downstream passage of sub-adult bull trout, Aquatic SWG members (including the USFWS) agree that it is not feasible to assess sub-adult passage because sub-adult bull trout have not been observed at Wells Dam. During the previous six years of bull trout data collection at Wells Dam (BioAnalyst Inc. 2004; LGL 2008), sub-adult bull trout have not been documented passing Wells Dam (based upon fishway video counts and bull trout trapping for radio-telemetry). However, it is expected that through the increased monitoring associated with the implementation of the BTMP that there may be additional encounters with sub-adult bull trout. If at any time during the new license term, sub-adult bull trout are observed passing Wells Dam in significant numbers (>10 per calendar year), the Aquatic SWG will recommend reasonable and appropriate methods for monitoring sub-adult bull trout. Specifically, Douglas may modify counting activities, continue to provide PIT tags and equipment, and facilitate training to enable fish sampling entities to PIT tag sub-adult bull trout when these fish are collected incidentally during certain fish sampling operations. This activity will occur the following year of first observation of sub-adult bull trout (>10 per calendar year) and subsequently as recommended by the Aquatic SWG.

4.3 Implement Reasonable and Appropriate Measures to Modify the Upstream Fishway and Downstream Bypass if Adverse Impacts on Bull Trout are Identified (Objective 3)

Douglas shall continue to operate the upstream fishway and downstream bypass at Wells Dam in accordance with the HCP. However, if upstream or downstream passage problems for bull trout are identified (as agreed to by the USFWS and Douglas), Douglas will identify and implement, in consultation with the Aquatic SWG and HCP Coordinating Committee, reasonable and appropriate options to modify the upstream fishway, downstream bypass, or operations to reduce the identified impacts to bull trout passage.

4.4 Investigate Entrapment or Stranding of Bull Trout during Periods of Low Reservoir Elevation (Objective 4)

During the implementation of the WBTMMP from 2004-2008, Douglas, through the use of high resolution bathymetric information, hydraulic and elevation data, and backwater curves, identified potential bull trout entrapment and stranding areas in the Wells Reservoir. Although no stranded bull trout were observed in these areas during the implementation of the WBTMMP, Douglas will continue to investigate potential entrapment or stranding areas for bull trout through periodic monitoring when periods of low reservoir elevation expose identified sites. During the first five years of the new license, Douglas will implement up to five bull trout entrapment/stranding assessments during periods of low reservoir elevation (below 773’ MSL).

If no incidences of bull trout stranding are observed during the first five years of study, additional assessment will take place every fifth year during the remainder of the license term, unless waived by the Aquatic SWG. If bull trout entrapment and stranding result in take in exceedance of the authorized incidental take level, then reasonable and appropriate measures will be implemented by Douglas, in consultation with the Aquatic SWG, to address the impact.

4.5 Participate in the Development and Implementation of the USFWS Bull Trout Recovery Plan (Objective 5)

4.5.1 Monitoring Other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout

Douglas will monitor activities associated with the implementation of other Aquatic Resource Management Plans (white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality) and Predator Control Program that may result in the incidental capture and take of bull trout. If the incidental take of bull trout is exceeded due to the implementation of other Aquatic Resource Management Plan activities, then Douglas will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take. If the incidental take of bull trout is exceeded due to the implementation of the Predator Control Program, then Douglas will develop a plan, in consultation with the HCP Coordinating Committee and the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

4.5.2 Funding Collection of Tissue Samples and Genetic Analysis

Beginning in year 10 of the new license, and continuing every 10 years thereafter for the term of the new license, Douglas will, if recommended by the Aquatic SWG, collect up to 10 adult bull trout tissue samples in the Wells Dam fishway facilities over a period of one year and fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the bull trout radio-telemetry monitoring study. Samples will be submitted to the USFWS Central Washington Field Office in Wenatchee, Washington. Any sub-adult bull trout collected during these activities will also be incorporated into the bull trout genetic analysis.

Beginning in year one of the new license, Douglas will collect up to 10 adult bull trout tissue samples from the Twisp River brood stock collection facility over a period of one year and will fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the Off-Project bull trout radio-telemetry monitoring study.

4.5.3 Information Exchange and Regional Monitoring Efforts

Douglas will continue to participate in information exchanges with other entities conducting bull trout research and regional efforts to explore availability of new monitoring methods and coordination of radio-tag frequencies for bull trout monitoring studies in the Project.

Douglas will make available an informational and educational display at the Wells Dam Visitor Center to promote the conservation and recovery of bull trout in the Upper Columbia River and associated tributary streams.

4.6 Identify Any Adverse Impacts of Project-related Hatchery Operations on Adult and Sub-adult Bull Trout (Objective 6)

4.6.1 Bull Trout Monitoring During Hatchery Activities

During the term of the new license, Douglas shall monitor hatchery actions (e.g., salmon trapping, sturgeon brood stocking and capture activities) that may encounter adult and sub-adult bull trout for incidental capture and take. Actions to be monitored shall be associated with the Wells Hatchery, the Methow Hatchery, and any future facilities directly funded by Douglas.

If the incidental take of bull trout is exceeded due to Douglas's hatchery actions then Douglas will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

4.7 USFWS Section 7 Consultation

The PMEs contained within the BTMP were specifically developed, in consultation with the USFWS, to address potential Reasonable and Prudent Measures (RPMs) for the Project relicensing and associated section 7 consultation. All of the FWS's potential RPMs for the Wells Project can be found in Appendix A. Each of these RPMs has been cross referenced with the specific supporting objective and PME (Sections 4.1 - 4.6) found within the BTMP. The purpose of Appendix A is to provide consistency with Douglas PUD's Aquatic Settlement Agreement and the FWS' subsequent section 7 consultation on the relicensing of the Wells Project.

4.8 Reporting

Douglas will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the BTMP. The report will document all bull trout activities conducted within the Project and describe activities proposed for the following year. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this BTMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

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APPENDIX A

CROSS REFERENCED UNITED STATES FISH AND WILDLIFE SERVICE (USFWS) REASONABLE AND PRUDENT MEASURES (RPMS) WITH WELLS BULL TROUT MANAGEMENT PLAN (BTMP) OBJECTIVES AND SUPPORTING PROTECTION, MITIGATION AND ENHANCEMENT MEASURES (PMES)

<u>FWS RPM 1</u>: FERC shall require Douglas PUD, in coordination with the Service, to provide adequate year-round passage conditions for all life history stages of bull trout at all Project facilities.

Associated BTMP Objectives and PMEs:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP (Section 4.1).

> PME: Provide Upstream and downstream Passages for Adult and Sub-Adult Bull Trout (Section 4.1.1).
>
> PME: Upstream Fishway Counts (Section 4.1.2).
>
> PME: Upstream Fishway Operations Criteria (Section 4.1.3).
>
> PME: Bypass Operations Criteria (Section 4.1.4).

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage (Section 4.2).

> PME: Adult Bull Trout Upstream and Downstream Passage Evaluation (Section 4.2.1).
>
> PME: Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities (Section 4.2.2).
>
> PME: Sub-Adult Bull Trout Monitoring (Section 4.2.3).

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate effectiveness of these measures.

<u>FWS RPM 2.</u> FERC shall require Douglas PUD, in coordination with the Service, to minimize the effect of spillway operations and hydrographic variation to all life history stages of bull trout at all Project facilities.

Associated BTMP Objectives and PMEs:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP (Section 4.1).

> PME: Provide Upstream and downstream Passages for Adult and Sub-Adult Bull Trout (Section 4.1.1).
>
> PME: Upstream Fishway Operations Criteria (Section 4.1.3).
>
> PME: Bypass Operations Criteria (Section 4.1.4).

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate effectiveness of these measures (Section 4.3).

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations (Section 4.4).

<u>FWS RPM 3.</u> FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the Hatchery Supplementation Program to all life stages of bull trout.

Associated BTMP Objectives and PMEs:

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage (Section 4.2).

> PME: Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities (Section 4.2.2).

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult bull trout.

> PME: Bull Trout Monitoring During Hatchery Activities (Section 4.6.1).

FWS RPM 4. FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the other Aquatic Resource Management Plans and Predator Control Program to all life stages of bull trout.

Associated BTMP Objectives and PMEs:

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan, including information exchange and genetic analysis (Section 4.5).

> PME: Monitor other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout (Section 4.5.1).

FWS RPM 5. FERC shall require Douglas PUD, in coordination with the Service, to design and implement a bull trout monitoring program that will adequately detect and quantify Project impacts. This information will reduce uncertainty regarding Project impacts over the life of the project and shall be used to modify Project operations to the extent practicable to further minimize the manner or extent of take.

Associated BTMP Objectives and PMEs:

Refer to Wells Bull Trout Management Plan in its entirety.

Additional PMEs Proposed in the BTMP (not listed above):

> PME: Funding Collection of Tissue Samples and Genetic Analysis (Section 4.5.2).
> PME: Information Exchange and Regional Monitoring Efforts (section 4.5.3).

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ATTACHMENT D: PACIFIC LAMPREY MANAGEMENT PLAN

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PACIFIC LAMPREY MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

September 2009

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

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EXECUTIVE SUMMARY

The Pacific Lamprey Management Plan (PLMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans, but declined because its interests are currently satisfied by the measures within the HCP.

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey (*Lampetra tridentata*) resulting from the Project during the term of the new license. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several Pacific lamprey PMEs in support of the PLMP. The PMEs presented within the PLMP are designed to meet the following objectives:

Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific lamprey;

Objective 2: Identify and address any Project-related impacts on downstream passage and survival and rearing of juvenile Pacific lamprey;

Objective 3: Participate in the development of regional Pacific lamprey conservation activities.

The PLMP is intended to be compatible with other Pacific lamprey management plans in the Columbia River mainstem. Furthermore, the PLMP is intended to be supportive of the HCP, the critical research needs identified by the Columbia River Basin Technical Working Group, the Resident Fish Management Plan, Bull Trout Management Plan, and White Sturgeon Management Plan by continuing to monitor and address ongoing impacts, if any, on Pacific lamprey resulting from Project operations. The PLMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under Washington state water quality standards found at WAC 173-201A.

1.0 INTRODUCTION

The Pacific Lamprey Management Plan (PLMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The PLMP will direct implementation of measures to protect against and mitigate for potential Project impacts on Pacific lamprey (*Lampetra tridentata*). To ensure active stakeholder involvement and support, Douglas developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management of Pacific lamprey in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies the goal and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for Pacific lamprey during the term of the new license.

2.0 BACKGROUND

2.1 Pacific Lamprey Biology

Pacific lamprey are present in most tributaries of the Columbia River and in the mainstem Columbia River during their migration stages. They have cultural, utilitarian and ecological significance in the basin, because Native Americans have historically harvested them for subsistence, ceremonial and medicinal purposes (Close et al. 2002). As an anadromous species, they also play an important role in the food web by contributing marine-derived nutrients to the basin and may act as a predatory buffer for juvenile salmon and steelhead. Little specific information is available on the life history or status of lamprey in the mid-Columbia River watersheds. They are known to occur in the Methow, Wenatchee and Entiat rivers (NMFS 2002) and recently have been captured during juvenile salmon and steelhead trapping operations in the Okanogan River.

In general, adults are parasitic on fish in the Pacific Ocean while ammocoetes (larvae) are filter feeders that inhabit the fine silt deposits in backwaters and quiet eddies of streams (Wydoski and Whitney 2003). Adults generally spawn in low-gradient stream reaches in the tail areas of pools and in riffles, over gravel substrates (Jackson et al. 1997). Adults die after spawning. After hatching, the ammocoetes burrow into soft substrate for an extended larval period filtering particulate matter from the water column (Meeuwig et al. 2002). The ammocoetes undergo a metamorphosis into macrophthalmia (outmigrating juvenile lamprey) between 3 and 7 years after hatching, and then migrate from their parent streams to the ocean (Close et al. 2002). Adults typically spend 1-4 years in the ocean before returning to freshwater tributaries to spawn.

Pacific lamprey populations of the Columbia River have generally declined in abundance over the last 40 years according to counts at dams on the lower Columbia and Snake rivers (Close et al. 2002). Starke and Dalen (1995) reported that adult lamprey counts at Bonneville Dam regularly exceeded 100,000 fish in the 1960s and more recently have ranged between 20,000 and 120,000 for the period 2000-2004 (DART - www.cqs.washington.edu/dart/adult.html).

In the mid-Columbia River Basin, adult lamprey count data at hydroelectric projects varies by site but is generally available for all projects since 1998 (with the exception of Wanapum Dam where data is only available for 2007). As is expected, the general trend for mid-Columbia River counts is relatively consistent with observations at Bonneville Dam from year to year (i.e., relatively high count years at Bonneville result in relatively high count years in the mid-Columbia River). It is important to note that the daily and seasonal time periods as well as the counting protocols may differ at each project. These differences may affect data reliability and need to be considered when examining and comparing these data. Table 2.1-1 provides a summary of adult lamprey passage data for mid-Columbia River hydroelectric facilities.

Table 2.1-1. Minimum, maximum, and average counts for adult Pacific lamprey at mid-Columbia River hydroelectric projects from 1998 to 2007.

	Priest Rapids	Wanapum*	Rock Island	Rocky Reach	Wells
Min	1,130	4,771	559	303	21
Max	6,593	4,771	5,074	2,583	1,417
Average	3,016	4,771	2,157	952	326

* Wanapum Dam counts are only available for 2007.

Close et al. (1995, 2002) identified several factors that may account for the decline in lamprey counts in the Columbia River Basin. This includes reduction in suitable spawning and rearing habitat from flow regulation and channelization and pollution, reductions of prey in the ocean, and juvenile and adult passage problems at dams. Mesa et al. (2003) found that adult Pacific lamprey had a mean critical swimming speed of approximately 85 cm/s which suggests that they may have difficulty negotiating fishways with high current velocities that were designed for salmon and steelhead passage.

The study of adult Pacific lamprey migration patterns past dams and through reservoirs in the lower Columbia River has provided the first data sets on lamprey passage timing, travel times, and passage success at hydroelectric projects (Vella et al. 2001; Ocker et al. 2001; Moser et al. 2002a; Moser et al. 2002b). These studies have shown that approximately 90% of the radio-tagged lamprey released downstream of Bonneville Dam migrated back to the tailrace below Bonneville Dam; however, less than 50% of the lamprey which encountered a fishway entrance actually passed through the ladder exit at the dam (Nass et al. 2005).

Similar collection and passage efficiency results were observed at Rocky Reach, Wanapum, and Priest Rapids dams during tagging studies conducted at those projects (Nass et al. 2003; Stevenson et al. 2005).

Of the 125 radio-tagged lampreys released approximately 7 kilometers downstream of Rocky Reach Dam, 93.6% were detected at the project, and of those fish, 94.0% entered the fishway. Of the fish that entered the Rocky Reach fishway, 55.5% exited the ladder (Stevenson et al. 2005).

During studies at Wanapum and Priest Rapids dams, a total of 51 and 74 lamprey were radio-tagged and released downstream of Priest Rapid Dam in 2001 and 2002, respectively. Over the two years of study, the proportion of fish that approached the fishway that exited the ladders was 30% and 70% at Priest Rapids and 100% and 51% at Wanapum Dam in 2001 and 2002, respectively (Nass et al. 2003).

Two recent reviews of Pacific lamprey (Hillman and Miller 2000; Golder Associates Ltd. 2003) in the mid-Columbia River have indicated that little specific information is available regarding their population status (Stevenson et al. 2005).

2.2 Status of Pacific Lamprey

In January 2003, the USFWS received a petition from 11 environmental groups seeking the listing of four lamprey species (Pacific lamprey, river lamprey, western brook lamprey, and Kern brook lamprey). The petition cited population declines and said lampreys are threatened by artificial barriers to upstream and downstream migration, de-watering and habitat degradation among other threats. In response to the petition, the USFWS conducted an initial review to determine whether an emergency listing was warranted and decided in March 2003 that such a situation did not exist.

In an agreement stemming from a lawsuit filed by the petitioners in response to the initial finding, the USFWS committed to the issuance of a 90-day finding on the petition by December 20, 2004. Again, the USFWS announced that the petition seeking a listing of the four lamprey species did not contain enough information to warrant further review and the agency was not going to place the lamprey species on the Endangered Species list. For Pacific lamprey, the petitioners provided information showing a drop in range and numbers, but did not provide information describing how the regional portion of the species' petitioned range, or any smaller portion, is appropriate for listing under the Endangered Species Act (ESA). The agency did however decide it will continue to work with others on efforts to gather information related to the conservation of lamprey and their habitats.

2.3 Monitoring and Studies of Outmigrating Juvenile Lamprey (Macrophthalmia)

Little information in the mid-Columbia River basin exists with regard to the outmigration timing and abundance of juvenile Pacific lamprey. Upstream of the Project, recent juvenile salmonid trapping operations by WDFW and the Colville Tribe have provided preliminary information on the presence of juvenile lamprey outmigrants in both the Methow and Okanogan rivers. This information represents incidental captures of juvenile lamprey, and may not be reflective of actual abundance or population trends. In the Okanogan River, information is available for 2006 and 2007 where 220 and 24 juvenile lamprey were observed, respectively, during spring trapping operations. In the Methow River watershed, information is available for two sites; the Twisp and Methow rivers. At the Twisp River site, no juvenile lamprey have been observed since data has been collected (2005). At the Methow River site, for the years 2004-2007, 89, 84, 831, and 37 juvenile lamprey were observed, respectively, in trapping operations that typically last from April to November with peaks generally occurring in the spring. Data collection from these activities is likely to continue and provide information on juvenile Pacific lamprey as they begin their outmigration through the Columbia River hydrosystem towards the Pacific Ocean.

Although there is a growing body of information on adult Pacific lamprey and their interactions at hydroelectric projects, relatively little information exists describing the effects of hydroelectric plant operations on outmigrating juvenile lamprey (macrophthalmia). Recent juvenile lamprey studies at hydroelectric projects have addressed testing for lamprey macrophthalmia survival through juvenile bypass facilities (Bleich and Moursund 2006), impingement at intake diversion screens (Moursund et al. 2000 and 2003), validation of existing screening criteria (Ostrand 2005), and responses of juvenile Pacific lamprey to simulated turbine passage environments (Moursund et al. 2001; INL 2006). Results of other studies targeting predaceous birds and fish suggest that juvenile lamprey may compose a significant proportion of the diets of these predators (Poe et al. 1991; Merrell 1959).

A review of the recent body of work addressing juvenile lamprey at hydroelectric facilities concludes that there is a current lack of methods and tools to effectively quantify the level of survival for juvenile lamprey migrating through hydroelectric facilities. Furthermore, no studies exist that assign a level of survival attributed to a project's operations. This is due to the lack of miniaturized active tag technologies to overcome two study limitations. Macrophthalmia (juvenile outmigrating lamprey) are relatively small in size and unique in body shape and they tend to migrate low in the water column resulting in the rapid attenuation of active tag signal strength. In an effort to develop a tagging protocol, the Bonneville Power Administration (BPA) funded Oregon State University (OSU) to identify and develop tag technologies for lamprey macrophthalmia. Recent reports on this developmental effort have concluded that the smallest currently available radio-tag was still too large for implantation in the body cavity of a juvenile lamprey (Schreck et al. 2000). Additionally, external application was not effective as animals removed tags within the first week and fish performance was affected. This report also concluded that internal implantation of Passive Integrated Transponder (PIT) tags was the most viable option for tagging juvenile lamprey although this method included severe limitations such as the limited range of detection systems and the ability to tag only the largest outmigrating juvenile lamprey (Schreck et al. 2000).

2.4 Project Adult Pacific Lamprey Counts and Passage Timing

Returning adult Pacific lamprey have been counted at Wells Dam since 1998. Between the years of 1998 and 2007, the number of lamprey passing Wells Dam annually has averaged 326 fish and ranged from 21 fish in 2006 to 1,417 fish in 2003 (Table 2.3-1). In addition to the overriding condition that Pacific lamprey numbers are declining in the Columbia River system, the relatively small number of adult lamprey observed at Wells Dam may be attributed to fact that the Project is the last of nine passable dams on the mainstem Columbia River and the fact that the Project is over 500 miles upstream from the Pacific Ocean and the bioenergetic expenditure for a relatively poor swimming species such as Pacific lamprey is likely great.

Adult lamprey pass Wells Dam from early July until late November with peak passage times between mid-August and late October (Figures 2.4-1 and 2.4-2). In all years since counting was initiated, Pacific lamprey counts at the east fish ladder were greater than at the west fish ladder except for 2007. It is important to note that historically, counting protocols were designed to assess adult salmonids and did not necessarily conform to lamprey migration behavior (Moser and Close 2003). Traditional counting times for salmon did not coincide with lamprey passage activity which occurs primarily at night; the erratic swimming behavior of adult lamprey also makes them inherently difficult to count (Moser and Close 2003). Beamish (1980) also noted that lamprey overwinter in freshwater for one year prior to spawning. Consequently, lamprey counted in one year may actually have entered the system in the previous year (Moser and Close 2003) which confounds annual returns back into the Columbia River Basin. In addition to salmonid-specific counting protocols, adult fishway facilities have been constructed specifically for passage of salmonids. Recent research has identified areas such as picketed lead structures downstream of fish count windows that adult lamprey may access to bypass count stations and avoid being enumerated (LGL 2008). It is unknown to what degree lamprey behavior and methodological and structural concerns are reflected in Columbia River lamprey passage data. However, it is important to consider such caveats when examining historic lamprey count data at Columbia River dams including Wells Dam.

Table 2.4-1 Adult Pacific lamprey counts at Wells Dam for east and west fish ladders, 1998-2007.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
East	174	47	96	153	226	724	263	151	13	17
West	169	26	59	106	117	694	140	64	8	18
Total	343	73	155	259	343	1418	403	215	21	35

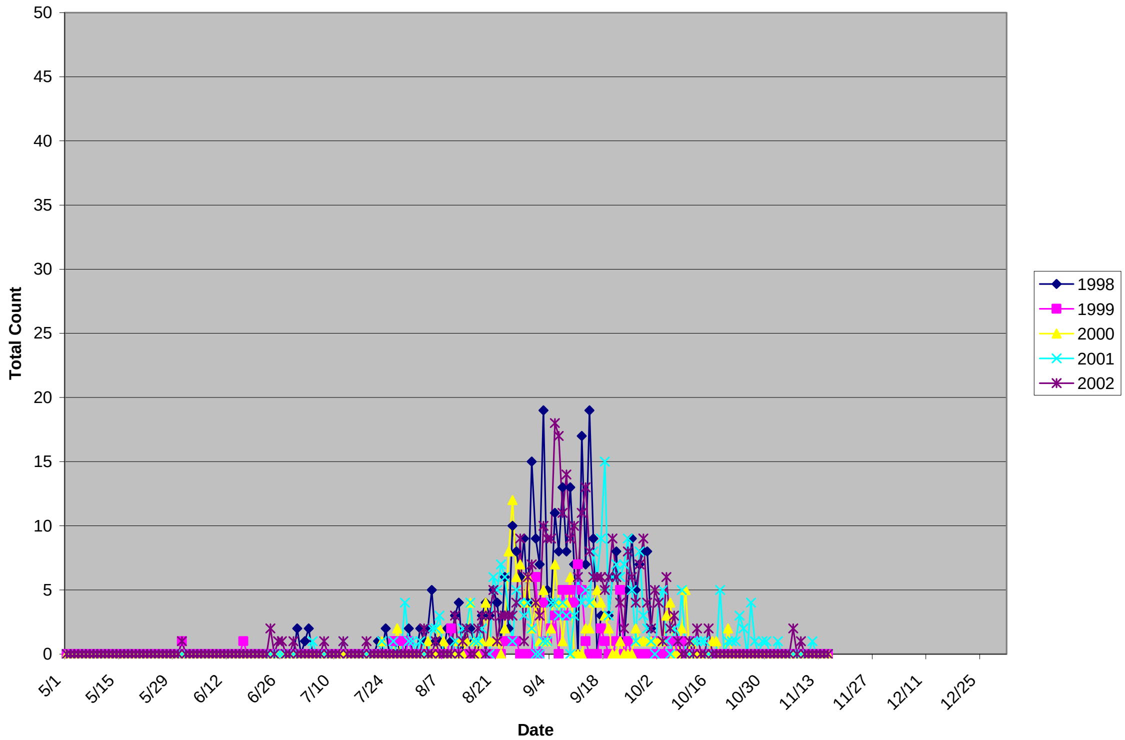

Figure 2.4-1 **Daily counts of adult Pacific lamprey at Wells Dam during the fish counting season, 1998-2002.**

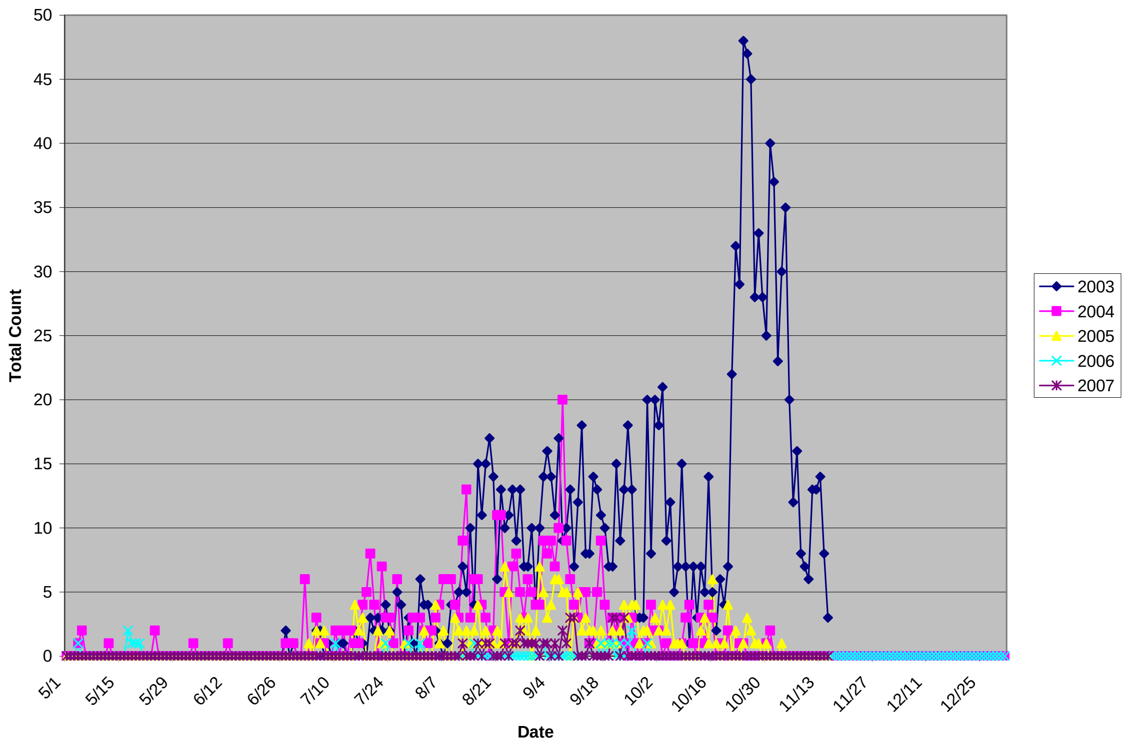

Figure 2.4-2 **Daily counts of adult Pacific lamprey at Wells Dam during the fish counting season, 2003-2007.**

2.5 Project Pacific Lamprey Studies

Until recently, relatively little information was available on Pacific lamprey in the mid-Columbia River Basin. However, with increased interest in the species coupled with a petition for listing under the ESA (Section 2.2), Douglas has initiated studies to address Pacific lamprey passage and migratory behavior in the Project consistent with currently available technology.

2.5.1 2001-2003 Project Pacific Lamprey Study

In 2004, Douglas contracted with LGL Limited to conduct a lamprey radio-telemetry study at Wells Dam in coordination with Chelan PUD, which was conducting a similar study at Rocky Reach Dam. A total of 150 lamprey were radio-tagged and released at or below Rocky Reach Dam. The radio-tags used in this study had an expected operational life of 45 days (Nass et al. 2005). It is important to note that as a result of the lamprey release site being located over 50 miles downstream of Wells Dam, the value of the study results for the Project was limited by the relatively small numbers of tagged fish detected upstream at Wells (n=18) and the fact that many of the radio-tags detected at Wells Dam were within days of exceeding their expected battery life.

The 2004 study at Wells Dam was implemented through a combination of fixed-station monitoring at the dam and fixed-stations at tributary mouths. Collectively, these monitoring sites were used to determine migration and passage characteristics of lamprey entering the Project Area. Of the 150 adult lamprey released at or below Rocky Reach in 2004, 18 (12% of 150) were detected in the Wells Dam tailrace, and ten (56% of 18) of these were observed at an entrance to the fishways at Wells Dam. A total of 3 radio-tagged lamprey passed Wells Dam prior to expiration of the tags, resulting in a Fishway Efficiency estimate of 30% (3 of 10) for the study period. A single lamprey was detected upstream of Wells Dam at the mouth of the Methow River (Nass et al. 2005).

For lamprey that passed the dam, the majority (92%) of Project Passage time was spent in the tailrace. Median time required to pass through the fishway was 0.3 d and accounted for 8% of the Project Passage time (Nass et al. 2005).

Although the 2004 study at Wells Dam provided preliminary passage and behavioral information for migrating adult lamprey, the limited observations due to the small sample size (n=18) were insufficient in addressing the objectives of the 2004 study.

2.5.2 2007-2008 Project Pacific Lamprey Study

In 2007, Douglas contracted with LGL Limited to conduct a second lamprey radio-telemetry study at Wells Dam. The study was scheduled to occur from early August through November and utilized tags that had 87 days of battery life. A total of 21 adult lamprey were tagged and released for the purpose of this study. However, due to very low adult lamprey returns to Wells Dam in 2007 (n=35) and low trapping efficiency, only 6 adult Pacific lamprey were captured at Wells Dam during trapping activities (August 14 to October 3). Therefore, 15 additional adult lamprey were collected at Rocky Reach Dam, transported to Wells Dam, tagged and released. The project was continued in 2008 to obtain additional information.

A comprehensive report was produced in February of 2009 containing the results from the two-year radio-telemetry behavior studies (Robichaud et al. 2009). Results indicated that the "greatest impediment to successful passage of adult lamprey at Wells Dam appears to be the conditions at the fishway entrance, probably related to water velocities that limit swimming and attachment capabilities." An equally significant impediment to successful passage of adult lamprey at Wells Dam in 2008 was the installation of perforated plates on the floor of the weir orifices in an effort to increase trapping efficiency. Robichaud et al. further recommended the following:

- Implement a reduction in fishway head differential to reduce entrance velocities to levels within the swimming capabilities of Pacific lamprey (0.8 to 2.1 m/s). These proposed flow reductions should be restricted to hours of peak lamprey activity (i.e., nighttime) and within their primary migratory period at Wells Dam (August-September).
- Remove perforated plates from orifice floors at the current trapping locations and discontinue trapping efforts at Wells Dam.
- Consider using monitoring tools that are less intrusive, do not require the collection of fish from the ladders at Wells Dam, and minimize the surgical implantation of tags in fish that are nearing their physiological limits.

2.5.3 2009 Pacific Lamprey Ladder Modification Study

In response to Robichaud et al. (2009), Douglas PUD, in consultation with the Aquatic SWG, prepared a plan to implement and evaluate measures to enhance passage of adult Pacific lamprey at Wells Dam (Murauskas and Johnson, 2009). These measures, originally scheduled for year two after license issuance (2013), were designed to determine whether temporary velocity reductions at the fishway entrances would enhance the attraction and relative entrance success of adult lamprey at Wells Dam. Three alternative entrance flow velocities (i.e., existing high, moderate, and low) will be assessed using Dual-frequency Identification Sonar (DIDSON) in a randomized block design during the fall of 2009. The goal is to identify optimal hydraulic conditions conducive to entry of adult lampreys into the fishways at Wells Dam.

3.0 GOALS AND OBJECTIVES

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Project during the term of the new license. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several Pacific lamprey PMEs in support of the PLMP. The PMEs presented within the PLMP are designed to meet the following objectives:

Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific lamprey;

Objective 2: Identify and address any Project-related impacts on downstream passage and survival, and rearing of juvenile Pacific lamprey;

Objective 3: Participate in the development of regional Pacific lamprey conservation activities.

The PLMP is intended to be compatible with other Pacific lamprey management plans in the Columbia River mainstem. Furthermore, the PLMP is intended to be supportive of the HCP, the critical research needs identified by the Columbia River Basin Technical Working Group, the Resident Fish Management Plan, Bull Trout Management Plan, and White Sturgeon Management Plan by continuing to monitor and address ongoing impacts, if any, on Pacific lamprey resulting from Project operations. The PLMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under Washington state water quality standards found at WAC 173-201A.

The schedule for implementation of specific measures within the PLMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

Douglas, in consultation with the Aquatic SWG, will implement PMEs for Pacific lamprey in the Project consistent with the goals and objectives identified in Section 3.0. The measures proposed in this section are intended to serve as PMEs for Pacific lamprey throughout the new license term.

4.1 Adult Pacific Lamprey Passage (Objective 1)

4.1.1 Upstream Fishway Operations Criteria

Douglas shall operate the upstream fishways at Wells Dam in accordance with criteria outlined in the HCP. Based upon information collected from activities conducted in Sections 4.1.3 - 4.1.7, Douglas, in consultation with the Aquatic SWG and the HCP Coordinating Committee, may evaluate various operational and structural modifications to the upstream fishways (e.g., reduction in fishway flows at night) for the benefit of Pacific lamprey passing upstream through Wells Dam during the new license term. If requested, the Aquatic SWG shall develop an Operations Study Plan (OS Plan) that specifically identifies all operational modifications to be evaluated, the proposed monitoring strategy, implementation timeline and criteria for success. The plan shall include a component to evaluate the effects of lamprey modifications on salmon. Upon completion of the evaluation, the Aquatic SWG, in consultation with the HCP Coordinating Committee, will determine whether the proposed modifications should be made permanent, removed, or modified.

4.1.2 Salvage Activities During Ladder Maintenance Dewatering

Douglas shall continue to implement the Adult Fish Passage Plan and associated Adult Ladder Dewatering Plan as required by the HCP. These plans include practices and procedures utilized during fishway dewatering operations to minimize fish presence in the fish ladders and then once dewatered directs Douglas staff to remove stranded fish and safely place them back into the

Columbia River. All fish species, including Pacific lamprey that are encountered during dewatering operations are salvaged consistent with the protocol identified in the HCP. Any adult lamprey that are captured during salvage activities will be released upstream of Wells Dam, unless otherwise determined by the Aquatic SWG. Douglas will coordinate salvage activities with the Aquatic SWG and allow for member participation. Douglas will provide a summary of salvage activities in the annual report.

4.1.3 Upstream Fishway Counts and Alternative Passage Routes

Douglas shall continue to conduct annual adult fish passage monitoring in the Wells Dam fishways using the most current technology available, to count and provide information on upstream migrating adult Pacific lamprey 24-hours per day during the adult fishway monitoring season (May 1- November 15). Based upon information collected from activities conducted in Sections 4.1.6 - 4.1.7, Douglas, in consultation with the Aquatic SWG, may choose to address the use of alternative upstream passage routes around Wells Dam fishway counting stations by adult Pacific lamprey. Potential measures to improve counting accuracy, following consultation and approval of the Aquatic SWG, may include, but may not be limited to, the development of a correction factor based upon data collected during passage evaluations (Sections 4.1.6 and 4.1.7) or utilization of an alternative passage route as a counting facility for adult Pacific lamprey.

4.1.4 Upstream Passage Improvement Literature Review

If additional passage improvement measures are deemed necessary by the Aquatic SWG, then within six months after this determination, Douglas, in consultation with the Aquatic SWG, shall complete a literature review on the effectiveness of upstream passage measures (i.e., lamprey passage systems, plating over diffuser grating, modifications to orifices, rounding sharp edges, fishway operational changes, etc.) implemented at other Columbia and Snake river hydroelectric facilities. The literature review will be conducted in support of activities identified in Section 4.1.5 to help in the selection of reasonable measures that may be implemented to improve adult lamprey passage at Wells Dam.

4.1.5 Fishway Modifications to Improve Upstream Passage

If additional passage improvement measures are deemed necessary by the Aquatic SWG, based upon the results of studies conducted at Wells Dam, then within one year or as soon as practicable following consultation with the Aquatic SWG, Douglas shall identify, design and implement any reasonable upstream passage modifications (structural and/or operational). Passage measures will be designed to improve passage performance by providing safe, effective, and volitional passage for Pacific lamprey through the Wells Dam fishways without negatively impacting the passage performance of adult anadromous salmonids. The following components shall be included in these passage measures:

- Fishway Inspection: Within one year of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas shall conduct a fishway inspection with the Aquatic SWG and regional lamprey passage experts to identify and prioritize measures to improve adult lamprey passage and enumeration at Wells

Dam. Additional ladder inspections will be conducted at the request of the Aquatic SWG, consistent with winter ladder dewatering operations.

- Entrance Efficiency: Within one year of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas shall develop a Lamprey Entrance Efficiency Plan (LEE Plan) for evaluating operational and physical ladder entrance modifications intended to create an environment at the fishway entrances that are conducive to adult lamprey passage without significantly impacting the passage of adult salmonids. These improvements shall be evaluated until compliance, as described below, is attained.
- Diffuser Gratings: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas shall identify and address, if needed, diffuser gratings within fishways at Wells Dam that adversely affect passage of adult Pacific lamprey.
- Transition Zones: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas shall identify and address, if needed, transition zones within fishways at Wells Dam that adversely affect passage of adult Pacific lamprey.
- Ladder Traps and Exit Pools: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas shall identify and address, if needed, lamprey ladder traps and exit pools within fishways at Wells Dam that adversely affect passage of adult Pacific lamprey.

Douglas shall exhibit steady progress, as agreed to by the Aquatic SWG, towards improving adult lamprey passage until performance at Wells Dam is determined to be similar to other mid-Columbia River hydroelectric dams, or until scientifically rigorous standards and evaluation techniques are established by the Lamprey Technical Workgroup, or its successor, and adopted regionally. The Aquatic SWG will then evaluate, and if applicable and appropriate, adopt these standards for use at Wells Dam. If compliance is achieved, Douglas shall only be required to implement activities pursuant to Section 4.1.7 (Periodic Monitoring) for adult Pacific lamprey passage.

4.1.6 Adult Pacific Lamprey Upstream Passage Evaluation

Should upstream passage measures be implemented under Section 4.1.5, then within one year following the implementation of such measures, Douglas, in consultation with the Aquatic SWG, shall conduct a one-year study to monitor the effectiveness of such measures on upstream passage performance of adult Pacific lamprey through Wells Dam. If monitoring results indicate that passage rates at Wells Dam are not similar to passage rates at other mid-Columbia River dams or within standards as described in Section 4.1.5, Douglas, in consultation with the Aquatic SWG, shall develop and implement additional measures to improve upstream Pacific lamprey passage. Measures described in Sections 4.1.5 and 4.1.6 may be repeated, as necessary, until adult passage through Wells Dam is similar to passage rates at other mid-Columbia River hydroelectric dams or within standards as described in Section 4.1.5.

4.1.7 Periodic Monitoring

Once adult Pacific lamprey upstream passage rates at Wells Dam are similar to rates at other mid-Columbia River dams or within standards as described in Section 4.1.5, Douglas, in consultation with the Aquatic SWG, shall periodically monitor adult Pacific lamprey passage performance through Wells Dam fishways to verify the effectiveness of passage improvement measures. Specifically, every ten years after compliance has been achieved, or as determined by the Aquatic SWG, Douglas shall implement a one-year study to verify the effectiveness of the adult fish ladders with respect to adult lamprey passage. If results of the monitoring program confirm the effectiveness of adult lamprey passage measures and the results indicate that passage rates are still in compliance, then no additional measures are needed. If the results indicate that adult upstream passage rates are out of compliance, then the upstream passage study will be replicated to confirm the results. If the results after two years of study both indicate that passage rates have not been maintained, Douglas, in consultation with the Aquatic SWG, shall develop and implement measures to improve upstream Pacific lamprey passage, if any (see Section 4.1.5).

4.2 Juvenile Pacific Lamprey Downstream Passage and Survival and Rearing (Objective 2)

4.2.1 Downstream Bypass Operations Criteria

Douglas is required to operate the downstream bypass system at Wells Dam in accordance with criteria outlined in the HCP.

4.2.2 Salvage Activities During Ladder Maintenance Dewatering

Douglas shall continue to conduct salvage activities as required by the HCP's Adult Fish Passage Plan during fishway dewatering operations. All fish species, including Pacific lamprey that are encountered during dewatering operations shall be salvaged consistent with the protocol identified in the HCP. Any juvenile Pacific lamprey that are captured during salvage activities will be released downstream of Wells Dam. Douglas will coordinate salvage activities with the Aquatic SWG and allow for member participation. Douglas will provide a summary of salvage activities in the annual report.

4.2.3 Juvenile Pacific Lamprey Passage and Survival Literature Review

Beginning in year five and every five years thereafter during the new license, Douglas, in consultation with the Aquatic SWG, shall conduct a literature review to summarize available technical information related to juvenile lamprey passage and survival through Columbia and Snake river hydroelectric facilities. This information will be used to assess the feasibility of conducting activities identified in Section 4.2.4.

4.2.4 Juvenile Pacific Lamprey Downstream Passage and Survival Evaluation

Based upon the current state of the science regarding tag technology and methodologies for Pacific lamprey macrophthalmia (Section 2.3), coupled with the challenges of obtaining macrophthalmia in sufficient numbers within the Project to meet sample size requirements for a statistically rigorous study, a juvenile downstream passage and survival evaluation is not feasible at this time.

During the term of the new license, if tag technology and methodologies are developed and field tested and a sufficient source of macrophthalmia in or upstream of the Project are identified to ensure that a field study will yield statistically rigorous and unbiased results, Douglas, in consultation with the Aquatic SWG, shall implement a one-year juvenile Pacific lamprey downstream passage and survival study.

If statistically valid study results indicate that Project operations have a significant negative impact on the Pacific lamprey population above the Wells Dam, Douglas, in consultation with the Aquatic SWG, shall identify and implement scientifically rigorous and regionally accepted measures (e.g., translocation, artificial production or habitat enhancement), if any, or additional studies to address such impacts. If operational changes are needed to improve passage survival of juvenile lamprey migrants, then those changes need to be coordinate with the HCP Coordinating Committee.

4.2.5 Juvenile Pacific Lamprey Habitat Evaluation

Within three years of the effective date of the new license, Douglas shall implement a one-year study to examine presence and relative abundance of juvenile Pacific lamprey in habitat areas within the Project that may be affected by Project operations. As part of this measure, Douglas shall identify areas of potential juvenile Pacific lamprey habitat for future evaluation. Sampling of these areas will assess presence/absence and relative abundance. Any sampling methodologies used in support of this activity will require coordination with the HCP Coordinating Committee and regulatory approval of the federal and state agencies.

4.3 Participate in Regional Pacific Lamprey Conservation Activities (Objective 3)

4.3.1 Regional Lamprey Working Groups

Douglas shall participate in Pacific lamprey work groups in order to support regional conservation efforts (e.g., the Pacific Lamprey Technical Work Group and the USFWS Lamprey Conservation Initiative). Activities may include but are not limited to information exchanges with other entities, meeting attendance, and coordination of Douglas' Pacific lamprey activities with other entities conducting lamprey research in the mid-Columbia River. Activities may also include conducting PLMP research within the Project, and sharing that information with other entities.

4.4 Reporting

Douglas will provide an annual report to the Aquatic SWG summarizing the previous year's activities and proposed activities for the following year undertaken in accordance with the PLMP. The report will document all Pacific lamprey activities conducted within the Project and describe activities proposed for the following year. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this PLMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

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ATTACHMENT E: RESIDENT FISH MANAGEMENT PLAN

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RESIDENT FISH MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

August 2008

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

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EXECUTIVE SUMMARY

The Resident Fish Management Plan (RFMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans, but declined because its interests are currently satisfied by the measures within the HCP.

The goal of the RFMP is to protect and enhance native resident fish populations and habitat in the Project during the term of the new license. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several resident fish PMEs in support of the RFMP. The PMEs presented within the RFMP are designed to meet the following objectives:

Objective 1: Continue to provide additional benefits to resident fishery resources in the Project as a result of continued implementation of the HCP, Predator Control Programs and Douglas PUD’s Land Use Policy.

Objective 2: In year 2 and every 10 years thereafter during the new license term, Douglas will conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Project. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species (ANS) Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir. The results of this study may be used to inform the implementation activities of the other Wells aquatic resource management (ANS, bull trout, Pacific lamprey, and white sturgeon) plans and HCP predator control activities.

Objective 3: If any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through implementation of other aquatic resource management plans or activities (white sturgeon, Pacific lamprey, bull trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas.

Objective 4: In response to proposed major changes in Wells Dam operations requiring FERC approval, Douglas will assess the potential effects, if any, on Project habitat functionally related to spawning, rearing, and migration of native resident fish, in order to make informed management decisions towards the success of the RFMP. Douglas will implement reasonable and appropriate measures to address any effects on social, economic, and culturally important native species.

This RFMP is intended to be compatible with other resident fish management plans in the Columbia River mainstem. Furthermore, the RFMP is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan and White Sturgeon Management Plan by continuing to monitor changes, if necessary, in the resident fish assemblage within the Project. The RFMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

1.0 INTRODUCTION

The Resident Fish Management Plan (RFMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The RFMP will direct implementation of measures to protect and enhance native resident fish populations in the Wells Reservoir. To ensure active stakeholder involvement and support, Douglas developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management of native resident fish populations in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for native resident fish during the term of the new license.

2.0 BACKGROUND

2.1 Resident Fish Species

The resident fish assemblage present in the Wells Reservoir is composed of a diverse community of native and introduced, warm and coldwater, and recreational and non-recreational fish species. Since the construction of Wells Dam several studies have either directly (McGee 1979; Beak 1999) or indirectly (Dell et al. 1975; Burley and Poe 1994) addressed the resident fish assemblage in the Wells Reservoir.

2.1.1 Project Resident Fish Assessments

In assessing the occurrence of gas bubble disease in fish in the mid-Columbia River reservoirs, Dell et al. (1975) observed that the most abundant resident fish species in the Wells Reservoir were northern pikeminnow (*Ptychocheilus oregonensis*), stickleback (*Gasterosteus spp.*), and suckers (*Catostomus* spp.). They also determined that mountain whitefish (*Prosopium williamsoni*) and pumpkinseed (*Lepomis gibbosus*) were the most abundant resident game fish, although these two species accounted for less than two percent of the total 32,289 fish sampled. Overall, 27 species of resident and migratory fish were identified in the study area (Table 2.1-1).

In 1993, a one-year study was conducted to determine the relative predation by northern pikeminnow on outmigrating juvenile salmonids and to develop relative predation indices for each of the five mid-Columbia River reservoirs. During the study, incidental catch (species captured other than northern pikeminnow) was high with over 25 fish species recorded and catch dominated by Catostomidae (suckers) (Burley and Poe 1994).

Table 2.1-1 Native and non-native resident fish species that have been documented in the Wells Reservoir from past resident fish assessments, monitoring efforts, and miscellaneous studies (Dell et al. 1975; McGee 1979; Burley and Poe 1994; Beak 1999; NMFS 2002; BioAnalyst, Inc. 2004).

Native Species	Non-Native Species
White sturgeon *Acipenser transmontanus**	Carp *Cyprinus carpio*
Chiselmouth *Acrocheilus alutaceus*	Black bullhead *Ictalurus melas*
Longnose sucker *Catostomus catostomus*	Brown bullhead *Ictalurus nebulosus*
Bridgelip sucker *Catostomus columbianus*	Pumpkinseed *Lepomis gibbosus*
Largescale sucker *Catostomus macrocheilus*	Bluegill *Lepomis macrochirus*
Lake whitefish *Coregonus clupeaformis*	Smallmouth bass *Micropterus dolomieu*
Prickly sculpin *Cottus asper*	Largemouth bass *Micropterus salmoides*
Threespine stickleback *Gasterosteus aculeatus*	Yellow Perch *Perca flavescens*
Burbot *Lota lota*	Black crappie *Pomoxis nigromaculatus*
Peamouth *Mylocheilus caurinus*	Walleye *Stizostedion vitreum*
Rainbow trout *Oncorhynchus mykiss*	Tench *Tinca tinca*
Mountain whitefish *Prosopium williamsoni*	
Northern pikeminnow *Ptychocheilus oregonensis*	
Redside shiner *Richardsonius balteatus*	
Dace Rhinichthys spp.	
Bull Trout *Salvelinus confluentus**	

* Individual management plans for both white sturgeon and bull trout have been developed and as such, they are not addressed in this Resident Fish Management Plan.

McGee (1979) noted that chiselmouth (*Acrocheilus alutaceus*), redside shiners (*Richardsonius balteatus*), and largescale suckers (*Catostomus macrocheilus*) were the most abundant non-game fish captured during Wells Reservoir surveys while pumpkinseed were the most abundant game fish caught. Similar sampling design and methodology to the 1974 study (Dell et al. 1975) were employed in order to ensure that results of the study were comparable with past observations. In total, 2,480 fish were collected during the study using live traps, beach seines and angling.

Twenty of the 27 known species previously trapped in other mid-Columbia reservoirs (Dell et al. 1975) were captured in the Wells Reservoir during the study.

In 1998, Douglas conducted an updated Wells Reservoir resident fish assessment (Beak 1999). Again, an effort was made to implement a sampling design similar to the two previous studies (1974 and 1979) so as to be consistent and allow comparisons with past results. In total, 22 species of fish were identified with 5,657 fish captured using beach seines and 716 fish observed via diving transects. Beak (1999) reported suckers (*Catostomus* spp.) as the most abundant resident fish captured in beach seining sampling in the Wells study area. These species represented 41 percent of the beach seining catch and 46 percent of the underwater dive survey count. Other abundant species in the beach seine catch were bluegill (*Lepomis macrochirus*) (32 percent), northern pikeminnow (10 percent), peamouth (*Mylocheilus caurinus*) (6 percent), and carp (*Cyprinus carpio*) (5 percent). Fifteen other species represented the remaining 7 percent of the total catch of 3,783 fish. Table 2.1-2 ranks the relative abundance of dominant fish species captured in the 1974, 1979, and 1998 Project studies and how species abundance has shifted over time.

Table 2.1-2 Ranking of relative abundance of dominant fish species in the 1974, 1979, and 1998 Wells Reservoir resident fish assessments (Beak 1999).

Species	1974	1979	1998
Largescale sucker *Catostomus macrocheilus*	1	4	1
Redside Shiner *Richardsonius balteatus*	3	3	3
Northern Pikeminnow *Ptychocheilus oregonensis*	2	5	4
Bluegill *Lepomis macrochirus*	16	0	2
Pumpkinseed *Lepomis gibbosus*	11	2	18
Chiselmouth *Acrocheilus alutaceus*	4	1	10

2.1.2 Recreational Fish Species

Kokanee

Landlocked sockeye (*Oncorhynchus nerka*), known as kokanee are a native fish which occur in several lakes in the mid and upper Columbia basins including Lake Wenatchee, Lake Chelan, Lake Osoyoos, and Lake Roosevelt. Although previous resident fish assessments have not detected the presence of this fish species in the Project, anecdotal information exists indicating that low numbers of kokanee may be present in the Project. These fish likely originate from Lake Roosevelt, above Grand Coulee Dam, and during periods of high spring flow are displaced downstream through Grand Coulee and Chief Joseph dams and into the Wells Reservoir.

Largemouth Bass

Largemouth bass (*Micropterus salmoides*) were widely introduced in Washington in the late 1800s (Wydoski and Whitney 2003). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002). They prefer clear water habitat with mud and sand substrates, which is best suited for aquatic vegetation production (Wydoski and Whitney 2003). Little is known about the populations in the Wells Reservoir as they are infrequently captured (Beak 1999; Duke 2001; Burley and Poe 1994).

Mountain Whitefish

Mountain whitefish are assumed to occur in all small-order tributaries to the Methow, Okanogan, Wenatchee and Entiat rivers, and in connecting larger lake systems. They are also believed to occur in the mainstem reservoirs, although their behavior patterns are not known. They mostly inhabit riffles in summer and large pools in winter (Wydoski and Whitney 2003). Spawning typically occurs from October through December, generally in riffles, but also on gravel shoals of lake shores. Mountain whitefish feed primarily on instar forms of benthic aquatic insects, although they also occasionally eat crayfish, freshwater shrimp, leeches, fish eggs and small fish. In lakes, they feed extensively on zooplankton, particularly cladocerans. There is evidence that mountain whitefish still spawn in the lower reaches of some tributaries (NMFS 2002). Mountain whitefish appear to use the Wells Reservoir principally as a migration route between spawning areas in the Methow River and the Wells Dam tailrace (Zook 1983).

Northern Pikeminnow

Northern pikeminnow are a slow-growing, long-lived predator native to the Columbia River basin. In summer, adult northern pikeminnow prefer shallow, low velocity areas in cool lakes or rivers. During the winter, they use deeper water and pools (Scott and Crossman 1973). Spawning occurs during the summer, in shallow water areas with gravel substrate. They tend to concentrate in tailrace areas downstream of mainstem dams during the juvenile salmonid migration period, holding in relatively slow-moving water areas (less than about 3 feet per second) near passage routes (NMFS 2002). Due to their large numbers and distribution throughout the Columbia River basin, northern pikeminnow are considered to pose the greatest predation threat to migrating juvenile anadromous salmonids (NMFS 2002).

Resident Rainbow Trout

Rainbow trout (*Oncorhynchus mykiss*) are an inland (remains in freshwater) form of steelhead. However, some rainbow trout remain in freshwater for most of their life but undergo a physiological change to a smolt and migrate to the ocean late in life. In addition to the potential for rainbow trout to become anadromous, the progeny of steelhead are believed to have the potential to become resident rainbow (Peven 1990). Inland rainbow and juvenile steelhead are not distinguishable from each other until the steelhead undergo smoltification. The mid-Columbia River tributaries contain a mixture of resident rainbow and ocean-migrating steelhead. Resident rainbow trout are likely present in low numbers in the Wells Reservoir. During the 1998 resident fish assessment, rainbow trout consisted of 0.05 percent of the relative catch (Beak 1999).

Smallmouth Bass

Smallmouth bass (*Micropterus dolomieu*) are a non-native game fish that have inhabited the mid-Columbia River reach since at least the 1940s. They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002). Preferred habitat for this species includes rocky shoals, banks, or gravel bars. Adult smallmouth bass in the mid-Columbia River are most abundant around the deltas of warmer tributary rivers. In the Wells Reservoir, smallmouth bass are typically found in the lower Okanogan River and the confluence of the Okanogan and Columbia rivers (Beak 1999). They are also abundant in areas upstream of the mid-Columbia River.

Smallmouth bass were the second most abundant predator species captured in the mid-Columbia River during predator assessment sampling conducted in 1994. They were most frequently captured from forebay sampling sites (Burley and Poe 1994). Similar relative abundance estimates of smallmouth bass were observed in recent sampling programs in other mid-Columbia River reservoirs (Beak 1999; Duke 2001). They are a significant fish predator species in the Columbia River, and prey on juvenile salmonids. In the 1994 predator assessment, fish composed 87 percent of the smallmouth bass diet, with salmonids consisting of 11 percent of the prey fish.

<u>Walleye</u>

Walleye (*Stizostedion vitreum*) are a cool-water, piscivorous game fish believed to have moved downstream into the mid-Columbia River reach from a population established for recreational fishing in Lake Roosevelt in the late 1950s (Zook 1983). They were the least abundant predator species captured in the mid-Columbia River in 1994 (Burley and Poe 1994). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002).

Walleye occur throughout the mainstem reservoirs but are not typically found in the tributaries. Although suitable spawning habitat appears to be plentiful in the mid-Columbia River, peak summer temperatures in this section of river are suboptimal and appear to restrict the recruitment of subyearling walleye to the yearling age class (Zook 1983). Recruitment of walleye into the mid-Columbia River reservoirs is suspected to result from the entrainment of young fish through Grand Coulee Dam during spring run-off (Zook 1983).

2.1.3 Other Resident Species

Resident, non-recreational species make up the bulk of the standing crop of fish in the Wells Reservoir. Many of these species are native to the Wells Reservoir, including burbot (*Lota lota*), chiselmouth, peamouth chub, redside shiner, largescale sucker, bridgelip sucker (*C. columbianus*), longnose sucker (*C. catostomus*), lake whitefish (*Coregonus clupeaformis*), Prickly sculpin (*Cottus asper*), threespine stickleback (*Gasterosteus aculeatus*), and dace species (*Rhinichthys spp.)*(See Table 2.1-1). Currently, no management actions or active fisheries for these species occur.

2.2 Resident Fish Habitat

2.2.1 Spawning habitat

Objectives of past resident fish studies (McGee 1979; Zook 1983; Beak 1999) did not specifically address spawning habitat but rather focused on species diversity, relative abundance and spatial distribution. Therefore, little information exists about the location and availability of spawning habitat for resident fish species in Project waters. It is likely that some resident fish species (cyprinids, catostomids, cottids) that spend their entire lives in Project waters utilize areas of the Wells Reservoir, tailrace, and lower tributaries (Methow and Okanogan rivers) to reproduce while other resident species, although present in the Wells Reservoir, utilize areas outside of the Project Boundary. Zook (1983) in his review of resident fish in the Wells Reservoir, hypothesized that some resident species such as mountain whitefish, rainbow trout, and walleye, although present, may not be successfully reproducing. Zook's review (1983) suggests that resident rainbow trout are primarily a product of residualism of hatchery-produced steelhead and that mountain whitefish appear to use the Wells Reservoir principally as a migration route between spawning areas in the Methow River and the Wells Tailrace. The report also suggests that walleye populations in the Wells Reservoir are recruited from the Lake Roosevelt population that was introduced in the late 1950s. The report also states that although spawning habitat appears to be available, evidence of successful reproduction has not been observed (Zook 1983).

Northern pikeminnow control efforts have been implemented at the Wells Reservoir starting in 1995. Part of these efforts included the identification of known spawning locations through the use of radio-telemetry. Based upon results of this study, northern pikeminnow spawning habitat is located in the Wells Reservoir near Park Island, near river mile (RM) 1.5 on the Methow River and in the Wells tailrace immediately downstream of the east bank fish ladder (Bickford and Skillingstad 2000).

2.2.2 Rearing habitat

Past resident fish surveys (McGee 1979; Beak 1999) observed significant spatial trends in species distribution within the Wells Reservoir. Both McGee (1979) and Beak (1999) noted that in general, spiny ray species (centrarchids) were most abundant between RM 530 and RM 540 and in the lower Okanogan River portion of the Project. This unique area of the Wells Reservoir is shallow and broad with slower water velocities, finer substrate, warmer water temperatures, and higher turbidity (Beak 1999) and is conducive to rearing spiny ray fish species while excluding more streamlined fish that prefer fast flowing water. Both surveys also found that the more streamlined resident fish species, such as chiselmouth and redside shiner (cyprinids), were most abundant downstream of RM 530 where water velocities increased, turbidity decreased, and the amount of shallow littoral habitat decreased. Other resident fish such as various sucker species and white sturgeon are most likely distributed throughout the Wells Reservoir but reside and feed at depths near the river bottom. Migratory, cold water species such as bull trout and whitefish spawn outside of the Wells Reservoir and it is likely that the majority of juvenile fish of these species rear in tributary habitats. Sub-adult bull trout, however, have been observed passing over other mid-Columbia River dams and recent studies suggest that bull trout forage for resident species present in the Wells Reservoir (BioAnalysts Inc. 2004).

2.3 Management Activities Affecting Resident Fish

2.3.1 Habitat Conservation Plan's Predator Control Program

Section 4.3.3 of the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) includes the requirement that Douglas implement a northern pikeminnow and piscivorous bird harassment and control program to reduce the level of predation upon anadromous salmonids in the mid-Columbia Basin. The northern pikeminnow removal program includes a northern pikeminnow control program, participation in fishing derbies and tournaments and the use of long-line fishing equipment. These efforts are designed to provide an immediate and substantial reduction in the predator populations present within the waters of the Project.

Since efforts were first initiated in 1995, Douglas's northern pikeminnow removal program has captured over 134,000 northern pikeminnow (1995-2006). The continual harvest of northern pikeminnow from these waters will provide additional decreases in predator abundance. Yearly removal efforts will also keep the northern pikeminnow population in a manageable state.

The other component of the predator control program is the implementation of control measures for piscivorous birds. The focus of Douglas's piscivorous bird control program is not removal but hazing and access deterrents. Hazing includes propane cannons, pyrotechnics and the physical presence of hazing staff. Access deterrents include steel wires across the hatchery ponds and tailrace, fencing and covers for hatchery ponds, and electric fencing. When hazing and access deterrents fail, options for removal are also implemented by the US Department of Agriculture (DOA) Animal Control staff hired to conduct the hazing programs.

Although the intent of the predator control program is for the protection of anadromous salmonids, reductions in aquatic and terrestrial predator abundance within the Reservoir may benefit many native resident fish species.

2.3.2 Project Shoreline Management and Land Use Policy

Douglas owns approximately 89 miles of shoreline in fee title and addresses shoreline management issues through the implementation of a strict Land Use Policy that requires formal approval of all land use activities that take place within the Project Boundary. Applications to permit activities such as construction of boat docks, piers, and landscaping are reviewed and considered for approval by Douglas after all required regulatory permits are acquired by the applicant. Additionally, when making land use or related permit decisions on Douglas owned lands that affect habitat within the Project Boundary, Douglas is required by Section 5 of the HCP to notify and consider comments from the HCP signatory parties (Douglas 2002). Shoreline management activities directly related to Project land use benefit resident fish, juvenile anadromous fish, and aquatic invertebrates and plants by minimizing impact in littoral areas within the Project Boundary.

3.0 GOALS AND OBJECTIVES

The goal of the RFMP is to protect and enhance native resident fish populations and habitat in the Project during the term of the new license. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several resident fish PMEs in support of the RFMP. The PMEs presented within the RFMP are designed to meet the following objectives:

Objective 1: Continue to provide additional benefits to resident fishery resources in the Project as a result of continued implementation of the HCP, Predator Control Programs and Doulas PUD's Land Use Policy.

Objective 2: In year 2 and every 10 years thereafter during the new license term, Douglas will conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Project. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species (ANS) Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir. The results of this study may be used to inform the implementation activities of the other Wells aquatic resource management (ANS, bull trout, Pacific lamprey, and white sturgeon) plans and HCP predator control activities.

Objective 3: If any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through implementation of other aquatic resource management plans or activities (white sturgeon, Pacific lamprey, bull trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas.

Objective 4: In response to proposed major changes at Wells Dam requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, on Project habitat functionally related to spawning, rearing, and migration of native resident fish, in order to make informed management decisions towards the success of the RFMP. Douglas will implement reasonable and appropriate measures to address any effects on social, economic, and culturally important native species.

This RFMP is intended to be compatible with other resident fish management plans in the Columbia River mainstem. Furthermore, the RFMP is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, and White Sturgeon Management Plan by continuing to monitor changes, if necessary, in the resident fish assemblage within the Project. This management plan is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

The schedule for implementation of specific measures within the RFMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

In order to fulfill the goal and objectives described in Section 3.0, Douglas, in consultation with the Aquatic SWG, shall develop and implement a resident fish management program that includes the following PMEs.

4.1 Implementation Of Programs that Benefit Resident Fish (Objective 1)

4.1.1 HCP Predator Control Programs

Douglas shall continue to conduct annual predator control activities for northern pikeminnow and avian predators as outlined in the HCP (Douglas 2002). Although implementation of this program is targeted at reducing predation on anadromous species covered by the HCP, it is also anticipated to have direct benefits for resident fish species.

4.1.2 Project Shoreline Management and Land Use Policy

Douglas shall continue to implement the Douglas Land Use Policy which requires approval of all land use activities that take place within the Project Boundary. All permit activities such as construction of boat docks, piers, and landscaping within Project Boundary will be subject to review and approval by Douglas only after the applicant has received all other required regulatory permits, in addition to consideration by the HCP signatory parties and permit review by state and federal action agencies. The intent of the review and approval process captured in the Land Use Policy is to protect aquatic habitats and aquatic species that may be affected by proposed land use activities within the Project.

4.2 Monitoring the Resident Fish Assemblage within the Wells Reservoir (Objective 2)

Douglas shall conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Wells Reservoir. This assessment shall occur in year 2 and every 10 years thereafter during the term of the new license. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir.

In order to maintain comparative assemblage information over time to inform Project resident fish status and trends, methodology for monitoring activities shall remain consistent with the methods described in Beak (1999). Information collected from these monitoring activities may be used to inform the implementation activities of the other Wells aquatic resource management plans and the HCP predator control activities.

4.3 Actions to Address Major Shifts in Native Resident Fish Assemblage (Objective 3)

Based upon information collected during the resident fish status and trends monitoring (Section 4.2), if any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through the implementation of other Aquatic Resource Management Plans or activities (white sturgeon, Pacific lamprey, bull trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas.

4.4 Monitoring in Response to Proposed Changes in Project Operations (Objective 4)

If at any time during the new license term, future changes in Wells Dam operations are proposed that require FERC approval and the Aquatic SWG concludes that either reservoir or tailrace habitat within Project Boundary may be affected with regards to spawning, rearing, and migration (aquatic life designated uses) of native resident fish, an assessment will be implemented to identify potential effects, if any, in order to make informed license decisions. If the results of the assessment identify adverse effects to native resident fish species of social, economic and cultural importance, attributable to such changes in Project operations, then Douglas will consult with the Aquatic SWG to select and implement reasonable and appropriate measures to address such effects.

4.5 Reporting

Douglas will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the RFMP. The report will document all native resident fish activities conducted within the Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this RFMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

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ATTACHMENT F: AQUATIC NUISANCE SPECIES MANAGEMENT PLAN

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AQUATIC NUISANCE SPECIES MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

August 2008

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

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EXECUTIVE SUMMARY

The Aquatic Nuisance Species Management Plan (ANSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The National Marine Fisheries Service (NMFS) was invited to participate in the development of Aquatic Resource Management Plans, but declined because its interests are currently satisfied by the measures within the HCP.

The goal of the ANSMP is to prevent the introduction and/or spread of aquatic nuisance species in Project waters. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several PMEs in support of the ANSMP. The PMEs presented within the ANSMP are designed to meet the following objectives:

Objective 1: Implement best management practices to prevent Eurasian watermilfoil (*Myriophyllum spicatum*) proliferation during in-water (i.e., construction, maintenance, and recreation improvements) improvement activities in the Project.

Objective 2: Continue participation in regional and state efforts to prevent the introduction and spread of aquatic nuisance species. Activities include continued monitoring for the presence of ANS, monitoring bycatch data collected during other aquatic management plan activities, and conducting education outreach within the Project.

Objective 3: In response to proposed changes in the Project requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, with respect to the introduction or proliferation of aquatic nuisance species in the Project to inform management decisions to support success of the ANSMP and will implement reasonable and appropriate measures to address any potential effects.

This ANSMP is intended to be compatible with other aquatic nuisance species management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Water Quality Management Plan by continuing to prevent the introduction and/or spread of aquatic nuisance species in Project waters. The ANSMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies.

1.0 INTRODUCTION

The Aquatic Nuisance Species Management Plan (ANSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama), and Douglas.

The ANSMP will direct implementation of measures to prevent the introduction and/or spread of aquatic nuisance species in Project waters. To ensure active stakeholder participation and support, Douglas developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management and prevention of aquatic nuisance species in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for aquatic nuisance species during the term of the new license.

2.0 BACKGROUND

Nonnative aquatic species may be released or “introduced” into an aquatic environment intentionally or unintentionally. Most often, such species are unable to adapt to their new environments and do not form self-sustaining populations (ANSC 2001). However, if such a species is able to adapt, become established, and thrive, it has the potential to threaten the diversity or abundance of native species and aquatic habitats and may even affect economic resources and human health. Such species are considered aquatic nuisance species or ANS (ANSC 2001).

RCW 77.60.130 defines the term aquatic nuisance species as a “nonnative aquatic plant or animal species that threatens the diversity or abundance of native species, the ecological stability of infested waters, or commercial, agricultural, or recreational activities dependent on such waters" (RCW 2007). Since few natural controls exist in their new habitat, ANS may spread rapidly, damaging recreational opportunities, lowering property values, clogging waterways, impacting irrigation and power generation, destroying native plant and animal habitat, and sometimes destroying or endangering native species (ANSC 2001).

2.1 Aquatic Nuisance Species of Concern

2.1.1 Eurasian Watermilfoil (*Myriophyllum spicatum*)

Eurasian watermilfoil (EWM) is an aquatic plant native to Europe, Asia, northern Africa, and Greenland. It was once commonly sold as an aquarium plant (Ecology 2007). EWM may have been introduced to the North American continent at Chesapeake Bay in the 1880's, although evidence shows that the first collection was made from a pond in the District of Columbia during the fall of 1942. By 1985, EWM had been found in 33 states, the District of Columbia, and the Canadian provinces of British Columbia, Ontario, and Quebec (Ecology 2007). The first documented occurrence of EWM in the State of Washington was in 1965. The source of introduction was most likely from sources in Canada and despite an effort to stop its spread, EWM infestations in Lake Osoyoos, British Columbia spread down through the Okanogan Lakes and into the Okanogan River and the Columbia River in 1974 (Duke 2001).

EWM is extremely adaptable with the ability to thrive in a variety of environmental conditions. It grows in still to flowing waters, can tolerate salinities of up to 15 parts per thousand, grows rooted in water depths from 1 to 10 meters, and can survive under ice (Ecology 2007). Relative to other submersed plants, EWM requires high light, has a high photosynthetic rate, and can grow over a broad temperature range (Ecology 2007). EWM exhibits an annual pattern of growth. In the spring, shoots begin to grow rapidly as water temperatures approach 15 degrees centigrade. When they near the surface, shoots branch profusely, forming a dense canopy (Ecology 2007). Typically, plants flower upon reaching the surface and die back to the root crowns, which sprout again in the spring.

Although EWM can potentially spread by both sexual and vegetative means, vegetative spread is considered the major method of reproduction. During the growing season, the plant undergoes autofragmentation. The plant fragments often develop roots at the nodes before separation from the parent plants. Fragments are also produced by wind and wave action, control harvest activity and boating activities, with each plant fragment having the potential to develop into a new plant (Ecology 2007).

EWM is classified as a class B noxious weed by the Washington State Noxious Weed Control Board (WNWCB 2007). Class B noxious weeds are nonnative plants whose distribution is limited to portions of Washington State. Additionally, EWM has been identified as a nuisance species in the Washington State Aquatic Nuisance Species Management Plan (ANSC 2001). EWM can adversely impact aquatic ecosystems by forming dense canopies that often shade out native vegetation. Monospecific stands of EWM affect aquatic habitat, water quality, can impact power generation and irrigation, and interfere with recreational activities. In Washington, private and government sources spend about $1,000,000 per year on EWM control (Ecology 2007).

2.1.2 Zebra Mussel (*Dreissena polymorpha*) and Quagga Mussel (*Dreissena rostriformis bugensis*)

Zebra and quagga mussels are freshwater, bivalve mollusks that typically have a dark and white (zebra-like) pattern on their shells. They are native to Eurasia and were both introduced into the Great Lakes as a result of ballast water discharge from transoceanic ships that were carrying veligers, juveniles, or adult mussels (USGS 2007). Zebra mussels first invaded North America in the mid-1980s and quagga mussels invaded a few years later in 1989 (USFWS 2007). These two species are closely related with subtle morphological differences. More research is needed on North American quagga mussels to assess ecological differences between the two species, but the practical implications of both species are essentially identical (USFWS 2007). The North American distribution of these species has been concentrated in the Great Lakes region of the U.S. with the zebra mussel distribution also spanning farther into the southern U.S. (Figure 2.1-1). Despite recent measures to prevent their westward expansion, quagga mussels were discovered in the Lake Mead Recreation Area. Populations have subsequently been found throughout the Boulder Basin of Lake Mead (Figure 2.1-1) and in more than a dozen reservoirs serving Southern California (Pam Meacham, pers. comm.).

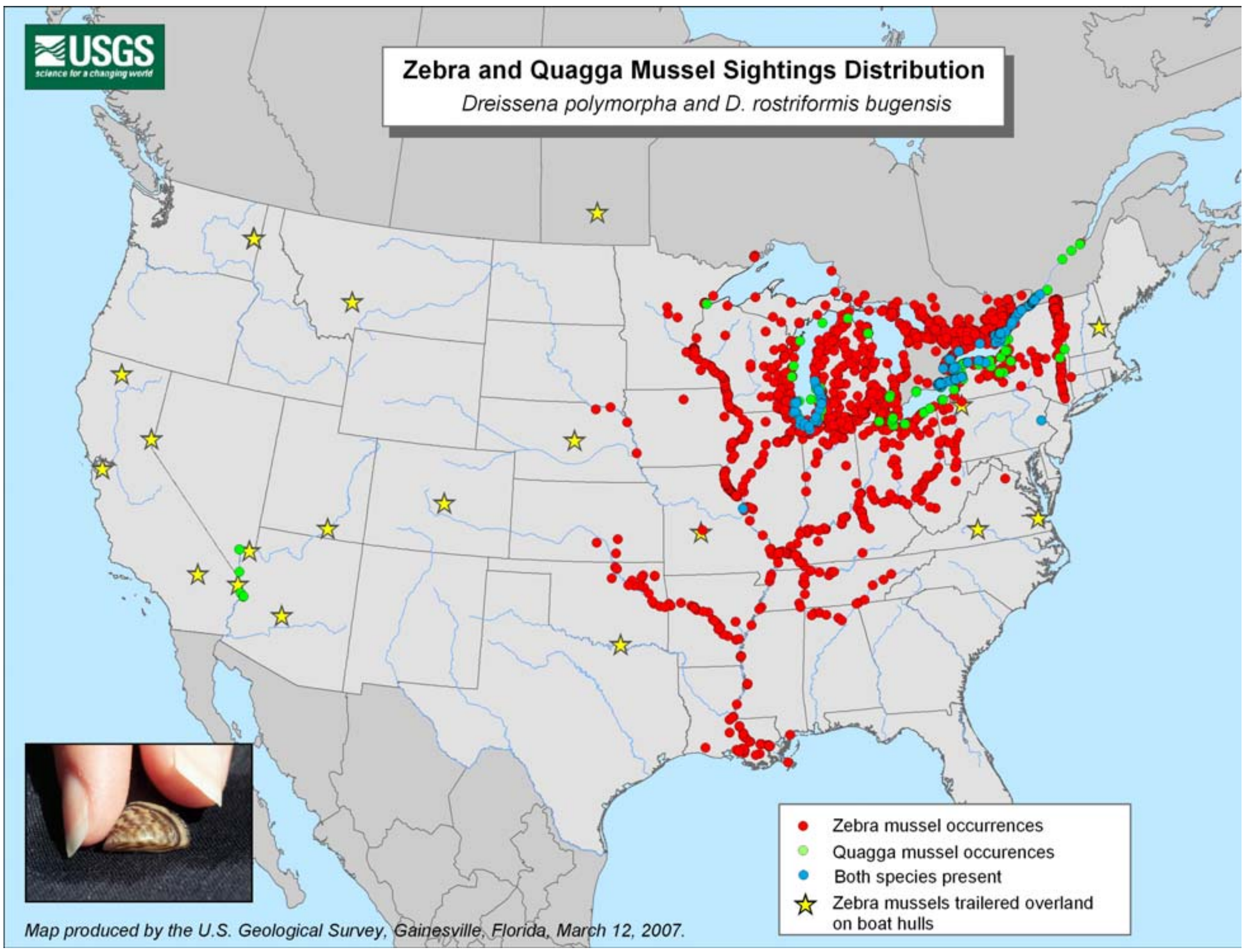

Figure 2.1-1 Zebra and Quagga Mussel Sightings Distribution Map (USGS 2007).

Zebra and quagga mussel size varies from microscopic to two inches long. Typical lifespan is up to 5 years. Both species may spawn year around if conditions are favorable. Peak spawning typically occurs in spring and fall. *Dreissena* are dioecious (either male or female) with external fertilization. Both species are prolific reproducers. Fecundity is high with a few individuals having the capability of producing millions of eggs and sperm (USFWS 2007). After fertilization, pelagic microscopic larvae, or veligers, develop within a few days and these veligers soon acquire minute bivalve shells. Free-swimming veligers drift with currents for three to four weeks until suitable substrate for settling is located. Adults attach to hard surfaces via byssal threads, but can detach and move to new habitat. Both species can tolerate a wide range of water temperatures (1-30°C), low velocities (<2 m/sec), and prefer hard surfaces for attachment although quagga mussels can live in soft sediments (USFWS 2007). Zebra mussels are typically found just below the surface to about 12 meters and quagga mussels are typically found at any depth where oxygen is available (USFWS 2007).

Zebra mussels have caused major ecological and economic problems since their arrival in North America, and quagga mussels pose many of the same threats. Both species are prolific filter feeders, removing substantial amounts of phytoplankton and suspended particulate from the water thus impacting aquatic ecosystems by potentially altering food webs (USGS 2007). *Dreissena's* ability to rapidly colonize hard surfaces causes serious economic problems. These major bio-fouling organisms can clog water intake structures such as pipes and screens, therefore reducing capabilities for power and water treatment plants. Recreation-based industries and activities have also been heavily impacted; docks, breakwalls, buoys, boats, and beaches have all been heavily colonized (USGS 2007). Zebra mussel densities have been reported to be over 700,000 individuals per square meter in some facilities in the Great Lakes area. Each year, the economic impact to the U.S. and Canada is approximately $140 million in damage and control costs (Sea Grant 2007).

2.2 Project Information

Past aquatic studies contributing information to aquatic nuisance species of concern, discussed above, consisted of an aquatic macrophyte species composition and mapping survey (Lê and Kreiter 2005) and a macroinvertebrate assessment and rare, threatened, and endangered (RTE) species survey (Bioanalysts 2006). Results of these studies and other Project aquatic studies indicate that the aquatic ecosystem within the Project is composed of a diverse community of flora and fauna consisting of varied aquatic taxa such as plankton, macroinvertebrates (insects, snails and bivalves), fish, and plants. Although nonnative species are present within Project waters, the aquatic community is characterized by a native species dominated assemblage. It is important to note the varying degree to which a nonnative species can be characterized as a "nuisance" species. The many factors that determine a nonnative species' magnitude of infestation and impact are complex and not always well understood.

2.2.1 Aquatic Macrophytes

Some information exists on aquatic macrophyte communities in the mid-Columbia River system. Vegetation mapping in and around the Rocky Reach Reservoir (River Miles (RM) 473.6 to 515.5) identified 979 acres of aquatic macrophytes (Duke 2001) out of a total surface area of 8,167 acres (Duke 2001). Nonnative EWM represented 34 percent of the biomass samples collected from within the Rocky Reach Reservoir (Duke 2001). In the Priest Rapids and Wanapum reservoirs, the composition of EWM in the aquatic macrophyte community was higher at 42 percent of littoral plant biomass (Normandeau et al. 2000).

In August and September 2005, Douglas conducted an aquatic macrophyte study in the Wells Reservoir. Sixty-one transects totaling 369 sample points were completed during the 2005 study (Lê and Kreiter 2005). Depths of up to 30 feet were sampled and sampling points along transects were completed at intervals of 5 feet or less. A total of nine aquatic plant species were documented (Table 2.2-1). Table 2.2-1 presents the percentage of samples in which each of the identified aquatic species was categorized as the dominant species (consisting of >60 percent of the sample composition). The two most dominant species in samples collected were common waterweed (*Elodea canadensis*) and leafy pondweed (*Potamogeton foliosus*) at 24.7 percent and 16.7 percent, respectively. Both of these species are native. EWM was dominant in only 6.3 percent of samples (Table 2.2-1). Samples with no plants (absent) consisted of 41.7 percent of all samples taken. This observation supports the concept that macrophyte communities maintain a patchy distribution.

Table 2.2-1 Aquatic macrophyte species identified and the frequency at which each of the species was considered the dominant species (consisting of >60 percent of the total sample) in a given sample during the Macrophyte Identification and Distribution Study, 2005 (Lê and Kreiter 2005).

Scientific Name	Common Name	Percentage of samples in which dominant
Chara spp.	Muskgrass	.003% (1/396)
Elodea canadensis	Common waterweed	24.7% (98/396)
Myriophyllum spicatum	Eurasian watermilfoil	6.3% (25/396)
Potamogeton crispus	Curly leaf pondweed	4.3% (17/396)
Potamogeton foliosus	Leafy pondweed	16.7% (66/396)
Potamogeton nodosus	American pondweed	1.3% (5/396)
Potamogeton pectinatus	Sago pondweed	0.8% (3/396)
Potamogeton zosteriformis	Flat-stemmed or eelgrass pondweed	2.3% (9/396)
Absent		41.7% (165/396)

Although EWM is present in the Project, the 2005 study indicated that it is not a dominant component of the Project aquatic plant community. During the Project study, EWM was often sub-dominant to several native species in samples collected. These contrasting observations between the Wells Reservoir and downstream reservoirs (Rocky Reach, Priest Rapids, and

Wanapum) where EWM was found to be the most abundant species are not clearly understood. One possible explanation may be that EWM, which is a species that can proliferate from plant fragments (Ecology 2001), has increased its ability to colonize due to potentially higher levels of disturbance in the downstream reservoirs as compared to the Wells Reservoir. The Rocky Reach Reservoir serves a larger population base, maintains an EWM removal program at recreational sites, and has higher levels of recreational use and development as compared to the Wells Reservoir. It is possible that these activities directly and indirectly re-mobilize EWM plant fragments and increase the potential for colonization in the Rocky Reach Reservoir as well as in downstream reservoirs (Lê and Kreiter 2005).

2.2.2 Aquatic Macroinvertebrates

In September and October 2005, Douglas conducted an aquatic invertebrate inventory and an assessment of the presence of rare, threatened, and endangered (RTE) aquatic invertebrates within the Wells Reservoir. The overall objective of the study was to document the distribution, habitat associations and qualitative abundance of the current aquatic invertebrate (e.g., clams, snails and insects) assemblage in the Wells Reservoir.

Samples were collected within representative habitats throughout the Wells Reservoir using an air lift suction device, Ponar grabs and colonization baskets. A total of 17 sites were sampled. In addition to the varied aquatic insects and worms found during the survey, approximately 20 species of freshwater mollusks were identified during the inventory from dredge samples (Table 2.3-1). Within the Methow, Okanogan and Columbia portions of the Wells Reservoir, 13, 11, and nine species of mollusks were present, respectively. Of the 20 species, 10 gastropods (snails) and 10 bivalves (clams, mussels) were identified. The gastropods included nine native species and one nonnative species (Big-ear radix, *Radix auricularia*). Similarly, the bivalves also included nine native species and one nonnative species (Asian clam, *Corbicula fluminea*) (BioAnalysts, Inc. 2006). The 2005 macroinvertebrate assessment did not discover the presence of any zebra mussels or quagga mussels within the Project.

2.2.3 Project Aquatic Nuisance Species Monitoring

In 2006, Douglas, in coordination with the Aquatic Nuisance Species Division of WDFW, began monitoring for zebra mussels and quagga mussels in Project waters. Activities consisted of monthly plankton tows to target mussel veligers at sites downstream of boat launches within the Wells Reservoir. Sampling activities were conducted during the summer and early fall when recreational boating activity is at a peak. Sampling protocols were provided by WDFW. All samples were sent back to WDFW for analysis. To date, none of the samples collected within the Project have contained any signs of zebra or quagga mussel presence.

In 2007, Douglas, in coordination with the Center for Lakes and Reservoirs at Portland State University, installed a permanent substrate sampler in the Wells Dam forebay to monitor for zebra and quagga mussel colonization within the Project. Douglas staff checks the substrate sampler monthly throughout the year as specified by the monitoring protocol. To date, no signs of zebra or quagga mussel presence have been detected. Both of these monitoring activities are ongoing.

Table 2.3-1 Mollusks collected from sampling stations on the Methow, Okanogan, and Columbia rivers during the 2005 Project Aquatic Macroinvertebrate Inventory.

Location	Common Name	Taxon
Methow River	Western pearlshell	*Margaritinopsis falcata*
	Striate fingernail clam	*Sphaerium striatinum*
	Ridgebeak peaclam	*Pisidium compressum*
	Western lake fingernail clam	*Musculium raymondi*
	Shortface lanx	*Fisherola nuttalli*
	Ashy pebblesnail	*Fluminicola fuscus*
	Western floater	*Anodonta kennerlyi*
	Ubiquitous peaclam	*Pisidium casertanum*
	Big-ear radix*	*Radix auricularia*
	Golden fossaria	*Fossaria obrussa*
	Prairie fossaria	*Fossaria (Bakerilymnaea) bulimoides*
	Ash gyro	*Gyraulus parvus*
		Corbicula sp.
Okanogan River	Western ridgemussel	*Gonidea angulata*
	Striate fingernail clam	*Sphaerium striatinum*
	Ridgebeak peaclam	*Pisidium compressum*
	Ubiquitous peaclam	*Pisidium casertanum*
	Asian clam*	*Corbicula fluminea*
	Ashy pebblesnail	*Fluminicola fuscus*
	Fragile ancylid	*Ferrissia californica*
	Ash gyro	*Gyraulus parvus*
	Western lake fingernail clam	*Musculium raymondi*
		Physella sp.
		Anodonta sp.
Columbia River	Western floater	*Anodonta kennnerlyi*
	Asian clam*	*Corbicula fluminea*
	Ridgebeak peaclam	*Pisidium compressum*
	Three ridge valvata	*Valvata tricarinata*
	Rocky Mountain physa	*Physella propinqua propinqua*
	Ash gyro	*Gyraulus parvus*
	Golden fossaria	*Fossaria (F.) obrussa*
	Prairie fossaria	*Fossaria (Bakerilymnaea) bulimoides*
	Big-ear radix*	*Radix auricularia*

*Nonnative taxon.

3.0 GOAL AND OBJECTIVES

The goal of the ANSMP is to prevent the introduction and/or spread of aquatic nuisance species in Project waters. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several PMEs in support of the ANSMP. The PMEs presented within the ANSMP are designed to meet the following objectives:

Objective 1: Implement best management practices to prevent Eurasian watermilfoil proliferation during in-water (i.e., construction, maintenance and recreation improvements) improvement activities in the Project.

Objective 2: Continue participation in regional and state efforts to prevent the introduction and spread of aquatic nuisance species. Activities include continued monitoring for the presence of ANS, monitoring bycatch data collected during other aquatic management plan activities and conducting education outreach within the Project.

Objective 3: In response to proposed changes in the Project requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, with respect to the introduction or proliferation of aquatic nuisance species in the Project to inform management decisions to support success of the ANSMP and will implement reasonable and appropriate measures to address any potential effects.

The ANSMP is intended to be compatible with other aquatic nuisance species management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Water Quality Management Plan by continuing to prevent the introduction and/or spread of aquatic nuisance species in Project waters. The ANSMP is intended to be not inconsistent with other management strategies of federal, state, and tribal natural resource management agencies.

The schedule for implementation of specific measures within the ANSMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

In order to fulfill the goals and objectives described in Section 3.0, Douglas, in consultation with the Aquatic SWG, has agreed to implement the following PMEs.

4.1 Implement Best Management Practices During Recreational Improvement Activities (Objective 1)

If at any time during the new license term, Douglas is required to construct, improve or maintain recreation access at boat launches and swim areas and the removal or disturbance of aquatic macrophtye beds that contain Eurasian watermilfoil may potentially occur, Douglas will implement containment efforts utilizing best management practices agreed to by the Aquatic SWG during such activities.

4.2 Participation in Regional and State ANS Efforts (Objective 2)

4.2.1 Coordination with Regional and State Entities

Douglas shall continue to coordinate with regional and state entities to implement activities in Project waters to monitor for the presence of ANS, specifically zebra and quagga mussels. Activities covered by this objective will consist of monitoring for the presence of zebra and quagga mussels as is identified in Section 2.2.3. If ANS are detected during monitoring activities, Douglas will immediately notify the appropriate regional and state agencies and assist in the implementation of reasonable and appropriate measures to address the ANS presence as is consistent with ANS Management protocols.

Douglas shall participate in information exchanges and regional efforts to coordinate monitoring activities.

4.2.2 Monitor Bycatch from other Project Aquatic Resource Management Activities

Douglas shall monitor bycatch data collected from ongoing Project aquatic resource management activities for aquatic nuisance species presence to support regional and state efforts and the ANSMP. Such ongoing activities may consist of broodstock collection activities at Wells Dam and in associated Project tributaries, the northern pikeminnow removal program, water quality monitoring and any other aquatic resource activities related to implementation of Aquatic Resource Management Plans for bull trout, Pacific lamprey, white sturgeon, and resident fish.

4.2.3 ANS Information and Education

Douglas shall make information regarding the effects of ANS introductions and the importance of prevention available to the public. Such outreach activities may consist of posting signage at Project recreation areas and boat launches.

Douglas shall also provide literature produced by appropriate state entities (Ecology and WDFW) for distribution at the visitor centers of local communities of the Project (Pateros, Brewster, Bridgeport) including Wells Dam.

4.3 Monitor and Address ANS Effects to Aquatic Communities During Changes in Project Operations (Objective 3)

If at any time during the new license term, future changes in Project operations requiring FERC approval are proposed and the Aquatic SWG concludes that such proposed operations may encourage the introduction or proliferation of aquatic nuisance species within the Project, the Aquatic SWG will assess the potential effects, if any, in order to make informed management decisions.

If the assessment identifies adverse effects to Aquatic Resources due to aquatic nuisance species attributable to changes in Project operations, Douglas shall consult with the Aquatic SWG to select and implement reasonable and appropriate PMEs to address the identified adverse effect(s).

4.4 Reporting

Douglas will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the ANSMP. The report will document all ANS activities conducted within the Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this ANSMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

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ATTACHMENT G: WATER QUALITY MANAGEMENT PLAN

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WATER QUALITY MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

August 2009

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

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EXECUTIVE SUMMARY

The Water Quality Management Plan (WQMP) is one of six Aquatic Resource Management Plans (Plans) contained within the Aquatic Settlement Agreement (Agreement). To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). The goal of the WQMP is to protect the quality of the surface waters affected by the Wells Hydroelectric Project (Project) with regard to the numeric criteria. Studies conducted during the relicensing process have found water quality within the Wells Project to be within compliance. Douglas, in collaboration with the Aquatic SWG, has agreed to implement measures in support of the WQMP. Reasonable and feasible measures will be implemented in order to maintain compliance with the numeric criteria of the Washington State Water Quality Standards (WQS), Chapter 173-201A WAC. The measures presented within the WQMP (Section 4.0) are designed to meet the following objectives:

Objective 1: Maintain compliance with state WQS for TDG. If non-compliance is observed, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas;

Objective 2: Maintain compliance with state WQS for water temperature. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas;

Objective 3: Maintain compliance with state WQS for other numeric criteria. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas;

Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill; and

Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin.

The WQMP is intended to be compatible with other water quality management plans in the Columbia River mainstem, including Total Maximum Daily Loads (TMDL). Furthermore, the WQMP is intended to be supportive of the Habitat Conservation Plan (HCP), Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Aquatic Nuisance Species Management Plan through the protection of designated uses (WAC 173-201A-600) in Project waters. The WQMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies.

1.0 INTRODUCTION

The Water Quality Management Plan (WQMP) is one of six Aquatic Resource Management Plans (Plans) contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license. The Plans, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) for aquatic life in support of the Clean Water Act (CWA) Section 401 Water Quality Certification (401 Certification) for the Wells Hydroelectric Project (Project).

During the development of this plan, the Aquatic Settlement Work Group (Aquatic SWG) focused on management priorities for resources potentially impacted by Project operations. Entities that participated in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama), and Douglas.

The Washington State Water Quality Standards (WQS) found at WAC 173-201A include designated uses (recreation, agriculture, domestic and industrial use, and habitat for aquatic life) and supporting numeric criteria. The WQMP is intended to address only the numeric criteria of the WQS. Aquatic life uses of the Project identified by the WQS shall be addressed by the five other Aquatic Resource Management Plans within the Agreement and by the measures implemented in the HCP.

This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and describes the relevant measures (Section 4) to maintain compliance with the numeric criteria of state WQS during the term of the new license.

2.0 BACKGROUND

Section 401 of the Clean Water Act (33 USC Chapter 26 § 1341 *et seq.*) requires that applicants for a hydroelectric project license from the Federal Energy Regulatory Commission (FERC) provide FERC with a 401 Certification that provides reasonable assurance that the Project will comply with applicable WQS and any other appropriate requirements of state law. In Washington State, Ecology is responsible for issuing 401 Certifications.

2.1 Water Quality Standards

Congress passed the CWA in 1972, and designated the U.S. Environmental Protection Agency (EPA) as the administering federal agency. This federal law requires that a state's water quality standards protect the surface waters of the U.S. for beneficial or designated uses, such as recreation, agriculture, domestic and industrial use, and habitat for aquatic life. Any state WQS, or amendments to these standards, do not become effective under the CWA until they have been approved by EPA.

Ecology is responsible for the protection and restoration of Washington State's waters. Ecology establishes WQS that set limits on pollution in lakes, rivers, and marine waters in order to protect water quality and specified designated uses of such water bodies. These standards are found in WAC 173-201A.

2.1.1 Water Quality Standards for the Project

The Project includes the mainstem Columbia River above Wells Dam, one mile of the mainstem Columbia River below Wells Dam, the Methow River (up to river mile [RM] 1.5) and the Okanogan River (up to RM 15.5).

Under the 2006 WQS, the Project includes designated uses for spawning/rearing (aquatic life), primary contact recreation, and all types of water supply and miscellaneous uses. Numeric criteria to support the protection of these designated uses consist of various physical, chemical, and biological parameters including total dissolved gas (TDG), temperature, dissolved oxygen (DO), pH, turbidity, and toxins.

Unless stated otherwise in the subsections below, WQS criteria discussed in subsections 2.1.1.1 to 2.1.1.6 apply to all waters within the Project.

2.1.1.1 Total Dissolved Gas

TDG is measured as a percent saturation. Based upon criteria developed by Ecology, TDG measurements shall not exceed 110% at any point of measurement in any state water body. The WQS state that an operator of a dam is not held to the TDG standards when the river flow exceeds the seven-day, 10-year-frequency (7Q10) flood. The 7Q10 flow is the highest value of a running seven consecutive day average using the daily average flows that may be seen in a 10-year period. The 7Q10 total river flow for the Project was computed by Ecology (Pickett et al 2004) using the hydrologic record from 1974 through 1998 and a statistical analysis to develop the number from 1930 through 1998. The U.S. Geological Survey Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" was followed. The resulting 7Q10 flow at Wells Dam is 246,000 cubic feet per second (cfs).

In addition to allowances for TDG standard exceedances during natural flood flows in excess of 7Q10, the TDG criteria may be adjusted to accommodate spill to facilitate fish passage over hydroelectric dams when consistent with an Ecology-approved Gas Abatement Plan (GAP). Ecology has approved on a per application basis, an interim exemption to the TDG standard (110%) to allow spill for juvenile fish passage on the Columbia and Snake rivers (WAC 173-201A-200(1)(f)(ii)). Dams in the Columbia and Snake rivers may be granted such an exemption. The GAP must be accompanied by fisheries management, physical, and biological monitoring plans (173-201A-200(1)(f)(ii)).

Columbia and Snake River TDG Exemption

On the Columbia and Snake rivers, three conditions apply to the TDG exemption. First, in the tailrace of a dam, TDG shall not exceed 125% as measured in any one-hour period during spillage for fish passage. Second, TDG shall not exceed 120% in the tailrace of a dam, as an average of the 12 highest consecutive hourly readings in any one day (24-hour period), relative to atmospheric pressure. Third, TDG shall not exceed 115% in the forebay of the next dam downstream, also based on an average of the 12 highest consecutive hourly readings in any one day (24-hour period), relative to atmospheric pressure.

The increased levels of spill resulting in elevated TDG levels are intended to allow increased fish passage without causing more harm to fish populations than caused by turbine passage. The TDG exemption provided by Ecology is based on a risk analysis study conducted by the NMFS (NMFS 2000).

2.1.1.2 Temperature

Temperature is measured by the 7-day average of the daily maximum temperatures (7-DADMax). The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date (WAC 173-201A-020).

Under the WQS, the 7-DADMax temperature within the Columbia, Methow, and Okanogan river portions of the Project shall not exceed 17.5°C (63.5°F) (WAC 173-201A-602 and 173-201A-200(1)(c)). Additionally, the WQS contains additional supplemental temperature requirements for the Project portion of the Methow River (see Methow River Supplemental Requirements section below). When a water body's temperature is warmer than 17.5°C (or within 0.3°C (0.54°F) of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the 7-DADMax temperature of that water body to increase more than 0.3°C (0.54°F).

When the background condition of the water is cooler than 17.5°C, the allowable rate of warming up to, but not exceeding, the numeric criteria from human actions is restricted as follows:

(A) Incremental temperature increases resulting from individual point source activities must not, at any time, exceed 28/(T+7) as measured at the edge of a mixing zone boundary (where "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge).

(B) Incremental temperature increases resulting from the combined effect of all non-point source activities in the water body must not, at any time, exceed 2.8°C (5.04°F).

Temperatures are not to exceed the criteria at a probability frequency of more than once every ten years on average. Temperature measurements should be taken to represent the dominant aquatic habitat of the monitoring site. This typically means samples should:

(A) Be taken from well mixed portions of rivers and streams.

(B) Not be taken from shallow stagnant backwater areas, within isolated thermal refuges, at the surface, or at the water's edge.

The following guidelines on preventing acute lethality and barriers to migration of salmonids are also used in determinations of compliance with the narrative requirements for use protection established in WAC 173-201A (e.g., WAC 173-201A-310(1), 173-201A-400(4), and 173-201A-410 (1)(c)). The following site-level considerations do not, however, override the temperature criteria established for waters in WAC 173-201A-200(1)(c) or WAC 173-201A-602:

(A) Moderately acclimated (16-20°C, or 60.8-68.0°F) adult and juvenile salmonids will generally be protected from acute lethality by discrete human actions maintaining the 7-DADMax temperature at or below 22°C (71.6°F) and the 1-day maximum (1-DMax) temperature at or below 23°C (73.4°F).

(B) Lethality to developing fish embryos can be expected to occur at a 1-DMax temperature greater than 17.5°C (63.5°F).

(C) To protect aquatic organisms, discharge plume temperatures must be maintained such that fish could not be entrained (based on plume time of travel) for more than two seconds at temperatures above 33°C (91.4°F) to avoid creating areas that will cause near instantaneous lethality.

(D) Barriers to adult salmonid migration are assumed to exist any time the 1-DMax temperature is greater than 22°C (71.6°F) and the adjacent downstream water temperatures are 3°C (5.4°F) or cooler.

Methow River Supplemental Requirements

Ecology has identified water bodies, or portions thereof, which require special protection for spawning and incubation in accordance with Ecology publication 06-10-038. This publication indicates where and when the following criteria are to be applied to protect the reproduction of native char, salmon, and trout. Water temperatures are not to exceed 13°C from October 1 to June 15 in the lower Methow River including the portion within the Project boundary (up to RM 1.5).

2.1.1.3 Dissolved Oxygen

DO criteria are measured in milligrams per liter (mg/L). Under the WQS, DO measurements shall not be under the 1-day minimum of 8.0 mg/L. 1-day minimum is defined as the lowest DO reached on any given day. When a waterbody's DO is lower than the 8.0 mg/L criteria (or within 0.2 mg/L of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the DO of that water body to decrease more than 0.2 mg/L. Concentrations of DO are not to fall below 8.0 mg/L at a probability frequency of more than once every ten years on average.

DO measurements should be taken to represent the dominant aquatic habitat of the monitoring site. This typically means samples should:

(A) Be taken from well mixed portions of rivers and streams.

(B) Not be taken from shallow stagnant backwater areas, within isolated thermal refuges, at the surface, or at the water's edge.

2.1.1.4 pH

pH is defined as the negative logarithm of the hydrogen ion concentration. Under the WQS, pH measurements shall be in the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.5 units.

2.1.1.5 Turbidity

Turbidity is measured in nephelometric turbidity units (NTUs). Turbidity shall not exceed 5 NTU over background when the background is 50 NTU or less; or a 10% increase in turbidity when the background turbidity is more than 50 NTU.

2.1.1.6 Toxins

Toxic substances shall not be introduced above natural background levels in waters of the state which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by Ecology.

Ecology shall employ or require chemical testing, acute and chronic toxicity testing, and biological assessments, as appropriate, to evaluate compliance with WAC 173-201-240 and to ensure that aquatic communities and the existing and characteristic beneficial uses of waters are being fully protected.

Within the Project Area, specifically within the Project portion of the Okanogan River, two toxic substances are of concern: Dichloro-Diphenyl-Trichloroethane (DDT) and Polychlorinated Biphenyls (PCBs). DDT is a synthetic organochlorine insecticide that was frequently used in agriculture prior to being banned in 1972. PCBs are an organic compound that were used as coolants and insulating fluids for transformers, and capacitors. PCBs are classified as persistent organic pollutants and production was banned in the 1970s due to its high level of toxicity.

Toxic substances criteria identified in the WQS for these two substances are as follow:

(A) In freshwater, DDT (and metabolites) shall not exceed 1.1 µg/L as an instantaneous concentration at any time. Exceedance of the criteria is defined as an acute condition. DDT (and metabolites) shall not exceed 0.001 µg/L as a 24-hour average. Exceedance of the criteria is defined as a chronic condition.

(B) In freshwater, PCBs shall not exceed 2.0 µg/L as a 24-hour average. Exceedance of the criteria is defined as an acute condition. PCBs shall not exceed 0.01 µg/L as a 24-hour average. Exceedance of the criteria is defined as a chronic condition.

2.1.2 305(b) Report, 303(d) List and Total Maximum Daily Loads

Every two years, the EPA, as specified in section 305(b) of the CWA, requires Ecology to compile an assessment of the state's water bodies. Data collected from the water quality assessment are used to develop a 305(b) report. The report evaluates and assigns each water body into five categories based upon the Ecology's evaluation of the water quality parameters collected from within each water body.

Category 1 states that a water body is in compliance with the State WQS for the parameter of interest.
Category 2 states a water body of concern.
Category 3 signifies that insufficient data are available to make an assessment.
Categories 4a-4c indicates an impaired water body that does not require a Total Maximum Daily Load (TMDL) for one of three reasons:

- Category 4a indicates a water body with a finalized TMDL.
- Category 4b indicates a water body with a Pollution Control Program.
- Category 4c indicates a water body impaired by a non-pollutant (e.g., low water flow, stream channelization, and dams).

Category 5 represents all water bodies within the state that are considered impaired and require a Water Quality Implementation Plan (WQIP) (formerly TMDL). The 303(d) list consists of only water bodies with Category 5 listings.

Information presented below in subsections 2.1.2.1 to 2.1.2.6 are based upon the Draft 2008 Water Quality Assessment and candidate 303(d) list that has been finalized by Ecology and submitted to the EPA for approval.

2.1.2.1 Total Dissolved Gas

The reach of the Columbia River within the Project is on the state's 1998 303(d) list for TDG impairment (Category 5 listing). In 2004, Ecology developed a TDG TMDL (which was approved by EPA) for the mid-Columbia River and as such, this reach of the Columbia River, which includes the Project, is no longer on the 303(d) list for TDG (Category 4a).

Neither the reach of the Methow River within the Project (RM 1.5) nor the reach of the Okanogan River within the Project (RM 15.5) are listed on the 2008 303(d) list for TDG.

2.1.2.2 Temperature

The reach of the Columbia River within the Project is on the state's 2004 303(d) list for temperature impairment. The EPA has developed a draft temperature TMDL for the mainstem Columbia River, including that portion of the Columbia River contained within the Project. It is anticipated that the EPA will issue the final temperature TMDL for the Columbia River at some future date. The TMDL will address the water temperature effects of dams and other human actions, including model analyses and load allocations for mainstem hydroelectric projects including Wells Dam.

The reach of the Methow River within the Project (RM 1.5) is not on the 2008 303(d) list for temperature.

The reach of the Okanogan River within the Project (RM 15.5) is not on the 2008 303(d) list for temperature. However, reaches of the Okanogan River upstream of the Wells Project boundary are listed on the 2008 303(d) list for temperature.

2.1.2.3 DO

No part of the Project area is on the 2008 303(d) list for DO.

2.1.2.4 pH

No part of the Project area is on the 2008 303(d) list for pH.

2.1.2.5 Turbidity

No part of the Project area is on the 2008 303(d) list for turbidity.

2.1.2.6 Toxins

Neither the reach of the Columbia River within the Project nor the reach of the Methow River within the Project (RM 1.5) is on the 2008 303(d) list for toxins.

The reach of the Okanogan River within the Project (RM 15.5) is not listed on the 2008 303(d) list for toxins. In 1998, Ecology put the portion of the Okanogan River within Project boundary on the 303(d) list for 4, 4'-DDE, 4,4'-DDD, PCB-1254, and PCB 1260 concentrations above standards in edible carp tissue (Ecology 1998). In 2004, Ecology completed the Lower Okanogan River DDT and PCB TMDL (which was approved by EPA).

2.2 Project Water Quality Monitoring Results

2.2.1 Total Dissolved Gas

TDG supersaturation is a condition that occurs in water when atmospheric gasses are forced into solution at pressures that exceed the pressure of the overlying atmosphere. Water containing more than 100% TDG is in a supersaturated condition. Water may become supersaturated through natural or dam-related processes that increase the amount of air dissolved in water. Supersaturated water in the Columbia River may result from the spilling of water at Columbia River dams. The occurrence of TDG supersaturation in the Columbia River system is well documented and has been linked to mortalities and migration delays of salmon and steelhead (Beiningen and Ebel 1970; Ebel et al. 1975).

At Wells Dam, Douglas has monitored TDG for compliance with state and federal water quality regulations since 1998 and more recently in support of its GAP and TDG exemption issued by Ecology for juvenile fish passage (Le 2008). Douglas is required to monitor TDG in the Wells Dam forebay and tailrace area (on the Columbia River, near RM 515.6). Douglas uses Rocky Reach forebay TDG data collected by Chelan County PUD for downstream forebay monitoring compliance data.

A TDG study conducted in 2006 indicated that the current location of the TDG compliance monitoring stations are appropriate in providing representative TDG production information both longitudinally and laterally downstream of Wells Dam (EES Consulting et al. 2007). Detailed information regarding the study is provided in Section 2.3.1.2.

Since 2003, Douglas has operated the Project during the juvenile fish passage season (April – August) in accordance with an Ecology-approved GAP and associated TDG exemption. TDG monitoring at Wells Dam is facilitated through the deployment of Hydrolab Minisonde probes in the center of the Wells forebay and approximately 3 miles downstream of Wells Dam. TDG data are logged every fifteen minutes, averaged (4 in an hour) and transmitted on the hour. Probes are serviced and checked monthly for accuracy and calibrated if necessary. Average, minimum, and maximum TDG measurements in the Wells Dam forebay and tailrace since monitoring began are provided in Table 2.2-1. Also included in Table 2.2-1 are Rocky Reach forebay TDG data acquired from Chelan County PUD's TDG monitoring program.

Levels of TDG at Wells Dam and the Rocky Reach Dam forebay that result in exceedances of the numeric criteria are most likely to occur during April through August as a result of high flows caused by either rapid snow melt or federal flow augmentation intended to aid downstream juvenile salmonid passage. Douglas monitors for TDG at Wells Dam between April 1 and September 15 annually to coincide with this observation (Figure 2.2.1 and 2.2.2). Chelan County PUD monitors for TDG at Rocky Reach Dam between April 1 and August 31 (Figure 2.2.3). High TDG values at both Wells Dam and Rocky Reach Dam resulting in exceedances are often associated with various factors including high spring flows, unit outages, and upstream Federal Columbia River Power System operations, including federal flow augmentation, resulting in water entering the Project with relatively high TDG levels. During these time periods, river conditions in the mid-Columbia River system are conducive to exceedances of the TDG criteria.

In past years, Wells forebay monitoring data show that on average TDG values at this location range from 107-110% with maximum values sometimes exceeding the 115% standard specified by the TDG exemption. Rocky Reach forebay monitoring data indicate that on average TDG values at this location range from 108-110% with maximum values sometimes exceeding the 115% standard. In general, Wells Dam adds relatively small amounts of TDG through the use of spill intended to aid in the passage of juvenile salmonids (0-2%). However, similar to other hydroelectric facilities on the Columbia River system, probabilities for exceedances are more likely during late spring periods of high river flow and low electrical demand. Table 2.2-1 contains historic average, minimum and maximum TDG measurements associated with the Wells Project. Note that the high TDG values recorded during 2006 were a direct result of the 2006 TDG Study that required Douglas to intentionally spill water in various spillway configurations. This study was intended to define the gas generation dynamics of the Wells Project under various operating parameters.

Table 2.2-1 Average, minimum, and maximum TDG measurements at Wells Dam from Hydrolab MiniSonde stations placed in the Wells Forebay, Wells Tailrace and Rocky Reach Forebay. Values are in percent dissolved gas and are 12-hour high (non-consecutive) averages.

Location	TDG	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Wells Forebay	Avg.	108.3	110.1	108.5	107.1	110.8	108.1	108.2	107.4	109.9	108.3
	Min	104.4	104.0	101.8	100.1	102.6	101.3	102.0	110.8	102.5	100.9
	Max	113.7	113.9	113.2	111.7	118.5	114.5	113.5	100.9	116.1	113.2
Wells Tailrace	Avg.	111.1	112.4	110.1	108.1	113.9	109.8	109.6	109.1	114.0	110.9
	Min	105.5	105.6	102.2	100.4	103.9	101.9	101.6	102.8	103.2	103.5
	Max	122.4	125.7	125.4	112.0	136.9	126.0	113.7	116.8	131.3	122.0
Rocky Reach Forebay	Ave	109.4	N/A	108.5	108.5	112.9	110.1	109.1	109.6	114.4	110.4
	Min	101.8	N/A	101.9	104.7	103.9	103.8	104.7	103.3	102.7	104.5
	Max	118.7	N/A	112.6	113.0	133.8	120.8	114.3	120.4	130.0	118.0

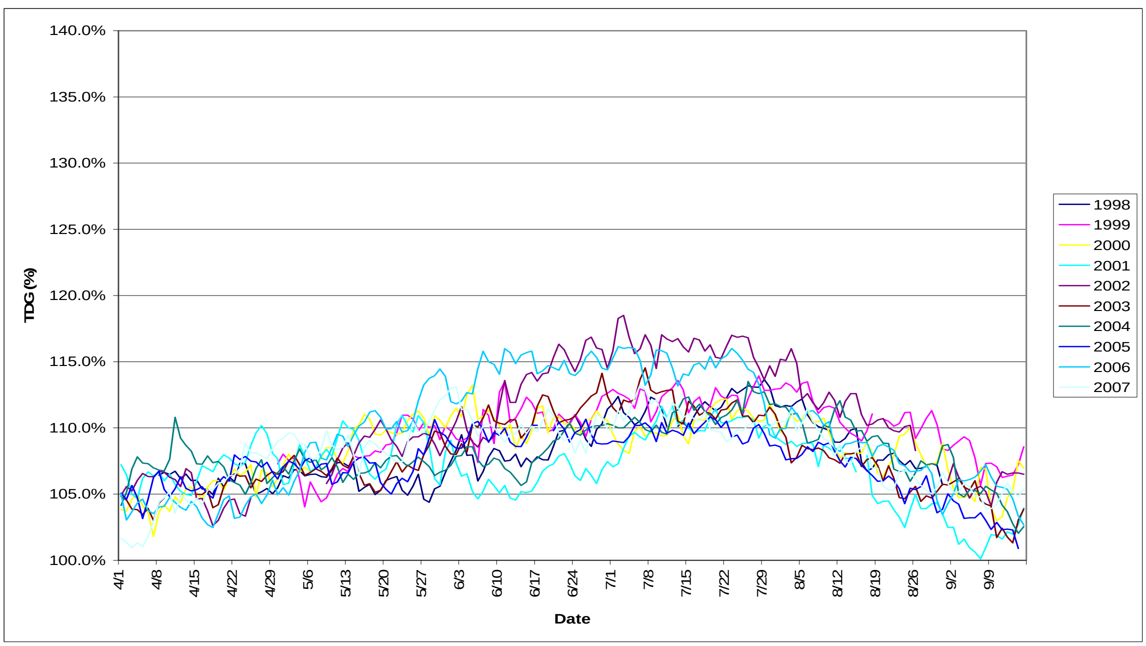

Figure 2.2-1 Wells Dam forebay average 12-hour high TDG measurements. The average 12-hour high is defined as the average of the 12 highest hourly readings within a 24-hour period. Monitoring season is typically April 1 to September 15. Data for years 1998-2007.

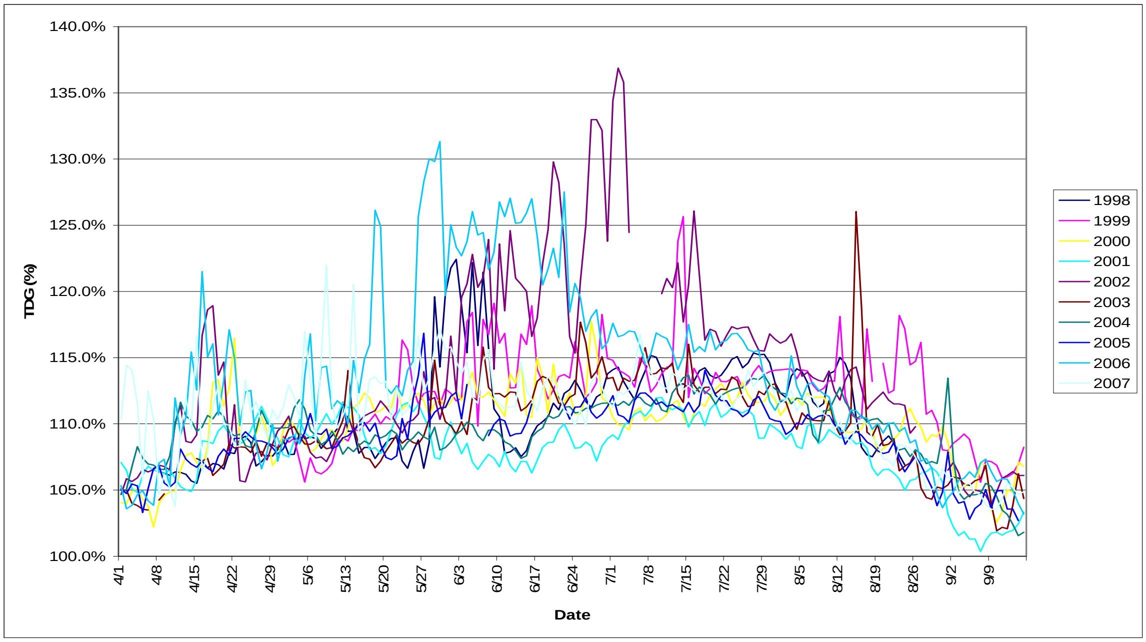

Figure 2.2-2 **Wells Dam tailrace average 12-hour high TDG measurements. The average 12-hour high is defined as the average of the 12 highest hourly readings within a 24 hour period. Monitoring season is typically April 1 to September 15. Data for years 1998-2007 (Breaks in data are the result of equipment malfunction).**

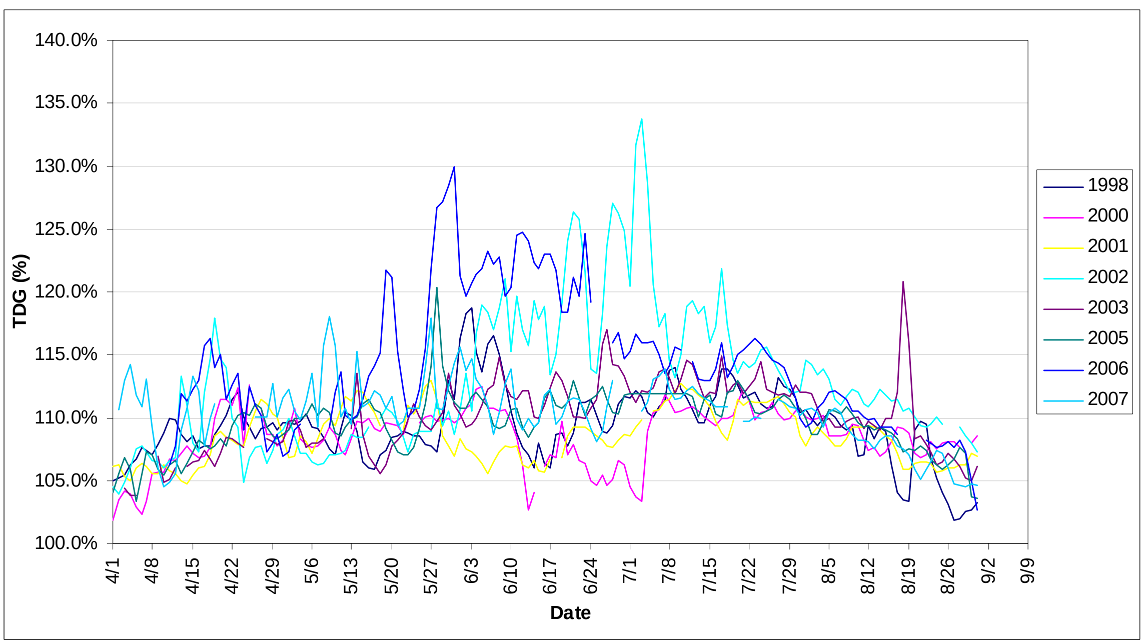

Figure 2.2-3 **Rocky Reach forebay average 12-hour high TDG measurements. The average 12-hour high is defined as the average of the 12 highest hourly readings within a 24 hour period. Monitoring season is typically April 1 to August 31. Data for years 1998-2007 (Breaks in data are the result of equipment malfunction).**

2.2.2 Temperature

Beginning in 2001, an extensive water temperature monitoring effort was initiated by Douglas in order to better understand the temperature dynamics throughout the Wells Reservoir. Temperature data was collected by Douglas at four locations in the Columbia River (RM 544.5, RM 535.3, RM 530.0, and RM 515.6) and at one site each on the Okanogan (RM 10.5) and Methow (RM 1.4) rivers. Data collected by Douglas were collected hourly using Onset tidbit temperature loggers. Monitoring start and end dates varied from year to year but generally began in the early spring and ended in late fall. Quality assurance and control measures were implemented prior to deploying and upon retrieving temperature loggers to ensure that data collected were accurate. Due to sensor loss or sensor malfunction in some years, the availability of data at some of these monitoring locations is sporadic.

In general, 7-DAD Max temperature data indicate that the portion of the Columbia River upstream of and within the Project generally warms to above 17.5°C (WQS numeric criteria) in mid-July and drops below the numeric criteria by early October (Figure 2.2-4). Water temperatures in the Methow River upstream of the Project warm to above 17.5°C in mid-July and drop below the numeric criteria by September (Figure 2.2-5), while trends in the Okanogan River (upstream of the Project) indicate warming above 17.5°C from early June with cooling by late September (Figure 2.2-6). Maximum water temperatures typically occur in late summer (August) with temperatures below Chief Joseph Dam, the Methow River (RM 1.4), and the Okanogan River (RM 10.5) reaching 20.0°C, 22.5°C, and 27.0°C, respectively. It is important to note that these data are representative of water temperatures as they flow into the Project. In 2006, Douglas expanded the Project temperature monitoring season to cover the entire year and implemented a more frequent downloading schedule. Douglas also added additional monitoring stations at the mouths of the Okanogan (RM 0.5) and Methow (RM 0.1) rivers. These have been used to model temperature and allocate the effects of Project operations on water temperatures at Wells Dam and within the Wells Reservoir as they relate to compliance with the WQS numeric criteria for temperature.

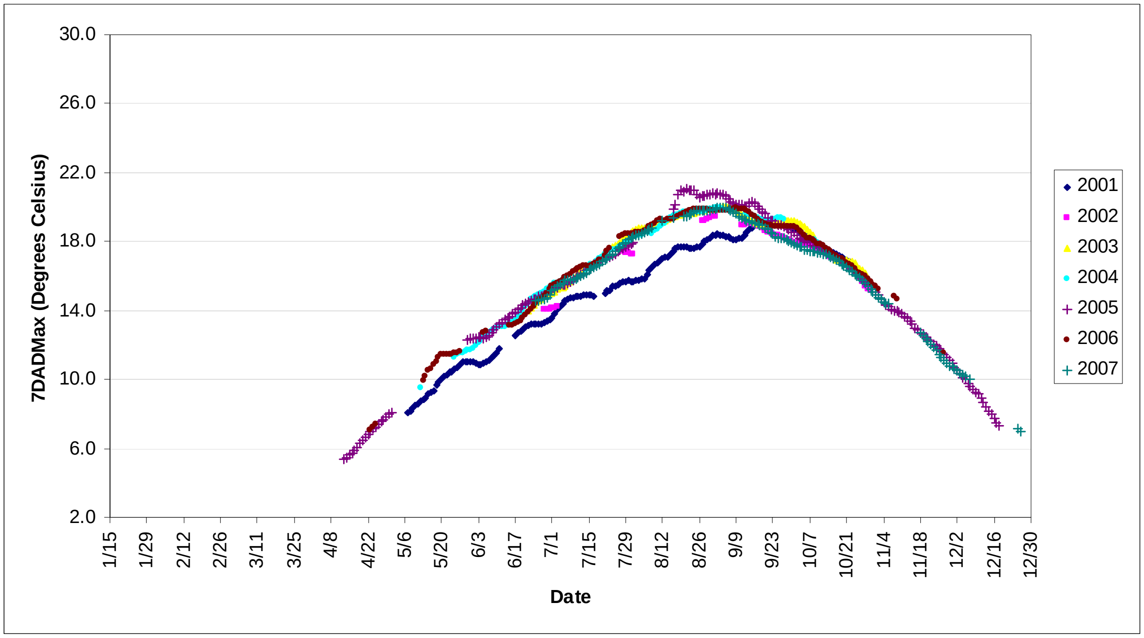

Figure 2.2-4 7-DAD Max water temperature collected in the tailrace of Chief Joseph Dam (RM 544) using Onset temperature loggers for years 2001-2007.

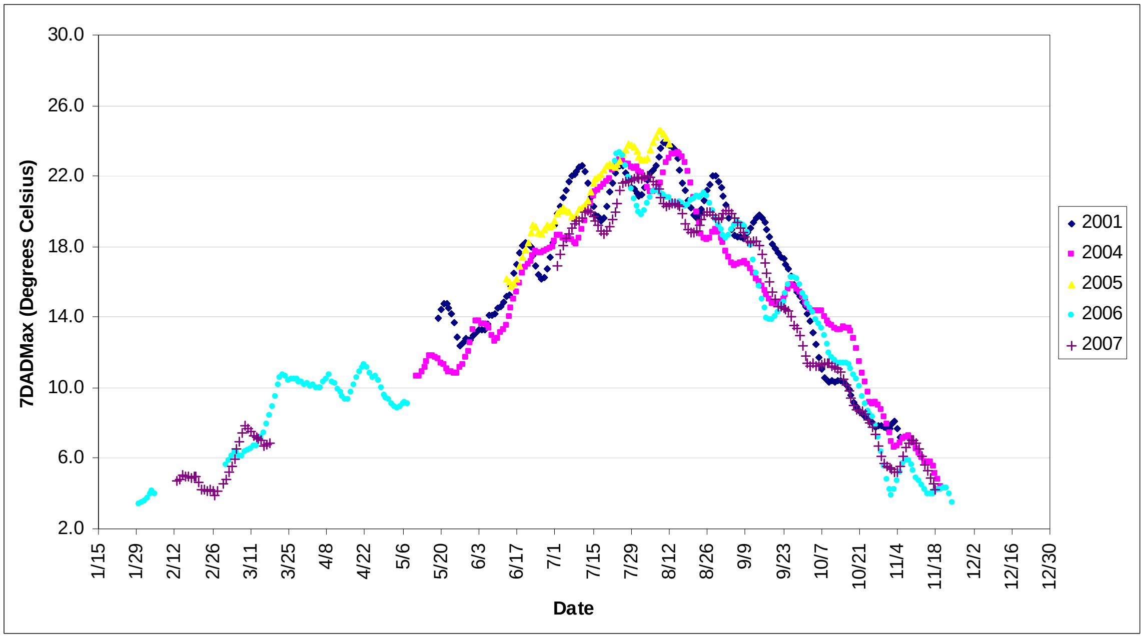

Figure 2.2-5 **7-DADMax water temperature collected in the Methow River upstream from the influence of Wells Dam (RM 1.4) using Onset temperature loggers for years 2001-2007. Data were unavailable in 2002 and 2003.**

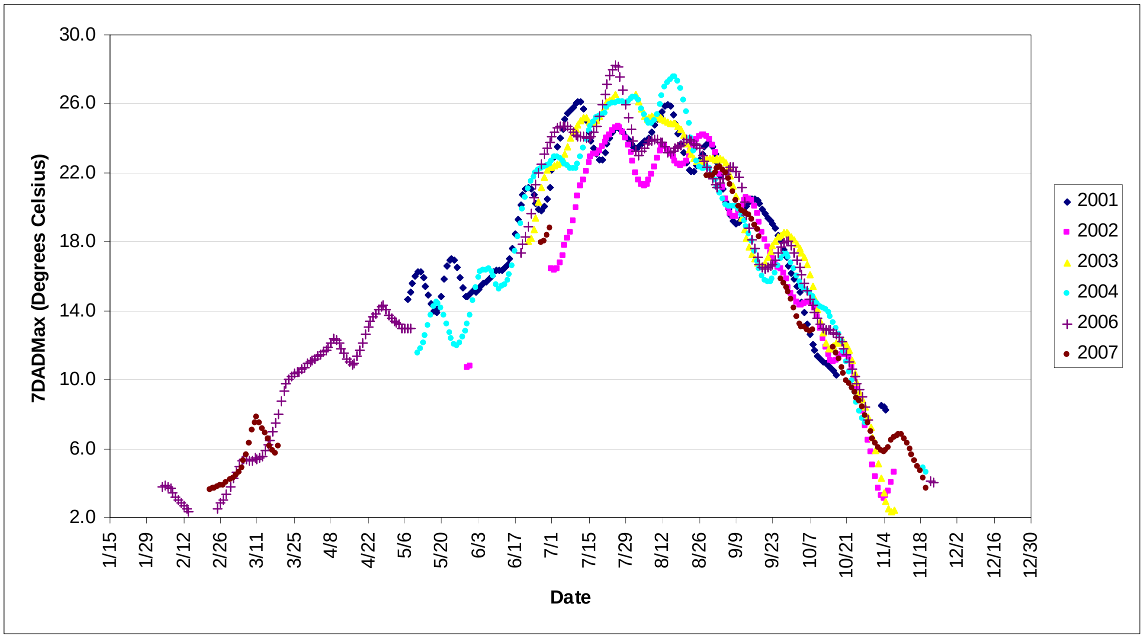

Figure 2.2-6 **7-DADMax water temperature collected in the Okanogan River (RM 10.5) using Onset temperature loggers for years 2001-2007.**

2.2.2.1 Wells Dam Fish Ladder Temperature Monitoring

Wells Dam has two fish ladders, one at each end of the dam. The two fish ladders are conventional staircase type fish ladders with 73 pools. The water source for the upper pools is the Wells Dam forebay. The flow through the upper 17 pools varies from 44 cfs at full reservoir to approximately 31 cfs at maximum reservoir drawdown. The lower 56 pools discharge a constant 48 cfs of water. To maintain the flow at 48 cfs in the lower ladder pools, supplementary water (auxiliary water supply) is introduced into Pool No. 56 through a pipeline from the reservoir. Pools are numbered in order from the bottom (near the collection gallery and entrance) to the top (exit to the Wells Dam forebay). The ladders are enclosed.

According to the HCP Biological Opinion (BO) issued by NMFS, all entities that use the fish trapping facilities at Wells Dam are required to discontinue trapping operations when fish ladder water temperatures exceed 68.0º F (20.6°C). In 2001 and 2003, Douglas added supplemental temperature recording equipment at Pool 39 near the broodstock collection facilities in the east fishway at Wells Dam to ensure compliance with requirements in the NMFS BO. In 2001, hourly data indicated that water temperatures at this location in the east fish ladder did not exceed 68.0ºF (20.6°C) at any time during the monitoring period (Figure 2.2-7), which ran from late July to early December. In 2003, data were recorded every two hours and exceedances of greater than 68.0ºF (20.6°C) were observed on three hourly occasions (Figure 2.2-8).

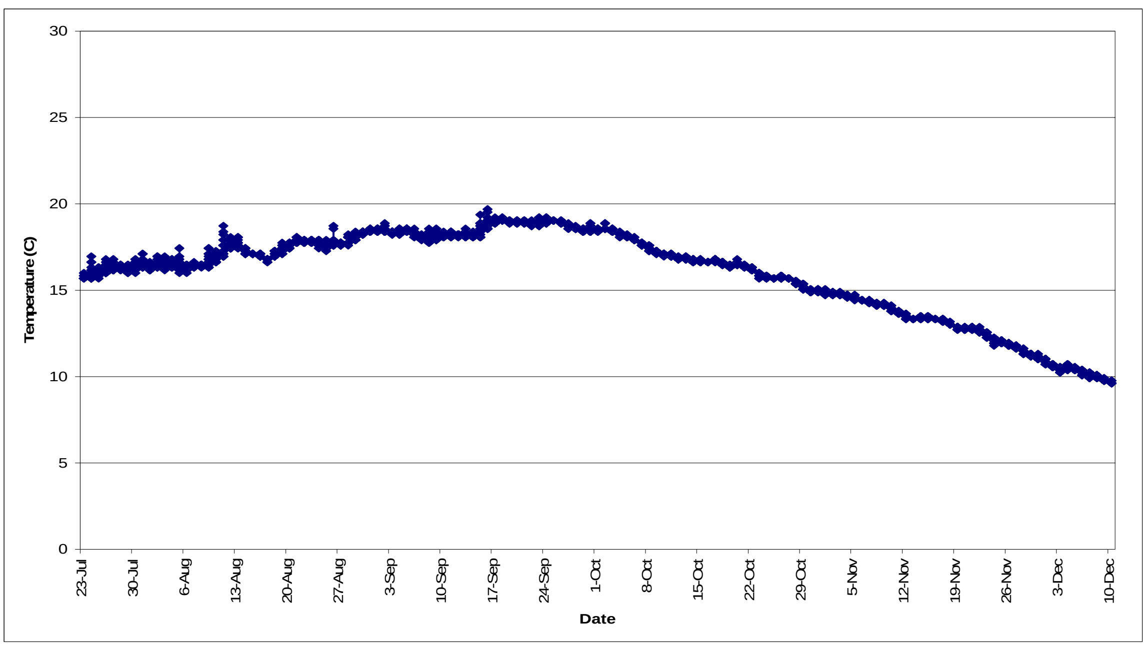

Figure 2.2-7 Hourly water temperatures collected at the Wells Dam east fish ladder trap during 2001.

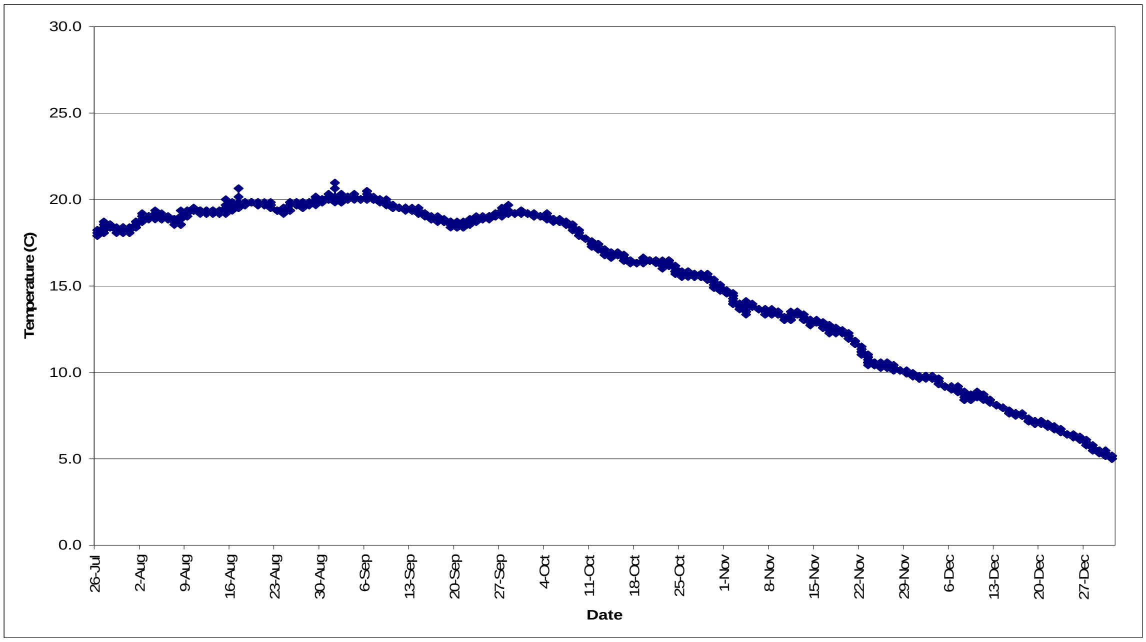

Figure 2.2-8 Water temperatures collected every two hours at the Wells Dam east fish ladder trap during 2003.

2.2.3 DO, pH, and Turbidity

2.2.3.1 DO and pH

In 2005, Douglas added sensors to its existing forebay TDG monitoring equipment (Hydrolab Minisonde) in order to collect preliminary information on pH and DO within the Project to monitor these parameters during the late summer when probabilities of exceedance are highest. In 2006, Douglas expanded the monitoring period to include the entire late summer period. In 2007, Douglas further expanded the monitoring period to begin in July and end in early December (Figure 2.2-9 and 2.2-10). The monitoring data indicate that values for these parameters are generally in compliance with the WQS numeric criteria at this site. pH values are consistently within the range of 6.5 to 8.5 as specified by the numeric criteria. During August and September periods of this study, there were periodic excursions of DO below the numeric criteria of 8.0 mg/L. Probable causes are likely due to the physiological processes of aquatic plants; however, these exceedances do not appear to be the dominant trend.

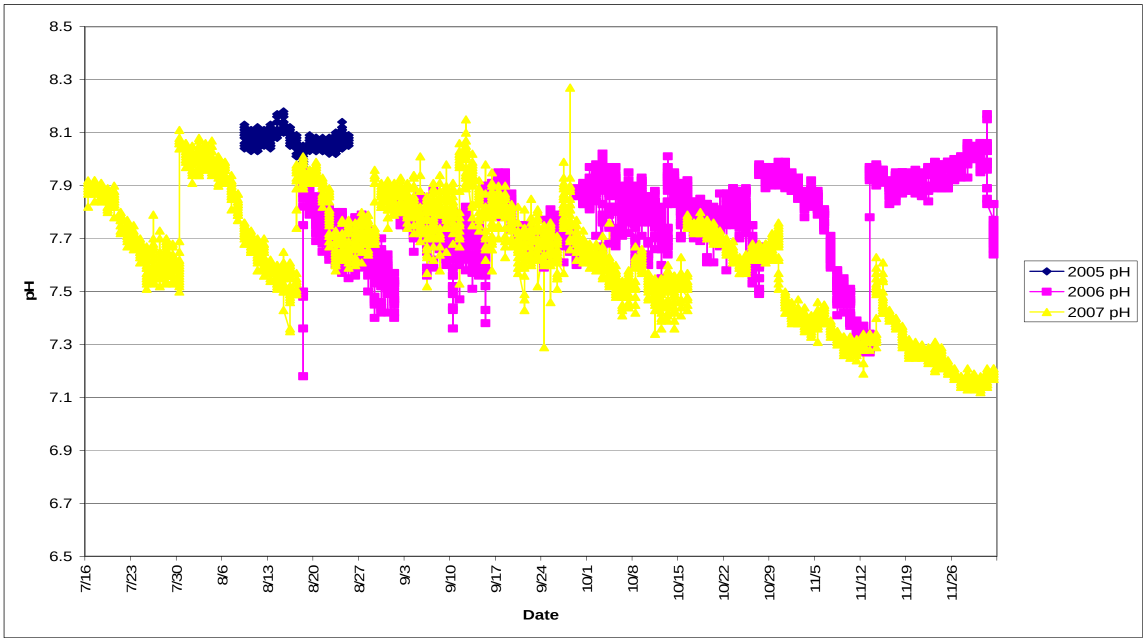

Figure 2.2-9 pH measurements collected at the Wells Forebay TDG monitoring station (Hydrolab MiniSonde), 2005-2007.

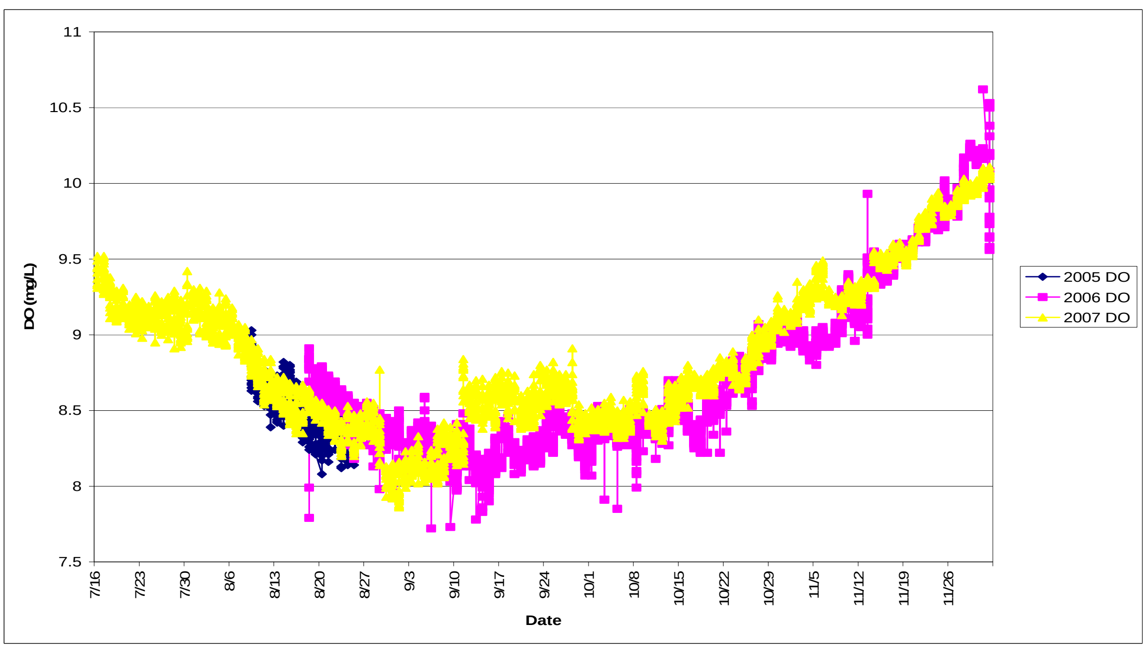

Figure 2.2-10 DO measurements collected at the Wells Forebay TDG monitoring station (Hydrolab MiniSonde), 2005-2007.

2.2.3.2 Turbidity

At Wells Dam, Secchi disk readings are taken daily during the adult fish passage assessment period of May 1 to November 15 to examine turbidity. A standard Secchi disk is lowered into the forebay on the west side of Wells Dam near the exit to the west fishway. Measurements are recorded in meters of visibility and records have been made since the early 1970s; however, continuous, reliable information adhering to a standard protocol has been collected since 1998. General trends of Secchi disk data suggest relatively lower periods of visibility (0.6 meters to 1.2 meters) during the spring and early summer. These relatively low periods of visibility are highly correlated with high flows during the spring runoff period. As the high flow period subsides, Secchi disk values increase to between 3.4 and 4.6 meters for the remainder of the monitoring period. In 2008, Douglas installed a fixed turbidity sensor near the east fishway exit in the Wells forebay and collected turbidity data in the Wells Dam forebay.

2.3 Project Water Quality Studies

2.3.1 Total Dissolved Gas

Each year from 2003-2008, Douglas implemented spill testing activities to examine the relationship between water spilled over the dam and the production of TDG. These results were subsequently used by IIHR-Hydroscience and Engineering of University of Iowa to develop and calibrate an unsteady state three-dimensional (3D), two-phase flow computational fluid dynamics (CFD) tool to predict the hydrodynamics of gas saturation and TDG distribution within the Wells tailrace. These tools were then used to reliably predict TDG production at Wells Dam and establish how preferred operating conditions and spillway configurations can be used as methods to manage TDG within WQS numeric criteria (Politano et al. 2009b).

2.3.1.1 Project TDG Assessments 2003-2005

In 2003 and 2004, Douglas hired Columbia Basin Environmental (CBE) to determine the effectiveness of the tailwater sensor relative to the tailwater cross section profile for TDG and better define the relationship between spillway releases and TDG production (CBE 2003, 2004). CBE deployed TDG sensors along two transects. Based on the results of these studies, the tailwater station provided an accurate record of daily average TDG values in the Wells Dam tailrace. The studies also showed that at times, gas levels from some turbine flows were being affected by spill.

In spring 2005, Douglas contracted with CBE to implement a TDG study at Wells Dam designed to measure TDG pressures resulting from various spill patterns at the dam (CBE 2006). An array of water quality data loggers was installed in the Wells Dam tailwater for a period of two weeks between May 23, 2005 and June 6, 2005. The Wells Dam powerhouse and spillway were operated through a predetermined range of operational scenarios that varied both total flow and shape of the spillway discharge. A total of eight configurations were tested including flat spill patterns (near equal distribution of spill across the entire spillway), crowned spill patterns (spill is concentrated towards the center of the spillway) and spill over loaded and unloaded units (Table 2.3-1).

Table 2.3-1 Test matrix for 2005 Wells Dam TDG Production Dynamics Study.

Test	Description
1A	Spill over load, east spill/east generation
1B	Spill over unloaded units, east spill/west generation
1C	Spill over unloaded units, west spill/east generation
1D	Spill over load, west spill/west generation
2A	Crowned spill, modest flow
2B	Dentated spill, modest flow
2C	Crowned spill, high flow
2D	Flat spill, high flow

Results from the study indicated that spill from the west side of the spillway resulted in consistently higher TDG saturations than similar spill from the east side. All Dentated spill patterns and flat spill patterns at high river flow yielded higher TDG saturations than crowned spill for similar total discharges. The results of this study also indicated that TDG levels of powerhouse flows may have been influenced by spill.

2.3.1.2 EES Consulting 2006 Project TDG Production Dynamics Study

In 2006, Douglas continued TDG assessments at the Project by examining the best spillway configurations and project operations to minimize the production of TDG. Douglas hired a team of hydraulic and TDG experts from the Pacific Northwest to help design a monitoring program for a study that would examine various operational scenarios and their respective TDG production dynamics.

Thirteen sensors were placed along three transects at 1,000, 2,500, and 15,000 feet below Wells Dam. There were also three sensors placed across the forebay, one being the fixed monitoring station midway across the face of the dam and two more a distance of 300 feet from the dam. The sensors were programmed to collect data in 15-minute intervals for both TDG and water temperature. Each test required the operations of the dam to maintain static flows through the powerhouse and spillway for at least a three-hour period. While there were 30 scheduled spill events, there were an additional 50 events where the power house and spillway conditions were held constant for a minimum three-hour period. These “incidental” events provided an opportunity to collect additional TDG data on a variety of Project operations that met study criteria and are included in the results of the 2006 TDG Abatement Study. Spill amounts ranged from 5.2 to 52% of project flow; the volume of spill ranged from 2.2 to 124.7 kcfs and the total discharge ranged from16.4 to 254.0 kcfs. There were six tests that were done at flows that exceeded the Wells Dam 7Q10 flows of 246 kcfs.

Results of the study indicated that two operational scenarios, spread spill and concentrated spill, produced the lowest levels of TDG. The EES Consulting team recommended continued testing of operational measures to ameliorate TDG production at Wells Dam (EES Consulting et al. 2007). The 2006 study confirmed that the current locations of the forebay and tailwater TDG compliance monitoring station are appropriate in providing representative TDG production information both longitudinally and laterally downstream of Wells Dam.

2.3.1.3 IIHR-Hydroscience and Engineering TDG Modeling

A study was initiated with the University of Iowa IIHR-Hydroscience and Engineering in 2007 to develop a numerical model capable of predicting the hydrodynamics and TDG concentrations in the tailrace of the Wells Project. The purpose of the model was to assist in the understanding of the underlying dynamics of TDG production allowing an accurate evaluation of the effectiveness of various spill configurations and plant operations in reducing TDG at Wells Dam. The modeling efforts were divided into three phases. Phase I was a developmental stage for calibration and validation. The results from Phase I were successful and the model was proven to provide a reliable predictor of tailrace TDG and therefore a useful tool to identify Project operations that can minimize TDG concentrations downstream of Wells Dam (Politano et al. 2008). Phase II was a series of model runs using varying spill configurations based on typical 7Q10 events observed over the past decade. The final model run, referred to as Scenario-9, showed that preferred operating conditions and spillway configurations are able to reduce tailrace TDG to levels within Washington State WQS (< 120%) during a 7Q10 flow (Politano et al. 2009a).

Phase III included a final series of model runs aimed at gaining further reductions in tailrace TDG by reconfiguring the spillway operations used to achieve the tailrace standard in Phase II (Scenario-9). In addition to gaining additional reductions in TDG, IIHR-Hydroscience and Engineering ran a “Standard Compliance Comparison” scenario. The Standard Compliance Comparison scenario included a forebay TDG of 115%, along with 9 of 10 units operating at full capacity (i.e., 90% of total powerhouse capacity), to provide results comparable to downstream hydroelectric project TDG evaluations. The Phase III report also demonstrated compliance with two other requirements of the state WQS: (1) the ability to meet 115% in the forebay of Rocky Reach Dam during fish spill; and (2) the ability to maintain 110% in the tailrace during non-fish spill periods (Politano et al. 2009b).

2.3.1.4 Project TDG Playbooks

Since 2007, spill playbooks have been developed annually for operators at Wells Dam. The original spill playbook in 2007 focused on a range of operations to evaluate TDG production along with potential operational constraints. The subsequent playbooks evolved to the current 2009 format that simply focuses on strategies that have been identified to effectively manage TDG production in the tailrace of Wells Dam. The resulting spill strategies are based on three basic principles:

- Spill operations concentrated through a single spillbay (as opposed to spread through several spillbays) reduce TDG production and increase degasification at the tailwater surface.
- Discharge from spillbays (denoted S hereafter) located near the middle of the dam (e.g., S7) prevent water with high TDG from attaching to the shoreline.
- Forced spill exceeding Juvenile Bypass System (JBS) flows of 2.2 kcfs must be increased to ≥ 15 kcfs to ensure that the submerged spillway lip below the ogee is engaged. The resulting force creates flows that are surface oriented, ultimately promoting degasification at the tailwater surface.

The above principles are used as a guideline for Project operators to spill at a range of outflows to ensure the future compliance with the Washington State WQS for TDG.

2.3.2 EES Consulting 2006 Project Limnology

In 2005, Douglas implemented a study to collect baseline limnological information for waters within the Project (EES Consulting 2006). The objectives of this study were to further document existing water quality conditions within the Project and to collect information to fill water quality data gaps identified by Douglas to support the water quality certification process administered by Ecology. A total of nine sampling sites, consisting of 5 mainstem sites, 2 tributaries and 2 littoral habitats, were selected to represent the spatial variability within the Project (Table 2.3-2). The year-long study began in May 2005 and investigated various water quality parameters at each of the nine sampling sites. Sampling included physical, chemical and biological water quality characteristics. A total of 22 water quality characteristics were sampled. All procedures used for the purpose of collecting, preserving and analyzing samples followed established EPA 40 CFR 136 protocol.

Table 2.3-2 Water quality sampling sites for the 2005-2006 Project Limnological Investigation.

Site	Description
1	Downstream of Chief Joseph Dam (at Hwy 17 bridge)
2	Columbia River just downstream of the Brewster Bridge
3	Bridgeport Bar littoral site
4	Columbia River downstream of Pateros where the thalweg approaches maximum depth in the lower Wells Reservoir
5	Okanogan River upstream of confluence with Columbia River
6	Methow River upstream of confluence with Columbia River
7	Lower Wells Reservoir/Starr Boat Launch littoral site
8	Wells Forebay
9	Wells Tailrace

Results from the limnological investigation showed that the Project is characterized by low to moderately low levels for nutrients, slightly basic pH (range 7.5–8.5), well-oxygenated water and low turbidity with moderately low algae growth. Average Secchi depth for the Wells Reservoir varied minimally during May through August with only a slight increase as the season progressed (study average per site range 4.1 meters to 4.5 meters). Secchi depth (transparency) increased to a seasonal peak in September of 6.25 meters before slightly decreasing in October to a mean depth of 5.3 meters. Transparency increased downstream at the Brewster Bridge and Wells Forebay relative to the head of the reservoir at the Chief Joseph Dam tailrace for all months.

Turbidity in the Columbia River showed little seasonal variation with an annual average of 0.98 NTU and a variation of 0.38 NTU in September, 2005 (Wells Forebay site) to 3.81 NTU in February, 2006 (Brewster Bridge site). Longitudinal variation in turbidity was also minimal; sampling did not occur within the mixing zone plume of the Okanogan River. Turbidity in the Okanogan River was consistently higher than the Columbia River. Turbidity in the Methow

River was higher than in the Columbia River in May (due to sediment load) and in August due to phytoplankton growth. The only turbidity reading over 5.0 NTU was in the Methow River during May where turbidity was 5.6 NTU.

Under the EES Consulting limnology study, water temperature in the Wells Reservoir is primarily governed by the temperature of inflowing water at Chief Joseph Dam with little warming occurring as water traverses the Wells Reservoir's length. Similar to the Wells hourly temperature monitoring data (Section 2.2.2), results of the study indicate that the Project waters remained unstratified throughout the entire study period and was vertically homogeneous for DO. Figure 2.3-1 shows a vertical water profile of the Project. Low respiration rates at depth, a lack of vertical stratification and short water retention times resulted in homogeneous DO levels at all depths within the Project.

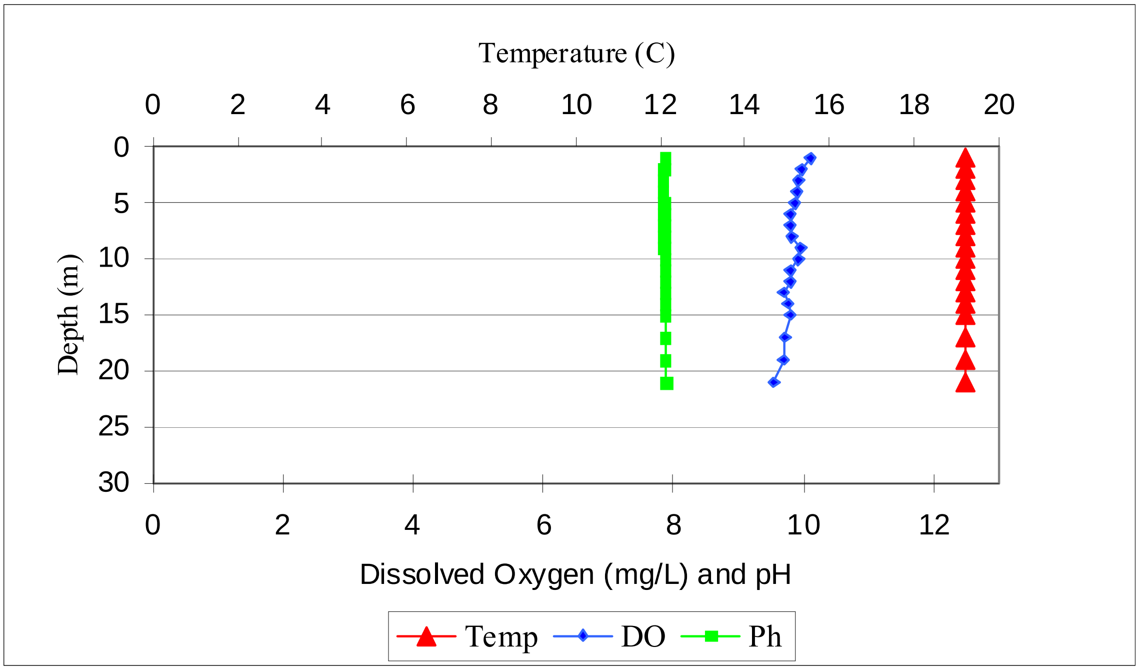

Figure 2.3-1 **Vertical water quality profile of the Project forebay from sampling date August 17, 2005.**

DO levels at one meter depth increased from upriver to downriver; the average difference (May through October) was 1.07 mg/L. The difference was more pronounced during May through August. The difference in September and October was 0.3 mg/L, which is at the limit of instrument reliability. Upstream to downstream differences in surface DO were negligible for the February 2006 sampling event. Littoral DO was similar or slightly higher than pelagic DO for surface waters. DO saturation levels were equal to or greater than 100% for all sites and all depths in all months except October when DO percent saturation for surface waters ranged from 110% to 91% saturation. The lower saturation levels in October may be due to reduced primary productivity while water temperatures were still relatively warm. All DO readings were above 8.0 mg/L and in compliance with the WQS numeric criteria.

Nitrogen and phosphorus are the two primary macronutrients needed for plant growth. Silica is important for diatomaceous phytoplankton. Ammonia (Nitrogen) levels were near or below detection levels for pelagic and littoral Columbia River Project waters as well as the Okanogan River for May through August and in February. Ammonia levels were only slightly higher in September and October. Ammonia peaked in the Methow River in August. Nitrates/Nitrites (Nitrogen) for Columbia River Project waters were higher in May before leveling off during the summer and fall. Nitrates/Nitrites were significantly higher at all sites for the February sample than any other month. Nitrates within littoral waters were lower than pelagic waters except in February when levels were similar. Nitrates/Nitrites in both the Okanogan and Methow rivers showed an increasing trend during the growing season. Total nitrogen levels for Columbia River pelagic and littoral waters were similar and relatively constant with the exception of significantly higher levels at most sites during February.

Orthophosphorus peaked for all stations in July. Orthophosphorus levels for pelagic and littoral waters were similar in all months except July when littoral orthophosphorus concentrations were significantly higher than observed for pelagic areas. Orthophosphorus levels in the Methow and Okanogan rivers were higher than in the Columbia River. Orthophosphorus was partially depleted in the Okanogan River but not in the Methow River at the time of the August sampling. Total phosphorus was slightly higher in littoral waters than in pelagic areas. Wave disturbance to bottom sediments may be a factor for this difference. Total phosphorus levels in pelagic surface waters ranged from below detection limits to 30.8 ug/L. Total phosphorus was higher for the Okanogan River than elsewhere, which is likely due to the higher sediment load. Total phosphorus for all stations peaked in July before gradually declining throughout the rest of the growing season.

The range in Nitrogen to Phosphorus (N:P) ratios for the Project waters was 2.5 to 30.8. The average Total Nitrogen to Total Phosphorus (TN:TP) ratio in the Project waters was 13.7 for the photic zone and averaged 14.8 for samples from all depths. These values are within the suggested literature ranges for phosphorus limitation. The N:P ratios peaked in July with pelagic and littoral waters showing similar trends. A decreasing N:P ratio through the major part of the algae growing season is typical of moderate to low nutrient waters as algae assimilate available nutrients. The N:P ratios were higher in the tributary rivers relative to the Columbia River. The N:P ratios are an indicator but not an absolute confirmation of factors limiting productivity.

Moderate to low chlorophyll *a* concentrations (range 0.5 *u*g/L to 5.8 *u*g/L) occurred throughout the sample period with peaks in July and October for the Project waters. Concentrations were lowest in August and also had the least variability among sites for the August sampling event. Pelagic and littoral waters were similar for chlorophyll *a* concentrations in most months except October when littoral waters reported twice as high *c*hlorophyll *a* levels.

Phytoplankton were dominated by diatoms for all months at all sites sampled with Chryptophyta (small unicellular flagellates) being second dominant based on biovolume. Diatoms and Chryptophyta are both considered a good food source for the rest of the aquatic food web. Diatoms comprised 75% to 84% of the total phytoplankton biomass for the Project sites. Chlorophytes (green algae) were sub-dominant in the tailrace but only a minor component elsewhere. Total phytoplankton biomass was relatively low for all Project sample sites; total biomass was generally less than 200,000 um^3/ml. Biomass peaked in July and August for pelagic areas of the Project waters and minor peaks occurred in October for littoral sites. The timing of peaks varied among all stations. Cyanophyta (blue-green algae) were only recorded in the Project sites for the July sample at Brewster Bridge where they comprised 16% of the total biomass; however, the biomass of Cyanophytes were comprised of relatively few but very large multicellular units. Cyanophytes also were recorded in the Wells Tailrace (4.7% biomass) in July. Diatoms dominated phytoplankton in the Methow River where peak biomass occurred in August (1,455,158 um^3/ml). This peak is much higher than biomass observed anywhere else in the Project. Biomass levels in the Okanogan River were only slightly higher than in the Columbia River for most months with minor peaks occurring in May and October. Cyanophytes were a small proportion of the August biomass sample for the Okanogan River.

Diatoms also dominated periphyton. Seasonal lows occurred in July for all sites except Bridgeport shallows where the trend was decreasing periphyton biovolume as the season progressed.

Zooplankton density for pelagic waters was greatest in July (6,080/m^3) and lowest (1,289/m^3) in August. Copepods dominated the zooplankton population. Zooplankton densities in the tributary river mouths peaked in May. Although rotifers were present in all months, their density dropped to very low levels after May. Cladocera were the third most prevalent group with a minor peak occurring in July for this group.

Trophic Status Index (TSI) developed by Carlson (1977, 1996) and modified for nitrogen by Kratzer and Brezonik (1981) is an indication of the productivity of a lake based on Secchi depth, TP, TN and chlorophyll *a* concentrations for summer months (June through September). Project waters are classified as oligo-mesotrophic based on a mean TSI score of 36.5 with 40 to 50 being the range for mesotrophic classification (EES 2006).

2.3.3 Okanogan River Sediment Loading Analysis

In 2006, Douglas, at Ecology's request, conducted an analysis to assess sediment accumulation within the Project portion of the Okanogan River (lower 15.5 miles). The request was based upon concerns that Project operations might be contributing to the accumulation of DDT and PCB-laden sediment that could impact aquatic life designated use. Douglas contracted with Erlandsen and Associates to collect bathymetric information at nine transects (RM 0.8, 1.3, 2.7, 4.9, 8.2, 10.5, 14.4, 16.6, and 19.0) within and above the Project portion of the Okanogan River. Bathymetric data of these same nine transects were collected previously by the Bechtel Corporation in 1997. A comparison of the bathymetric data for all nine transects between 1997 and 2006 indicated that sediment is not accumulating in the Project portion of the Okanogan River. It was concluded that with regard to sediment loading, the Okanogan River is exhibiting natural riverine processes and is not affected by Project operations. Douglas presented the results of the information to Ecology and the issue has been resolved.

2.3.4 Temperature, Dissolved Oxygen, pH, and Turbidity

2.3.4.1 Water Temperature Modeling

To assess compliance with the State temperature standards, two 2D laterally-averaged temperature models (using CE-QUAL-W2) were developed that represent existing (or "with Project") conditions and "without Project" conditions of the Wells Project including the Columbia River from the Chief Joseph Dam tailrace to Wells Dam, the lowest 15.5 miles of the Okanogan River, and the lowest 1.5 miles of the Methow River. The results were processed to develop daily values of the seven-day average of the daily maximum temperatures (7-DADMax), and then compared for the two conditions (West Consultants, Inc. 2008).

The model analyses demonstrated that "with Project" temperatures in the Columbia, Okanogan and Methow rivers do not increase more than 0.3^{o}C compared to ambient ("without Project") conditions anywhere in the reservoir, and that the Project complies with state water quality standards for temperature. The analyses also show that backwater from the Wells Project can reduce the very high summer temperatures observed in the lower Okanogan and Methow rivers. The intrusion of Columbia River water into the lowest 1-2 miles of the Okanogan River and lowest 1.5 miles of the Methow River can significantly decrease the temperature of warm summer inflows from upstream, and can also moderate the cold winter temperatures by 1-3^{o}C, reducing the extent and length of freezing.

2.3.4.2 Dissolved Oxygen, pH, and Turbidity

A study to collect additional DO, pH, and turbidity data from within the Wells Project was proposed by the Aquatic Resource Workgroup in 2007. The goal of this study was to obtain required DO, pH, and turbidity information for the Wells Dam forebay and lower Okanogan River, both above and within the Wells Project boundary. The information gathered from these monitoring efforts demonstrated that the Project, as proposed to be operated under the new license, will meet the numeric criteria for WQS (Parametrix, Inc. 2009).

DO measurements demonstrated that the Okanogan River and the forebay of Wells Dam were in compliance with WQS. Project effects on DO concentrations in the Okanogan River were not evident as incoming water quality closely resembled that of the inundated portions of the Okanogan River. Changes in background minimum DO levels at Malott (above Project boundary) have a strong and significant linear relationship ($P < 0.0001$) with minimum values recorded within Project boundaries at both Monse and the Highway 97 Bridge. These results indicate that there is no statistically significant difference between minimum DO measurements collected above the Project and within the Project. DO concentrations in the forebay of Wells Dam remained well above the minimum numeric water quality criterion, excluding an instrument-related malfunction observed in early October (Parametrix, Inc. 2009).

Only on one occasion did pH within the Project exceed background measurements, but only by 0.06 units, well within the water quality allowance for human caused conditions. These results indicate that pH measurements within the Project boundary are well within the numeric criteria for WQS (Parametrix, Inc. 2009).

It is not clear what effect, if any, the Wells Project may have had on turbidity. Elevated turbidity values appeared to coincide with snowmelt and precipitation causing increased river flow. Turbidity levels in the Okanogan River above the Project (at Malott) were inconsistent with readings collected at both Monse (5 of 122 comparable days, or 4%) and Highway 97 (8 of 165 comparable days, or 5%), suggesting that such events are not widespread or persistent within the Wells Project (Parametrix, Inc. 2009). In 2009, Douglas contracted Columbia Basin Environmental to continue monitoring turbidity for an additional year. Results from the 2009 field season indicate that turbidity decreases from the background monitoring location (Malott, RM 17.0), to both Monse (RM 5.0) and the Highway 97 Bridge (RM 1.3). No exceedances were observed and the data showed that the Wells Project is in compliance with the Washington State water quality standards for turbidity (DCPUD and CBE 2009).

2.3.5 Summary of Compliance with WQS

Based on the Initial and Updated Study Reports the Aquatic SWG was able to determine that waters within the Wells Project currently meet state numeric criteria of WQS as defined in Chapter 173-201A WAC. The following table presents supporting studies, by standard:

Standard	Studies	Result(s)	Continued Monitoring
TDG	Politano et al. 2008, 2009a, 2009b.	Compliance met under preferred operating conditions and standard compliance scenario.	Yes
Temperature	West Consultants, Inc. 2008	Compliance met, zero exceedances. Potential future TMDL.	Yes
DO	Parametrix, Inc. 2009	Compliance met, zero exceedances	No
pH	Parametrix, Inc. 2009	Compliance met, zero exceedances	No
Turbidity	Parametrix, Inc. 2009; DCPUD and CBE 2009.	Compliance met, zero exceedances	No

3.0 GOAL AND OBJECTIVES

The goal of the WQMP is to protect the quality of the surface waters affected by the Project with regard to the numeric criteria. Studies conducted during the relicensing process have found water quality within the Wells Project to be within compliance. Douglas, in collaboration with the Aquatic SWG, has agreed to implement measures in support of the WQMP. Reasonable and feasible measures will be implemented in order to maintain compliance with the numeric criteria of the Washington State WQS, Chapter 173-201A WAC. The measures presented within the WQMP (Section 4.0) are designed to meet the following objectives:

Objective 1: Maintain compliance with state WQS for TDG. If non-compliance is observed, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas;
Objective 2: Maintain compliance with state WQS for water temperature. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas;

Objective 3: Maintain compliance with state WQS for other numeric criteria. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas;

Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill; and

Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin.

The WQMP is intended to be compatible with other water quality management plans in the Columbia River mainstem, including TMDLs. Furthermore, the WQMP is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Aquatic Nuisance Species Management Plan through the protection of designated uses (WAC 173-201A-600) in Project waters. The WQMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies.

The schedule for implementation of specific measures within the WQMP is based on the best information available at the time the Plan was developed. As new information becomes available, the measures proposed in the WQMP may be adjusted through consultation with the Aquatic SWG.

4.0 WATER QUALITY MEASURES

In order to fulfill the goals and objectives described in Section 3.0, Douglas, in consultation with the Aquatic SWG, has agreed to implement the following measures.

4.1 TDG Compliance (Objective 1)

4.1.1 Monitoring

Douglas shall continue to maintain fixed monitoring stations in the forebay and tailrace area of Wells Dam to monitor TDG and barometric pressure. TDG will be monitored hourly during the fish spill season each year. Data from the Wells forebay and tailrace stations will be transmitted on a daily basis to the applicable web-accessible database used by Ecology and regional fish management agencies. Douglas shall maintain this monitoring program consistent with activities described in the then-current Wells Gas Abatement Plan (Section 4.1.3).

Douglas shall provide an annual report of all spill (and predicted TDG levels in the tailrace) occurring outside the fish passage season (currently October 1 to March 15).

4.1.2 Spill Operations

Within one year of issuance of the new license, Douglas shall coordinate the annual HCP Project Fish Bypass/Spill Operations Plan with the Aquatic SWG and the GAP, using best available information to minimize the production of TDG during periods of spill. All operations identified within the plan shall require the approval of the Wells HCP Coordinating Committee and the Aquatic SWG in order to ensure that spill operations are aimed at protecting designated uses and complying with the WQS numeric criteria for TDG in the Columbia River at the Project. In consultation with the Wells HCP Coordinating Committee and Aquatic SWG, the spill operations plan will be reviewed and updated, as necessary.

4.1.3 Project Gas Abatement Plan and TDG Exemption

Pending Ecology's approval of each subsequent GAP (which provides for the TDG exemption), Douglas shall continue to implement the activities identified within the previously-approved plan. Douglas shall submit the GAP to Ecology by February 28th of each year, or on a less frequent basis, as documented by Ecology in writing. Douglas shall submit the GAPs through the term of the new license or until no longer required by Ecology.

The GAP will include the Spill Operations Plan (Section 4.1.2) and will be accompanied by a fisheries management plan and physical and biological monitoring plans. The GAP shall include information on any new or improved technologies to aid in the reduction in TDG.

It is anticipated that: (1) the TDG monitoring activities described in Section 4.1.1 will be adequate for the physical monitoring plan requirement; and (2) the Wells HCP and Aquatic Resource Management Plans in the Aquatic Settlement Agreement with respect to fish passage will be adequate for fish management plans, for the purposes of the GAP. Additional biological monitoring studies for purposes of Gas Bubble Trauma Monitoring may be required.

Douglas shall provide an annual TDG report as required by the Ecology-approved GAP.

4.1.4 Measures to Address Non-Compliance

Douglas shall report all occurrences of non-compliance with TDG numeric criteria immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration.

If the Project is found to be consistently out of compliance with TDG at any time during the new license term, Douglas shall, in coordination with the Aquatic SWG, take the following steps:

(A) Evaluate any new reasonable and feasible technologies that have been developed; and

(B) After the evaluation, if no new reasonable and feasible improvements have been identified, propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

4.2 Water Temperature Compliance (Objective 2)

4.2.1 Monitoring

Douglas shall continue to monitor temperature at the Wells Dam forebay and tailrace in conjunction with its TDG monitoring program (currently April 1-September 15). Temperature data from the TDG monitoring program will be recorded hourly and reported daily to regional databases. Water temperatures shall also be monitored at all boundary conditions of the Project (Methow River RM 1.5, Okanogan River RM 10.5, and Columbia River RM 544.5) and in the Well Dam forebay and tailrace as required by the Aquatic SWG.

Douglas shall continue to collect hourly fish ladder temperatures 24 hours a day during the fish passage season (May 1 to November 15) at Pool No. 39 on the east ladder. Water temperatures shall also be monitored hourly in the auxiliary water supply system and near the east shore of the Wells Dam forebay (bottom, middle, and surface depths) during this same time period.

4.2.2 Temperature TMDL Development and Implementation

Douglas shall participate in EPA Region 10's water temperature TMDL development for the U.S. portion of the Columbia River, in coordination with the Parties of the Aquatic SWG. Temperature data from the monitoring program at Wells Dam (Section 4.2.1) and software and results of the CE-QUAL-W2 model will be made available to EPA and other entities to assist in the development of the Columbia River temperature TMDL.

Where the measures identified in the TMDL are more protective than other measures in this plan, provisions of the temperature TMDL and implementation plans relevant to the Project and its operations, including specified time frames for implementing improvement measures, shall be implemented at the Project.

If a TMDL is not timely approved by EPA, Ecology may establish an allocation. In this case, Ecology will work with the Aquatic SWG and other interested parties to identify reasonable and feasible measures.

This plan does not exclude the option of the Aquatic SWG to consider modifying the water quality standard through a use attainability analysis or other process.

4.2.3 Measures to Address Non-Compliance

Douglas shall report information indicative of non-compliance with water temperature immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration. Such information may include changes in Project operations likely to increase water temperature or observations inconsistent with related environmental parameters.

If the Project is found to be consistently out of compliance with water temperature at any time during the new license term, Douglas shall, in coordination with the Aquatic SWG, take the following steps:

(A) Evaluate alternative Project operations or any new reasonable and feasible technologies that have been developed; and

(B) After the evaluation, if no new reasonable and feasible improvements have been identified, propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

4.3 Compliance with Other Numeric Criteria (Objective 3)

Douglas shall report information indicative of non-compliance with other numeric criteria immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration. This includes existing or developed criteria for toxic substances in water or sediments within Project Boundaries. The Aquatic SWG shall evaluate the information, and, if needed, require Douglas to develop a plan to identify and address Project-related impacts, if any.

After the evaluation, if no reasonable and feasible improvements have been identified, Douglas may propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

4.4 Spill Prevention and Control (Objective 4)

4.4.1 Spill Prevention and Control Requirements

Douglas shall operate the Project in a manner that will minimize spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill. The Project Spill Prevention Control and Countermeasures Plan (SPCC) will be updated pursuant to FERC requirements and recommendations as provided by Ecology. Douglas shall comply with the updated version(s) of the SPCC.

4.4.2 Participation in the Columbia and Snake River Spill Response Initiative

Douglas shall continue participation in the Columbia and Snake River Spill Response Initiative (CSR-SRI). The CSR-SRI is a collaborative effort made up of local, state, and federal oil spill response community as well as members of industry and was developed to address the immediate need for oil spill preparedness and response in the area along the Columbia and Snake rivers. In addition to participation in the CSR-SRI, Douglas shall continue to operate the Project in accordance with its SPCC (Jacobs 2007).

4.4.3 Inspections

For the term or the new license, Douglas shall, upon reasonable notice, allow Ecology staff or representatives access to inspect the Project, including inside the dam, for the purpose of assessing Spill Prevention and Control measures and compliance with Section 4.4.1. Following inspection, Douglas shall address oil and hazardous material prevention and control issues identified by Ecology.

4.5 Regional Forums (Objective 5)

4.5.1 Participation in Regional Water Quality Forums

Douglas shall continue its participation in both the Water Quality Team and Adaptive Management Team meetings to address regional water quality issues, including sharing the results from monitoring, measuring, and evaluating water quality in the Wells Project. However, Douglas will not advocate for any water quality measures in regional forums without consulting with the Aquatic SWG.

4.5.2 Project Operations

Douglas may, following notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with other mid-Columbia hydroelectric operations to the extent practicable. Coordinated operations are intended to reduce spill, increase generating efficiencies and thereby reduce the potential for exceedances of the TDG numeric criteria. These coordinated operations should be beneficial to TDG compliance and Aquatic Resources.

4.6 Reporting

Douglas shall provide a draft annual report to the Aquatic SWG summarizing the previous year's water quality activities and activities proposed for the coming year, in accordance with the WQMP and as determined by the Aquatic SWG. The report will include any decisions, statements of agreement, evaluations, or changes made pursuant to this WQMP. If significant activity was not conducted in a given year, Douglas may prepare a memorandum providing an explanation of the circumstances in lieu of the annual report. A summary of monitoring results, any analyses and compliance with the WQS numeric criteria will be included in an appendix to the annual report.

4.6.1 Study Plans

Douglas shall prepare study plan(s) that include quality assurance project plan(s) (QAPP) for each parameter to be monitored. The QAPPs shall follow the Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (July 2004 Ecology Publication Number 04-03-030) or its successor. The QAPPs shall contain, at a minimum, a list of parameter(s) to be monitored, a map of sampling locations, and descriptions of the purpose of the monitoring, sampling frequency, sampling procedures and equipment, analytical methods, quality control procedures, data handling and data assessment procedures and reporting protocols.

Douglas shall review and update the QAPPs annually based on a yearly review of data and data quality. Ecology may also require future revisions to the QAPP based on monitoring results, regulatory changes, changes in Project operations, and/or the requirements of TMDLs.

The initial QAPPs and any changes shall be submitted to the Aquatic SWG for review and are subject to approval by Ecology. Implementation of the monitoring program shall begin upon Ecology's written approval of the QAPP, unless otherwise provided by Ecology.

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Appendix E-3

Wildlife and Botanical Management Plan

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WILDLIFE AND BOTANICAL MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

June 2009

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

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EXECUTIVE SUMMARY

The Wildlife and Botanical Management Plan (WBMP), in conjunction with Public Utility District No. 1 of Douglas County's (Douglas PUD) Land Use Policy and the Avian Protection Plan, directs implementation of resource protection measures for wildlife and botanical resources during the term of the new Federal Energy Regulatory Commission (FERC) license for the Wells Hydroelectric Project (Wells Project). With the goal of ensuring active stakeholder support during the development and implementation of management plans, Douglas PUD developed this management plan in consultation with agency and tribal natural resource managers (Resource Work Groups or RWG). During the development of the WBMP, the Terrestrial RWG focused on developing management priorities for resources potentially impacted by ongoing Project operations. The members of the Terrestrial RWG include the U.S. Fish and Wildlife Service (USFWS), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (CCT), U.S. Bureau of Land Management (BLM), and Douglas PUD.

The goal of the Wildlife and Botanical Management Plan is to protect, maintain and enhance wildlife and habitat on Project lands commensurate with ongoing effects of operating the Wells Project. The plan is also intended to guide wildlife management activities and to protect rare, threatened and endangered (RTE) wildlife and plant species on Project lands during the term of the new license for the Wells Project.

The main objectives of the plan are:

Objective 1: Protect and enhance RTE wildlife species' habitat on Wells Project lands.

Objective 2: Protect RTE botanical species from land disturbing activities and herbicide sprays.

Objective 3: Conserve habitat for species on Wells Project lands protected by the federal Endangered Species Act, Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act.

Objective 4: Protect native habitat on Wells Project lands.

Objective 5: Maintain productive wildlife habitat on the Cassimer Bar Wildlife Management Area.

Objective 6: Control noxious weeds on Wells Project lands.

Objective 7: Consultation.

1.0 INTRODUCTION

The Wildlife and Botanical Management Plan (WBMP) is an important component in the relicensing of the Wells Hydroelectric Project (Wells Project). The WBMP will guide the selection of proposed measures in the new license application to protect and mitigate potential project impacts on wildlife and botanical resources, and the implementation of such measures, during the term of the new license. Toward ensuring support for the WBMP, the Public Utility District No. 1 of Douglas County (Douglas PUD) developed this plan in consultation with the members of the Terrestrial Resources Work Group (RWG). Members of the Terrestrial RWG include the U.S. Fish and Wildlife Service (USFWS), Washington State Department of Fish and Wildlife (WDFW), U.S. Bureau of Land Management (BLM), the Confederated Tribes of the Colville Reservation (CCT) and Douglas PUD.

The Terrestrial RWG has agreed on the need to develop a plan for the long-term management of wildlife and botanical resources in the Wells Project. This Management Plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3) and defines the relevant protection, mitigation, and enhancement (PME) measures (Section 4) for wildlife and botanical resources that Douglas PUD will implement under the term of the new license.

2.0 BACKGROUND

The shoreline of the Wells Reservoir is approximately 105 miles in length. Douglas PUD owns nearly 104 miles of shoreline within the Project. Approximately 2,140 acres of land lies between the Wells Project boundary and the ordinary high water elevation of the Wells Reservoir.

The majority of the land within the Wells Project boundary was cleared during construction of the Project. Numerous riparian and wetland plant communities have become established along the shoreline since the filling of the Wells Reservoir in 1967. The riparian vegetation that has developed naturally since the reservoir was filled closely resembles riparian vegetation outside the Wells Project boundary. Areas on the reservoir that were replanted include both native and cultivated riparian species. Riparian vegetation on the Okanogan River from River Mile (RM) 8 to RM 15.5 was not cleared before the reservoir was filled and includes original riparian plant communities.

Shrub steppe is the most common upland vegetation type found within and adjacent to the Wells Project. Grass cover types are also present in upland areas where ground disturbing activities or fire removed the sagebrush or where higher amounts of available soil moisture favor grasses. Conifer cover types dominated by ponderosa pine (*Pinus ponderosa*) are present in a few locations with favorable aspect, soil and moisture conditions.

Much of the land in the immediate vicinity of the reservoir is, or at one time was, cultivated for a variety of crops including wheat, alfalfa and orchards. Currently, irrigated orchards are the dominant crop.

The Wells Wildlife Area, managed by WDFW, is located in Douglas and Okanogan counties in Washington State and consists of six units: three shoreline/riparian units and three upland units. Bridgeport Bar (502 acres), Okanogan (91 acres) and Washburn Island (300 acres) are located along the shoreline of the Wells Reservoir and a portion of each unit lies within the Project boundary. West Foster Creek (1,025 acres), Central Ferry (1,602 acres) and Indian Dan Canyon (4,716 acres) are upland units and are entirely outside the Wells Project boundary (Figure 2.0-1).

The Cassimer Bar Wildlife Management Area (116 acres) is located in Okanogan County, and is a shoreline/riparian and wetlands unit at the Okanogan River confluence on the Colville Indian Reservation (Figure 2.0-1). The Cassimer Bar Wildlife Management Area is managed by Douglas PUD in cooperation with the CCT.

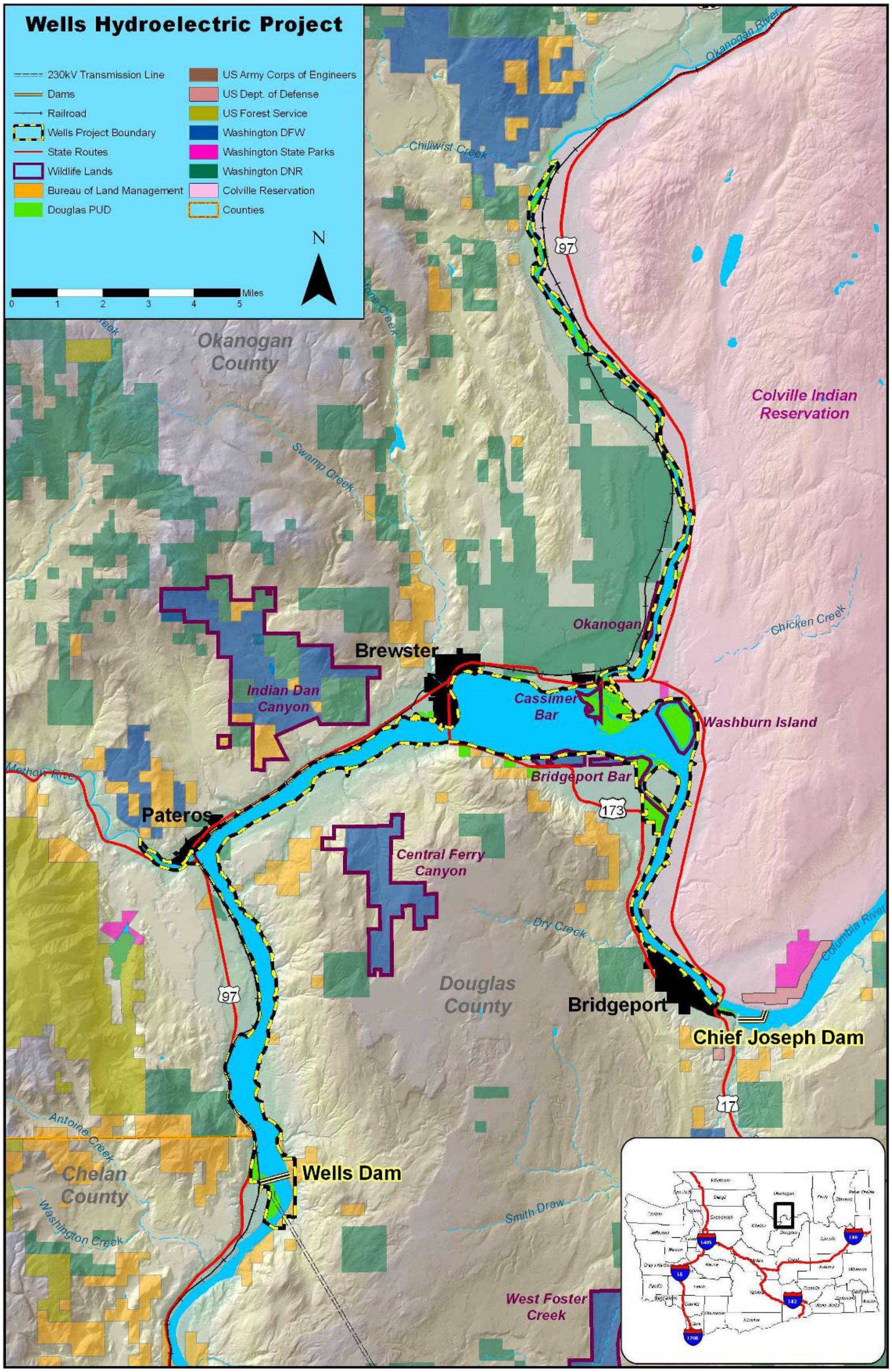

Figure 2.0-1 Wells Project Map

2.1 Off-License Settlement Agreement

In December 2007, WDFW and Douglas PUD signed an Off-License Settlement Agreement that addresses WDFW's wildlife, wildlife habitat, botanical, resident fish and resident fish habitat concerns related to the ongoing operation of the Wells Project. While not intended to be included as a measure under the new FERC operating license, it complements the goals and objectives of the WBMP; this section is provided in the WBMP for information purposes only.

The goals of the Off-License Settlement Agreement include creating, protecting, maintaining and enhancing wildlife habitat within the Wells Wildlife Area. The funding obligations of the agreement commence June 1, 2012, and include Douglas PUD providing WDFW $200,000 annual funding for maintenance and operations of the Wells Wildlife Area; up to $50,000.00 over the term of the agreement for habitat restoration after wildland fires on the Wells Wildlife Area; and provisions for replacement of certain capital equipment used to meet the program goals. The Off-License Settlement Agreement also provides for the protection of rare, threatened and endangered (RTE) wildlife and botanical resources, noxious weeds management and wetland habitat protection on all six units of the Wells Wildlife Area (including the three shoreline units that are partly or completely within the Wells Project boundary).

2.2 Resource Protection, Enhancement and Mitigation Under the Original License

2.2.1 Original Construction

Douglas PUD and the CCT signed a wildlife mitigation agreement on January 26, 1970. The agreement addressed mitigation for the construction of the Wells Project and the project-related impacts to wildlife on reservation lands caused by the original construction of the Wells Project. The terms of the mitigation agreement required Douglas PUD to pay CCT $16,800 annually for ten years. The funds were to be used to develop wildlife habitat and hunting improvements within the boundaries of the CCT Reservation. An agreement between Douglas PUD, CCT, and Ervin and Loretta Wolley signed on May 4, 1970 set aside 116 acres of land on Cassimer Bar within the CCT Reservation as the Cassimer Bar Wildlife Management Area. The Cassimer Bar Wildlife Management Area is jointly managed by CCT and Douglas PUD.

Douglas PUD and WDFW, then Washington Department of Game (WDG), signed an agreement on July 15, 1974 which defined the mitigation necessary to address the impacts of the construction and operation of the Wells Project to wildlife. The 1974 agreement required Douglas to transfer, in fee title, 5,755.8 acres of land to WDFW and provided WDFW with management rights to 596.2 acres of Douglas PUD owned lands within the Wells Project boundary. The agreement also included a requirement that Douglas PUD provide WDFW with a lump sum payment of $1,250,000.00 for a special Wildlife Fund. The fund was used to develop the Wells Wildlife Area on these lands, for the purchase of capital equipment and to provide operation and maintenance funding. Management rights were also secured on 1,884.0 acres of BLM and Washington Department of Natural Resources (WDNR) land adjacent to fee land provided by Douglas PUD. The Special Wildlife Fund has paid for the operation of Wells

Wildlife Area since that time. Active management of the Wells Wildlife Area began in the summer of 1975.

WDFW's original management objective for the Wells Wildlife Area was to develop habitat for game species and to release upland game birds, primarily ring-necked pheasants (*Phasianus colchicus*), with the goal of replacing hunting opportunities that were lost due to the original construction of the Wells Project. Over the years, WDFW's wildlife management directives evolved, at a state-wide level, from solely managing the mitigation lands for game species (upland birds, waterfowl and big game) to providing more general wildlife protection and recreation opportunities. The agency is now responsible for protecting game and non-game species and their habitats, managing for species diversity, and providing consumptive (hunting) and non-consumptive (wildlife viewing) wildlife related recreation.

2.2.2 Two-Foot Increase in the Wells Dam Forebay

WDFW and Douglas PUD signed a mitigation agreement on July 19, 1982 as a result of the two-foot raise in the forebay elevation of the Wells Reservoir. To fulfill the terms of the mitigation agreement, Douglas PUD rebuilt the islands used for Canada goose nesting in the Wells Reservoir. As part of the agreement, Douglas PUD created four islands (Kirk Islands) between Brewster and Pateros and eleven islands (Bridgeport Bar Islands) near the Wells Wildlife Area. The new islands replaced the former islands that were affected by the two-foot pool raise and ongoing erosion. Shoreline areas were raised using fill material and pit-run cobble was used to armor the shorelines of the islands. Interior areas of the goose nesting islands, below the reservoir elevation, were not filled, creating ponds and wetlands in the interior of some of the islands. In addition to protecting the island from erosion, to date, over 29 miles of reservoir shoreline, representing nearly one-third of the Wells Project shoreline, have been armored to protect against erosion. Emergent wetlands on Washburn Island were protected from inundation by slowly raising the water level of the Washburn Island pond over 4 years to allow the wetland plants to reestablish at a higher elevation. Douglas PUD also planted fourteen acres of riparian vegetation and erected 25 raptor perch poles as part of the mitigation for the two-foot increase in the Wells forebay elevation.

Douglas PUD and CCT signed a wildlife mitigation agreement on May 2, 1984 for the two-foot-raise in Wells Dam forebay elevation. The terms of the agreement included building dikes along the shoreline of Cassimer Bar to stabilize the water levels of three sloughs that support aquatic plants and are important habitat for waterfowl and other species. The sloughs were also fenced to protect the wetlands from livestock grazing.

2.2.3 Supplemental Wildlife Funding

On July 19, 1994, WDFW determined that the Special Wildlife Fund did not contain adequate monies to continue operation of the Wells Wildlife Area through the term of the Wells Project license. To ensure continued operation of the Wells Wildlife Area, Douglas PUD and WDFW entered into a memorandum of agreement in which Douglas provided "Supplemental" funding to WDFW to augment the income from the Special Wildlife Fund. The Special Wildlife Fund will be depleted and the "Supplemental" funding of the Wells Wildlife Area both terminate on May 31, 2012.

2.3 Wildlife and Botanical Studies

Since 1975, Douglas PUD and WDFW have collected information on the wildlife species in the vicinity of the Wells Project. A summary of each year's surveys is provided to FERC in an annual report detailing wildlife mitigation program activities conducted on the Wells Wildlife Area. The annual report to FERC contains data on wildlife, goose nesting numbers, hunting activity and harvest on the wildlife area, bald eagle abundance and roost use in the vicinity of the Wells Project.

Further, in anticipation of data needs for relicensing, Douglas PUD conducted studies of existing wildlife and botanical resources found within the Wells Project ("baseline studies").

These studies were conducted specifically to collect relevant and timely information for the Pre-Application Document. Baseline botanical and terrestrial studies included:

- Rare, threatened and endangered plant surveys.
- Vegetation cover type mapping.
- Invasive weed surveys and mapping.
- Avian presence and distribution surveys.
- Small mammal presence and distribution surveys.
- Amphibian presence and distribution surveys.
- Reptile presence and distribution surveys.

2.3.1 Baseline Study Findings

A botanical survey of the Wells Project was conducted in 2005 (EDAW 2006a) to determine the presence of RTE plants and to identify invasive plant species. The study also included a cover type mapping component, in which approximately 2,539 acres were mapped by digitizing aerial orthophotos in ArcMap™ Geographic Information System (GIS). Ground truthing of the cover type maps was completed during field surveys (EDAW, 2006a).

The study reported 13 occurrences of four rare plants in the Wells Project including little bluestem (*Schizachyrium scoparium*), chaffweed (*Centunculus minimus*), northern sweetgrass (*Hierochloe odorata*) and brittle prickly-pear (*Opuntia fragilis*) (EDAW, 2006a). Brittle prickly-pear, found at six locations on project lands, has been found to be more abundant in Washington State than previously thought and has been recently removed from the list of plants tracked by the Washington Natural Heritage Program (WNHP) (personal communication between S. Moody, Environmental Review Coordinator, Washington Natural Heritage Program, Olympia Washington, to J. McGee, Wildlife Biologist, Douglas PUD, East Wenatchee, Washington). Ute ladies' tresses (*Spiranthes diluvialis)*, a federally-listed threatened species of orchid, was not observed during rare plant surveys conducted in 2005 despite the presence of suitable wetland habitat in the Wells Project (EDAW, 2006a).

Noxious weed surveys in the Wells Project documented and mapped 99 occurrences of four Class B-designate weed species, including purple loosestrife (*Lythrum salicaria*), Dalmatian toadflax (*Linaria dalmatica*), leafy spurge (*Euphorbia esula*), and perennial pepperweed (*Lepidium latifolium*). No Class A weeds were found. Although not mapped, two Class B weeds—Russian knapweed (*Acroptilon repens*) and diffuse knapweed (*Centaurea diffusa*)—were common in upland or transitional upland/wetland habitats; two Class C weeds—reed canarygrass (*Phalaris arundinacea*) and yellow flag (*Iris pseudacorus*)—were common species in Project Area wetlands and along reservoir shorelines (EDAW, 2006a).

Cover types were mapped and field verified on 2,539 acres of land within the Wells Project. Upland and wetland habitats comprised 32 percent and 31 percent of the Project Area, respectively; 26 percent of the land was agricultural and another 6.9 percent shows evidence of development. The remaining areas mapped included Upland Rock Habitats, Littoral Zone, and Bare-Disturbed-Eroded which comprised, in total, less than 5 percent of the Project Area (EDAW, 2006a).

A terrestrial study of the Wells Project was also conducted by EDAW (2006b) to document the occurrence, distribution, and habitat use of birds, amphibians, reptiles, and small mammals on Project lands, including those species listed as rare, threatened, or endangered. The only federally-listed species documented during the study was the bald eagle (*Haliaeetus leucocephalus*). Two state-listed species were detected during the study, American white pelican (*Pelecanus erythrorhynchos*, State Endangered) and bald eagle (State Threatened). In 2007, the bald eagle was removed from the federal Endangered Species List, and in early 2008 the Washington Fish and Wildlife Commission down-listed bald eagles from threatened to sensitive on the state list of protected wildlife.

Surveys documented the presence of 120 bird species in the Wells Project with the greatest species diversity of birds in wetland habitat during the breeding season. The relative abundance of birds peaked in the fall. Three native species of amphibians were documented in wetland on Project lands and one invasive amphibian species was also documented. Six species of snakes and one species of turtle were documented during surveys. Twelve species of small mammals were found on project lands. A full list of species documented during the study can be found in EDAW (2006b) or Douglas PUD (2006).

2.3.2 Studies Developed by the Terrestrial Resource Work Groups

The Terrestrial RWG, originally formed prior to the beginning of the formal Project relicensing process, evaluated all of the available information and recommended that two additional studies be conducted during the Wells ILP. The first, a study of habitats along the Wells 230 kV transmission line corridor, included these elements:

- RTE plant surveys.
- Vegetation cover type map development and field verification.
- Invasive weed surveys and mapping.
- Avian presence and distribution surveys.
- RTE terrestrial species.
- Reptile presence and distribution surveys.

The second study developed by the Terrestrial RWG was a study to assess control measures for piscivorous (fish eating) birds and mammals preying on fish rearing at Wells Project hatcheries.

2.3.2.1 Wells 230 kV Transmission Line Study

In 2008, Douglas PUD conducted botanical and wildlife surveys within the Wells Project transmission line corridor (Figure 2.3-1) (Parametrix 2009). The overall goal of these surveys was to provide information needed to guide land management decisions, avoid damage to valuable habitat during future transmission corridor management activities, and minimize the spread of invasive weeds. The study provides baseline data on plants and animals found within or adjacent to the corridor and information on the presence and habitat associations of RTE plant and animal species in the corridor. Surveys in the transmission line corridor targeted RTE plant and animal species, habitat mapping, invasive plant species and recorded the presence of terrestrial species. Additional data were collected to document (1) nesting by raptors and corvids, (2) use by Columbian sharp-tailed grouse (*Tympanuchus phasianellus*) and greater sage-grouse (*Centrocercus urophasianus*), and (3) evidence, or lack thereof, of avian collisions with the transmission line and associated structures in the study area.

The botanical survey observed and mapped one occurrence of Thompson's clover (*Trifolium thompsonii*) growing in the transmission line right of way. Thompson's clover is a state-listed threatened species and a federal species of concern. No federally-listed plant species were found in the transmission line corridor. The identified occurrence of Thompson's clover covers over 11 acres within the Right of Way (ROW) and extends outside of the transmission line corridor. The transmission line access road crosses through the population, but does not appear to be a threat as many individual plants were observed on the road.

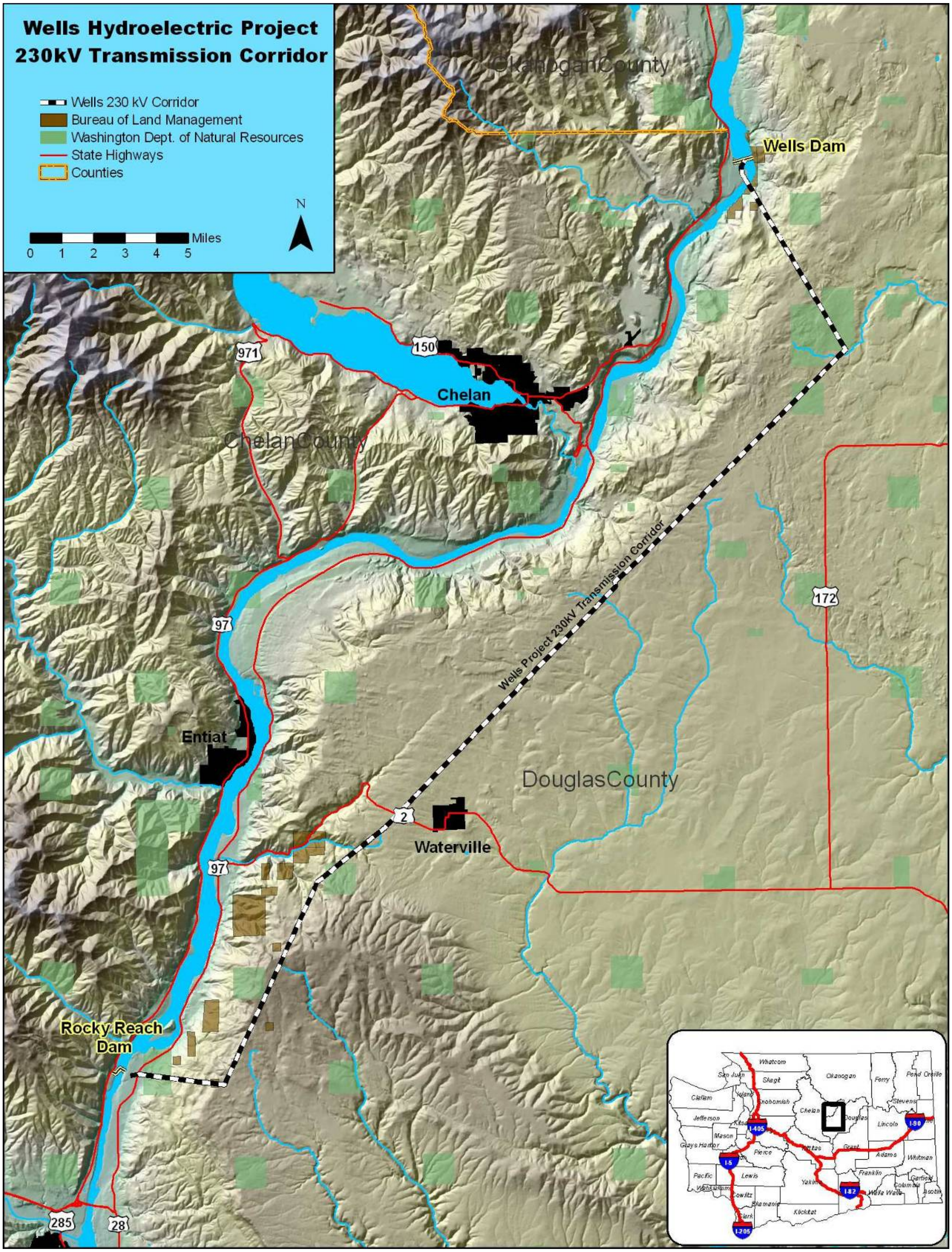

Figure 2.3-1 Wells 230 kV Transmission Line Corridor.

Invasive plant surveys in the transmission line corridor documented and mapped nine occurrences of two Class B designate weed species, Dalmatian toadflax and spotted knapweed (*Centaurea stoebe*).

Two avian RTE bird species were documented in the study area. These were sage thrasher (*Oreoscoptes montanus*) and golden eagle (*Aquila chrysaetos*), both state candidates. The American white pelican, a state endangered species, was observed where the transmission line crosses the Columbia River below Wells Dam. No evidence of use by either sage-grouse or sharp-tailed grouse was found.

Eleven nests of raptors or corvids were detected within or adjacent to the study area, including four on Douglas County PUD transmission towers. Three bird carcasses were found during focused surveys, and three were found incidentally to other survey efforts. No direct evidence of collision was observed along the transmission line. One great blue heron (*Ardea herodias*) carcass was found near the transmission line on Carpenter Island, which may have died by colliding with the line (Parametrix 2009).

2.3.3 Project Effects

2.3.3.1 RTE Terrestrial Species and Habitat

There are two RTE birds that are known to use Project lands and waters:

- American White Pelican - State Endangered
- Sharp-tailed Grouse - State Threatened

American white pelicans are shy summer residents on the Wells Reservoir. There is no known Project effect on the American white pelican. Recreational boating and fishing on the reservoir could potentially disturb the birds by creating too much visual and auditory disturbance particularly when power boats move too close to the flock.

Sharp-tailed grouse are not currently found within the Wells Project including the transmission corridor (Parametrix 2009). Sharp-tailed grouse in Douglas County are found in shrub steppe and riparian areas at higher elevation, except during hard winters when snow depth and crusting snow forces them to lower elevations. Sharp-tailed grouse have been found on Project lands in the past but they have not been found in the past twenty years (M. Hallet, WDFW, pers. comm.). Sharp-tailed grouse are dependent on riparian habitat with water birch during winter months for food and shelter. There is no known Project effect on sharp-tailed grouse**.**

No federally-listed plant species have been observed within the Wells Project (EDAW, 2006a). There are two state-listed threatened plant species and two state-listed sensitive plant species on the Project lands including:

- Little bluestem - Threatened
- Chaffweed - Sensitive
- Northern sweetgrass - Sensitive
- Thompson’s clover - Threatened

Little bluestem, chaffweed, and northern sweetgrass are all susceptible to land disturbing activities, use of herbicides and extended occurrences of low water levels which may lower the soil-moisture content during the growing season. Historic reservoir operating levels do not appear to have adversely affected RTE plant species found in various locations on the reservoir and wetland and riparian vegetation (DTA, 2006).

Thompson's clover is susceptible to the misuse of herbicides and land disturbing activities. The transmission line access road crosses through the population, but does not appear to be a threat as many individual plants were observed on the road.

2.3.3.2 Resident and Migratory Wildlife

Changes in water surface levels of a foot or less are typical of many large lakes and rivers and would not be expected to impact associated wildlife or the vegetation on the Wells Reservoir. Impacts due to low reservoir levels for extended periods may have an effect on plants and wildlife, and may lower nesting success for Canada geese (*Branta canadensis*) at the Bridgeport Bar islands.

Shoreline conditions vary considerably throughout the Wells Reservoir. The majority of the shoreline is stable and vegetated, while other areas have varying degrees of erosion. Erosion is an ongoing natural process in the Okanogan and Columbia rivers, making the influence of Wells Project operations difficult to evaluate. The Terrestrial RWG observed no indications that important wildlife species or wildlife habitats on the Wells pool are being affected by Project-induced erosion.

2.3.3.3 Invasive Weeds

Invasive weeds can have an effect on wildlife habitat and agriculture. Douglas PUD has worked closely with the Okanogan County Weed Board and adjacent landowners to control noxious weeds on the Wells Project lands. Herbicide spray records have been kept on file since 1990 when Washington State law was changed to require the retention of records. These records show that Douglas PUD has treated Scotch thistle (*Onopordum acanthium*) since 1990, Dalmatian toadflax (1995), leafy spurge (1990) and perennial pepperweed (2004). Biological agents are also collected and dispersed annually by Douglas PUD to control leafy spurge and Dalmatian toadflax in the Wells Project. In 1989, Douglas PUD discovered and began controlling purple loosestrife by digging out the plants in wetlands along the Columbia River. Rodeo™ Herbicide was used between 1990 and 1999 to control purple loosestrife. Biological control agents (beetles) have been released annually beginning in 2000 to control purple loosestrife rather than using herbicide in the wetlands along the Wells Reservoir. WDFW also controls noxious weeds in the Wells Project when managing the Wells Wildlife Area.

The weed control program administered on the Wells 230 kV transmission line corridor targets invasive weeds that can reduce the quality of forage on rangeland and dry land agriculture crops. Invasive species controlled along the transmission line corridor and access roads include: diffuse, Russian and spotted knapweeds and Dalmatian toadflax and thistle species. Biological control agents (beetles) have been released along the transmission line corridor annually beginning in 2004 to control Dalmatian toadflax.

3.0 MANAGEMENT PLAN GOALS AND OBJECTIVES

The overall goal of this Management Plan is to protect, maintain and enhance wildlife populations and habitat to a level commensurate with the effects of ongoing operation of the Wells Project. The plan is also intended to guide wildlife enhancement, protection and mitigation activities and to protect RTE wildlife and botanical species found within the Wells Project boundary.

The main objectives of the plan are:

Objective 1: Protect and enhance RTE wildlife species' habitats on Wells Project lands.

Objective 2: Protect RTE botanical species from land disturbing activities and herbicide sprays.

Objective 3: Conserve habitat for species on Wells Project lands protected by the federal Endangered Species Act, Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act.

Objective 4: Protect native habitat on Wells Project lands.

Objective 5: Maintain productive wildlife habitat on the Cassimer Bar Wildlife Management Area.

Objective 6: Control noxious weeds on Wells Project lands.

Objective 7: Consultation.

4.0 MANAGEMENT MEASURES

This section of the Management Plan outlines the measures that will be employed to protect wildlife within the boundaries of the Wells Project.

4.1 Objective 1: Protect RTE Terrestrial Species Habitat on Wells Project Lands

The WDFW maintains a list of endangered, threatened and sensitive fish and wildlife species (Washington Administrative Codes 232-12-014 and 232-12-011). Listing procedures were developed by a group of citizens, interest groups, and state agencies and adopted by the Washington Fish and Wildlife Commission in 1990 (Washington Administrative Code 232-12-297).

State- listed wildlife species known to use the Wells Project include the American white pelican and sharp-tailed grouse.

4.1.1 American White Pelican

The American white pelican is listed as a state endangered species in Washington State; white pelicans are not federally-listed. White pelicans usually arrive on the reservoir in June and remain on the reservoir until October or mid November. There is no evidence of sexually mature birds being present within the Project; all white pelicans observed appear to be immature. Consequently, there does not appear to be any nesting taking place within the Project. The white pelicans are feeding on the abundant resident fish found within the reservoir.

Following receipt of a new license, Douglas PUD will do the following:

- Beginning in year 2 of the new license, Douglas PUD will provide educational material (signs) at Douglas PUD boat launches and local visitor centers. Educational materials will advise boaters to avoid pelicans while boating, fishing and hunting. Signs will be inspected during other duties and repaired as soon as practicable after damage is discovered.

4.1.2 Sharp-tailed Grouse

Columbian sharp-tailed grouse are federal species of concern and a threatened species in Washington State. Sharp-tailed grouse are found in shrub steppe and riparian areas at higher elevations, except during hard winters when snow depth and crusting snow force them to lower elevations. Sharp-tailed grouse have been found on Project lands (Bridgeport Bar Unit of the Wells Wildlife Area) in the past but they have not been observed there in the past twenty years (M. Hallet, WDFW, pers. comm.). Within the Wells Project, the irrigated riparian vegetation on the Bridgeport Bar Unit provides food items that could be used by sharp-tailed grouse during harsh winter conditions. There is no known Project effect on sharp-tailed grouse**.**

Following receipt of a new license, Douglas PUD will do the following:

- Beginning in year one of the new license, as an enhancement, Douglas PUD will continue to water irrigation-dependent riparian trees, shrubs and associated vegetation located below Project boundary within the confines of the Bridgeport Bar Unit of the Wells Wildlife Area. Continued management of this habitat will benefit a wide range of wildlife species, including sharp-tailed grouse.

4.2 Objective 2: Protect RTE Botanical Species from Land Disturbing Activities and Herbicide Sprays

The WNHP, which is administered by the Washington Department of Natural Resources, has developed a list of plant species considered endangered, threatened, sensitive, possibly extirpated, and under review (lists 1 and 2) for conservation purposes.

EDAW, Inc. (2006a) conducted a baseline botanical survey of Wells Project lands. Studies included cover type mapping, RTE plant surveys and weed surveys. The four RTE plant species that were documented include two state-threatened species, Thompson's clover and little bluestem; and two WNHP Review 1 Species: chaffweed and northern sweetgrass. All RTE plant locations were documented using a handheld Global Positioning System (GPS) unit.

Following receipt of a new license, Douglas PUD will do the following:

- Beginning in year five of the new license, and every 10 years thereafter, Douglas PUD will survey and revise site boundaries for populations of little bluestem and Thompson's clover found within the Wells Project boundary.

- Beginning in year one of the new license, for lands owned by Douglas PUD within the Wells Project boundary, no new ground disturbing activities will be allowed within a 500 foot buffer zone surrounding the RTE plant locations and no land use permits will be issued for these buffer areas. Any weed control needed within the buffer zone will utilize the following methods in descending order of preference: biological control, hand pulling, and hand wiping of individual weeds with herbicide. Details of the Weed Control Plan can be found in Section 4.6 of this plan.

- Beginning in year one of the new license, Douglas PUD will control weeds within a 500 foot buffer of Thompson's clover occurrences within the transmission line right of way. Weed control work will utilize the following methods in descending order of preference: biological control, hand pulling, and hand wiping of individual weeds with herbicide.

4.3 Objective 3: Conserve Habitat for Species on Wells Project Lands Protected by the Federal Endangered Species Act, Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act

4.3.1 Bald Eagles

Bald eagles were delisted from the Federal ESA on August 8, 2007 (72 FR 37345) and were listed as sensitive on the Washington list of wildlife classified as protected under WAC 232-12-011, in 2008. USFWS has published guidelines for protecting bald eagle habitat under the authority of the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act (USFWS, 2007). In the 1980s, Douglas PUD installed 25 shoreline bald eagle perch poles to provide the eagles elevated perches for hunting, sunning and resting. The eagles also perch on ponderosa pine and black cottonwood (*Populus balsamifera ssp trichocarpa*) trees and old snags. The abundant waterfowl and American coots (*Fulica americana)*, found within the Wells Reservoir, provide the majority of prey eaten by bald eagles during the winter (Fielder, 1982).

Following receipt of a new license, Douglas PUD will do the following:

- Beginning in year one of the new license, Douglas PUD will inspect raptor perch poles annually and repair or replace perch poles as warranted. The perch poles near the Starr Boat Launch will be removed to reduce avian predation on downstream migrating salmonids.

- Beginning in year one of the new license, Douglas PUD will perform monthly boat surveys during the months of November through March to inventory wintering bald eagle numbers and to identify large perch trees regularly used by bald eagles. Douglas PUD will determine if the perch trees need immediate protection from beavers or if they are likely to fall down in the near future due to bank erosion.

- Beginning in year two of the new license, Douglas PUD will begin, and then continue as necessary, protecting large living trees within the Project boundary that are used by eagles as perches and which are likely to be lost from beaver damage. Protection measures will be completed by year five of the new license for those trees identified within the first four years of the new license. To prevent beaver damage to eagle perch trees, each tree will be wrapped with galvanized welded wire. Wire wrapped trees will be inspected annually and the wire repaired or replaced, as needed.

- At any time during the implementation of the new license, as site specific issues arise regarding potential losses of large eagle perches due to bank erosion, Douglas PUD will consult with the TRWG to determine if any reasonable measures are available to address the issue.

- Beginning in year one of the new license, Douglas PUD will ensure establishment and protection of sufficient smaller trees of appropriate age classes to ensure future abundance of potential perch trees is at least equal to the baseline abundance documented in year one of the new license.

4.3.2 Waterfowl

Waterfowl (ducks, geese and swans) are protected as migratory gamebirds under the Migratory Bird Treaty Act. Wells Reservoir is an important waterfowl wintering area in eastern Washington. Aerial survey data from fall 2001 to spring 2005 show a maximum of 33,912 ducks and geese during the fall migration, and a maximum of 38,909 ducks and geese wintering on the Wells Reservoir. The native pond weeds found growing in the Wells Reservoir, along with grain crops grown on the Wells Wildlife Area, provide food for wintering and migrating waterfowl. Spring and summer resident waterfowl, mostly Canada geese, utilize the islands, wetlands and open areas of grass for breeding habitat and food.

Douglas PUD conducted an aquatic macrophyte study in the Wells Reservoir (Le and Kreiter, 2006). The results indicated the macrophyte community found within the Wells Project is healthy and dominated by native species. Project operations, including reservoir fluctuations, do not appear to be encouraging the growth of non-native macrophytes, including Eurasian watermilfoil (*Myriophyllum spicatum*). Daily reservoir fluctuations do have an effect on the growth of macrophytes in the upper 2-4 feet of the reservoir but the overall community types and species composition are not affected by reservoir operations (DTA, 2006).

Shoreline wetlands have developed under the daily fluctuations of the reservoir. Wells Reservoir provides the water that supports a variety of wetland cover types that were less abundant or did not occur in the former Columbia and Okanogan river basins. These wetlands are composed of species requiring high and relatively consistent soil moisture during the growing season and that can also withstand frequent water level fluctuations (EDAW, 2006a).

Following receipt of a new license, Douglas PUD will do the following:

- Beginning in year one of the new license, Douglas PUD will plant at least 50 acres of annual grain crops within the Bridgeport Bar Unit of the Wells Wildlife Area below Project boundary, to provide food for wintering Canada geese and dabbling ducks.

4.4 Objective 4: Protect Wildlife Habitat on Wells Project Lands

The Wells Reservoir and wetlands provide habitat for a variety of waterfowl, shorebirds and aquatic furbearers. Riparian plant communities within the Wells Project support more wildlife species than any other vegetation type and include important habitat for migratory and nesting birds, mammals, reptiles and amphibians. Shrub steppe plant communities provide habitat for birds, reptiles and mammals adapted to thrive in this dry open habitat. Wildlife surveys detected 120 avian, 3 amphibian, 6 reptile, and 12 small mammal species within the Wells Project. The results of the wildlife surveys indicate that the Wells Project supports an abundance of healthy, native wildlife species (EDAW 2006b).

Douglas PUD has planted riparian shrubs and trees on the shoreline of the Wells Reservoir as mitigation for various construction projects and in areas where erosion was occurring to help stabilize the shoreline. Riparian shrubs and trees have been replanted where livestock disturbance has damaged the shoreline. Fencing has been installed to exclude livestock from shoreline riparian areas.

Land use permits are a tool Douglas PUD uses to balance private use of Wells Project lands with fish, wildlife, cultural resources and public recreation demands. Project lands have been monitored twice a month by boat to detect unauthorized encroachments from adjoining properties including vegetation removal and livestock trespass. Douglas PUD staff also monitors activities on Project land while performing normal land maintenance duties.

Douglas PUD has worked cooperatively with the CCT concerning land use issues within Project boundary on the Colville Indian Reservation. WDFW and Douglas PUD have worked closely on land use issues within Project boundary outside of the Reservation. In an effort to continue these important relationships, Douglas PUD will request an annual meeting with the CCT and WDFW to discuss land use and wildlife management issues related to implementation of this Management Plan.

Following receipt of a new license, Douglas PUD will do the following:

- Beginning in year one of the new license, Douglas PUD will continue twice a month boat monitoring of Project lands for unauthorized encroachment and damage caused by recreational activities and adjacent land owners. Wildlife habitat damage caused by unauthorized encroachment activities will be repaired or replaced with in-kind habitat within 12 months of identifying unauthorized activity.

4.5 Objective 5: Maintain Productive Wildlife Habitat on the Cassimer Bar Wildlife Management Area

The Cassimer Bar Wildlife Management Area protects and enhances wildlife habitat on 116 acres of land near the mouth of the Okanogan River. Since 1970 Douglas PUD, in cooperation with the CCT, has managed the land for wildlife habitat.

The three sloughs on Cassimer Bar were diked in the 1980s to provide furbearer and waterfowl habitat. After more than 25 years, the tide gates and culverts through the dikes, used to regulate the water elevation, have failed.

Douglas PUD will manage Cassimer Bar Wildlife Management Area lands for the benefit of wildlife.

Following receipt of a new license, Douglas PUD will do the following:

- Beginning in year one of the new license, Douglas PUD will implement weed management annually to control new occurrences of noxious weeds and to reduce existing weed occurrences.

- Beginning in year one of the new license, Douglas PUD will manage access and replace damaged habitat to reduce adverse effects of recreation on wildlife habitat.

- Beginning in year one of the new license, Douglas PUD will install and maintain perimeter fencing to protect Cassimer Bar wildlife habitat from livestock.

- Beginning in year one of the new license, Douglas PUD will evaluate the dikes on Cassimer Bar and determine an appropriate method to fix the dikes. In year two, Douglas PUD will apply for permits from appropriate agencies. Contingent on receiving the necessary permits, Douglas PUD will repair the dikes to enhance waterfowl and other aquatic habitats on Cassimer Bar. In year four and every year thereafter, the dikes will be inspected and repaired as soon as the design work and permitting allow.

4.6 Objective 6: Control Noxious Weeds on Project Lands

Invasive weeds are introduced either deliberately (e.g., free seeding garden plants) or accidentally through human activity. Because of their aggressive growth and lack of natural enemies, these plants can be highly destructive, competitive, or difficult to control. These exotic species can harm the economy and natural resources by reducing crop yields, destroying native plant and animal habitat, reducing recreational opportunities, decreasing land value and in some cases poisoning humans and livestock.

Invasive non-native plants under Washington State law (17.10 RCW) are considered noxious weeds. The Washington State Noxious Weed Control Board annually develops a list of noxious weed species of statewide importance. The Chelan and Okanogan Noxious Weed Control Boards maintain a noxious weed list which includes those weed species found in their counties that must be controlled by landowners. Douglas County has not established a noxious weed control board, but still must follow Washington State noxious weed mandates. On each weed board list, noxious weeds are classified according to their current distribution and degree of concerns; control efforts are required of landowners for some weed classes (Table 4.6-1). However, numerous invasive species have been judged to be too widespread to control (e.g., Cheat grass (*Bromus tectorum*)), and are not listed. Douglas PUD will annually check the state and county weed lists for changes, and will comply with legal requirements for noxious weed control.

Table 4.6-1 Washington State Noxious Weed Classification.

Classification	Distribution and required management
A	Limited distribution statewide. Eradication required in all areas.
B	Limited distribution, but well established in some parts of the state. Control required in non-infested areas (B designate); containment required in already infested areas (B non-designate).
C	Widespread. Management requirements are determined locally.

4.6.1 Weed Map

EDAW, Inc. (2006a) and Parametrix (2009) conducted noxious weed surveys and rare plant surveys on Project lands and the transmission corridor, respectively. The noxious weed map was developed in ArcView GIS to identify weed infestation on Project lands.

Following receipt of a new license, Douglas PUD will do the following:

- Beginning in year one of the new license, Douglas PUD will annually control identified Class A and B designate weed occurrences on Wells Project lands.

- Beginning in year five of the new license, Douglas PUD will survey Wells Project lands for new terrestrial weed infestations every five years throughout the term of the new license. Douglas PUD will use weed maps to identify problem areas and will update the maps as new weed populations are discovered.

4.6.2 Weed Management Planning

Careful planning is required to control noxious weeds while minimizing damage to native plant communities or rare plants.

Within one year of receipt of a new license, Douglas PUD will implement the following steps to control weeds on Project lands:

1. Consider the species of noxious weeds, density and size of the sites and surrounding vegetation when determining control measures.
2. Consider the land use of the site.
3. Acquire all environmental permits required (e.g., wetlands).
4. Consult the Washington State Department of Agriculture, pesticide-sensitive individuals list for properties adjacent to the control site.
5. Determine the effectiveness of various control options: burning, tilling, digging, herbicide application by wicking, spot spraying or broadcast spraying, or biological control agent.
6. Determine the most effective physiological growth stages of the target weed to obtain maximum control with least impact to surrounding vegetation.
7. Control weeds using method(s) selected for the site.
8. Monitor all application sites to determine the effectiveness of the weed control.
9. Control sites denuded by herbicide treatment will be replanted with native plant species appropriate to the site.

4.6.3 Preventing Weed Infestations

Douglas PUD will use practices that minimize the introduction of new weed species or the spread of existing weed species on Project lands. Prevention methods include limiting weed seed dispersal, minimizing soil disturbance and properly managing desirable native vegetation.

Within one year of receipt of a new license, Douglas PUD will implement the following practices and protocols intended to minimize new weed infestations:

- Use certified weed free straw and mulch and seed for habitat restoration projects.

- Limit public vehicle traffic to designated roads on Project lands.

- Douglas PUD employees and contractors will be instructed to check their vehicle undercarriage for weeds before driving on undeveloped Project lands.

- Minimize earth disturbing activities by vehicles, machinery, and water runoff on undeveloped land.

- Manage healthy native vegetation and replant native vegetation disturbed by Douglas PUD's management activities.

4.7 Objective 7: Consultation

A summary of all WBMP activities and a schedule of implementation are provided in Table 4.7-1. Douglas PUD will meet with resource agencies and/or tribes when requested to discuss management of wildlife and botanical species on Project lands. All changes to the plan must be in writing and made by unanimous consent by all Parties. Any agreed-upon changes to the WBMP will be submitted to FERC for review and approval.

Table 4.7-1 Summary of implementation measures and schedule

Douglas PUD Action	Frequency	Schedule
Install signs at access sites regarding American white pelican avoidance. (Section 4.1.1)	Signs will be repaired as soon as practicable after damage is discovered.	Beginning in year two of the new license.
Provide irrigation for irrigation dependent riparian vegetation at Bridgeport Bar Wildlife Unit. (Section 4.1.2)	Annually, as needed.	Beginning in year one of the new license.
Survey and revise site boundaries for RTE plants. (Section 4.2)	Every ten years	Beginning in year five of the new license.
Allow no ground disturbing activities or land use permits within 500 feet of known RTE plants. (Section 4.2)	Annually, as needed.	Beginning year one of the new license.
Follow specific protocols for weed control on Project lands, in the 230kV corridor, and near RTE plants. (Section 4.2, 4.5, 4.6)	Annually, as needed.	Beginning year one of the new license.
Inventory Raptor Perch poles and replace as needed. (Section 4.3.1)	Annually.	Beginning year one of the new license.
Remove raptor perch poles at Starr Boat Launch. (Section 4.3.1)	Once.	Beginning year one of the new license.
Conduct monthly bald eagle and perch tree inventories. (Section 4.3.1)	Monthly (November – March).	Beginning year one of the new license.
Install beaver protection on raptor perch trees. (Section 4.3.1)	Annually, as needed	Within five years following issuance of the new license.
Inspect and repair beaver protection on raptor perch trees. (Section 4.3.1)	Annually, as needed.	Beginning year two of the new license.
As needed, consult with TRWG regarding feasibility of site specific protection for large eagle perches, if threatened by erosion.	As needed	As needed.
Ensure recruitment of small trees for future perch trees. (Section 4.3.1)	Annually, as needed.	Beginning year one of the license.
Plant at least 50 acres of grain crops at Bridgeport Bar Wildlife Unit. (Section 4.3.2)	Annually.	Beginning year one of the license.
Conduct reservoir monitoring to identify unauthorized habitat damage. (Section 4.4)	Twice monthly.	Beginning year one of the new license.
Repair or replace lost habitat due to unauthorized damage. (Section 4.4)	Within one year of finding damage.	Beginning year one of the new license.
Manage Cassimer Bar Wildlife Management Area for wildlife. (Section 4.5)	Annually.	Beginning year one of the new license.
Evaluate and design a fix for the Cassimer Bar Wildlife Management Area dikes. (Section 4.5).	Once.	Beginning year one of the new license.
Apply for permits to repair Cassimer Bar dikes. (Section 4.5)	Once.	Beginning year two of license.
Contingent upon receiving permits, repair Cassimer Bar dike. (Section 4.5)	Once.	Beginning year three of license, or following receipt of permits.
Inspect Cassimer Bar dikes and repair as needed. (Section 4.5)	Inspect annually.	Beginning in year four of the new license.
Control Class A and B designate weeds. (Section 4.6)	Annually	Beginning year one of the new license.
Conduct weed surveys. (Section 4.6)	Every 5 years.	Beginning year five of the new license.
Consult with agencies as needed. (Section 4.7)	As needed.	As needed.

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Appendix A

Wildlife Mitigation Chronology

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Wells Project Wildlife Mitigation Chronology (1963 – 2009)

Date	Description
Wildlife Mitigation Agreements	
1963	Master Memorandum of Agreement Between Douglas PUD and Washington Department of Fisheries, Washington Department of Game, the Bureau of Sport Fisheries and Wildlife and Bureau of Commercial Fisheries of the U. S. Department of the Interior. Agreement related to proposed Wells Hydroelectric Development on the Columbia River. Memorandum of Agreement provided $139,500 for various pre and post inundation fish and wildlife studies.
1970	Agreement Between Douglas PUD and the Confederated Tribes of the Colville Reservation for Fish and Wildlife. Wildlife portion of the mitigation agreement provided a total of $168,000, paid in 10 equal yearly payments, for wildlife habitat development on the Colville Reservation.
1970	Agreement Between Douglas PUD, the Confederated Tribes of the Colville Reservation and Ervin D. and Loretta M. Wolley. Agreement established 116 acre wildlife management area on Cassimer Bar.
1974	Agreement Between Douglas PUD and the State of Washington Department of Game for Wildlife Mitigation. The wildlife mitigation agreements provided 5,715.8 acres of land, $1,250,000 for an O & M fund and established the Wells Wildlife Area.
1976	Agreement Between Douglas PUD and Washington Department of Game. The agreement provided $2,927.50 for baseline studies of the Wells Wildlife Area.
1979	Agreement Between Douglas PUD and the State of Washington, Department of Game, for Preliminary Assessment of Effects to Wildlife. The agreement provided $8,179 to study the wildlife impacts associated with raising the Wells Dam forebay two feet.
1982	Agreement Between Douglas PUD and the State of Washington, Department of Game. The agreement outlined the wildlife mitigation package for impacts associated with raising the Wells Dam forebay two feet.
1984	Agreement Between Douglas PUD and the Confederated Tribes of the Colville Reservation. Offer of partial settlement for wildlife habitat mitigation associated with the Wells Dam forebay elevation increase.
1994	Memorandum of Agreement Between Douglas PUD and Washington Department of Fish and Wildlife. The agreement provides supplemental funding for the Wells Wildlife Area.
2007	Off-License Settlement Agreement with WDFW for the continuation of funding for the Wells Wildlife Area and for the production of 20,000 pounds of trout for off-site fishing enhancement.

Wildlife Mitigation with Colville Confederated Tribes	
1970-1980	Mitigation to develop wildlife habitat and hunting improvement projects within the boundaries of the CCT Reservation - Douglas PUD paid $16,800 per year for 10 years, $168,000 total.
1970	Set aside 116 acres of land on Cassimer Bar as a wildlife management area. Cost of land $49,795.
1984	Mitigation for the Wells Project two foot raise in forebay elevation. Constructed dikes across 3 sloughs on Cassimer Bar to stabilize water levels and preserve wildlife habitat. Project cost $90,950.
Wildlife Mitigation with Washington Department of Fish and Wildlife	
1974	Wells Wildlife Area established by 1974 agreement.
1974-1975	5,715.8 acres of land purchased by Douglas PUD and given in fee title to WDG as wildlife habitat.
1974-1975	566.2 acres of land below Wells Project boundary and owned by Douglas PUD are incorporated into the Wells Wildlife Area.
1974-1975	1884.0 acres of leased land with an annual fee are also incorporated into the wildlife areas.
1974	Douglas PUD provided $1,250,000, for O & M funding to WDG, as part of the 1974 wildlife mitigation agreement.
1994- present	To date, Douglas PUD has provided $750,337 of supplemental O & M funds (1997 to 2004) to support the Wells Wildlife Area.
1974- present	To date, approximately $5,409,027 has been expended for the operation and maintenance of the Wells Wildlife Area (1975-2004).
1975–2005	WDFW developed food plots, riparian habitat, developed shrub steppe vegetation, maintained upland bird feeders, developed springs, installed guzzlers, built dikes in Foster Creek and developed ponds.
1982-1984	Mitigation for the Wells Dam two foot raise in forebay elevation. Protected goose nesting islands, protected cattail marsh on Washburn Island pond, planted 14 acres of riparian shrubs and 25 raptor perch poles.
WDFW Studies and Mitigation Reports	
1978 -2008	Annual fall wildlife surveys.
1978 - 2008	Annual goose nesting surveys.
1975–2008	Annual reports on wildlife mitigation program to FERC.

Douglas PUD Wildlife Inventories and Studies	
1996 - 2004	Annual bald eagle winter surveys.
1996 - 2000	Quarterly bird surveys.
2005	Botanical Resource Study, rare threatened and endangered plant survey and invasive plant surveys.
2005	EDAW, Inc. 2006a. Cover Type Mapping, Rare Threatened and Endangered Plant Surveys and Invasive Plant Surveys. Report by EDAW, Inc. Consultants for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.
2005	EDAW, Inc. 2006b. Avian, Amphibian, Reptile and Small Mammal Surveys. Report by EDAW, Inc. Consultants for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.
2009	Parametrix, Inc. 2009. Plant and Wildlife Survey and Cover Type Mapping of the Wells Hydroelectric Project 230 kV Transmission Corridor. Report by Parametrix, Inc. Consultants for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

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Appendix E-4

Historic Properties Management Plan

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WELLS HYDROELECTRIC PROJECT
FERC NO. 2149-131

FINAL LICENSE APPLICATION

EXHIBIT E – APPENDIX E-4
HISTORIC PROPERTIES MANAGEMENT PLAN

Prepared by:
Glenn Hartmann – Senior Archaeologist
Cultural Resource Consultants
710 Ericksen Avenue, Suite 100
Bainbridge Island, WA 98110

Prepared for:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

May 2010

INTRODUCTION

The Historic Properties Management Plan in Appendix E-5 of Exhibit E contains confidential cultural information, the disclosure of which would create a risk of harm, theft or destruction of archaeological or Native American cultural resources and therefore qualifies as privileged information under FERC regulations, 18 C.F.R. §§ 5.6, 388.112. Accordingly, one original of the Historic Properties Management Plan has been marked as Privileged Information in accordance with instructions issued by the Secretary and is being filed separately from the public volume of the DLA. Douglas PUD requests that the Historic Properties Management Plan be maintained in a non-public file and withheld from public disclosure in accordance with applicable regulations.

Appendix E-5

Recreation Management Plan

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RECREATION MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

May 2010

Prepared by:
Public Utility District No. 1 of Douglas County

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EXECUTIVE SUMMARY

The Recreation Management Plan (RMP) describes Public Utility District No. 1 of Douglas County's (Douglas PUD) plans for operations and maintenance, design, and development of Wells Hydroelectric Project (Wells Project) recreation facilities within the Wells Project Boundary. The goal of the RMP is to provide recreational opportunity at the Wells Project throughout the term of the new Federal Energy Regulatory Commission (FERC) license in accordance with the relevant FERC requirements and the needs of the Project. The RMP provides guidance for addressing current recreational uses and opportunities at the Project and provides a process for identifying the need over time for any new measures to enhance the use and enjoyment of the recreational resources associated with the Wells Project.

Measures proposed within this plan are based on the recreational resources available at the Project as well as statewide and regional recreation use trends identified through studies conducted as part of the Wells Integrated Licensing Process (ILP). Proposed measures are defined within two programs: 1) the Recreation Facility Improvement Program; and 2) the Recreation Facility Operation, Maintenance and Monitoring Program.

1.0 INTRODUCTION

The development of the Recreation Management Plan (RMP) is an important component of the relicensing of the Wells Hydroelectric Project (Wells Project). The RMP replaces the Recreation Action Planning Process used during the term of the original license. The RMP establishes a schedule for providing improvements to the current recreational facilities and a process for planning, developing and implementing any new recreational facilities and opportunities at the Project during the term of the new license.

Public Utility District No. 1 of Douglas County (Douglas PUD) developed this plan in consultation with the members of the Recreation Work Group (RWG). Members of the RWG include representatives from the cities of Pateros, Brewster and Bridgeport; Okanogan and Douglas counties; Washington State Parks and Recreation Commission (State Parks); Washington Recreation and Conservation Office (RCO); Washington Department of Fish and Wildlife (WDFW); the National Park Service (NPS); Confederated Tribes of the Colville Reservation (CCT); Bureau of Land Management (BLM) and Douglas PUD.

This RMP provides a summary of studies conducted for relicensing (Section 2); identifies the goals and objectives for managing the recreation resources related to the Wells Project (Section 3); describes the existing Wells Project recreation facilities (Section 4); and defines appropriate measures for developing and protecting recreational opportunities at the Project (Section 5).

2.0 BACKGROUND

Douglas PUD conducted three studies during the relicensing process to identify and support future recreation needs at the Wells Project. A Recreation Visitor Use Assessment (DTA, 2006) was conducted in 2005 to identify recreation use and preferences related to the Wells Project. In 2007, a Recreational Needs Analysis (DTA, 2008) was conducted to identify current and potential future recreation needs in the Project area over the course of the new license term. In 2008, a Public Access Study (Jacobs Engineering, 2008) was conducted to identify areas of the reservoir that may be difficult to access due to reservoir operations, aquatic plant growth, or obstructions.

The primary goals of the Recreation Visitor Use Assessment (DTA 2006) were to describe use levels, preferences, attitudes, and characteristics of visitors to the Wells Project recreation sites. The study concluded that respondents were satisfied with facilities, with survey respondents rating their overall experience as 8.7 on a 10 point scale. The highest levels of crowding were reported at Marina Park recreational vehicle (RV) campground in Bridgeport, and the wildlife areas. The majority of respondents did not feel more controls were needed to prevent user conflicts, or to prevent environmental damage, and that enough educational/interpretive opportunities exist (DTA 2006).

The goal of the Recreation Needs Analysis (DTA 2008) study was to identify current and future recreation needs at the Wells Project. The study indicated that maintenance of facilities was good overall, with a future need to upgrade restroom and access sites to meet Americans with Disabilities Act (ADA) standards. Future recreational measures included adding additional signage in Spanish, ADA related improvements, near-shore tent camping for water trail users, and providing education about the Wells Project (DTA 2008).

The goal of the Public Access Study (Jacobs Engineering 2008) was to evaluate whether Wells Project recreation facilities such as docks, boat launches and swimming areas, can be reasonably utilized under various reservoir operating scenarios and conditions. The study determined that 15 out of 17 formal access sites were accessible greater than 95% of the time. The only two sites that were accessible less than 95% of the time were the Winter Boat Launch in Pateros (91%) and the Monse Boat Launch on the Okanogan River (35%). In 2008, the Winter Boat Launch in Pateros was repaired and extended, and is now accessible over 98% of the time. Swimming areas were identified as most affected by aquatic plant growth.

3.0 GOALS AND OBJECTIVES

3.1 Purpose

The purpose of the RMP is to describe Douglas PUD's role and responsibilities related to the management of the recreation resources of the Wells Project during the term of the new license. This RMP contains a comprehensive list of measures for the maintenance and development of Project-related recreation facilities during the term of the new license. The RMP also describes the process and procedures for managing recreation resources, and monitoring recreation use and trends over the term of the new license.

3.2 Principles

The following principles were used to guide the development of the RMP:

- Recreation at the Wells Project is an important resource that must be actively managed;

- Douglas PUD shall provide adequate access to Project lands and waters for recreational purposes in a manner that is consistent with responsibilities for protecting other resources at the Project;

- Management of the Wells Project requires a balancing of energy, environmental, and social values. Not all recreation demands can or should be accommodated by Douglas PUD;

- Recreation needs change over time; therefore, an "adaptive management" approach is appropriate;

- There is a desire to maintain and/or improve the experience now enjoyed by recreation users at the Wells Project;

- It is acknowledged that capital improvements to recreation facilities can be costly and require adequate time to design, permit and implement;

- Douglas PUD is responsible for the implementation of the RMP. The RMP does not include commitments by other agencies or organizations; and

- Other entities may propose and fund recreation site improvements and maintenance on Wells Project lands with Douglas PUD approval and the approval of other relevant regulatory authorities.

3.3 Goals and Objectives

The goal of the RMP is to provide recreational opportunity at the Wells Project throughout the term of the new Federal Energy Regulatory Commission (FERC) license in accordance with the relevant FERC requirements and the needs of the Project. This includes providing for current recreational uses and opportunities within the Project Boundary and identifying the need for any new measures or facilities to enhance recreational opportunity at the Project over the term of the new license. This management plan provides a comprehensive list of measures to support recreation uses and opportunities at the Wells Project. This plan also serves as the roadmap for operating, maintaining, updating, and improving the existing recreation facilities and a process for meeting recreation needs as they change over time.

The goal of the RMP will be met through the implementation of two programs that encompass Douglas PUD's overall approach to managing recreation resources for the term of the new license. The main elements of the RMP are as follows:

> <u>Program 1: Recreation Facility Improvement Program</u> (Section 5.1)
> This program defines Douglas PUD's responsibilities for new Project recreation developments and improvements to existing facilities. Conceptual designs are included in Appendix A.
>
> <u>Program 2: Recreation Facility Operation, Maintenance and Monitoring Program</u> (Section 5.2)
> This program defines Douglas PUD's responsibilities for ongoing O&M at Project recreation facilities. Guidelines are provided for each type of O&M activity. Douglas PUD's recreation use monitoring program will inform future planning related to recreation management during the term of the new license.

The RMP will be integrated with other management strategies of Douglas PUD as well as management plans of federal, state and tribal natural resource management agencies.

4.0 EXISTING PROJECT RECREATION FACILITIES

The Wells Project currently provides significant recreation opportunities for local residents and visitors. Local residents have numerous access points to the Wells Reservoir and associated Project lands. Access to the Wells Reservoir from the greater Seattle/Puget Sound area is most common via Interstate 90 over Snoqualmie Pass to US Highway 97. Highway 97 borders the Wells Reservoir on the west and extends into British Columbia. Other routes from western Washington include US Highway 2 over Stevens Pass and summer access via State Route 20 (also known as the North Cascades Highway). Visitors from eastern Washington typically visit the area via Highway 2 from Spokane. Canadian visitors access the area by heading south on Highway 97, which meets the Wells Reservoir near Malott, Washington.

Many people take advantage of the recreation opportunities provided at the Wells Project during the spring and summer for boating, fishing, bird watching, hiking and RV camping. Additionally, sportsmen visit the area during the fall season to fish for steelhead and to hunt waterfowl, upland birds and deer.

Douglas PUD's approach to developing and enhancing recreational access to and use of the lands and waters within the Project Boundary has been documented in its Wells Recreation Plan (1967), Wells Recreation Plan Supplement (1974), Public Use Plan (1982) and Recreation Action Plans (1987, 1992, 1997, 2002 and 2007). Douglas PUD has funded and developed 17 formal recreation facilities along the Wells Reservoir in Pateros, Brewster and Bridgeport and along the lower reaches of the Methow and Okanogan rivers.

Figure 4.0-1 is a map of recreation sites and use areas in the Wells Project. Descriptions of existing recreational sites and facilities within the Wells Project are provided below.

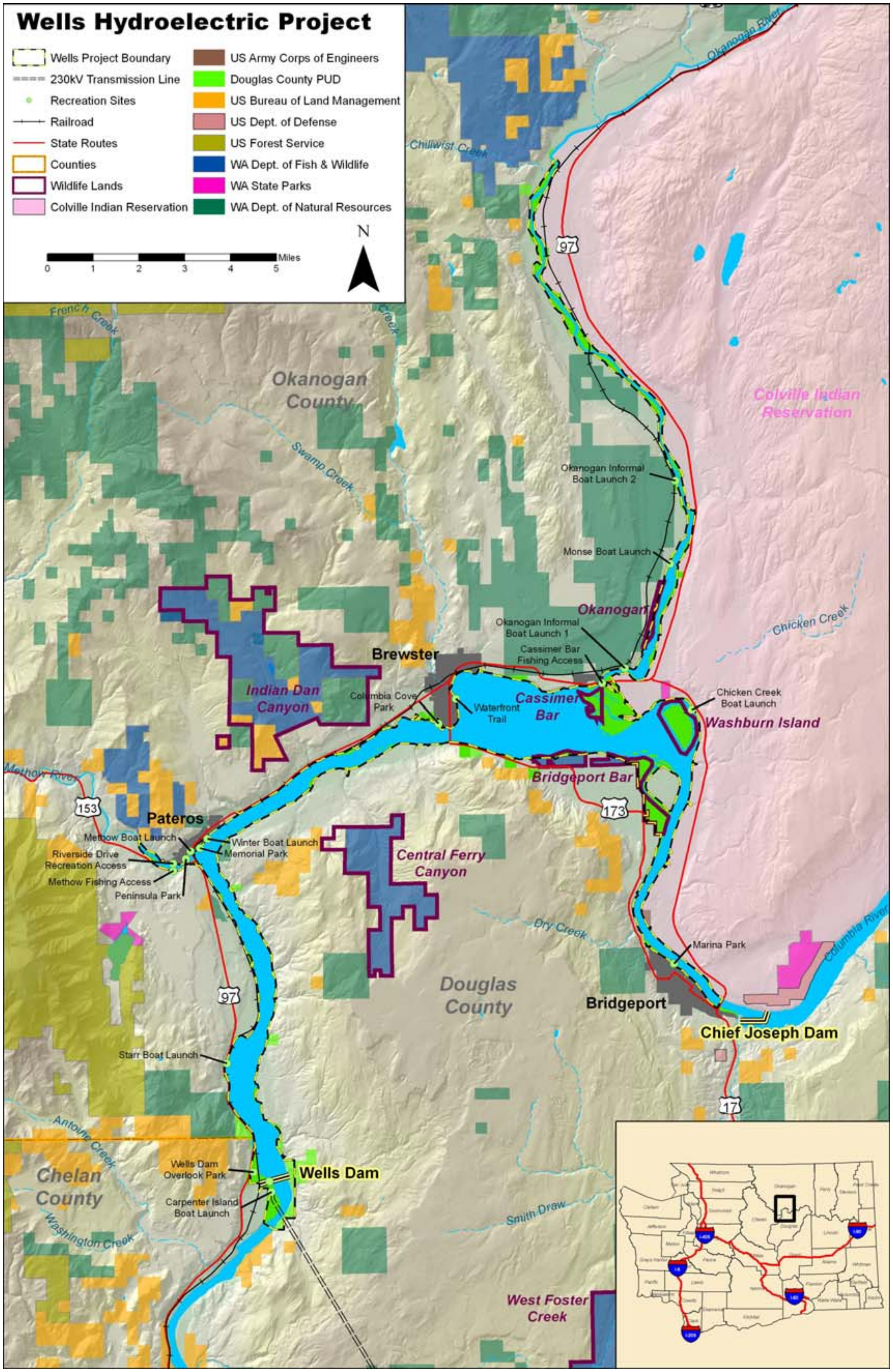

Figure 4.0-1 Map of Recreation Sites in the Wells Project

4.1 Recreation Facilities within the Cities of Pateros, Brewster and Bridgeport

4.1.1 Facilities in Pateros, Washington

Project recreation facilities located within the City of Pateros include Peninsula Park, Memorial Park, one Methow River recreation access site, two concrete boat launches, parking and restrooms.

4.1.1.1 Peninsula Park

Peninsula Park is located near the confluence of the Methow and Columbia rivers. It includes one gazebo, paved walking path, covered picnic shelter, swimming beach, restroom facilities, playground equipment, swimming lagoon, vehicle parking and lawn area.

4.1.1.2 Memorial Park

Memorial Park is located in Pateros along the Columbia River. It includes three covered picnic shelters, fishing and ski docks, vehicle parking, interpretive displays, playground equipment, concrete water access ramp, restroom facilities and a developed waterfront trail with park benches and lighting. The waterfront trail begins at the east end of Memorial Park near City Hall and meanders through the park, under the Highway 97 Bridge and terminates at the Methow Boat Launch.

4.1.1.3 Pateros Winter Boat Launch

The Pateros Winter Boat Launch is located in Pateros upstream of Memorial Park along the Columbia River. The site includes a concrete boat launch, dock and parking. This boat launch provides year-round access to the Wells Reservoir, including winter when the Methow Boat Launch may be unusable due to ice on the Methow River.

4.1.1.4 Methow Boat Launch

The Methow Boat Launch is located in Pateros between Peninsula Park and Memorial Park at the confluence of the Columbia and Methow rivers. The site includes a concrete boat launch and dock, parking, basketball hoops and restrooms. The boat launch area is connected to Memorial Park via an accessible walkway underneath Highway 97 and the railroad bridge.

4.1.1.5 Riverside Drive Recreation Access

The Riverside Drive Recreation Access is located along the left bank of the Methow River, upstream from Peninsula Park. The site includes a gradual landscaped access to the Methow River for fishing, kayaking, or canoeing.

4.1.2 Facilities in Brewster, Washington

Project recreation facilities located within the City of Brewster include Columbia Cove Park and a developed waterfront trail.

4.1.2.1 Columbia Cove Park

Columbia Cove Park includes a boat launch, boat docks, three covered picnic shelters, a swimming beach, restroom facilities, playground equipment, a lawn area, and vehicle parking.

4.1.2.2 Brewster Waterfront Trail

The waterfront trail in Brewster is located north of Columbia Cove Park and consists of a compacted stone surface that extends approximately ½ mile along the Brewster city waterfront. The City of Brewster developed the trail with the assistance of Douglas PUD and the Washington Department of Natural Resources. The trail is generally 6 to 8 feet above the water level and 20 feet or more below adjacent streets and residential areas. It is connected to city streets at either end by ramps and at three intermediate locations by stairs.

4.1.3 Facilities in Bridgeport, Washington

Project recreation facilities include Marina Park, which is located within the Wells Project Boundary in the City of Bridgeport. The City of Bridgeport operates an 18-site RV park within Marina Park.

4.1.3.1 Marina Park

Marina Park includes a fish cleaning station, covered picnic shelters, gazebo, playground equipment, swimming lagoon with beach, a lawn area, restrooms, vehicle parking, asphalt pathway, a boat launch, and an RV campground. The RV campground includes 18 full hookups and four tent sites.

4.2 Recreation Sites Outside the Cities

In addition to the facilities in Pateros, Brewster and Bridgeport, Douglas PUD has developed additional Project related recreation sites to provide access to all segments of the Wells Reservoir. These sites are described in the following sections.

4.2.1 Wells Dam Overlook

A viewing area overlooking Wells Dam from the west is located off of Highway 97. The Wells Dam Overlook includes vehicle and day-use RV parking, restrooms and a picnic shelter. Exhibits at the Overlook include Native American pictographs, a Wells Project information kiosk and an original Wells Project turbine runner. The Wells Dam Overlook is accessible 24-hours a day.

4.2.2 Carpenter Island Boat Launch

The Carpenter Island Boat Launch is a concrete plank boat launch located on the right bank of the Wells Tailrace immediately downstream of the Wells Project near RM 515.5. This boat launch is located within the Wells Project Boundary on land owned by Douglas PUD and is used primarily for fishing access. It includes a single launch lane and portable toilets. Access to this launch is provided via Azwell Road. As a recreation enhancement measure under the original Project license, Douglas PUD is currently relocating this boat launch to a more accessible location nearby. Relocating the launch is a separate action from relicensing and is contingent upon receiving the appropriate environmental permits.

4.2.3 Starr Boat Launch

The Starr Boat Launch is located on 2.1 acres of land on the right bank of the Wells Reservoir near RM 518. It is accessible via Highway 97. This site includes a gravel parking area, concrete boat launch and vault toilet. Recreation users access the Wells Reservoir via the Starr Boat Launch for boating, skiing and waterfowl hunting.

4.2.4 Methow Fishing Access

The Methow Fishing Access was funded by Douglas PUD and is located off of State Highway 153 approximately ½ mile from Highway 97 at the confluence of the Columbia and Methow rivers. The site is 2.4 acres and includes a gravel car-top boat launch, gravel parking area and two vault toilets.

4.2.5 Chicken Creek Boat Launch

The Chicken Creek Boat Launch is located near RM 537 at Washburn Island where Chicken Creek flows into the Washburn Pond. The facilities at the site are owned by Douglas PUD and include a concrete plank boat launch, gravel parking lot and vault toilet. The boat launch provides access to the Washburn Pond but not the Wells Reservoir.

4.2.6 Monse Bridge Boat Launch

The Monse Bridge Boat Launch was developed by Douglas PUD and is located on the right bank of the Okanogan River at RM 4.7. Facilities at the boat launch include a concrete plank launching ramp, gravel parking and a vault toilet.

4.2.7 Cassimer Bar Fishing Access

The Cassimer Bar Fishing Access site was developed by Douglas PUD and is located on the left bank of the Okanogan River near RM 1. The site is in close proximity to the Highway 97 Bridge near the confluence of the Okanogan and Columbia rivers. This site includes shoreline access, a parking area, and a vault toilet.

4.2.8 Okanogan River Informal Boat Launch and Fishing Site 1

The Okanogan River Informal Boat Launch 1 is located on the right bank of the Okanogan River at RM 2.5. Public access to the site is available via Monse River Road off of Highway 97. This undeveloped area serves as a boat launch primarily for fishermen and waterfowl hunters. This site also provides shoreline fishing access.

4.2.9 Okanogan River Informal Boat Launch and Fishing Site 2

The Okanogan River Informal Boat Launch 2 is located on the right bank of the Okanogan River at RM 6.7. Public access to the site is available via Monse River Road. This undeveloped area serves as boat launch for waterfowl hunters and fishermen. This site also provides shoreline fishing access.

5.0 RECREATION PLAN MEASURES

5.1 Recreation Facility Improvement Program

Douglas PUD conducted three studies during the relicensing process to identify and support future recreation needs at the Wells Project. A Recreation Visitor Use Assessment (DTA 2006) was conducted in 2005 to identify recreation use and preferences related to the Wells Project. In 2007, a Recreational Needs Analysis (DTA 2008) was conducted to identify current and potential future recreation needs in the Project area over the course of the new license term. In 2008, a Public Access Study (Jacobs Engineering 2008) was conducted to identify areas of the reservoir that may be difficult to access due to reservoir operations, aquatic plant growth, or obstructions.

Douglas PUD evaluated the results of these and other studies to identify Project-related improvements that could be implemented during the term of the new license. Proposed recreation-related improvements are summarized below.

5.1.1 Wells Dam Overlook Interpretive Displays

The Wells Dam Visitor Center, previously located inside Wells Dam, has been closed to the public since 2001 due to security concerns. The Visitor Center included a variety of exhibits about the Wells Project, power generation, and regional history and geography. The facility also included a fish viewing window at the west fish ladder.

In order to continue to provide educational and interpretive information about the Wells Project, Douglas PUD will design and build a series of concrete interpretive display panels at Wells Dam Overlook Park within the Project Boundary. Exhibits may include, but not be limited to, power generation, the history of Wells Dam, benefits of hydropower, fish and wildlife, and recreation. A live video feed of the Wells Project fish ladder will also be provided at the facility. The exhibits will be completed by year 3 of the new license. Appendix A includes conceptual designs of the proposed interpretive exhibits. Designs are subject to change based on site conditions, permitting, and cost.

5.1.2 Marina Park Expansion

The results of the Recreation Needs Analysis (DTA 2008) estimated that Marina Park in Bridgeport receives the most visitation of any location on the Wells Project. Marina Park received 4,324 to 5,750 visitors, or "recreation days", which is 30 percent of Wells Project total estimated visitation. Marina Park is often filled to capacity during peak recreation season.

To accommodate increasing use, Douglas PUD will expand Marina Park to include an additional 10 RV spaces. The park will be expanded to the north, along the river within Project Boundary. The expansion will include all facilities needed to accommodate recreation use associated with 10 additional RV spaces, including restroom facilities, lift stations, landscaping and access roads. The expansion will be completed by year 5 of the new license. Appendix B includes a conceptual design for the proposed expansion. Designs are subject to change based on site conditions, permitting and cost.

5.1.3 Boat-in Tent Camping and Signage

The Recreation Needs Analysis (DTA, 2008) identified a need to improve access for non-motorized boat users. The study further identified potential opportunities for coordination with the Greater Columbia Water Trail (GCWT) Coalition so that non-motorized boat-in camping facilities would be consistent with other sections of the Columbia River.

To accommodate non-motorized boat users, Douglas PUD will implement several measures to improve access for non-motorized boaters, including installing GCWT signs and informational material at appropriate Wells Project recreational access facilities; providing information on portaging around Wells Dam; constructing a formal boat-in tent camping facility in the vicinity of the Okanogan River, including restroom and picnic shelter; and designating and providing basic improvements for an informal/rustic boat-in tent camping location on the west side of the river within several miles of Wells Dam. These improvements will be implemented on the following schedule:

- By year 2 of the new license, install GCWT signs and informational material at appropriate Wells Project recreational access facilities;
- By year 2 of the new license, provide information on portaging around Wells Dam;
- By year 2 of the new license, designate and provide basic improvements for an informal/rustic tent camping location on the west side of the river within several miles of Wells Dam; and
- By year 5 of the new license, construct a formal tent camping facility in the vicinity of the Okanogan River, including restroom and picnic shelter;

Camping facilities would be designated for non-motorized boat use only, and would be located within the Wells Project Boundary. Maintenance and operation of these facilities would be provided by Douglas PUD. Appendix C includes a conceptual design of the proposed formal campsite. Designs are subject to change based on site conditions, permitting and cost.

5.1.4 Extend Chicken Creek Boat Launch

The Public Access Study (Jacobs Engineering 2008) evaluated how reservoir elevations affected access to and from Wells Project boat launch facilities, fishing access sites, and swimming areas. The study determined that 15 out of 17 formal access sites were accessible greater than 95% of the time. In 2008, the Winter Boat Launch in Pateros was repaired and extended, and is now accessible over 98% of the time.

The Chicken Creek Boat Launch is located on Washburn Pond within the Wells Project Boundary. Lower pond levels often occur in the fall season, and public access can be restricted due to the short length of the launch. By year 3 of the new license, Douglas PUD will place additional concrete planks at the end of the launch in order to extend the launch for improved access during the fall season.

5.1.5 Reservoir Navigation Maps

In order to facilitate effective navigation of the reservoir, Douglas PUD will install maps of the reservoir showing areas of the reservoir where shallow waters may be encountered. These maps will be installed at high-use boat launches in Pateros, Brewster, and Bridgeport by year 2 of the new license.

5.2 Recreation Facility Operation, Maintenance and Monitoring Program

5.2.1 Recreation Facilities Operation and Maintenance

For the term of the new license, Douglas PUD will continue to ensure the operation and maintenance of recreation facilities described in this management plan and associated with the new license for the Wells Project. Administration, operation, and maintenance activities will include, but are not limited to maintaining parking areas, lawns, restrooms, lights, water, power, sewer/septic, playground equipment, shelters, and playfields. Table 5.2-1 provides a general description of the type of O&M activities anticipated to occur at each of the recreation facilities. Douglas PUD may contract for the necessary personnel, equipment, and/or materials in order to achieve the O&M standards.

Table 5.2-1 General maintenance activities at recreation facilities managed by Douglas PUD at the Wells Project.

Maintenance Activity	Frequency
Buildings/restrooms/shelters: Structures will be sanitary and maintained in good repair. If a structure is deemed in need of repair, it will be closed until repairs are completed.	During the high-use season (April – October), all facilities will be inspected at regular intervals (several times per week, as necessary). During the low-use season, facilities such as those located in the cities will be inspected less frequently but at regular intervals, and rustic facilities will be inspected periodically. The interior and exterior of all structures will be painted as needed; this is expected to be about every three years. Buildings will receive structural inspection at least once in 10 years, unless a safety issue is reported and confirmed sooner.
Boat Ramps: Surfaces are to be kept in good and serviceable condition, and free of debris.	Boat ramps will be inspected at regular intervals during the high-use season of April through November.
Boat Docks: Dock surfaces, hardware, bumper strips, and other components will be maintained to provide safe and effective use.	Docks will be inspected for wear, obstacles, and damage/vandalism at regular intervals. Maintenance and repairs will be performed on an as-needed basis.
Picnic sites/camp sites: Inspect for cleanliness, damage, and vandalism. Tables will be sturdy and ready for use. Grills and fire pits will be in good working condition.	Picnic sites/camp sites will be inspected frequently (daily or weekly) during April through September, weekly or as needed in October and November and intermittently during the remainder of the year.
Trash/litter collection: The park areas will be kept clean. Trash containers will be emptied regularly.	Trash containers will be emptied at least once per week at city facilities and at least once every two weeks at rustic facilities. Trash containers will also be emptied following holiday weekends during April through November.
Access roads and pavement: Roads and pavement will be maintained in good and passable condition.	Roads will be inspected annually and repaired as needed. Damaged roads/pavement will be scheduled for repair, if needed, within the year following the identification of significant damage.
Trails: Trail surfaces will be maintained in good condition and barriers will be removed to allow use of the trail. Trees and shrubs along the trails will be trimmed or removed seasonally and weeds will be controlled as needed.	Trails will be inspected weekly during the April through November season and intermittently the remainder of the year.
Park grounds/turf: Grass areas and gardens will be kept up through use of irrigation, fertilization, weed removal, and pesticide application where necessary. Grass will be mowed based on need. Signs will be installed during and after application of pesticides. Trees will be trimmed as needed.	Grass in parks will be mowed regularly. Roadsides and other natural areas at park facilities will be mowed as needed.
Snow removal: Snow will be removed from roads, parking areas, and trails at city parks in Brewster, Bridgeport, and Pateros and at the Wells Dam Overlook.	Snow will be removed within one day or as soon as feasible following a snow event.
Aquatic plant control: Aquatic plants will be controlled in designated swimming areas at Peninsula Park, Columbia Cove Park, and Marina Park.	Aquatic plants will be controlled in swimming areas on an as needed basis, using the most feasible methods. Methods may include, but not be limited to, harvesting, application of herbicide, or installation of liners or barriers.

5.2.2 Wildlife Viewing Trail Development

The Recreation Needs Analysis (DTA 2008) identified a need for additional wildlife viewing trails at the Wells Project. This action is consistent with growing interest in wildlife viewing and sightseeing identified in the Washington Statewide Comprehensive Outdoor Recreation Program (SCORP) and visitor surveys.

Existing trails in the Wells Project include walking trails at Memorial Park located in the City of Pateros, and the Waterfront Trail located in the City of Brewster. Opportunities may exist for additional trail development at one of these locations or at other developed recreation facilities, such as Wells Overlook. Incorporating new trail facilities at these locations may better accommodate recreationists, by offering multiple recreation opportunities at a single location, while also enhancing tourism and local economies. Concentrating these facilities in populated areas may also have a lower impact on wildlife. However, opportunities for additional trail facilities in these areas may be limited by existing developments such as the railroad, highways, and residential and commercial developments, which constrain the shoreline in both of these areas.

Opportunities may also exist for trail development within one of the Wells Project's designated wildlife areas. Wildlife area shorelines are less constrained than those found in developed areas. However, trail development at these locations is more likely to conflict with wildlife and wildlife habitat. Additionally, developing trails in shoreline and riparian environments may not be compatible with Endangered Species Act requirements, Douglas PUD's Land Use Policy, and the Wells Project Habitat Conservation Plan.

To address wildlife viewing and trail development, Douglas PUD will do the following:

TRAILS

- By the end of year 2 of the new license (May 31, 2014), initiate a feasibility study for trails in or near Brewster, Bridgeport and/or Pateros within the Wells Project Boundary. The objectives of the study would be to: 1) evaluate the opportunities and constraints of constructing additional trails in or near population centers, within the Wells Project Boundary; 2) prepare conceptual designs and cost estimates for the most feasible routes; and 3) prepare recommendations for trail improvements.
- In conjunction with the Form 80 review (March, 2015), Douglas PUD and the RRWG will evaluate the results of the trail feasibility study and identify appropriate measures for meeting local needs for trail development.
- Measures for implementation will be prioritized based on documented need, environmental impacts, cost, and overall appropriateness for the Wells Project, as determined by Douglas PUD and the RRWG. Selected measures must be acceptable to the RRWG, Douglas PUD and will be subject to FERC approval.
- If feasible measures are identified, implement the selected measure, or combination of measures up to a maximum of five (5) miles of non-motorized trails, prior to the 2021 Form 80 monitoring cycle.

WILDLIFE VIEWING

- By the end of year 2 of the new license (May 31, 2014), in consultation with the RRWG, Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and Colville Confederated Tribes, develop a plan for wildlife viewing facility enhancements.
- In conjunction with the Form 80 review (March, 2015), Douglas PUD and the RRWG will evaluate the wildlife viewing enhancement plan and identify appropriate measures to be implemented within the Project Boundary.
- Measures for wildlife viewing enhancement implementation will be prioritized based on documented need, environmental impacts, cost, and overall appropriateness for the Wells Project, as determined by Douglas PUD and the RRWG. Selected measures must be acceptable to the RRWG, Douglas PUD and will be subject to FERC approval.
- Measures may include, but not be limited to interpretive signs, wildlife viewing guides, and web based information about Douglas PUD's wildlife programs.
- Implement the selected measure, or combination of measures prior to the 2021 Form 80 monitoring cycle.

5.2.3 Promotion of Recreation Facilities

To support the use of Wells Project recreation facilities, Douglas PUD will make available printed and web-based material showing day-use sites, boat launches, wildlife viewing areas, campsites, trails, etc. These materials will be made available by year 2 of the new license.

Proposed recreation measures must be reviewed by the appropriate federal, state, and/or local permitting agencies. New facilities and significant upgrades will be designed and sited in accordance with the applicable permitting and environmental requirements. Any new construction or significant upgrades will comply with the then-current ADA requirements.

5.2.4 Recreation Resources Monitoring and Evaluation Program

Recreation use monitoring will be an important component in determining when changes are required at Project recreation facilities to ensure adequate recreation access during the license term. Douglas PUD will collect recreation data in the Project area as needed to complete the FERC Form 80 requirement[1]. Douglas PUD will use appropriate monitoring and analysis techniques to complete FERC Form 80 reporting. Recreation facility condition will be determined by periodic on-site inspections of each facility managed under this RMP.

Every 20 years during the term of the new license, Douglas PUD will conduct a comprehensive recreation study to assess recreation use and needs related to the Wells Project. The scope of the study will be similar to that contained in the 2006 Recreation Visitor Use Assessment (DTA 2006) and the 2008 Recreational Needs Analysis (DTA 2008). Douglas PUD will consult with interested parties in developing the final study plans. Douglas PUD will convene the RRWG every six years, immediately after submittal of the Form 80. The RRWG will discuss current

[1] The FERC Form 80, *Licensed Hydropower Development Recreation Report*, is a brief summary of the existing recreation conditions and facilities associated with a FERC licensed hydroelectric project. Based on current FERC regulations, the forms must be completed every six years to document current public recreation use within the Project area.

RMP activities and whether the RMP is continuing to meet the recreation needs within the Project Boundary.

Any changes to the RMP must be based on documented changes in use patterns, visitor needs (including facility upgrades), or new state mandates or regulations that are relevant to recreation in the Project area during the license term. Any disagreements regarding revisions to the RMP will be submitted to FERC for resolution.

6.0 RECREATION MANAGEMENT PLAN IMPLEMENTATION SCHEDULE

The RMP will become effective following FERC approval and issuance of a new FERC license. A summary of the specific implementation measures and schedule is provided in Table 6.0-1.

Table 6.0-1 Recreation Management Plan Measures

Action	Timeline
Wells Dam Overlook Interpretive Displays (Section 5.1.1): Construct new interpretive exhibits at Wells Dam Overlook Park.	By year 3 of the new license.
Marina Park Expansion (Section 5.1.2): Add 10 additional RV spaces.	By year 5 of the new license
Boat-in Tent Camping (Section 5.1.3): Construct a formal boat-in tent camping facility for non-motorized boat users.	By year 5 of the new license.
Boat-in Tent Camping and Signage (Section 5.1.3): Construct a rustic boat-in tent camping facility for non-motorized boat users.	By year 2 of the new license.
Boat-in Tent Camping and Signage (Section 5.1.3): Provide signs and informational material for non-motorized boat users. (Section 5.1.3)	By year 2 of the new license.
Extend Chicken Creek Boat Launch (Section 5.1.4): Extend the Chicken Creek launch 10 feet.	By year 3 of the new license.
Reservoir Navigation Maps (Section 5.1.5): Install reservoir navigation maps at boat launches.	By year 2 of the new license.
Recreation Facilities O&M (Section 5.2.1): Ensure that O&M standards are met at all Wells Project recreation facilities.	Continuous
Wildlife Viewing Trail Development (Section 5.2.2): Initiate a trail feasibility study.	By year 2 of the new license.
Wildlife Viewing Trail Development (Section 5.2.2): Evaluate results of trail feasibility study and identify measures.	In conjunction with 2015 Form 80 review.
Wildlife Viewing Trail Development (Section 5.2.2): Implement trail measures as appropriate.	By 2021 Form 80 monitoring cycle.
Wildlife Viewing Trail Development (Section 5.2.2): Develop wildlife viewing enhancement plan.	By year 2 of the new license.
Wildlife Viewing Trail Development (Section 5.2.2): Evaluate wildlife viewing enhancement plan with RRWG and identify appropriate measures.	In conjunction with 2015 Form 80 review.
Wildlife Viewing Trail Development (Section 5.2.2): Implement wildlife viewing enhancements.	By 2021 Form 80 monitoring cycle.
Promotion of Recreation Facilities (Section 5.2.3): Promote recreation facilities through printed and web-based materials.	By year 2 of the new license.
Recreation Resources Monitoring and Evaluation Program (Section 5.2.4): Form 80 reports and any relevant monitoring data will be provided to the RWG.	Every 6 years or as determined by FERC.
Recreation Resources Monitoring and Evaluation Program (Section 5.2.4): Douglas PUD will convene the RWG to discuss Form 80 results and to discuss whether the RMP is meeting recreation needs.	Every 6 years after submittal of the Form 80 report.
Recreation Resources Monitoring and Evaluation Program (Section 5.2.4): Conduct a Recreation Use/Needs Study to document changes in recreation use and needs.	Every 20 years

7.0 REFERENCES

Douglas PUD (Public Utility District No. 1 of Douglas County). 1967. Recreation Plan. Wells Hydroelectric Project FERC No. 2149. Prepared by Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Douglas PUD. 1974. Recreation Plan Supplement. Wells Hydroelectric Project FERC No. 2149. Prepared by Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Douglas PUD. 1982. Public Use Plan. Wells Hydroelectric Project FERC No. 2149. Prepared by Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Douglas PUD. 1987, 1992, 1997, 2002 and 2007. Recreation Action Plans. Wells Hydroelectric Project FERC No. 2149. Prepared by Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

DTA (Devine, Tarbell & Associates). 2006. Recreation Visitor Use Assessment. Wells Hydroelectric Project FERC No. 2149. Prepared by DTA for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

DTA. 2008. An Evaluation of Recreational Needs Within the Wells Project. Wells Hydroelectric Project FERC No. 2149. Prepared by DTA for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Jacobs Engineering. 2008. Evaluation of Public Access to and use of the Wells Reservoir as it Relates to Reservoir Fluctuations, Aquatic Plants and Substrate Buildup. Wells Hydroelectric Project FERC No. 2149. Prepared by Jacobs Engineering for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

APPENDIX A

Conceptual Design
Wells Dam Overlook Interpretive Facilities

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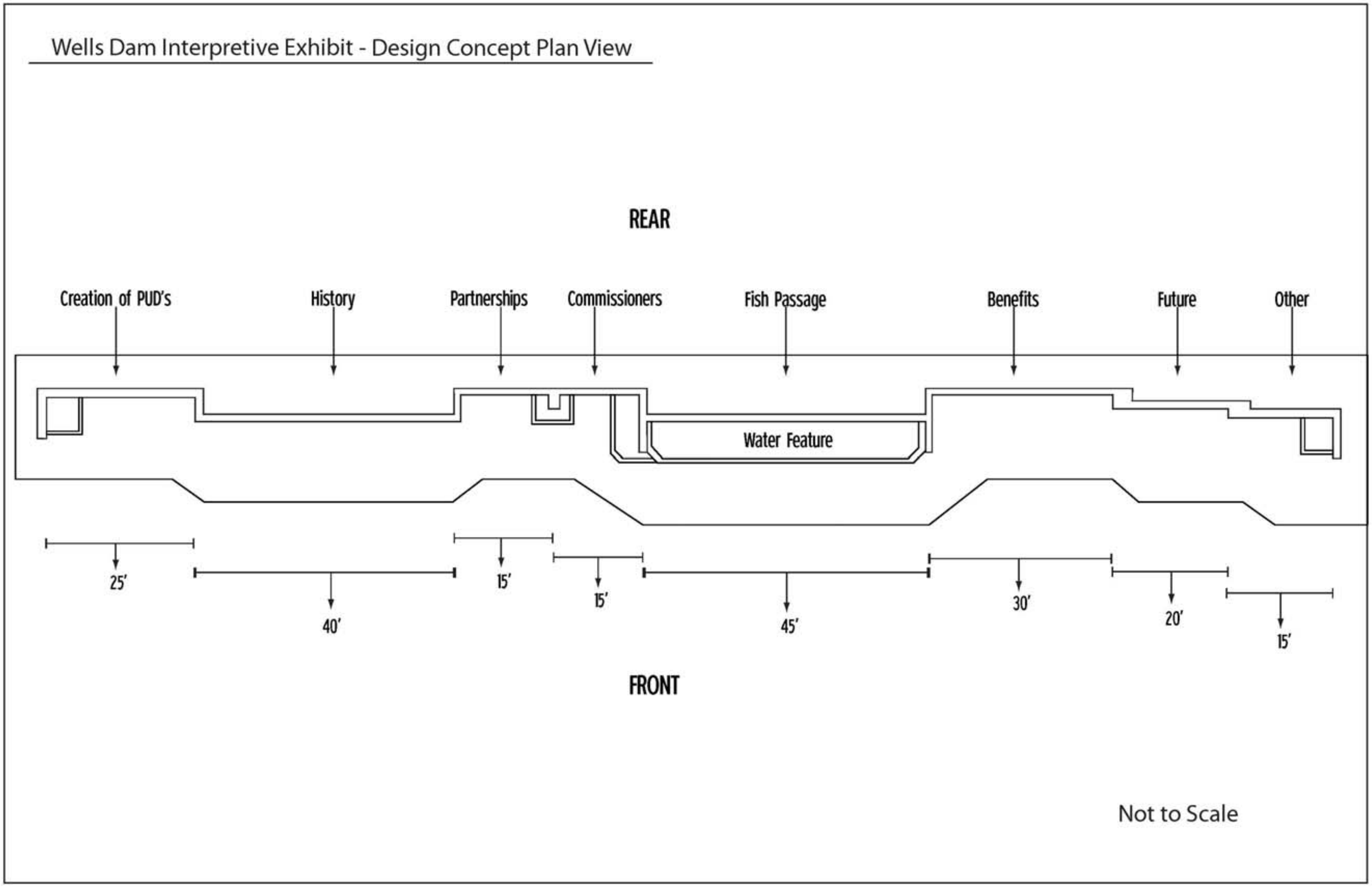
Wells Dam Interpretive Exhibit - Site View

Wells Dam Interpretive Exhibit - Design Concept Perspective View


Wells Dam Interpretive Exhibit - Design Concept Plan View
REAR
Creation of PUD's
History
Partnerships
Commissioners
Fish Passage
Benefits
Future
Other
Water Feature
25'
40'
15'
15'
45'
30'
20'
15'
FRONT
Not to Scale

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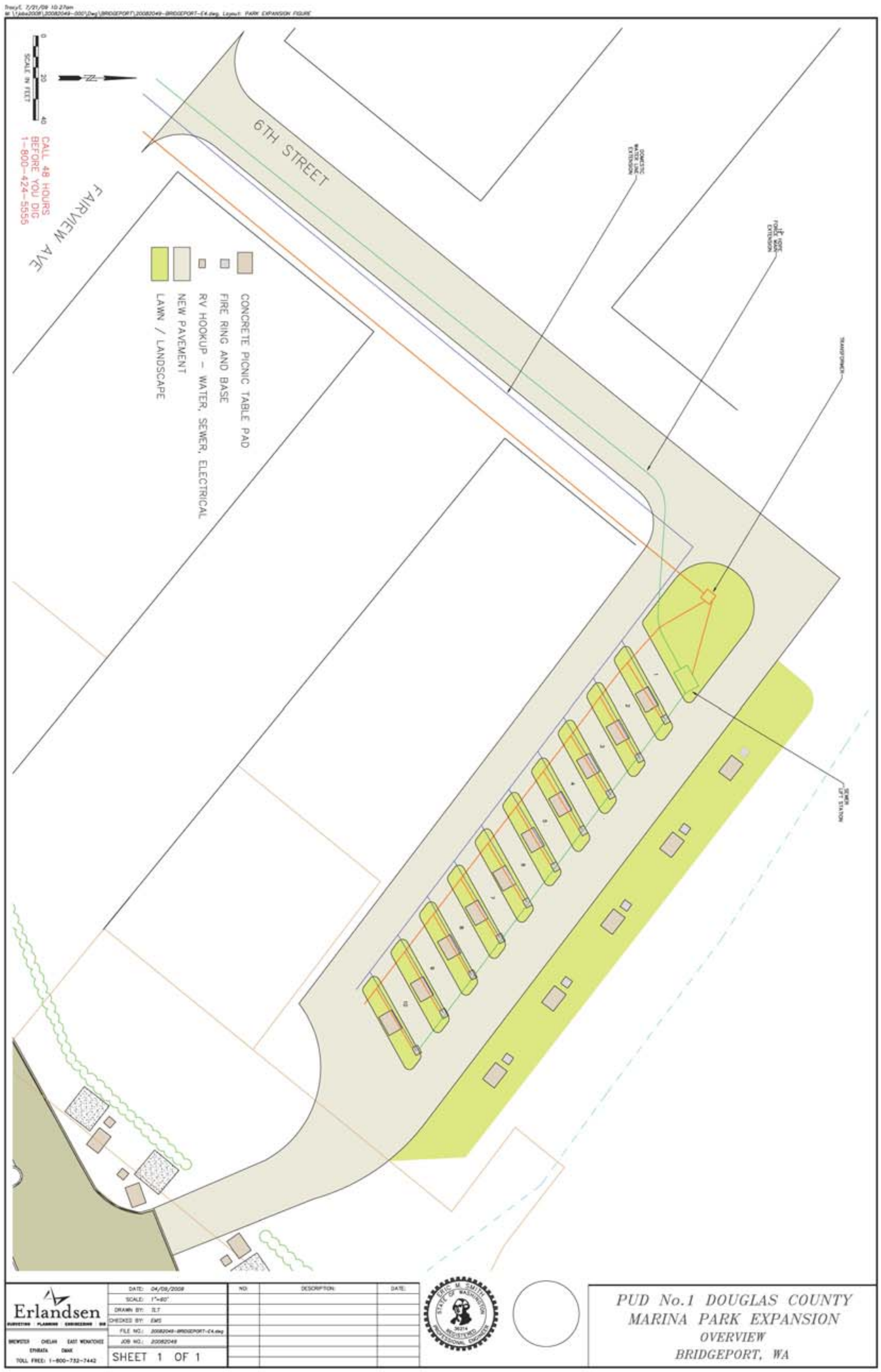
APPENDIX B

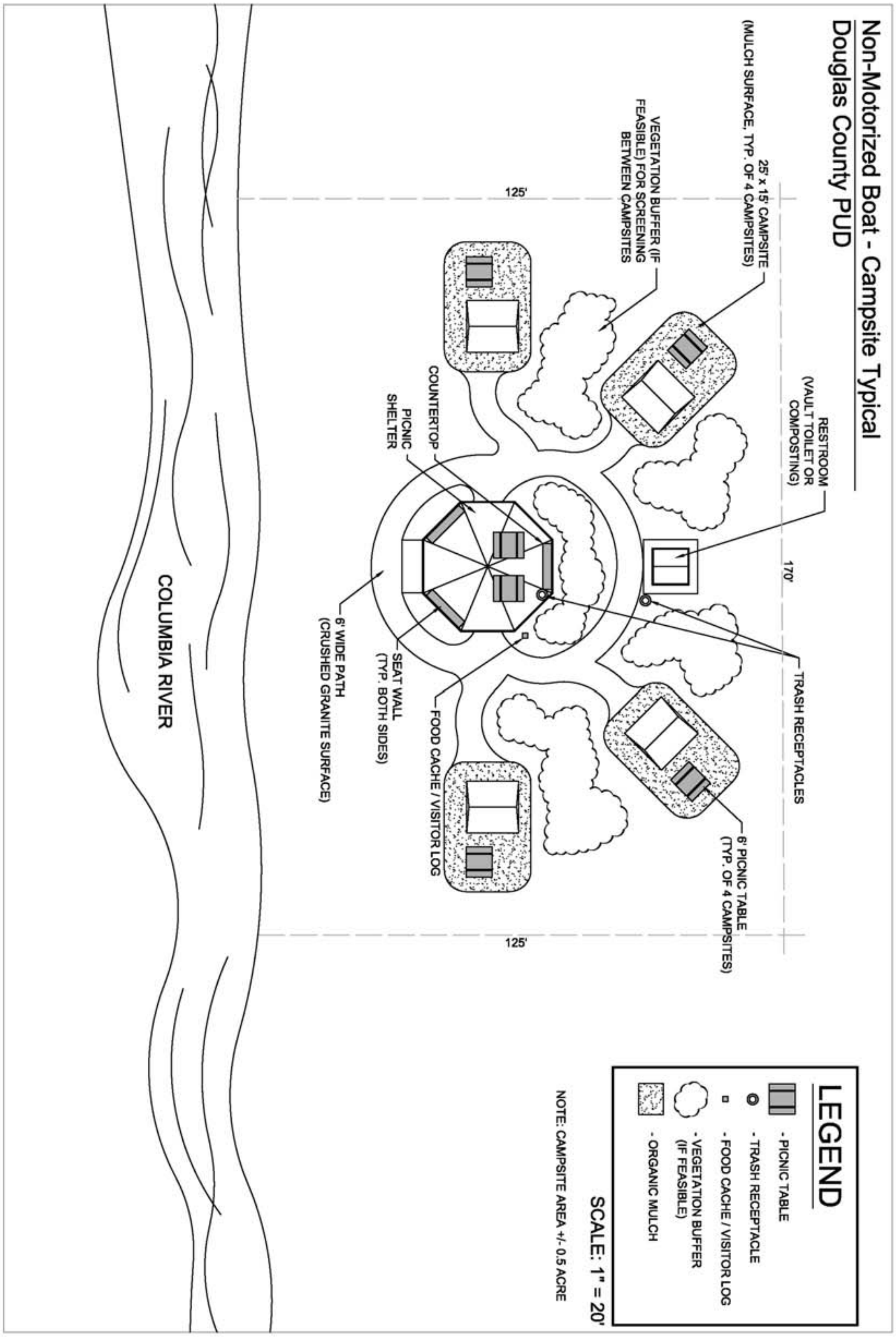
Conceptual Design
Marina Park Expansion



6TH STREET
FAIRVIEW AVE
CALL 48 HOURS
BEFORE YOU DIG
1-800-424-5555
CONCRETE PICNIC TABLE PAD
FIRE RING AND BASE
RV HOOKUP - WATER, SEWER, ELECTRICAL
NEW PAVEMENT
LAWN / LANDSCAPE
Erlandsen
SHEET 1 OF 1
PUD No.1 DOUGLAS COUNTY
MARINA PARK EXPANSION
OVERVIEW
BRIDGEPORT, WA

APPENDIX C

Conceptual Design
Non-Motorized Boat-in Tent Campsite


Non-Motorized Boat - Campsite Typical
Douglas County PUD
25' x 15' CAMPSITE (MULCH SURFACE, TYP. OF 4 CAMPSITES)
VEGETATION BUFFER (IF FEASIBLE) FOR SCREENING BETWEEN CAMPSITES
RESTROOM (VAULT TOILET OR COMPOSTING)
COUNTERTOP
PICNIC SHELTER
125'
170'
TRASH RECEPTACLES
6' WIDE PATH (CRUSHED GRANITE SURFACE)
SEAT WALL (TYP. BOTH SIDES)
FOOD CACHE / VISITOR LOG
6' PICNIC TABLE (TYP. OF 4 CAMPSITES)
COLUMBIA RIVER
LEGEND
- PICNIC TABLE
- TRASH RECEPTACLE
- FOOD CACHE / VISITOR LOG
- VEGETATION BUFFER (IF FEASIBLE)
- ORGANIC MULCH
SCALE: 1" = 20'
NOTE: CAMPSITE AREA +/- 0.5 ACRE

Appendix E-6

Avian Protection Plan

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WELLS PROJECT 230 KV TRANSMISSION LINE
AVIAN PROTECTION PLAN

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

June 2009

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

For copies of this Avian Protection Plan, contact:

Public Utility District No. 1 of Douglas County
Attention: Relicensing
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4497
Phone: (509) 884-7191
E-Mail: relicensing@dcpud.org

EXECUTIVE SUMMARY

The Wells 230kV Transmission Line Corridor Avian Protection Plan (APP) was developed to protect resident and migrant birds that interact with the Wells 230 kV transmission lines. Public Utility District No. 1 of Douglas County (Douglas PUD) is committed to maintaining the reliability of the transmission lines in a cost effective manner while meeting the regulatory requirements to conserve migratory species; rare, threatened and endangered species; and raptors. The APP considers both avian migrants interacting with the transmission lines crossing the Columbia River and birds nesting on the transmission line structures. Douglas PUD prepared the APP in consultation with the U.S. Fish and Wildlife Service (USFWS) and the Washington Department of Fish and Wildlife (WDFW).

Beginning in year one of the new license, Douglas PUD will implement the following practices and protocols under the APP:

- Reporting Protocol: All avian mortalities found in the transmission line corridor will be reported to the appropriate parties;

- Nest Management Protocol: Douglas PUD will implement a Nest Management Protocol in compliance with federal and state bird protection laws;

- Tree Removal Protocol: Tree removal as part of transmission corridor maintenance will only occur between August 31 and January 31 to protect migratory birds;

- Training Protocol: All appropriate utility personnel will be trained to evaluate avian issues when performing maintenance on the transmission lines and corridor.

1.0 INTRODUCTION

The Wells 230kV Transmission Line Corridor Avian Protection Plan (APP) was developed to reduce the potential for bird collisions with the Wells 230kV transmission lines and structures. Public Utility District No. 1 of Douglas County (Douglas PUD) is committed to maintaining the reliability of the transmission lines in a cost effective manner while meeting the regulatory requirements to conserve migratory species; rare, threatened and endangered species; and raptors. The APP considers both avian migrants interacting with the transmission lines crossing the Columbia River and nesting on the transmission line structures. Douglas PUD prepared the avian protection plan in consultation with the U.S. Fish and Wildlife Service (USFWS) and Washington Department of Fish and Wildlife (WDFW).

1.1 Wells Hydroelectric Project

Wells Dam was constructed between 1963 and 1967. The dam is located at river mile (RM) 515.6 on the Columbia River in Washington State, approximately 30 miles (48 km) downstream of Chief Joseph Dam and 42 miles (68 km) upstream of Rocky Reach Dam. Wells Dam has ten generating units with an installed nameplate capacity of 774,300 kilowatts (kW) and a maximum generating capability of 840,000 kW. Power from the Wells Hydroelectric Project (Wells Project) serves both Douglas PUD's owners/customers and utilities throughout the Northwest.

1.2 230 kV Transmission Lines

Two 230 kV single-circuit transmission lines were built for the Wells Project (Figure 1.2-1). Each of the 230 kV transmission lines is capable of transmitting the entire output of the Wells Project. The lines run 41 miles (65.6 km) from the switchyard atop the dam to the Douglas Switchyard operated by Douglas PUD. The lines run parallel to each other on 45-85 foot steel towers along a common 235-foot wide right-of-way. Each phase has two parallel conductors suspended 96 inches to 105 inches (2.4 to 2.6 m) below the bridge and approximately 24 feet (7.3 m) between phases. The transmission lines begin at Wells Dam and cross the Columbia River from Carpenter Island in Chelan County to Douglas County (Figure 1.2-2). After crossing the river, the transmission lines travel southeast to the Boulder Park area then turn southwest across wheat fields, past the town of Waterville and over Badger Mountain. The Douglas Switchyard is located in close proximity to the Rocky Reach Switchyard, operated by Public Utility District No. 1 of Chelan County (Chelan PUD) and the Sickler Substation, operated by the Bonneville Power Administration (BPA). The 230 kV lines connect to the regional transmission grid at BPA's Sickler Substation.

Figure 1.2-1 Wells Project Transmission Line

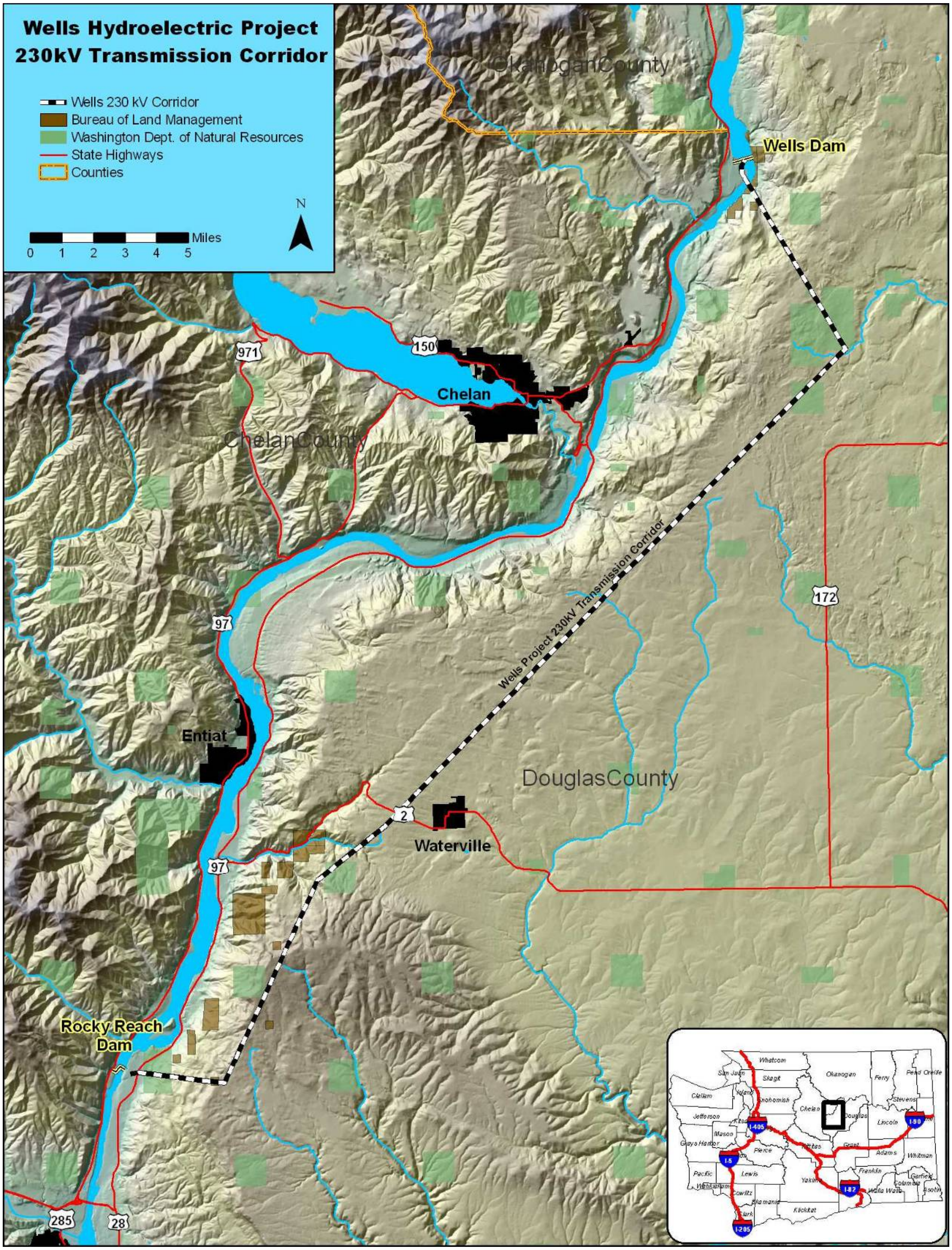

Figure 1.2-2 Wells Project 230 kV Transmission Line Corridor

2.0 BACKGROUND

Utility poles and transmission line structures can benefit raptors by providing perch and /or nesting structures in areas where few natural perches or nest sites are available. These same structures can pose a threat to raptors and migratory birds through electrocution and collision with conductors. Avian electrocutions and collisions with power lines have been documented nearly as long as utilities have provided power to the public and industry (APLIC, 2006, 1996 and 1994; APLIC and USFWS, 2005). Since the 1970s, utilities, USFWS and the National Audubon Society have worked together to document avian mortalities and to develop methods to reduce electrocutions and line collisions. In 2005, the Avian Power Line Interaction Committee and the USFWS jointly published Avian Protection Plan Guidelines to assist utilities in developing voluntary APPs.

Surveys of the transmission corridor were conducted in 2008 to identify evidence of avian collisions with the transmission line and associated structures. The process of collecting avian collision data consisted of two components: (1) a focused survey of two segments determined likely to have waterfowl and water birds flying through, and (2) observations of avian carcasses incidental to all other wildlife and botanical studies along the entire corridor. Three bird carcasses were found during focused surveys, and three other carcasses were found incidentally to other survey efforts. No direct evidence of collision was noted from these six carcasses (Parametrix, 2009).

During the Terrestrial Resource Work Group meeting on August 26, 2008, Douglas PUD and WDFW agreed to conduct additional surveys of raptor migration activity along the transmission line corridor. Between September 16 and 30, biologists from both entities collected observations of raptors from prominent ridges by Landingham Hill above Wells Dam, near McGinnis Canyon, and on Badger Mountain above Rocky Reach Dam. During that period, biologists spent two to three hours at these locations during the morning (9:00 to 11:00 am) and afternoon hours (2:00 to 4:00 pm), for a total of 10 observation periods.

Raptor migration activity surveys resulted in 37 observations, comprised of six identified raptor species, and three unidentified individuals. Raptors observed along the transmission line corridor were: northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), red-tailed hawk (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), merlin (*Falco columbarius*), and prairie falcon (*Falco mexicanus*). Thirteen raptors were observed crossing over or under the transmission lines and an additional 13 were seen perching on towers. Biologists found no indication of raptors avoiding or being adversely affected by the transmission lines or towers (WDFW, unpublished data).

3.0 MANAGEMENT PLAN GOAL

The goal of the Avian Protection Plan is to protect resident and migrant birds that interact with the Wells 230 kV transmission lines.

4.0 FEDERAL AND STATE BIRD PROTECTION LAWS

Federal laws protecting birds include the Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. 703-712), the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d) and the Endangered Species Act (ESA) (16 U.S.C. 1531-1543). These three laws are administered by the USFWS and are the cornerstone of modern bird conservation on a national level. There are only a few birds that are not protected by these laws including introduced species: house sparrow (*Passer domesticus*), European starling *(Sturnus vulgaris)* and rock dove (*Columba liviaor*) and escaped exotic pet trade species (parrots, finches and canaries**)**. Non-migratory species of birds (e.g. upland game birds) are not protected by these acts.

The MBTA, BGEPA and ESA are strict liability laws; the USFWS does not have to show intent to cause harm to a bird to charge an individual or company with a take under these laws. Violation of any of these laws can result in mandated remedial obligations, fines and/or imprisonment.

State RCW 77.15.130 protects fish and wildlife from unlawful take. Fish and wildlife eggs and nests are also protected by this law. Violation of this law is a misdemeanor.

5.0 AVIAN MORTALITY

5.1 Electrocution

5.1.1 Direct contact

Electrocutions occur when birds are large enough to span the distance between conductors or between an energized component and a ground. Sandhill cranes (*Grus canadensis*) are the largest migrant bird to stop over in fields in Douglas County but are not normally found in the vicinity of the transmission line. Bald eagles (*Haliaeetus leucocephalus*) and golden eagles are the largest birds anticipated to interact on the Wells 230 kV transmission line.

Suggested Practices for Avian Protection on Power Lines – The State of the Art in 2006 recommends 60 inches (152 cm) of separation between energized parts to protect eagle sized birds from electrocution (APLIC, 2006). The Wells 230 kV transmission lines were constructed to meet the National Electric Safety Code (NESC) conductor clearances. The transmission line exceeds the minimum eagle separation recommendation with a phase to ground separation of 8 feet (2.4 m) and horizontal separation of 24 feet (7.3 m) between phases. The phase to phase separation exceeds the maximum wing span for an adult female eagle of 8 feet (2.4 m) (APLIC, 2006). The use of suspension insulators contribute to the safety margin for eagles by suspending the conductor under the tower bridge preventing wing tip to wing tip contact between the phase and ground.

5.1.2 Bird Streamers

Large raptors, vultures and large wading birds can expel long streams of excrement called streamers in the utility industry. These streamers can cause flashovers and short-outages when they provide an electrical path from an energized conductor or hardware to ground. Streamer related faults are not normally lethal to the bird since streamers are often released as the bird flies from the structure though lethal injuries can occur (APLIC, 2006). Bird streamer flashovers are usually identified by fecal buildup and flash marks on insulators and structures. Douglas PUD has not identified bird streamer caused faults on the Wells 230 kV transmission lines (pers. comm. Arlen Simon, Douglas PUD).

5.2 Collisions

Factors that influence avian collision risk can be divided into three categories: those factors related to avian species, those related to the environment, and those related to the configuration or location of lines (APLIC and USFWS, 2005). Species-related factors include habitat use, body size, flight behavior, age, sex, and flocking behavior. Heavy-bodied, less agile birds or birds within large flocks may lack the ability to quickly negotiate obstacles, making them more likely to collide with overhead lines (e. g., herons and swans). Likewise, inexperienced birds as well as those distracted by territorial or courtship activities may collide with lines. Environmental factors influencing collision risk include the effects of weather and time of day on line visibility, surrounding land use practices that may attract birds, and human activities that may flush birds into lines. Line-related factors influencing collision risk include the configuration and location of the line and line placement with respect to other structures or topographic features. Collisions often occur with the overhead shield (ground) wire, which is smaller diameter and less visible than the primary conductors (APLIC and USFWS, 2005).

The height that birds fly is an important factor for evaluating a transmission line's avian collision potential. Birds migrate at elevations above the height of most transmission lines. Birds migrating at night have been recorded to fly from 800 to 3,700 feet (241 to 1127 m) above the ground (APLIC, 1994). Spring and fall radar studies of nocturnal migrating birds in Douglas County show the majority of birds fly at elevations of 750 to 3,350 feet (230.m to 990 m) above the ground (Hamer et. al, 2003). However, small nimble passerines (songbirds) can be detected migrating a few meters above the ground during inclement weather or daytime migrations (APLIC, 1994).

It is unlikely that the transmission line is a collision risk for migrating birds for the reasons described below.

The major portion of the transmission line runs for approximately 31 miles (50 km) from the Boulder Park area to south Badger Mountain. This portion of the line parallels the north and south flight paths of birds migrating through Douglas County. This portion of the transmission line also parallels the transmission right of way for two BPA 500 kV transmission lines and two 230 kV BPA transmission lines.

The Wells transmission lines run in parallel with the four BPA lines from Boulder Park southwest for 10.5 miles, where one 500 kV and two 230 kV lines turn west and cross the Columbia River near Earthquake Point. BPA's second 500 kV transmission line parallels the Wells transmission lines to substations near Rocky Reach dam. The 500 kV transmission lines, built to NESC standards, have greater ground to phase separation requiring taller lattice tower structures than the Wells 230 kV lines. Birds avoiding the BPA transmission lines fly well above the Wells transmission lines; the parallel location of multiple lines creates a greater visual structure, and is recommended by USFWS to reduce the potential for bird collisions (APLIC 2006).

The first 6.8 miles (10.9 km) of the transmission line travels southeast from Wells Dam to the Waterville Plateau near the Boulder Park area and the last 3.2 miles (5.1 km) of the transmission line travels southwest from Badger Mountain to the Columbia River near Rocky Reach Dam. The topography of these two slopes reduces the chance that migrating birds may collide with the lines, but raptors soaring and hunting along the slopes may be vulnerable.

Birds flying south along the Columbia River must fly above Wells Dam, approximately 14 feet (4.3 m) above the reservoir forebay and potentially above the gantry cranes and substation bus work, approximately 85 feet (25.9 m) above the forebay and 170 feet (51.8 m) above the dam tailwater. The bus work is heavily constructed and very visible during the day. The bus work has red aircraft marker lights on the top of the structure and the project is well lighted making the bus work very visible at night. Birds flying south over the dam are high enough to clear the transmission crossing below the dam. Birds flying north along the Columbia River must fly over the less visible transmission line crossing before encountering Wells Dam; light from the dam may help to make the line more visible under low light conditions.

The Wells 230 kV transmission lines were designed with two bundled conductors for each phase of the circuit. The bundled conductors, 1 1/4 inches (3.2 cm) diameter, are suspended below the lattice tower bridge by suspension insulators. The first and last mile of the transmission lines have shield wires 3/8 inch (95 mm) diameter located 18 to 22 feet (5.5 to 6.7 m) above the conductors. The shield wires protect the transmission line from lightning strikes.

The two Wells 230 kV transmission lines cross the Columbia River approximately one-half mile (0.8 km) downstream of Wells Dam. The crossing is approximately 2,400 feet (732 m) from tower to tower. APLIC (1994) reports that aerial marker balls on overhead lines reduce avian collisions by 40 to 54 percent. Fifteen round aircraft marker balls (36 inch (91 cm)) are spaced 600 feet (182 m) apart on each of the four shield wires. The markers are uniformly staggered across the four shield wires to provide an apparent spacing of 150 feet (46 m) between markers. Blinking, red aircraft warning lights are mounted on river crossing towers at the height of the shield wire.

Young birds or those unfamiliar with the area are more vulnerable to collisions with overhead lines than more experienced birds (APLIC, 1994). The crossing is potentially the most hazardous section of line for young resident birds learning to fly, raptors hunting in unfamiliar terrain, and piscivorous birds feeding below Wells Dam. Gulls, terns, cormorants and other piscivorous birds have fed below Wells Dam for years while avoiding gull wires (3/64 inch diameter) stretched across the tail water to reduce predation on salmonids. These piscivorous birds should be able to easily avoid the shield wire under all but low light conditions. Young osprey (*Pandion haliaetus*), and bald eagles searching for fish along the river course and other young raptors are also susceptible to collision with the lines during predation attempts. Great blue herons (*Ardea herodias*) are easily flushed by human activity and could fly into the ground wire if disturbed near the river crossing.

5.2.1 Bird Flight Diverters

Bird flight diverters (BDs) have been used in Europe and the United States since the early 1970s (APLIC, 1994). BDs are a preformed high impact plastic spiral which wraps around the shield wire to make the wire more visible (Figure 5.2-1). BDs increase the apparent shield wire diameter to 2.5 to 5.5 inches (6.4 to 13.9 cm) making the line more visible to birds. BDs are normally installed at a 49 foot (15 m) spacing. Reductions in bird collisions of 65 to 74 percent have been experienced using BDs.

Following receipt of a new license, Douglas PUD will do the following:

BDs will be installed on the Wells transmission line river crossing in the event that the transmission line is reconductored, or if the static wire or aviation markers are replaced. BDs will be spaced between the aerial marker balls to increase visibility of the shield wire. If available, light emitting BDs will be installed to improve low light visibility; Puget Sound Energy is working with Tyco Electronics to develop BDs that store solar energy and emit visible light during low light conditions.

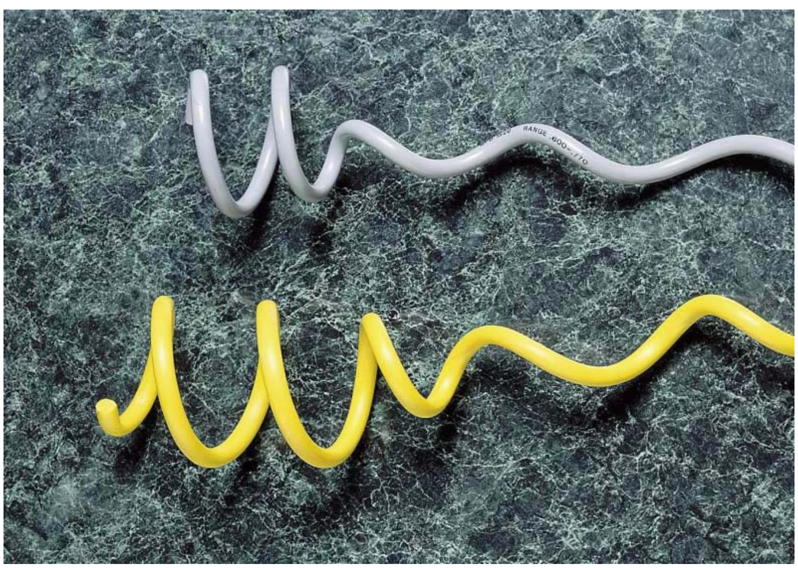

Figure 5.2.1 Bird Flight Diverters manufactured by Tyco Electronics

5.3 Record Keeping

Beginning in year one of the new license, Douglas PUD will do the following:

- Douglas PUD will maintain records of all avian mortalities detected on the Wells 230 kV transmission line right of way.

- Douglas PUD will report all avian mortalities caused by the Wells 230 kV transmission lines to USFWS through the online USFWS Bird Fatality/Injury Reporting Program (https://birdreport.fws.gov).

6.0 NEST MANAGEMENT AND TRANSMISSION LINE CORRIDOR MAINTENANCE

6.1 Nest Management

Power line structures in open habitat provide perch, roost and nest substrate for some avian species. This is especially true of raptors and ravens in open habitat where natural substrates are limited. Nests built on transmission line structures can cause outages and possibly fire when long sticks fall and cause phase to ground faults. A raptor incubating or brooding young will defecate over the side of the nest, potentially causing a streamer outage if the nest is above an energized phase.

The Wells 230 kV transmission lines travel the first 6.8 miles (10.9 km) through habitat rich with natural perching and nesting substrate including ponderosa pine (*Pinus ponderosa*) trees, cliffs and large basalt boulders. On the Waterville Plateau the transmission lines travel through 22.8 miles (36.6 km) of wheat fields with few nesting or perching opportunities. The final 11.4 miles (18.3 km) of the transmission line right of way again passes through habitat rich with ponderosa pine that provides ample perching and nesting opportunities.

Bird nests have not been a major problem on the Wells 230 kV transmission line towers. Parametrix (2009) found two common raven (*Corvus corax*) nests, a red-tailed hawk nest and a nest built by an unidentified occupant. Annual transmission line inspections have recorded an average of 4.75 nests per year, or 0.06 nest per mile per year on transmission line towers from 2004 to 2007.

Beginning in year one of the new license, Douglas PUD will implement a nest management protocol that includes:

- All nest management will be performed in compliance with federal and state laws.

- Douglas PUD's Wildlife Biologist will be consulted before any nest is removed and will secure permits from USFWS and WDFW, if necessary, before nest removal proceeds.

- Active nests will not be removed from the Wells 230 kV transmission line between February 1 and August 31 without prior approval from USFWS and WDFW.

Nests will only be removed if they are located above a line phase and have caused or threaten to cause an outage; present a fire hazard or other safety hazard; or because the size and weight of the nest threaten tower stability.

6.2 Transmission Line Corridor Maintenance

6.2.1 Tree Removal

The transmission line corridor passes through 64 acres of Douglas fir (*Pseudotsuga menziesii*) and ponderosa pine (Parametrix, 2009). The conifer canopy closure varies from sparse open canopy to closed canopy. When vegetation grows in close proximity to transmission line conductors, the vegetation can provide a path for electricity to travel to ground. An electrical flash over to ground can disrupt the delivery of energy to both customers in Douglas County and to other utilities purchasing power. Douglas PUD must maintain North America Electric Reliability Corporation (NERC) standards of 25 feet separation between conductors and vegetation to insure the transmission lines' reliability.

Removal of trees during the nesting season can have a negative impact on migratory bird species.

Beginning in year one of the new license, Douglas PUD will do the following:

- To protect nesting birds, Douglas PUD will only perform tree clearing on the transmission line corridor between August 31 and January 31. Clearing of the conifer trees on the transmission line corridor is anticipated to happen once every ten years beginning in 2018.

7.0 TRAINING

All appropriate utility personnel will be trained annually to understand avian issues on the Wells 230 kV transmission line. This training will include background information, protocols and procedures by which employees are required to report an avian mortality, implement a nest removal action, disposal of carcasses, perform vegetation management and comply with applicable regulations and the consequences of non-compliance.

Beginning in year one of the new license, Douglas PUD will do the following:

- Douglas PUD will train (as described above) all appropriate utility personnel to understand avian issues on the Wells 230 kV transmission lines.

8.0 CONSULTATION

Douglas PUD will meet with resource agencies or tribes, when requested, to discuss management of wildlife and botanical species on the transmission line corridor. All changes to the APP must be agreed to by the WDFW, USFWS and Douglas PUD. Any agreed-upon changes to the APP will be reported to FERC for review and approval.

Table 8.1-1 Summary of implementation measures and schedule

Douglas PUD Action	Frequency	Schedule
Install bird flight diverters at the transmission line river crossing. (Section 5.2.1)	Once	Only in the event that the transmission line is reconductored or if static wires or aviation markers are replaced.
Maintain records of avian mortalities detected on the 230kV right-of-way. (Section 5.3)	As needed.	Beginning in year one of the new license.
Report all avian mortalities caused by the 230kV transmission lines to USFWS. (Section 5.3)	As needed.	Beginning in year one of the new license.
Implement a nest management protocol. (Section 6.1)	As needed.	Beginning year one of the new license.
Tree clearing on the transmission line corridor will only be performed between August 31 and January 31. (Section 6.2.1)	Approximately every ten years.	Beginning year one of the new license.
Train appropriate utility personnel to understand avian issues related to the 230kV transmission lines. (Section 7.0)	Annually.	Beginning year one of the new license.
Consult with agencies as needed (Section 8.0)	As needed.	As needed.

9.0 REFERENCES

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Appendix E-7

Draft Biological Assessment

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Draft Biological Assessment
And
Essential Fish Habitat Analysis

For the Proposed Action of Issuing a New Operating License for the Wells Hydroelectric Project

FERC No. 2149-131

Image courtesy of USFWS

Prepared by:

Public Utility District No. 1 of Douglas County
East Wenatchee, WA

May 2010

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ACRONYMS

ac-ft .... acre-feet
APP .... Avian Protection Plan
ANS .... Aquatic Nuisance Species
ANSMP .... Aquatic Nuisance Species Management Plan
Aquatic RWG .... Aquatic Resources Work Group
Aquatic SWG .... Aquatic Settlement Work Group
BA .... Biological Assessment
BIA .... Bureau of Indian Affairs
BLM .... Bureau of Land Management
BO .... Biological Opinion
BPA .... Bonneville Power Administration
BTMMP .... Bull Trout Monitoring and Management Plan
BTMP .... Bull Trout Management Plan
cfs .... cubic feet per second
Chelan PUD .... Public Utility District No. 1 of Chelan County
Colville .... Confederated Tribes of the Colville Reservation
DO .... dissolved oxygen
DPS .... distinct population segment
Douglas PUD .... Public Utility District No. 1 of Douglas County
Ecology .... State of Washington Department of Ecology
ESA .... Endangered Species Act
ESU .... Ecologically Significant Unit
FCRPS .... Federal Columbia River Power System
FERC .... Federal Energy Regulatory Commission
FPC .... Federal Power Commission
GAP .... Gas Abatement Plan
GBT .... gas bubble trauma
GBD .... gas bubble disease
GCFMP .... Grand Coulee Fish Management Plan
Grant PUD .... Public Utility District No. 2 of Grant County
HCA .... Hourly Coordination Agreement
HCP or Wells HCP .... Anadromous Fish Agreement and Habitat Conservation Plan
ILP .... Integrated Licensing Process
ITP .... Incidental Take Permit
ITS .... Incidental Take Statement
JBS .... Juvenile Bypass System
kcfs .... thousand cubic feet per second
MSL .... mean sea level
NMFS .... National Marine Fisheries Service
NPDES .... National Pollutant Discharge Elimination System
NPRP .... Northern Pikeminnow Removal Program
NPS .... National Park Service
NNI .... no net impact
PAD .... Pre-Application Document

PGE .... Portland General Electric Company
PIT.. Passive Integrated Transponder
PLMP .... Pacific Lamprey Management Plan
PNCA .... Pacific Northwest Coordination Agreement
PM&E .... Protection, Mitigation, and Enhancement measure
Project or Wells Project .... Wells Hydroelectric Project
PSE.. Puget Sound Energy, Inc.
RCO .... Recreation and Conservation Office
RCW .... Revised Code of Washington
RFMP .... Resident Fish Management Plan
RM .... river mile
RMP .... Recreation Management Plan
ROW .... right-of-way
RPM .... reasonable and prudent measures
RTE .... rare, threatened and endangered
RRWG .... Recreation Resources Work Group
SPCC .... Spill Prevention Control and Countermeasures Plan
Spring Chinook .... Upper Columbia River Spring-Run Chinook
Steelhead .... Upper Columbia River Steelhead
TCP .... Tributary Conservation Plan
TDG .... total dissolved gas
TMDL .... Total Maximum Daily Load
TRWG .... Terrestrial Resources Work Group
UCR .... Upper Columbia River
UCSRP .... Upper Columbia Salmon Recovery Plan
US .... United States
USDA.. United States Department of Agriculture
USACE .... United States Army Corps of Engineers
USBR .... United States Bureau of Reclamation
USEPA .... United States Environmental Protection Agency
USFWS .... United States Fish and Wildlife Service
WAC .... Washington Administrative Code
WBMP .... Wildlife and Botanical Management Plan
WDFW .... Washington Department of Fish and Wildlife
Wells Project or Project .... Wells Hydroelectric Project
WQAP .... Water Quality Attainment Plan
WQI .... water quality index
WQMP .... Water Quality Management Plan
WQS .... Washington State Water Quality Standards
WRIA .... Water Resources Inventory Area
WSMP .... White Sturgeon Management Plan
WWA .... Wells Wildlife Area
Yakama .... Confederated Tribes and Bands of the Yakama Indian Nation

1.0 INTRODUCTION

This document presents a draft Biological Assessment (BA) prepared by the Public Utility District No. 1 of Douglas County (Douglas PUD) to describe the potential effects of the relicensing of the 774.3 MW Wells Hydroelectric Project (Wells Project or Project) on listed or candidate species and designated critical habitat under the Endangered Species Act (ESA). Douglas PUD is the Federal Energy Regulatory Commission's (FERC) designated non-federal representative for informal Endangered Species Act consultation.

Douglas PUD's existing FERC license for the Wells Project expires on May 31, 2012. Relicensing of the Project will allow Douglas PUD to continue the generation of electricity to serve local customers as well as tribal and utility power purchasers throughout the Pacific Northwest.

From 1969 to date, Douglas PUD has cooperatively entered into 16 major agreements related to protection, mitigation and enhancement measures (PM&Es) for aquatic and terrestrial resources in the vicinity of the Wells Project. Of note among these are Douglas PUD's Anadromous Fish Agreement and Habitat Conservation Plan (Wells HCP), initiated specifically for the relicensing of the Wells Project and the Bull Trout Monitoring and Management Plan (BTMMP), an effort designed to monitor incidental take associated with the Wells Project and guide the management and protection of bull trout and habitat within the Project area. Douglas PUD is not proposing any changes to Wells Project operations beyond the implementation of the existing and new resource management plans and settlement agreements.

New resource management plans and settlements proposed for inclusion in a new license are the measures contained within theWells HCP, the Aquatic Settlement Agreement (White Sturgeon, Pacific Lamprey, Bull Trout, Resident Fish, Water Quality and Aquatic Nuisance Species management plans), the Wildlife and Botanical Management Plan, Avian Protection Plan, Historic Properties Management Plan, Recreation Management Plan, and Douglas PUD's Land Use Policy.

The purpose of this BA is to review the proposed action of issuing a new operating license for the Wells Project, including all existing and proposed management plans and agreements, in sufficient detail to determine whether the proposed action may affect any of the threatened, endangered or candidate species and designated critical habitats listed below. The BA is prepared in accordance with Section 7 of the Endangered Species Act (16 U.S.C. 1536(c)), and follows the standards established in 50 CFR 402.12.

The species and critical habitats considered in this document are:

LISTED SPECIES

Endangered

Upper Columbia River Spring-run Chinook salmon (*Oncorhynchus tshawytscha*)
Pygmy rabbit (*Brachylagus idahoensis*) – Columbia Basin distinct population segment
Gray wolf *(Canis lupus)* [west of U.S. 97 and State Highway 17]
Hackelia venusta (Showy stickseed), plant
Sidalcea oregana var. *calva* (Wenatchee Mountains checker-mallow), plant

Threatened

Upper Columbia River steelhead (*Oncorhynchus mykiss*)
Bull trout *(Salvelinus confluentus)* – Columbia River distinct population segment
Canada lynx (*Lynx canadensis*)
Grizzly bear (*Ursus arctos horribilis*)
Northern spotted owl (*Strix occidentalis caurina*)
Spiranthes diluvialis (Ute ladies'-tresses), plant
Marbled murrelet *(Brachyramphus marmoratus)*

CANDIDATE SPECIES

Greater sage grouse *(Centrocercus urophasianus)* – Columbia Basin distinct population segment
Washington ground squirrel *(Spermophilus washingtoni)*
Fisher *(Martes pennanti)* - West Coast distinct population segment (west of the Okanogan River)
Yellow-billed cuckoo (*Coccyzus americanus*)

DESIGNATED CRITICAL HABITAT

Critical Habitat for Upper Columbia River Spring-run Chinook salmon
Critical Habitat for Upper Columbia River steelhead

PROPOSED CRITICAL HABITAT

Proposed Critical Habitat for Bull Trout

1.1 LICENSE HISTORY

On July 12, 1962, the Federal Power Commission (FPC), predecessor to the FERC, issued a 50-year license to build and operate the Wells Project to Douglas PUD. The term of the license runs through May 31, 2012. Construction of the Project began in the fall of 1963 and commercial operation began on September 1, 1967. The initial design and license for the Wells Project called for the construction of seven turbine generating units. On February 2, 1965, the FPC approved an application to amend the original license to include three additional generating units. The three additional units began commercial operation on January 24, 1969.

Pursuant to the requirements of the FERC's Integrated Licensing Process (ILP), Douglas PUD filed a Pre-Application Document (PAD) and Notice of Intent to relicense the Wells Project on December 1, 2006. Douglas PUD is currently progressing through the ILP and will file a Final License Application on or before May 31, 2010.

1.2 ESA CONSULTATION

In August 1993, Douglas PUD, Chelan PUD, and Grant PUD (collectively "mid-Columbia PUDs") initiated discussions to develop a long-term, comprehensive program for managing fish and wildlife that inhabit the mid-Columbia River basin (the portion of the Columbia River from the tailrace of Chief Joseph Dam to the confluence of the Yakima and Columbia rivers).

These discussions subsequently focused on the development of an agreement relating to anadromous salmonids, specifically: upper Columbia River (UCR) spring and summer/fall runs of Chinook salmon (*Oncorhynchus tshawytscha*); Okanogan River sockeye salmon (*O. nerka*); coho salmon (*O. kisutch*); and UCR summer-run steelhead (*O. mykiss*) (collectively, the Plan Species) which are under the jurisdiction of the National Marine Fisheries Service (NMFS). Douglas PUD already had a long-term anadromous fish settlement in place, but engaged in this process as an opportunity to define the fish mitigation strategy and requirements for the new Wells Project license.

As part of this process, Douglas PUD worked cooperatively with various state and federal fisheries agencies, local tribes and environmental organizations, including NMFS, the United States Fish and Wildlife Service (USFWS), the Washington Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama), the Confederated Tribes of the Umatilla Indian Reservation, and American Rivers, to develop the first hydropower Habitat Conservation Plan for anadromous salmon and steelhead. The plan commits Douglas PUD to a 50-year program to ensure that the Wells Project has no net impact (NNI) on mid-Columbia salmon and steelhead runs. The Wells HCP requires that this be accomplished through a combination of juvenile and adult fish passage measures at the dam, off-site hatchery programs and evaluations, and habitat restoration work conducted in tributary streams upstream of Wells Dam.

On July 30, 1998, following five years of negotiations, Douglas PUD submitted an unexecuted form of an Application for Approval of the Wells HCP to the FERC and to NMFS. Furthermore, to expedite formal consultation, biological evaluations of the effects (of implementing the HCP) on ESA-listed species under the jurisdiction of the USFWS were also prepared by Douglas PUD.

USFWS requested consultation under Section 7 of the ESA regarding the effects of hydroelectric project operations on bull trout (*Salvelinus confluentus*) in the Columbia River (letter from M. Miller, USFWS, to M. Robinson, FERC, dated January 10, 2000). The request for consultation was based on observations of bull trout in the study area. In its reply to the USFWS, the FERC noted that there was virtually no information on bull trout in the mainstem Columbia River. In response to requests from the USFWS, the mid-Columbia PUDs initiated bull trout collection, tagging and monitoring at their respective dams as a way to monitor incidental take and to gain insight into bull trout behavior.

In late 2003, the Wells HCP was reviewed and approved by NMFS following the issuance of Biological Opinions (BOs) and Incidental Take Permits (ITPs) covering hatchery and Wells Project operations. In November 2003, the Wells HCP was submitted to the FERC for approval and inclusion into the license for the Wells Project. On December 10, 2003, USFWS received a request from the FERC for formal consultation to determine whether the proposed incorporation of the Wells HCP into the FERC license for operation of the Wells Project was likely to jeopardize the continued existence of the Columbia River distinct population segment (DPS) of ESA-listed bull trout or destroy or adversely modify proposed bull trout critical habitat. In response to the FERC request, the USFWS submitted a BO and issued an ITP to Douglas PUD. The FERC approved the Wells HCP on June 21, 2004 along with similar HCPs submitted by Chelan PUD for the Rock Island and Rocky Reach hydroelectric projects.

As of April 2005, the Wells HCP has been signed by NMFS, USFWS, WDFW, Colville, Yakama, Douglas PUD and the Wells Project Power Purchasers (Puget Sound Energy, Inc. (PSE), Portland General Electric Company (PGE), PacifiCorp and Avista Corporation).

As part of the approval of the Wells HCP, the FERC amended the Wells Project license to include Article 61. Article 61 of the license required Douglas PUD to file with the FERC a Bull Trout Plan for monitoring take associated with the operations of the Wells Project. Article 61 further required that Douglas PUD prepare the Bull Trout Plan in consultation with the USFWS, NMFS, WDFW, and interested Indian Tribes (Colville and Yakama). On February 28, 2005, following consultation with the USFWS, NMFS, WDFW, Colville and Yakama, Douglas PUD filed the BTMMP with the FERC. The FERC approved the BTMMP on April 19, 2005.

The parties to the Wells HCP have agreed to be supportive of Douglas PUD's long-term license application filed with the FERC during the term of the HCP. The Wells HCP is also intended to constitute the parties' terms, conditions and recommendations for Plan Species under Sections 10(a), 10(j) and 18 of the Federal Power Act, the Fish and Wildlife Conservation Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Pacific Northwest Electric Power Planning and Conservation Act, and Title 77 RCW of the State of Washington.

In accordance with the conservation and mitigation measures proposed in the Wells HCP and BTMMP, NMFS and USFWS have proposed to formally consult on the impact of the proposed actions on ESA-listed and candidate species pursuant to Section 7 of the ESA. This document is intended to serve as Douglas PUD's BA for these listed species under the jurisdiction of NMFS and USFWS.

2.0 PROPOSED ACTION

Douglas PUD is proposing to relicense the 774.3-MW Wells Project, and implement a suite of six settlement agreements and twelve management plans meant to ensure resource protection and limit the potential for adverse effects on ESA-listed and candidate species. Relicensing will allow Douglas PUD to continue to generate electricity for its more than 18,000 local customers in Douglas County, and to fulfill long-term power purchase agreements with its tribal (Colville) and utility power purchasers (PSE, PGE, PacifiCorp, Avista Corporation, and Public Utility District No. 1 of Okanogan County) throughout the Pacific Northwest. Douglas PUD is not proposing to add capacity or make any major structural modifications to the Wells Project or substantially modify Project operations under a new license.

Douglas PUD proposed to continue implementation of the following agreements associated with the management and operation of the Wells Project, and to implement several new agreements, each described below. Many of these agreements specifically address PM&Es developed to avoid, minimize, and mitigate for any environmental effects associated with the operation of the Wells Project. Most of these agreements are detailed in Douglas PUD's PAD, filed with the FERC in December 2006. These consist of:

- Agreement between Douglas PUD and Ervin and Loretta Wolley and Colville Regarding Use of Freeboard Lands (1970).
- Memorandum of Understanding with USFWS and State of Washington Department of Fisheries (1990).
- Canadian Entitlement Allocation Extension Agreement (1997).
- Pacific Northwest Coordination Agreement (1997).
- Mid-Columbia Hourly Coordination Agreement (1997).
- Hatchery Sharing Agreement with Chelan PUD (2002).
- Hanford Reach Fall Chinook Protection Program Agreement (2004).
- Anadromous Fish Agreement and Habitat Conservation Plan (2004).
- Interlocal Cooperative Agreement with Grant PUD (2004).
- Settlement Agreement with Colville (2005).

2.1 ACTION AREA

For the purposes of this BA, the action area includes all areas affected directly or indirectly by the Wells Project. The Wells Project action area is specifically defined as the Columbia River from river miles (RM) 514.4 (approximately 1.2 miles downstream of the Wells Dam) to RM 544.9 (Chief Joseph tailrace). The Columbia River both upstream and downstream of Wells Dam is in compliance with state water quality standards and therefore the action area does not extend downstream of the Project. The action area also includes the Methow River 1.5 miles upstream from its confluence with the Columbia River and the lower 15.5 miles of the Okanogan River (Wells Reservoir tributaries), as both river segments are affected by the impoundment of the Wells Project; and the 41 mile 230kV transmission line right-of-way (ROW).

Additional Project hatchery program features include the Methow River from RM 51.0 to 49.8 (Methow Hatchery and related outfall channel). The Twisp River, a tributary to the Methow River, has trapping operations and an acclimation pond (located at RM 11.0) operated by Douglas PUD and is included in the action area. The Chewuch River, another tributary of the Methow River, has acclimation operations (located at RM 7.0) operated by Douglas PUD and is also included in the action area.

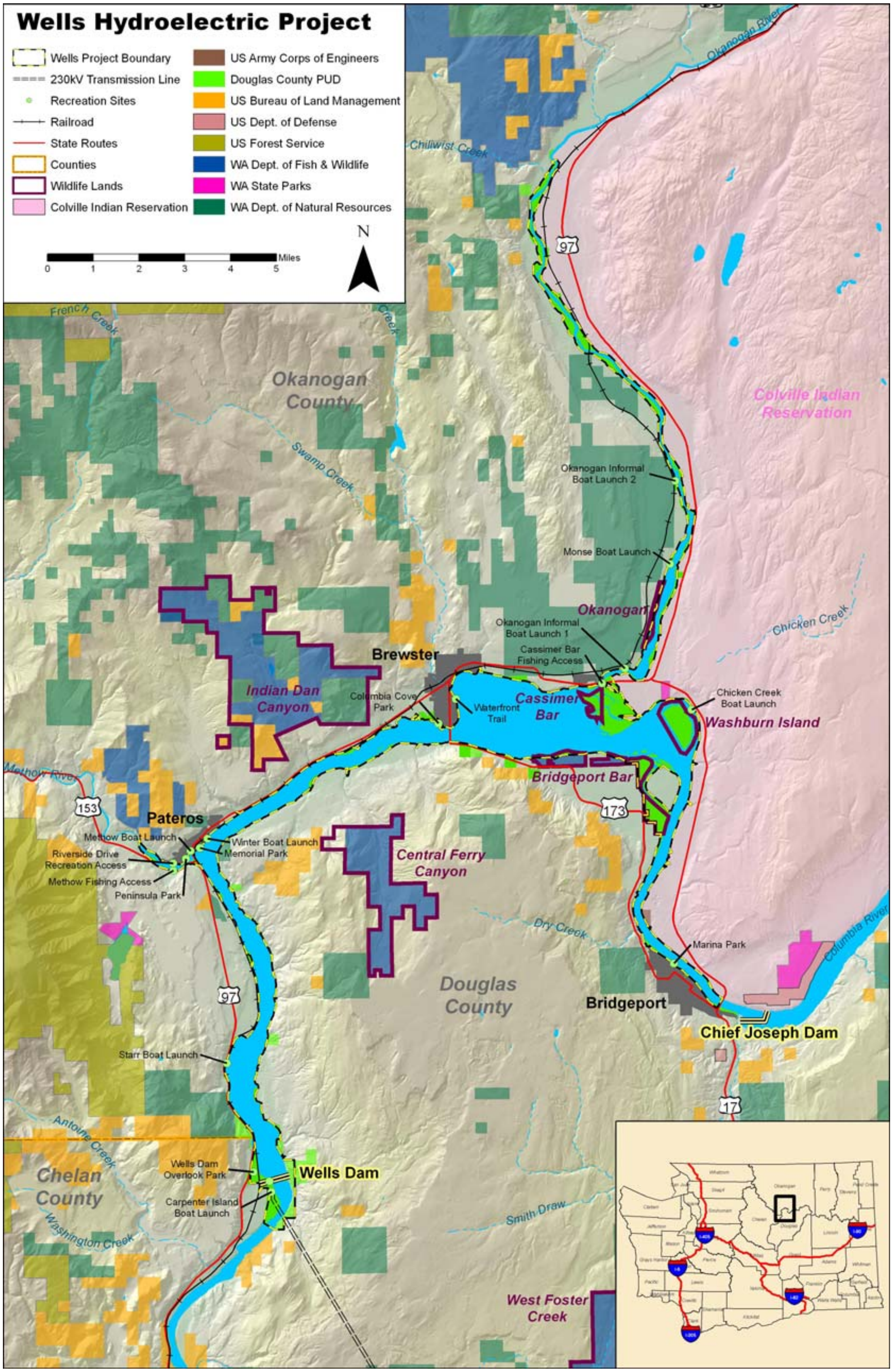

Figure 2.1-1 General Location of the Wells Project.

2.2 OPERATIONAL CHARACTERISTICS OF THE WELLS PROJECT

The Wells Project is a "run-of -river" hydroelectric project at which average daily inflow approximates the average daily outflow. The active storage capacity of the reservoir is only sufficient to regulate flow on a less-than-daily basis. The Wells Project has a water right for 220 thousand cubic feet per second (kcfs) for power production, with an impoundment right of 331,200 acre-feet (ac-ft) per year. The Wells Project is authorized by the FERC to maintain its reservoir level between elevation 781 and 771 feet above mean sea level (MSL) for power and non-power purposes. At elevation 781 feet MSL, total storage capacity is approximately 331,200 ac-ft, of which about 30 percent (97,985 ac-ft) is considered active storage (DTA 2006).

Reservoir fluctuations and power generation are largely driven by the discharge of water from regulated sources. Regulated sources of inflow include projects upstream of the Wells Reservoir in both the United States (US) and Canada. The closest project upstream from the Wells Project is the US Army Corps of Engineers' (USACE) Chief Joseph Project, also primarily a run-of-river project. Releases from Grand Coulee Dam largely dictate the flow regimes of the downstream projects including Wells. The primary sources of unregulated inflow include the two largest tributaries, the Methow and Okanogan rivers. Project operations reflect these inputs as well as the FERC license requirements, coordination of water releases on a continuous basis with other mid-Columbia River hydropower projects, fish and wildlife management requirements, and the power demands of the Wells Project power purchasers.

2.3 NORMAL DAILY OPERATIONS

Normal daily operations are coordinated according to the Mid-Columbia Hourly Coordination Agreement (HCA). The HCA provides for coordinated releases between the seven mid-Columbia River hydroelectric dams (Grand Coulee, Chief Joseph, Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids) to efficiently use the river, supply electricity during times of peak public demand, and maintain adequate flow to protect natural resources (HCA 1997). In effect, the HCA manages upstream releases and ensures downstream reservoirs make room to receive and release upstream flows. As a result of these coordinated operations, water fluctuations within Wells Reservoir are minimized, generally not exceeding one to two feet throughout the day. The Wells Project has operated under the terms of the HCA since 1972, and is currently operating within a 20-year agreement effective through 2017.

The daily operation of the Wells Project is influenced by the following factors: (a) the FERC license requirements; (b) natural stream flows; (c) regulation of upstream storage reservoirs in the US and Canada; (d) regulation of water releases from upstream power projects on an hourly basis to meet changing power demands; (e) actions in response to fish, wildlife and other environmental regulations; and (f) variable power demands for use within Douglas and Okanogan counties and under the long-term power sales contracts with PSE, PGE, PacifiCorp and Avista. The Wells Project has a 10 feet operating range, but typically operates within the upper one to two feet of the reservoir on any given day (see Figure 2.3-1). Over the period 1990 to 2005, the reservoir levels fell below 777 feet (four feet below normal maximum pool) only 1.1 percent of the time. Further discussion of reservoir levels is addressed in Section 2.4.

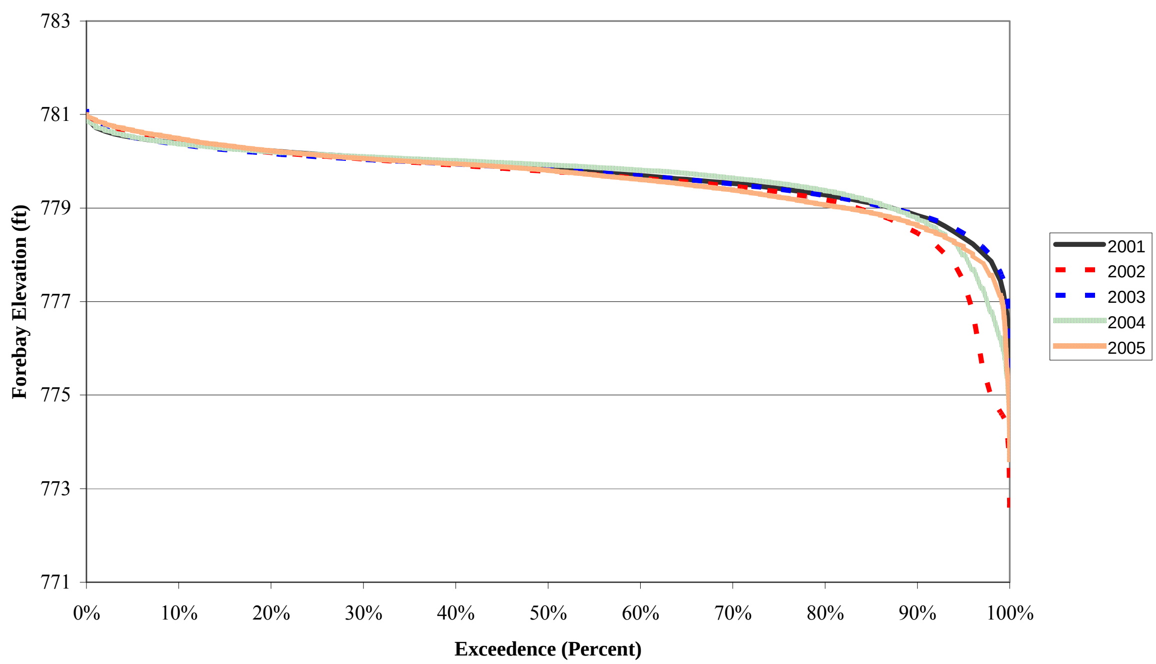

Figure 2.3-1 Headwater duration curves, Wells Forebay (hourly data) 2001-2005.

The Wells Project is operated in a coordinated manner with other regional hydroelectric projects to meet federal and state objectives for protecting and enhancing fish and wildlife and numerous other multi-purpose functions authorized by law such as power, flood control, navigation, recreation and water quality. The regulation of the upstream reservoirs in the US and Canada is primarily governed by the 1997 Pacific Northwest Coordination Agreement (PNCA) and the Columbia River Treaty between the US and Canada relating to the cooperative development of the Columbia River and its tributaries. The purpose of the PNCA is to optimize the firm load carrying capability of resources coordinated under the agreement, including the Wells Project, and to produce usable non-firm electricity from those resources as well. Importantly, the PNCA also sets forth a procedure approved by the FERC for apportioning costs to be borne by the Wells Project for purposes of headwater benefits compensation. This compensation addresses the benefit of improved stream flow regulation provided by the upstream storage reservoirs in the US, consistent with Article 47 of the Wells Project license.

Douglas PUD is required by Article 38 of the Wells Project license to use the improved stream flow resulting from Canadian storage for power production purposes and to make available to the federal system for delivery to Canada the Wells Project's share of coordinated system benefits resulting from such improved stream flow. Consistent with this requirement, Douglas PUD entered into agreements in 1964 (now expired) and 1997 with the Bonneville Power Administration (BPA) setting forth the share of Canadian benefits to be paid in the form of electricity deliveries by the Wells Project until September 15, 2024.

As previously noted, Douglas PUD is party to the HCA with the operators of six other federal and non-federal dams located both upstream and downstream of Wells Dam for a 20-year term through June 30, 2017. The HCA was originally conceived to find a means of protecting Wells and other downstream projects from adverse effects of "peaking" operations at the upstream federal projects. The primary objective of the agreement is to optimize the amount of electricity produced from available water consistent with power and non-power needs.

Douglas PUD also has an encroachment agreement (1968) with the USACE to compensate the federal system for power loss due to Wells Project encroachment on the tailwater of Chief Joseph Dam, consistent with Article 32 of the Wells Project license. The construction of the Wells Project increased the tailwater elevation at Chief Joseph Dam, which reduces the hydraulic head available for generation. The agreement was supplemented in 1982 when the FERC approved raising the upper elevation limit of Wells Reservoir from elevation 779 feet to 781 feet MSL.

Additional agreements affecting operation of the Wells Project include the Vernita Bar Settlement Agreement approved by the FERC on December 9, 1988. Its successor, the Hanford Reach Fall Chinook Protection Program Agreement, was submitted to the FERC by Grant PUD on April 19, 2004 and made part of the 2008 Priest Rapids license. Specifically, the Hanford Reach Fall Chinook Protection Program states that under certain circumstances Douglas PUD will release a limited amount of water from the Wells Project, in cooperation with prescribed federal upstream and non-federal downstream project water releases, to help adult spawning, incubation, and emergence of fall Chinook salmon downstream of the Priest Rapids Dam.

2.4 INFREQUENT RESERVOIR OPERATIONS

Typical operational fluctuations of the Wells Project are gradual, repetitive changes in reservoir stage that occur on a daily basis and generally result in reservoir elevation fluctuations of one to two feet (see Figure 2.3-1). Less frequent reservoir operations, defined as changes in water elevation which exceed twice the normal daily operation fluctuations (i.e., a change of more than four feet in a 24-hour period), also occur from time to time (DTA 2006). Under conditions that existed from 2001 through 2005, reservoir elevations below 774 feet MSL were observed four times. Past environmental management actions that required infrequent reservoir operations have included flushing flows to move sediment from the lower Methow River; increased discharge during low inflow periods to support downstream spawning, incubation and emergence for Hanford Reach fall Chinook; lowered water level elevations to facilitate construction of islands for waterfowl habitat and maintenance and repair of public boat launches and access facilities (DTA 2006).

From 2001through 2005, the daily fluctuation frequency of the reservoir was less than three feet 93.3 percent of the time and minimum elevations fell below 777 feet MSL only 3.8 percent of the time (DTA 2006). Infrequent reservoir operations resulting in fluctuations over four feet in a 24-hour period occurred only 1.1 percent of the time. From 1990 to 2005, the Project forebay maintained a minimum water surface elevation of at least 777 feet MSL 95.1 percent of the time (DTA 2006). From 2001 through 2005, reservoir operations resulting in fluctuations beyond six feet occurred only 0.1 percent of the time and never resulted in fluctuations past seven feet. Such infrequent reservoir operations are generally brief in duration as well (i.e., 1 to 5 hrs), and reservoir stage may rise and fall several times in the course of an event. Infrequent reservoir operations of four feet or more occurred a total of 21 times between 2000 and 2005, and ranged in frequency from one in 2003 to seven in 2005. The mean duration of occurrences was 7.1 hours, and the median value was 3.0 hours. This type of infrequent reservoir operation has occurred in each month except February, August, September, and December in the course of the last five years, and occurred most frequently in July (5 events) and April (4 events). However, the pattern of occurrence was highly variable, and infrequent reservoir operations rarely occurred in the same month in successive years.

2.5 PROPOSED PROJECT OPERATION

Douglas PUD is not proposing any changes to its operation of the Wells Project, other than the implementation of the proposed environmental measures described herein. Implementation of these measures is not anticipated to result in electric generation or reservoir operation changes.

2.5.1 Proposed Environmental Measures

Douglas PUD is proposing the following environmental measures in its application for a new FERC license:

2.5.1.1 HCP

The Wells HCP (Douglas PUD 2002) commits Douglas PUD to a 50-year program to ensure that the Wells Project has NNI on salmon and steelhead runs. The HCP requires that this be accomplished through a combination of juvenile and adult fish passage measures at the dam, off-site hatchery programs and evaluations, and habitat restoration work conducted in tributary streams upstream of Wells Dam. The Wells HCP outlines a schedule for meeting and maintaining NNI throughout the 50-year term of the agreement. NNI consists of two components including: (1) a 91 percent combined adult and juvenile Wells Project survival standard achieved by Wells Project improvement measures implemented within the geographic area of the Wells Project and (2) up to 9 percent compensation for unavoidable Wells Project related mortalities. Compensation to meet NNI is provided through hatchery and tributary programs under which 7 percent compensation is provided through hatchery production and 2 percent compensation is provided through the funding of enhancements to tributary habitats that support Plan Species.

The Wells HCP was designed to address Douglas PUD's obligations for relicensing and as such included all of the parties terms, conditions and recommended measures related to regulatory requirements to conserve, protect and mitigate plan species pursuant to ESA, the FPA, the Fish and Wildlife Coordination Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Pacific Northwest Electric Power Planning and Conservation Act and Title 77 RCW of the State of Washington. The HCP also obligates the parties to work together to address water quality issues.

The Wells HCP was signed in 2002 by NMFS, USFWS, Colville, WDFW, Douglas PUD and the Wells Project power purchasers (PSE, PGE, PacifiCorp and Avista Corporation). In 2005, the HCP was signed by Yakama. In late 2003, NMFS issued Douglas PUD a new ESA section 10 ITP (permit No. 1391) for the taking of UCR summer-run steelhead (steelhead), UCR spring-run Chinook salmon (spring Chinook), UCR summer/fall Chinook salmon and Okanogan River sockeye salmon in association with the operation and maintenance of the Wells Project. The Wells HCP was approved by the FERC on June 21, 2004 and made part of the Wells Project license. Following the FERC's approval of the HCP, Douglas PUD implemented the Wells HCP as part of the package of measures developed for the relicensing of the Wells Project.

Concurrent with the issuance of permit No. 1391, NMFS also issued Douglas PUD three separate ESA section 10 ITPs (permit No. 1395, 1347 and 1196) for the taking of salmon and steelhead associated with the operation of Douglas PUD's hatchery programs. These hatchery programs are central to Douglas PUD's fulfillment of the hatchery mitigation requirements of the HCP and Wells Project license. Permit No. 1196 and 1365 are for the taking of ESA-listed salmon and steelhead in association with the operation of

Douglas PUD’s spring Chinook and steelhead hatchery programs, respectively. Permit No. 1347 is for the taking of ESA-listed salmon and steelhead in association with the operation of Douglas PUD’s hatchery programs for non-ESA-listed salmon.

The Wells HCP also requires the formation of four committees that are used to implement, monitor and administer the agreement namely the Policy, Coordinating, Hatchery, and Tributary committees. The Wells HCP contains several plans and programs for implementing the components of the agreement.

Passage Survival Plan

The Passage Survival Plan contained within Section 4 of the Wells HCP provides specific detail regarding the implementation and measurement of unavoidable juvenile and adult losses for each of the Plan Species passing through Wells Dam. Due to an agreed upon inability of the parties to differentiate between sources of adult mortality, initial compliance with the combined adult and juvenile survival standard is based upon measurement of juvenile survival (93 percent juvenile Project survival and 95 percent juvenile dam passage survival). The plan lays out the methodologies for measuring survival rates and the decision process that will be followed depending on whether the applicable survival standards are achieved or not. This section of the plan also details the specific survival standards that must be achieved within defined time frames in order for the licensee to be considered in compliance with the terms of the Wells HCP (Douglas PUD 2002).

Wells Dam Juvenile Dam Passage Survival Plan

In addition to the specific details describing how survival studies will be implemented and evaluated relative to achievement of NNI, the HCP also contains specific criteria for the operation of the Wells juvenile fish bypass system. This section of the Wells HCP outlines specific bypass operational criteria, operational timing and evaluation protocols to ensure that at least 95 percent of the juvenile Plan Species passing through Wells Dam are provided a safe, non-turbine passage route around the dam. The operational dates for the bypass are set annually by unanimous agreement of the parties to the HCP.

Tributary Conservation Plan

The Tributary Conservation Plan (TCP) within Section 7 of the Wells HCP guides the funding for and allocation of dollars from the Plan Species Account. The Plan Species Account provides funding for tributary habitat protection and restoration projects within the Wells Project Boundary and within the portions of the Methow and Okanogan rivers that are accessible to Plan Species, in order to compensate for up to two percent unavoidable adult and/or juvenile mortality for HCP species passing through Wells Dam.

The Tributary Committee will select projects according to guidelines established in Supporting Document D, with a high priority given to the acquisition of land or interests in land such as conservation easements or water rights.

Hatchery Compensation Plan

The Hatchery Compensation Plan, as described in Section 8 of the Wells HCP, was established to provide hatchery compensation for up to 7 percent unavoidable juvenile passage losses of Plan Species passing through Wells Dam (Douglas PUD 2002). The goal of the program is to utilize hatchery produced fish to replace unavoidable losses in such a manner that the hatchery fish produced contribute to the rebuilding and recovery of naturally reproducing populations of Plan Species, in their native habitats, while maintaining the genetic and ecological integrity of each stock of Plan Species. Supporting harvest, where appropriate, is also a goal of the Hatchery Compensation Plan.

Adult Passage Plan

The Adult Passage Plan, as contained within Section 4.4 and Appendix A of the Wells HCP, is intended to ensure safe and rapid passage for adult Plan Species as they pass through the fish ladders at Wells Dam. The plan contains specific operating and maintenance criteria for the two adult fish ladders and the two adult fish ladder traps, and provides details regarding the implementation of passage studies on adult Plan Species including studies related to passage success, timing and rates of fallback.

Predator Control Program

Section 4.3.3 of the Wells HCP requires Douglas PUD to implement a northern pikeminnow, piscivorous bird and piscivorous mammal harassment and control program to reduce the level of predation upon anadromous salmonids migrating through Wells Dam. The northern pikeminnow removal program may include a northern pikeminnow bounty program, fishing derbies and tournaments, and the use of longline fishing and trapping.

The other component of the predator control program is the implementation of control measures for piscivorous birds and mammals. The focus of these programs is not removal but hazing and access deterrents. Hazing includes propane cannons, pyrotechnics and the physical presence of hazing staff. Access deterrents include steel wires across the hatchery ponds and tailrace, fencing and covers for hatchery ponds, and electric fencing.

Hatchery Genetic Management Plans

Hatchery and genetic management plans (HGMPs) are used to address the take of ESA-listed species that may occur as a result of artificial propagation activities. The primary goal of an HGMP is to devise biologically-based artificial propagation management strategies that ensure the conservation and recovery of listed evolutionarily significant units (ESUs). Information from HGMPs is used to evaluate impacts on anadromous salmon and steelhead listed under the ESA, and to inform issuance of ESA Section 10 incidental take permits for artificial propagation activities.

The Hatchery Compensation Plan, together with NMFS's authorized Incidental Take permits and HCP Hatchery Committee approved Hatchery Genetic Management plans, form the basis for the NNI hatchery programs. In 2010, new HGMPs were developed by the HCP Hatchery Committee for UCR spring Chinook salmon and UCR steelhead. Once approved by NMFS and the FERC, these new HGMPs will require substantial modification to the facilities and operations previously authorized at the Methow and Wells fish hatcheries.

2.5.1.2 Aquatic Settlement Agreement

Douglas PUD has entered into an Aquatic Settlement Agreement (ASA) with the Washington State Department of Ecology (Ecology), USFWS, BLM, the Colville, Yakama and WDFW. The purpose of the ASA is to resolve all remaining aquatic resource issues related to compliance with all federal and state law applicable to the issuance of a new license for the Wells Project. The ASA was developed to clearly define Douglas PUD's obligations for the protection of aquatic resources during the term of a new FERC license. The ASA established an Aquatic Settlement Work Group (Aquatic SWG), which serves as the primary forum for consultation and coordination between the Parties, and sets out the rules by which the agreement operates.

The ASA includes six aquatic resource management plans. Collectively, these six aquatic resource management plans are critical to guide implementation of PM&Es during the term of a new license. Together with the Wells HCP, these measures are intended to function as the Water Quality Attainment Plan (WQAP) in support of the Section 401 Water Quality Certification of the Clean Water Act for the Wells Project. NMFS was invited to participate in the development of aquatic resource management plans, but declined because its interests are satisfied by the measures identified within the Wells HCP. Implementation of the management plans, described individually in greater detail below, is not expected to result in any changes in future Project operations.

White Sturgeon Management Plan

The goal of the White Sturgeon Management Plan (WSMP) is to increase the white sturgeon (*Acipenser transmontanus*) population in Wells Reservoir to a level that can be supported by the available habitat and characterized by a diverse age structure consisting of multiple cohorts (juveniles and adults). In addition, the WSMP is intended to support spawning, rearing and migration as identified by the aquatic life designated use under Washington Administrative Code (WAC) 173-201A in the Washington State Water Quality Standards (WQS). Based upon the information available as of December 2006, the Aquatic SWG determined that an assessment of Wells Project effects on white sturgeon was not practical given sturgeon life history characteristics and the limited number of fish estimated to exist in the Wells Project. The Aquatic SWG concluded that resource measures related to white sturgeon should focus on population protection and enhancement by means of supplementation as an initial step to increase the number of fish within Wells Reservoir. In addition to the initial supplementation activities, the Aquatic SWG proposed implementation of a monitoring and evaluation program to assess natural recruitment, juvenile habitat use, carrying capacity, and the potential for natural reproduction in order to inform the scope of a future, long-term supplementation strategy.

To fulfill the goals and objectives of the WSMP, Douglas PUD, in consultation with the Aquatic SWG, developed a white sturgeon management program that will be implemented in two phases. Phase I will be implemented during the first ten years of a new license and includes juvenile stocking, and monitoring and evaluation activities. Phase II will include long-term juvenile stocking, adult passage evaluation and monitoring for the remainder of the new license. The scope of the Phase II activities will be determined in part by the results of the Phase I measures. Douglas PUD will provide an annual report that documents all white sturgeon activities conducted within the Wells Project and include any decisions, statements of agreement, evaluations, or changes made pursuant to the WSMP. The PM&Es presented within the WSMP were designed to meet the following objectives and will be implemented during a 50-year license term:

Objective 1: Supplement the white sturgeon population in order to address Project effects, including impediments to migration and associated bottlenecks in spawning and recruitment.

Due to the low numbers of sturgeon indicated by the 2001-2003 white sturgeon study (Jerald 2007) and the need to increase genetic variation, there is a low probability that brood stock from only the Wells Reservoir can be utilized as the basis for supplementation activities. Consequently, other sources of fish must be considered in addition to capturing fish from Wells Reservoir to increase the white sturgeon population. Within one year of issuance of a new license, Douglas PUD shall prepare and implement a Brood Stock Collection and Breeding Plan, in consultation with the Aquatic SWG, which considers such factors as genetics and questions of imprinting, and are consistent with the goal and objectives of the WSMP and includes the level of detail provided in other existing white sturgeon breeding plans.

Following is a prioritized list of juvenile fish source options that shall be incorporated into a Brood Stock Collection and Breeding Plan:

- Brood stock collected from the Wells Reservoir;
- Brood stock collected from nearby reservoirs (Priest Rapids, Wanapum, Rocky Reach, Rock Island);
- Brood stock collected from McNary Reservoir;
- Juvenile production from the Lake Roosevelt white sturgeon recovery effort;
- Brood stock collected from below Bonneville Dam in the lower Columbia River;
- Juveniles purchased from a commercial facility.

A white sturgeon supplementation program may include the following implementation options (Not listed in a priority order).

- Build new or retrofit existing Douglas PUD funded hatchery facilities to accommodate white sturgeon brood stock, egg incubation, and juvenile rearing;
- Development of a mid-Columbia hatchery facility funded by the mid-Columbia PUDs (Douglas, Chelan, and Grant) to accommodate various phases of white sturgeon supplementation: brood stock, egg incubation, and juvenile rearing;
- Direct release into the Wells Reservoir of juveniles produced via appropriate Breeding Plan criteria and reared at a commercial facility;
- Direct release into the Wells Reservoir of juveniles or adults trapped and hauled from the lower Columbia River.

The initial source of brood stock shall be determined within the first year of issuance of a new license. Collection of brood stock shall occur consistent with the brood stock collection plan in years 1-4 of the new license. Any additional years during the Phase I program (first ten years of the new license) in which brood stock collection shall occur in order to facilitate additional juvenile stocking into the Wells Reservoir will be determined by the Aquatic SWG. The intent of brood stock collection is to use their progeny, if feasible, for future white sturgeon stocking activities in the Wells Reservoir. The brood stock collection plan shall be updated annually, or as otherwise recommended by Douglas PUD in consultation with the Aquatic SWG, to incorporate new and appropriate information.

Juvenile White Sturgeon Stocking

Within two years following issuance of a new license, Douglas PUD shall release up to 5,000 yearling white sturgeon into the Wells Reservoir annually for four consecutive years (20,000 fish total). Additional years and numbers of juvenile sturgeon to be stocked during Phase I will be determined by the Aquatic SWG and will not exceed 15,000 juvenile sturgeon (total of 35,000 juvenile sturgeon during Phase I). Douglas PUD shall ensure that all hatchery-reared juvenile white sturgeon released into the Wells Reservoir are marked with Passive Integrated Transponder (PIT) tags and year-specific scute marks for monitoring purposes. In order to allow for tracking of juvenile white sturgeon emigration (Objective 2), Douglas PUD shall ensure that up to one percent (or a maximum of 50) of the juvenile white sturgeon released into the Wells Reservoir are large enough to allow implantation of an active tag prior to release. In addition, following the third year of supplementation (unless the Aquatic SWG determines more analysis is required), the Aquatic SWG may elect to release juveniles at an earlier or later life stage for the fourth year in order to compare success of fish released at varying life stages.

Objective 2: Determine the effectiveness of the supplementation activities through a monitoring and evaluation program.

Douglas PUD shall conduct a monitoring and evaluation program within the Wells Reservoir for the purpose of assessing the effectiveness of the supplementation activities described in the WSMP. Monitoring shall include both an Index Monitoring Program and a Marked Fish Tracking Program. Both programs will be used to collect life history and population dynamics information including rates of fish movements into and out of the Wells Reservoir and habitat use. Douglas PUD shall also obtain updated information, when available, on other white sturgeon recovery programs (e.g., Upper Columbia River, Kootenai River, mid-Columbia PUDs), in order to improve the monitoring and evaluation program and refine its implementation. The results of this information will also inform supplementation, monitoring and evaluation activities during implementation of Phase II of the WSMP.

Index Monitoring Program

Within three years following issuance of a new license, Douglas PUD shall initiate an index monitoring program (Years 3-5) for juvenile and adult sturgeon in the Wells Reservoir to determine age-class structure, survival rates, abundance, density, condition factor, growth rates, and to identify distribution and habitat selection of juvenile sturgeon. The indexing methods shall include using gillnets, set lines or other appropriate recapture methods for juveniles and adults.

As a component of the indexing monitoring program, Douglas PUD shall capture and implant active tags in a portion of the juvenile and sexually mature adult sturgeon population found in the Wells Reservoir. This tagging effort shall be used to augment broodstock collection, population level information and juvenile habitat use and natural reproduction potential.

The information collected during the index monitoring program will be used to assess age-class structure, survival rates, abundance, condition factor, and growth rates; identify distribution and habitat selection of juvenile sturgeon; and to inform the supplementation program strategy.

Marked Fish Tracking Program

Beginning in year three of the new license and continuing for three years (Years 3-5), Douglas PUD shall conduct tracking surveys of the juvenile white sturgeon that were released with active tags as part of supplementation activities. This will require one percent of each of the annual classes of juvenile sturgeon (up to a maximum of 50 fish each year) released in years 2, 3, 4, and 5 to be reared large enough to implant an active tag for tracking purposes. The purpose of tracking active-tagged fish is to determine juvenile white sturgeon emigration rates out of the Wells Reservoir and habitat use within the Wells Reservoir.

Douglas PUD shall repeat the tracking survey for two additional years during Phase I. The additional two years of surveys shall track: 1) active tags implanted in a percentage of juvenile fish from previous years of supplementation activities (dependent upon tag life) and 2) any juvenile and adult fish implanted with active tags during the last indexing period preceding the survey. Subsequent Phase I surveys are likely to coincide with the additional Phase I index monitoring and juvenile stocking activities.

Objective 3: Determine the potential for natural reproduction in the Wells Reservoir in order to appropriately inform the scope of future supplementation activities.

Objective 4: Adaptively manage the supplementation program as warranted by the monitoring results.

Pertaining to both Objectives 3 and 4, in years where environmental conditions are appropriate, Douglas PUD shall track sexually mature adult sturgeon that were captured and implanted with active tags for the purpose of identifying potential spawning locations and determining natural reproduction potential. Appropriate environmental conditions may be determined by examining the following factors: water quality and quantity (i.e., flow, temperature, and turbidity), the presence of reproductively viable adults during index monitoring activities, and the status of maturity for supplemented fish. In years in which sexually mature adult sturgeon are tagged under, Douglas PUD may also utilize egg collection mats in combination with tracking in areas of the Wells Reservoir for the purpose of identifying potential spawning locations and activity. Five surveys of natural reproduction using adult tracking and/or egg mat placement shall occur over the term of a new license. Several of these surveys are intended to be implemented during the latter part of the license in order to examine the natural reproductive potential of supplemented fish recruiting to sexual maturity.

Objective 5: Evaluate whether there is biological merit to providing safe and efficient adult upstream passage.

In year eleven of the new license and every 10 years thereafter for the duration of the new license unless otherwise determined by the Aquatic SWG, the Aquatic SWG shall evaluate the biological merit of providing upstream passage for adult white sturgeon. The assessment of biological merit shall be determined by: (i) evaluating information gathered from monitoring and evaluation activities and determining whether there is significant biological benefit and need for upstream passage; (ii) the availability of reasonable and appropriate means to provide upstream passage; and (iii) consensus from all other operators of the mid-Columbia projects to implement adult upstream passage measures. If all three criteria above are met, Douglas PUD, in consultation with the Aquatic SWG shall develop adult passage measures that are consistent with measures being implemented by other mid-Columbia project operators.

Objective 6: Identify white sturgeon educational opportunities that coincide with WSMP activities.

Douglas PUD, in consultation with the Aquatic SWG, shall identify appropriate WSMP activities as opportunities for education to local public entities such as schools, cities, fishing and recreation groups, and other interested local groups. WSMP activities that may be appropriate for public participation are hatchery tours, release of hatchery juveniles, and tagging of juveniles prior to release.

Supplementation Program Review

During the implementation of WSMP, Douglas PUD shall compile information on other white sturgeon supplementation programs in the Columbia River Basin as needed in order to assess whether the white sturgeon supplementation program being implemented at the Wells Project is: (i) consistent and comparable with the technology and methods being implemented by other supplementation programs in the region; (ii) reasonable in cost and effective to implement at the Project; and (iii) consistent with the supplementation program goals and objectives. The supplementation program review will be conducted annually in coordination with the development of the annual report.

Bull Trout Management Plan

The goal of the Bull Trout Management Plan (BTMP) is to identify, monitor, and address impacts to bull trout, if any, resulting from the Wells Project, in a manner that is consistent with the USFWS Bull Trout Recovery Plan and the terms of the Section 7 Incidental Take Statement (ITS). The BTMP is intended to continue the implementation of management activities to protect bull trout during the new license term in a manner consistent with the original BTMMP (Douglas PUD 2004). Douglas PUD, in consultation with the Aquatic SWG, will implement the following PM&Es in order to meet the goals and objectives of the BTMP:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP.

Provide Upstream and Downstream Passage for Adult and Sub-Adult Bull Trout

Douglas PUD will continue to provide upstream passage for adult bull trout through the existing upstream fishways and downstream passage of adult and sub-adult bull trout through the existing downstream bypass system. Both upstream fishway facilities (located on the west and east shores) are operational year around with maintenance occurring on each fishway at different times during the winter to ensure that one upstream fishway is always operational. Maintenance activities on Wells fishways occur during the winter when, based on past data from year-round monitoring efforts, bull trout have not been observed passing Wells Dam. Operation of the downstream passage facilities for bull trout will be consistent with bypass operations for Plan Species identified in the Wells HCP. Currently the bypass system is operated from April 12 through August 26 of each year. This operating period is consistent with the period of high bull trout and anadromous fish presence at the Project.

Upstream Fishway Counts

Douglas PUD shall continue to conduct video monitoring in the Wells Dam fishways from May 1st through November 15th to count and provide information on the population size of upstream moving bull trout.

Upstream Fishway Operations Criteria

Douglas PUD shall continue to operate the upstream fishway at Wells Dam in accordance with criteria outlined in the Wells HCP.

Bypass Operations Criteria

Douglas PUD operates a juvenile bypass system (JBS) annually to provide a non-turbine passage route through the dam for 95 percent of the spring and summer-run juvenile plan species outmigration. The bypass is in operation annually from April 12 through August 26, which is consistent with the period of high bull trout and anadromous fish presence at the Wells Project.

The procedures set forth in the Wells HCP are intended to guide the operating criteria for the JBS. This plan also includes specific operating criteria for the turbines and spillways sufficient to maximize fish use and survival through the JBS (USFWS 2004c). A more detailed description of JBS, spillway and turbine operations can be found in Section 4.3 and Appendix A of the Wells HCP." Douglas PUD shall continue to operate the bypass system at Wells Dam in accordance with criteria outlined in the Wells HCP.

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage.

Adult Bull Trout Upstream and Downstream Passage Evaluation

Douglas PUD shall continue to monitor upstream and downstream passage and incidental take of adult bull trout through Wells Dam and in the Wells Reservoir through the implementation of a radio-telemetry study. Specifically, in years 5 and 10 of the new license, and continuing every ten years thereafter during the new license term, Douglas PUD will conduct a one-year monitoring program to determine whether Douglas PUD remains in compliance with the ITS. This program was recommended and approved by the FERC and USFWS. The same study protocols used during past radio-telemetry assessments at Wells Dam (LGL and Douglas PUD 2007) will be employed for these monitoring studies.

If the adult bull trout counts at Wells Dam increases more than two times the existing 5-year average or if there is a significant change in the operation of the fish ladders or hydrocombine, then the Aquatic SWG will determine whether additional years of take monitoring are needed beyond those identified in this section of the BTMP. If the authorized incidental take level is exceeded during any one-year period, Douglas PUD will conduct another monitoring study in the succeeding year. If the authorized incidental take level is exceeded in this second year, Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to exceedance of the allowable level of incidental take.

Douglas PUD does not develop take estimates based upon observed mortality rates for bull trout. In the eight years of monitoring, Douglas PUD has never observed any bull trout mortality. Therefore, to develop take estimates based upon observed bull trout mortality at the Wells Project, other than zero mortality, is not possible. Douglas PUD's bull trout program seeks to reduce any potential incident of harassment or delay as a result of Project activity (i.e., sub-lethal take).

Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities

Douglas PUD shall assess upstream and downstream passage and incidental take of adult, migratory bull trout at off-Project (outside of the Project Boundary) adult salmon and steelhead brood stock collection facilities associated with the hatchery compensation component of the Wells HCP. Specifically, beginning in year one of a new license, Douglas PUD will conduct a one-year radio-telemetry study to assess passage and incidental take at off-Project adult collection facilities (i.e., Twisp weir). Douglas PUD will capture and tag up to 10 adult, migratory bull trout (>400mm) at adult collection facilities and use fixed receiver stations upstream and downstream of collection facilities to examine upstream and downstream passage characteristics and incidental take. Study protocols that have been used during past radio-telemetry assessments at Wells Dam will be employed for this assessment (LGL and Douglas 2008).

If negative impacts to passage associated with off-Project collection facilities are observed or the authorized incidental take level is exceeded during any one-year period, Douglas PUD will conduct another monitoring study in the succeeding year. If negative impacts to passage continue to be observed or the authorized incidental take level is exceeded in this second year, Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to passage impacts or the exceedance of the allowable level of incidental take.

After year one of a new license, the implementation of this sub-objective will be integrated into the one-year telemetry monitoring program that is to be conducted every ten years (beginning in year 10 of the new license) at Wells Dam. In year 10 of the new license and every 10 years thereafter, bull trout will be captured and tagged only at Wells Dam since data show that bull trout passing Wells Dam are migrating back into the Methow River watershed (LGL and Douglas 2008). Through the continued deployment of fixed station monitoring at off-Project adult salmon and steelhead brood stock collection facilities, these tagged bull trout will continue to provide passage and take information in support of this sub-objective throughout the term of a new license.

Sub-Adult Bull Trout Monitoring

While an objective of the BTMP is to identify potential Project impacts on upstream and downstream passage of sub-adult bull trout, Aquatic SWG members (including the USFWS) agree that it is not feasible to assess sub-adult passage because sub-adult bull trout have not been observed at Wells Dam. During the previous six years of bull trout data collection at Wells Dam (BioAnalyst Inc. 2004; LGL and Douglas 2008), sub-adult bull trout have not been documented passing Wells Dam. However, it is expected that through the increased monitoring associated with the implementation of the BTMP there may be encounters with sub-adult bull trout.

If at any time during the new license term, sub-adult bull trout are observed passing Wells Dam in significant numbers (>10 per calendar year), the Aquatic SWG will recommend reasonable and appropriate methods for monitoring sub-adult bull trout. Specifically, Douglas PUD may modify counting activities, continue to provide PIT tags and equipment, and facilitate training to enable fish sampling entities to PIT tag sub-adult bull trout when these fish are collected incidentally during certain fish sampling operations. This activity will occur the year following the first observation of >10 sub-adult bull trout (in a single calendar year), and subsequently as recommended by the Aquatic SWG.

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate effectiveness of these measures.

Douglas PUD shall continue to operate the upstream fishway and downstream bypass at Wells Dam in accordance with the Wells HCP. However, if upstream or downstream passage problems for bull trout are identified (as agreed to by the USFWS and Douglas PUD), Douglas PUD will identify and implement, in consultation with the Aquatic SWG and HCP Coordinating Committee, reasonable and appropriate options to modify the upstream fishway, downstream bypass, or operations to reduce the identified impacts to bull trout passage.

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations (similar to BTMMP).

During the implementation of the BTMMP from 2004-2008, Douglas PUD, through the use of high resolution bathymetric information, hydraulic and elevation data, and backwater curves, identified potential bull trout entrapment and stranding areas in the Wells Reservoir. Although no stranded bull trout were observed in these areas during the implementation of the BTMMP, Douglas PUD will continue to investigate potential entrapment or stranding areas for bull trout through periodic monitoring when periods of low reservoir elevation expose identified sites. During the first five years of the new license, Douglas PUD will implement up to five bull trout entrapment/stranding assessments during periods of low reservoir elevation (below 773’ MSL). If no incidences of bull trout stranding are observed during the first five years of study, additional assessment will take place every fifth year during the remainder of the license term, unless waived by the Aquatic SWG. If bull trout entrapment and stranding result in take in exceedance of the authorized incidental take level, then reasonable and appropriate measures will be implemented by Douglas PUD, in consultation with the Aquatic SWG, to address the impact.

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan, including information exchange and genetic analysis. Should bull trout be delisted, the Aquatic SWG will re-evaluate the needs and objectives of the BTMP.

Monitoring Other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout

Douglas PUD will monitor activities associated with the implementation of other Aquatic Resource Management Plans (white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality) and Predator Control Program that may result in the incidental capture and take of bull trout. If the incidental take of bull trout is exceeded due to the implementation of other Aquatic Resource Management Plan activities, then Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take. If the incidental take of bull trout is exceeded due to the implementation of the Predator Control Program, then Douglas PUD will develop a plan, in consultation with the HCP Coordinating Committee and the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

Funding Collection of Tissue Samples and Genetic Analysis

Beginning in year 10 of the new license, and continuing every 10 years thereafter for the term of the new license, Douglas PUD will, if recommended by the Aquatic SWG, collect up to 10 adult bull trout tissue samples in the Wells Dam fishway facilities over a period of one year and fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the bull trout radio-telemetry monitoring study. Samples will be submitted to the USFWS Central Washington Field Office in Wenatchee, Washington. Any sub-adult bull trout collected during these activities will also be incorporated into the bull trout genetic analysis.

Beginning in year one of the new license, Douglas PUD will collect up to 10 adult bull trout tissue samples from the Twisp River brood stock collection facility over a period of one year and will fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the off-Project bull trout radio-telemetry monitoring study.

Information Exchange and Regional Monitoring Efforts

Douglas PUD will continue to participate in information exchanges with other entities conducting bull trout research and regional efforts to explore availability of new monitoring methods and coordination of radio-tag frequencies for bull trout monitoring studies in the Project.

Douglas PUD will make available an informational and educational display at the Wells Dam Visitor Center to promote the conservation and recovery of bull trout in the Upper Columbia River and associated tributary streams.

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult bull trout.

Bull Trout Monitoring During Hatchery Activities

During the term of the new license, Douglas PUD shall monitor hatchery actions (e.g., salmon trapping, sturgeon brood stocking and capture activities) that may encounter adult and sub-adult bull trout for incidental capture and take. Actions to be monitored shall be associated with the Wells Hatchery, the Methow Hatchery, and any future facilities directly funded by Douglas PUD.

If the incidental take of bull trout is exceeded due to Douglas PUD's hatchery actions then Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

Pacific Lamprey Management Plan

The goal of the Pacific Lamprey Management Plan (PLMP) is to implement measures to monitor and address impacts, if any, on Pacific lamprey (*Lampetra tridentata*) resulting from the Wells Project during the term of the new license. The PLMP is intended to be compatible with other Pacific lamprey management plans in the Columbia River. Furthermore, the PLMP is intended to be supportive of the Wells HCP (see below for description); the critical research needs identified by the Columbia River Basin Technical Working Group, the Resident Fish Management Plan, Bull Trout Management Plan, and White Sturgeon Management Plan.

Douglas PUD, in collaboration with the Aquatic SWG, will implement PM&Es for Pacific lamprey in the Wells Project consistent with the goals and objectives identified in the PLMP. The PM&Es are designed to meet the following objectives:

Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific lamprey.

Upstream Fishway Operations Criteria

Douglas PUD is required to operate the upstream fishways at Wells Dam in accordance with criteria outlined in the Wells HCP. Based upon information collected from activities conducted during the implementation of the PLMP, Douglas PUD, in consultation with the Aquatic SWG and the HCP Coordinating Committee, may evaluate various operational and structural modifications to the upstream fishways (e.g., reduction in fishway flows at night) for the benefit of Pacific lamprey passing upstream through Wells Dam during the new license term. If requested, the Aquatic SWG shall develop an Operations Study Plan (OS Plan) that specifically identifies all operational modifications to be evaluated, the proposed monitoring strategy, implementation timeline and criteria for success. The plan shall include a component to evaluate the effects of lamprey modifications on salmon. Upon completion of the evaluation, the Aquatic SWG, in consultation with the HCP Coordinating Committee, will determine whether the proposed modifications should be made permanent, removed, or modified.

Salvage Activities During Ladder Maintenance Dewatering

Douglas PUD shall continue to implement the Adult Fish Passage Plan and associated Adult Ladder Dewatering Plan as required by the Wells HCP. These plans include practices and procedures utilized during fishway dewatering operations to minimize fish presence in the fish ladders and then once dewatered directs Douglas PUD staff to remove stranded fish and safely place them back into the Columbia River. All fish species, including Pacific lamprey that are encountered during dewatering operations are salvaged consistent with the protocol identified in the Wells HCP. Any adult lamprey that are captured during salvage activities will be released upstream of Wells Dam, unless otherwise determined by the Aquatic SWG. Douglas PUD will provide a summary of salvage activities in the annual PLMP report.

Upstream Fishway Counts and Alternative Passage Routes

Douglas PUD shall continue to conduct annual adult fish passage monitoring in the Wells Dam fishways using the most current technology available, to count and provide information on upstream migrating adult Pacific lamprey 24-hours per day during the adult fishway monitoring season (May 1- November 15). Based upon information collected from passage evaluation activities conducted as part of the PLMP, Douglas PUD, in consultation with the Aquatic SWG, may choose to address the use of alternative upstream passage routes around Wells Dam fishway counting stations by adult Pacific lamprey. Potential measures to improve counting accuracy, following consultation and approval of the Aquatic SWG, may include, but may not be limited to, the development of a correction factor based upon data collected during passage evaluations or utilization of an alternative passage route as a counting facility for adult Pacific lamprey.

Upstream Passage Improvement Literature Review

If additional passage improvement measures are deemed necessary by the Aquatic SWG, then within six months after this determination, Douglas PUD, in consultation with the Aquatic SWG, shall complete a literature review on the effectiveness of upstream passage measures (i.e., lamprey passage systems, plating over diffuser grating, modifications to orifices, rounding sharp edges, fishway operational changes, etc.) implemented at other Columbia and Snake river hydroelectric facilities. The literature review will be conducted in support of fishway modification activities identified in the PLMP to help in the selection of reasonable measures that may be implemented to improve adult lamprey passage at Wells Dam.

Fishway Modifications to Improve Upstream Passage

If additional passage improvement measures are deemed necessary by the Aquatic SWG, based upon the results of studies conducted at Wells Dam, then within one year or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall identify, design and implement any reasonable upstream passage modifications (structural and/or operational). Passage measures will be designed to improve passage performance by providing safe, effective, and volitional passage for Pacific lamprey through the Wells Dam fishways without negatively impacting the passage performance of adult anadromous salmonids. The following components shall be included in these passage measures:

- Fishway Inspection: Within one year of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall conduct a fishway inspection with the Aquatic SWG and regional lamprey passage experts to identify and prioritize measures to improve adult lamprey passage and enumeration at Wells Dam. Additional ladder inspections will be conducted at the request of the Aquatic SWG, consistent with winter ladder dewatering operations.
- Entrance Efficiency: Within one year of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall develop a Lamprey Entrance Efficiency Plan (LEE Plan) for evaluating operational and physical ladder entrance modifications intended to create an environment at the fishway entrances that are conducive to adult lamprey passage without significantly impacting the passage of adult salmonids. These improvements shall be evaluated until compliance, as described below, is attained.

- Diffuser Gratings: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall identify and address, if needed, diffuser gratings within fishways at Wells Dam that adversely affect passage of adult Pacific lamprey.
- Transition Zones: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall identify and address, if needed, transition zones within fishways at Wells Dam that adversely affect passage of adult Pacific lamprey.
- Ladder Traps and Exit Pools: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall identify and address, if needed, lamprey ladder traps and exit pools within fishways at Wells Dam that adversely affect passage of adult Pacific lamprey.

Douglas PUD shall exhibit steady progress, as agreed to by the Aquatic SWG, towards improving adult lamprey passage until performance at Wells Dam is determined to be similar to other mid-Columbia River hydroelectric dams, or until scientifically rigorous standards and evaluation techniques are established by the Lamprey Technical Work Group, or its successor, and adopted regionally. The Aquatic SWG will then evaluate, and if applicable and appropriate, adopt these standards for use at Wells Dam. If compliance is achieved, Douglas PUD shall only be required to implement activities pursuant to Section 4.1.7 (Periodic Monitoring) for adult Pacific lamprey passage.

Adult Pacific Lamprey Upstream Passage Evaluation

Should upstream passage measures be implemented, then within one year following the implementation of such measures, Douglas PUD, in consultation with the Aquatic SWG, shall conduct a one-year study to monitor the effectiveness of such measures on upstream passage performance of adult Pacific lamprey through Wells Dam. If monitoring results indicate that passage rates at Wells Dam are not similar to passage rates at other mid-Columbia River dams or within standards as described above, Douglas PUD, in consultation with the Aquatic SWG, shall develop and implement additional measures to improve upstream Pacific lamprey passage. Fishway modification and passage evaluation measures (pursuant to Sections 4.1.5 and 4.1.6 of the PLMP) may be repeated, as necessary, until adult passage through Wells Dam is similar to passage rates at other mid-Columbia River hydroelectric dams or within standards as described above.

Periodic Monitoring

Once adult Pacific lamprey upstream passage rates at Wells Dam are similar to rates at other mid-Columbia River dams, Douglas PUD, in consultation with the Aquatic SWG, shall periodically monitor adult Pacific lamprey passage performance through Wells Dam fishways to verify the effectiveness of passage improvement measures. Specifically, every ten years after compliance has been achieved, or as determined by the Aquatic

SWG, Douglas PUD shall implement a one-year study to verify the effectiveness of the adult fish ladders with respect to adult lamprey passage. If results of the monitoring program confirm the effectiveness of adult lamprey passage measures and the results indicate that passage rates are still in compliance, then no additional measures are needed. If the results indicate that adult upstream passage rates are out of compliance, then the upstream passage study will be replicated to confirm the results. If the results after two years of study both indicate that passage rates have not been maintained, Douglas PUD, in consultation with the Aquatic SWG, shall develop and implement measures to improve upstream Pacific lamprey passage, if any.

Objective 2: Identify and address any Project-related impacts on downstream passage and survival and rearing of juvenile Pacific lamprey.

Downstream Bypass Operations Criteria

Douglas PUD is required to operate the downstream bypass system at Wells Dam in accordance with criteria outlined in the Wells HCP.

Salvage Activities During Ladder Maintenance Dewatering

Douglas PUD shall continue to conduct salvage activities as required by the Wells HCP's Adult Fish Passage Plan during fishway dewatering operations. All fish species, including Pacific lamprey that are encountered during dewatering operations shall be salvaged consistent with the protocol identified in the Wells HCP. Any juvenile Pacific lamprey that are captured during salvage activities will be released downstream of Wells Dam. Douglas PUD will coordinate salvage activities with the Aquatic SWG and allow for member participation. Douglas PUD will provide a summary of salvage activities in the annual report.

Juvenile Pacific Lamprey Passage and Survival Literature Review

Beginning in year five and every five years thereafter during the new license, Douglas PUD, in consultation with the Aquatic SWG, shall conduct a literature review to summarize available technical information related to juvenile lamprey passage and survival through Columbia and Snake river hydroelectric facilities. This information will be used to assess the feasibility of conducting activities identified in Section 4.2.4 of the PLMP.

Juvenile Pacific Lamprey Downstream Passage and Survival Evaluation

Based upon the current state of the science regarding tag technology and methodologies for Pacific lamprey macrophthalmia, coupled with the challenges of obtaining macrophthalmia in sufficient numbers within the Project to meet sample size requirements for a statistically rigorous study, a juvenile downstream passage and survival evaluation is not feasible at this time.

During the term of a new license, if tag technology and methodologies are developed and field tested and a sufficient source of macrophthalmia in or upstream of the Project are identified to ensure that a field study will yield statistically rigorous and unbiased results, Douglas PUD, in consultation with the Aquatic SWG, shall implement a one-year juvenile Pacific lamprey downstream passage and survival study.

If statistically valid study results indicate that Project operations have a significant negative impact on the Pacific lamprey population above the Wells Dam, Douglas PUD, in consultation with the Aquatic SWG, shall identify and implement scientifically rigorous and regionally accepted measures (e.g., translocation, artificial production or habitat enhancement), if any, or additional studies to address such impacts. If operational changes are needed to improve passage of juvenile lamprey migrants, Douglas PUD, in consultation with the Aquatic SWG, will coordinate with the HCP Coordinating Committee to implement such measures.

Juvenile Pacific Lamprey Habitat Evaluation

Within three years of the effective date of a new license, Douglas PUD shall implement a one-year study to examine presence and relative abundance of juvenile Pacific lamprey in habitat areas within the Project that may be affected by Project operations. As part of this measure, Douglas PUD shall identify areas of potential juvenile Pacific lamprey habitat for future evaluation. Sampling of these areas will assess presence/absence and relative abundance. Any sampling methodologies used in support of this activity will require coordination with the HCP Coordinating Committee and regulatory approval of the federal and state agencies.

Objective 3: Participate in the development of regional Pacific lamprey conservation activities.

Regional Lamprey Working Groups

Douglas PUD shall participate in Pacific lamprey work groups in order to support regional conservation efforts (e.g., the Pacific Lamprey Technical Work Group and the USFWS Lamprey Conservation Initiative). Activities may include but are not limited to information exchanges with other entities, meeting attendance, and coordination of Douglas PUD's Pacific lamprey activities with other entities conducting lamprey research in the mid-Columbia River. Activities may also include conducting PLMP research within the Project, and sharing that information with other entities.

Resident Fish Management Plan

The goal of the Resident Fish Management Plan (RFMP) is to protect and enhance native resident fish populations and habitat in the Wells Project during the term of a new license. The RFMP is intended to be compatible with other resident fish management plans in the Columbia River mainstem. Furthermore, the RFMP is intended to be supportive of the Wells HCP (see below), BTMP, PLMP and WSMP by continuing to monitor changes, if necessary, in the resident fish assemblage within the Wells Project. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several resident fish PM&Es in support of the goals and objectives of the RFMP. The objectives and PM&Es are as follows:

Objective 1: Implementation of Programs that Benefit Resident Fish.

HCP Predator Control Programs

Douglas PUD shall continue to conduct annual predator control activities for northern pikeminnow and avian predators as outlined in the Wells HCP (Douglas PUD 2002). Although implementation of this program is targeted at reducing predation on anadromous species covered by the Wells HCP, it is also anticipated to have direct benefits for resident fish species.

Land Use Policy

Douglas PUD's Land Use Policy (LUP) requires approval of all land use activities that take place within the Project Boundary. All permit activities such as construction of boat docks, piers, and landscaping within Project Boundary will be subject to review and approval by Douglas PUD only after the applicant has received all other required regulatory permits, in addition to consideration by the Wells HCP signatory parties and permit review by state and federal action agencies. The purpose of the Douglas PUD review and approval process captured in the LUP is to protect habitats and species that may be affected by proposed land use activities within the Project.

The Land Use Policy is Douglas PUD's mechanism to ensure land use activities are consistent with all of Douglas PUD's license obligations and other binding agreements. The Wells HCP's Reservoir as Habitat criteria require habitat protection towards meeting NNI standards for anadromous salmonids. For example, Douglas PUD's LUP prohibits construction of additional docks outside the city limits of Pateros, Bridgeport and Brewster. In addition, Douglas PUD conducts regular reservoir shoreline monitoring patrols for unpermitted uses; damage caused by adjacent property owners' unauthorized use of Project lands is required to be repaired, and other unauthorized damage to habitat is repaired by Douglas PUD.

Objective 2: Resident Fish Assemblage Monitoring.

Douglas PUD shall conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Wells Reservoir. This assessment shall occur in year 2 and every 10 years thereafter during the term of the new license. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species (ANS) management plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir.

In order to maintain comparative assemblage information over time to inform Project resident fish status and trends, methodology for monitoring activities shall remain consistent with the methods described in Beak (1999). Information collected from these monitoring activities may be used to inform the implementation activities of the other Wells aquatic resource management plans and the Wells HCP predator control activities.

Objective 3: Actions to Address Major Shifts in Native Resident Fish Assemblage.

Based upon information collected during the resident fish status and trends monitoring, if any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through the implementation of other aquatic resource management plans or activities (white sturgeon, Pacific lamprey, bull trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas PUD.

Objective 4: Monitoring in Response to Proposed Changes in Project Operations.

If at any time during the new license term, future changes in Wells Dam operations are proposed that require the FERC's approval and the Aquatic SWG concludes that either reservoir or tailrace habitat within Project Boundary may be affected with regards to spawning, rearing, and migration (aquatic life designated uses) of native resident fish, an assessment will be implemented to identify potential effects, if any, in order to make informed license decisions. If the results of the assessment identify adverse effects to native resident fish species of social, economic and cultural importance, attributable to such changes in Project operations, then Douglas PUD will consult with the Aquatic SWG to select and implement reasonable and appropriate measures to address such effects.

In addition to these activities, Douglas PUD will provide an annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the RFMP. The report will document all native resident fish activities conducted within the

Wells Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this RFMP will be included in the annual report. If no significant activity was conducted in a given year, Douglas PUD will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

Aquatic Nuisance Species Management Plan

The goal of the Aquatic Nuisance Species Management Plan (ANSMP) is to prevent the introduction and/or spread of ANS in Wells Project waters. The ANSMP is intended to be compatible with other aquatic nuisance species management plans in the Columbia River mainstem. Furthermore, the management plan is intended to be supportive of the Wells HCP, BTMP, PLMP, RFMP, WSMP, and Water Quality Management Plan (WQMP) by continuing to prevent the introduction and/or spread of aquatic nuisance species in Wells Project waters. The PM&Es presented within the ANSMP are designed to meet the following objectives:

Objective 1: Implement best management practices to prevent Eurasian watermilfoil (*Myriophyllum spicatum*) proliferation during in-water (i.e., construction, maintenance, and recreation improvements) improvement activities in the Project.

If at any time during the new license term, Douglas PUD is required to construct, improve or maintain recreation access at boat launches and swim areas and the removal or disturbance of aquatic macrophtye beds that contain Eurasian watermilfoil may potentially occur, Douglas PUD will implement containment efforts utilizing best management practices (BMPs), agreed to by the Aquatic SWG, during such activities.

Objective 2: Continue participation in regional and state ANS efforts.

Coordination with Regional and State Entities

Douglas PUD shall continue to coordinate with regional and state entities to implement activities in Project waters to monitor for the presence of ANS, specifically zebra and quagga mussels. Activities covered by this objective will consist of continued monitoring for the presence of zebra and quagga mussels. If ANS are detected during monitoring activities, Douglas PUD will immediately notify the appropriate regional and state agencies and assist in the implementation of reasonable and appropriate measures to address the ANS presence as is consistent with ANS management protocols.

Douglas PUD shall participate in information exchanges and regional efforts to coordinate monitoring activities.

Monitor Bycatch from other Project Aquatic Resource Management Activities

Douglas PUD shall monitor bycatch data collected from ongoing Project aquatic resource management activities for aquatic nuisance species presence to support regional and state efforts and the ANSMP. Such ongoing activities may consist of broodstock collection activities at Wells Dam and in associated Project tributaries, the northern pikeminnow removal program, water quality monitoring and any other aquatic resource activities related to implementation of aquatic resource management plans for bull trout, Pacific lamprey, white sturgeon, and resident fish.

ANS Information and Education

Douglas PUD shall develop and make available to the public, information regarding the effects of ANS introductions and the importance of prevention. Such outreach activities may consist of posting signage at Project recreation areas and boat launches.

Douglas PUD shall also provide literature produced by appropriate state entities (Ecology and WDFW) for distribution at the visitor centers of local communities of the Project (Pateros, Brewster, Bridgeport) including Wells Dam.

Objective 3: Monitoring in Response to Proposed Changes in Project Operations.

If at any time during the new license term, future changes in Project operations requiring the FERC's approval are proposed and the Aquatic SWG concludes that such proposed operations may encourage the introduction or proliferation of aquatic nuisance species within the Project, the Aquatic SWG will assess the potential effects, if any, in order to make informed management decisions.

If the assessment identifies adverse effects to aquatic resources due to ANS, which are attributable to changes in Project operations, Douglas PUD shall consult with the Aquatic SWG to select and implement reasonable and appropriate PM&Es to address the identified adverse effect(s).

Water Quality Management Plan

The goal of the WQMP is to protect the quality of the surface waters affected by the Wells Project. Studies conducted during the relicensing process have found water quality within the Wells Project to be within compliance. Reasonable and feasible measures will be implemented in order to maintain compliance with the numeric criteria of the Washington State WQS, Chapter 173-201A WAC. In further support of the aquatic life designated uses in the Wells Project, five other aquatic resource management plans within the ASA and the measures in the Wells HCP are currently active or proposed for implementation through the new license term.

The measures presented within the WQMP are designed to meet the following objectives:

Objective 1: Maintain compliance with state WQS for TDG.

Project TDG Monitoring

Douglas PUD shall continue to maintain fixed monitoring stations in the forebay and tailrace area of Wells Dam to monitor TDG and barometric pressure. TDG will be monitored hourly during the fish spill season each year. Data from the Wells forebay and tailrace stations will be transmitted on a daily basis to the applicable web-accessible database used by Ecology and regional fish management agencies. Douglas PUD shall maintain this monitoring program consistent with activities described in the then-current Wells Gas Abatement Plan (GAP).

Douglas PUD shall provide an annual report of all spill (and predicted TDG levels in the tailrace) occurring outside the fish passage season (currently October 1 to March 15).

Project Spill Operations

Within one year of issuance of the new license, Douglas PUD shall coordinate the annual Wells HCP Project Fish Bypass/Spill Operations Plan with the Aquatic SWG and the GAP, using best available information to minimize the production of TDG during periods of spill. All operations identified within the plan shall require the approval of the HCP Coordinating Committee and the Aquatic SWG in order to ensure that spill operations are aimed at protecting designated uses and complying with the WQS numeric criteria for TDG in the Columbia River at the Project. In consultation with the HCP Coordinating Committee and Aquatic SWG, the spill operations plan will be reviewed and updated, as necessary.

Project Gas Abatement Plan and TDG Exemption

Pending Ecology's approval of each subsequent GAP (which provides for the TDG exemption), Douglas PUD shall continue to implement the activities identified within the previously-approved plan. Douglas PUD shall submit the GAP to Ecology by February 28th of each year, or on a less frequent basis, as documented by Ecology in writing. Douglas PUD shall submit the GAPs through the term of the new license or until no longer required by Ecology.

The GAP will include a Spill Operations Plan and will be accompanied by a fisheries management plan and physical and biological monitoring plans. The GAP shall include information on any new or improved technologies to aid in the reduction in TDG.

It is anticipated that for the purposes of the GAP: (1) the TDG monitoring activities described in Section 4.1.1 will be adequate for the physical monitoring plan requirement; and (2) the Wells HCP and aquatic resource management plans in the ASA with respect to fish passage will be adequate for fish management plans. Additional biological monitoring activities for purposes of Gas Bubble Trauma Monitoring may be required.

Douglas PUD shall provide an annual TDG report as required by the Ecology-approved GAP.

Objective 2: Maintain compliance with state WQS for water temperature.

Project Temperature Monitoring

Douglas PUD shall continue to monitor temperature at the Wells Dam forebay and tailrace in conjunction with its TDG monitoring program (currently April 1-September 15). Temperature data from the TDG monitoring program will be recorded hourly and reported daily to regional databases. Water temperatures shall also be monitored at all boundary conditions of the Project (Methow River RM 1.5, Okanogan River RM 10.5, and Columbia River RM 544.5) and in the Well Dam forebay and tailrace as required by the Aquatic SWG.

Douglas PUD shall continue to collect hourly fish ladder temperatures 24 hours a day during the fish passage season (May 1 to November 15) at Pool No. 39 on the east ladder. Water temperatures shall also be monitored hourly in the auxiliary water supply system and near the east shore of the Wells Dam forebay (bottom, middle, and surface depths) during this same time period.

Temperature TMDL Development and Implementation

Douglas PUD shall participate in EPA Region 10's water temperature TMDL development for the U.S. portion of the Columbia River, in coordination with the Aquatic SWG. Temperature data from the monitoring program at Wells Dam and software and results of the CE-QUAL-W2 model will be made available to EPA and other entities to assist in the development of the Columbia River temperature TMDL.

Where the measures identified in the TMDL are more protective than other measures in this plan, provisions of the temperature TMDL and implementation plans relevant to the Project and its operations, including specified time frames for implementing improvement measures, shall be implemented at the Project.

If a TMDL is not timely approved by EPA, Ecology may establish an allocation. In this case, Ecology will work with the Aquatic SWG and other interested parties to identify reasonable and feasible measures.

This plan does not exclude the option of the Aquatic SWG to consider modifying the water quality standard through a use attainability analysis or other process.

Objective 3: Maintain compliance with state WQS for other numeric criteria.

Douglas PUD shall report information indicative of non-compliance with other numeric criteria immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration. This includes existing or developed criteria for toxic substances in water or sediments within Project Boundaries. The Aquatic SWG shall evaluate the information, and, if needed, require Douglas PUD to develop a plan to identify and address Project-related impacts, if any.

After the evaluation, if no reasonable and feasible improvements have been identified, Douglas PUD may propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill.

Spill Prevention and Control Requirements

Douglas PUD shall operate the Project in a manner that will minimize spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill. The Project Spill Prevention Control and Countermeasures Plan (SPCC) will be updated pursuant to the FERC's requirements and recommendations as provided by Ecology. Douglas PUD shall comply with the updated version(s) of the SPCC.

Participation in the Columbia and Snake River Spill Response Initiative

Douglas PUD shall continue participation in the Columbia and Snake River Spill Response Initiative (CSR-SRI). The CSR-SRI is a collaborative effort made up of local, state, and federal oil spill response entities as well as members of industry and was developed to address the immediate need for oil spill preparedness and response in the area along the Columbia and Snake rivers. In addition to participation in the CSR-SRI, Douglas PUD shall continue to operate the Project in accordance with its SPCC (Jacobs 2007).

Inspections

For the term or the new license, Douglas PUD shall, upon reasonable notice, allow Ecology staff or representatives access to inspect the Project, including inside the dam, for the purpose of assessing Spill Prevention and Control measures and compliance with Section 4.4.1. Following inspection, Douglas PUD shall address oil and hazardous material prevention and control issues identified by Ecology.

Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin.

Participation in Regional Water Quality Forums

Douglas PUD shall continue its participation in both the Water Quality Team and Adaptive Management Team meetings to address regional water quality issues, including sharing the results from monitoring, measuring, and evaluating water quality in the Wells Project. However, Douglas PUD will not advocate for any water quality measures in regional forums without consulting with the Aquatic SWG.

Project Operations

Douglas PUD may, following notice and opportunity for hearing, coordinate the operation of the Project, electrically and hydraulically, with other mid-Columbia hydroelectric operations to the extent practicable. Coordinated operations are intended to reduce spill, increase generating efficiencies and thereby reduce the potential for exceedances of the TDG numeric criteria. These coordinated operations should be beneficial to TDG compliance and aquatic resources.

2.5.1.3 Terrestrial Resources Management Plans

In addition to the proposed implementation of the Wells HCP and ASA, Douglas PUD is also proposing to implement additional management plans and environmental measures for various terrestrial resources as part of the relicensing of the Wells Project. These plans and measures include the Wildlife and Botanical Management Plan (Douglas PUD 2009g), Wells 230 kV Transmission Line Corridor Avian Protection Plan (Douglas PUD 2009e), Douglas PUD's Land Use Policy (Douglas PUD 2009d), Recreation Management Plan (Douglas PUD 2009c), and Historic Properties Management Plan (Douglas PUD 2009b).

Wildlife and Botanical Management Plan

The goal of the Wildlife and Botanical Management Plan (WBMP) is to protect, maintain and enhance wildlife populations and habitat on Wells Project lands. The plan is also intended to guide wildlife management activities and to protect rare, threatened and endangered (RTE) wildlife species on Wells Project lands during the term of a new license for the Wells Project. Members of the Terrestrial Resource Work Group (TRWG) include USFWS, WDFW, BLM, Colville and Douglas PUD.

Douglas PUD, in collaboration with the TRWG, has agreed to implement several measures in support of the goals and objectives of the WBMP. The objectives and measures are as follows:

Objective 1: Protect and Enhance RTE Terrestrial Species Habitat on Project Lands.

The only State-listed terrestrial wildlife species known to use the Wells Project is the American white pelican (Douglas PUD 2006c, 2009h). Sharp-tailed grouse were found in the Bridgeport Bar unit of the Wells Wildlife Area, but have not been observed for over 20 years (M. Hallet, WDFW, email to B. Patterson, Douglas PUD, December 31, 2007). Currently no federal ESA listed, proposed or candidate terrestrial species utilize the Project.

Following receipt of a new license, Douglas PUD will do the following: A) starting in year 2 of the new license Douglas PUD will provide educational material (signs) at Douglas PUD boat launches and local visitor centers advising boaters to avoid pelicans while boating, fishing and hunting, and as an enhancement B) Douglas PUD will continue to water irrigation dependent riparian trees, shrubs and associated vegetation located below Wells Project Boundary within the confines of the Bridgeport Bar Unit of the Wells Wildlife Area (WWA). Continued watering of this habitat will benefit a wide range of wildlife species, including migratory waterfowl, and in harsh winters could benefit future wintering sharp-tailed grouse, if WDFW efforts to restore populations in the Dyer Hill area of Douglas County are successful.

Objective 2: Protect RTE Botanical Species from Land Disturbing Activities and Herbicide Sprays.

Based on botanical surveys that targeted RTE plants, the only federal or state listed plant species known to occur in the Wells Project are little bluestem and Thompson's clover (Douglas PUD 2006a, 2009h). In year five of the new license and every 10 years thereafter, Douglas PUD proposes to survey and revise site boundaries for populations of little bluestem and Thompson's clover found within the Project.

For lands owned by Douglas PUD within the Wells Project Boundary, no new ground disturbing activities will be allowed within a 500 feet buffer zone surrounding identified RTE plant locations and no new land use permits will be issued for these buffer areas. For private lands, located within the Wells transmission line corridor, Douglas PUD will control weeds within a 500 feet buffer around Thompson's clover occurrences within the transmission line right of way. Thompson's clover and little bluestem are State-listed threatened plant species.

Any weed control activities within the 500 feet buffer zones will utilize the following methods in descending order of preference: biological control, hand pulling and hand wiping of individual weeds with herbicide.

Objective 3: Conserve Habitat for Species on Project Lands Protected by the Federal Endangered Species Act, Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act.

Following receipt of a new license, Douglas PUD is proposing to A) inspect raptor perch poles annually and repair or replace perch poles as warranted and remove avian (cormorant) perch poles near Starr Boat Launch, B) conduct monthly boat surveys during the months of November through March to inventory wintering bald eagle numbers and to identify perch trees that may need protection from beavers, C) protect from beaver damage large living trees, regularly used by bald eagles as perches, and D) plant at least 50 acres of annual grain crops along Wells Reservoir to provide food for wintering Canada geese and dabbling ducks. Douglas PUD will implement the WBMP in a manner consistent with the National Bald Eagle Management Guidelines (USFWS 2007).

Objective 4: Protect Wildlife Habitat on Wells Project Lands.

Following receipt of a new license, Douglas PUD is proposing to monitor Wells Project lands by boat twice a month for unauthorized encroachment and damage caused by recreational activities and adjacent land owners. Wildlife habitat damage by unauthorized encroachments or recreational activities will be repaired or replaced with in-kind habitat within 12 months of identifying unauthorized activity.

Objective 5: Maintain Productive Wildlife Habitat on the Cassimer Bar Wildlife Management Area.

Following receipt of a new license, Douglas PUD is proposing to manage the Cassimer Bar Wildlife Area for the benefit of wildlife including implementation of the following specific measures: A) implement weed management annually to control new occurrences of noxious weeds and reduce existing weed occurrences, B) manage access and replace damaged habitat to reduce adverse effects of recreation on wildlife habitat, C) maintain perimeter fencing to protect habitat from livestock, and D) contingent upon receiving the necessary permits, repair the dikes on Cassimer Bar to enhance habitat for waterfowl and other aquatic species. In year four and every year thereafter, the dikes will be inspected and repaired as soon as the design work and permitting allow.

Objective 6: Control Noxious Weeds on Project Lands.

Douglas PUD annually checks the state and county weed lists for changes, and complies with legal requirements for noxious weed control. Douglas PUD annually controls Class

A (if any detected) and B designate weed occurrences on Wells Project lands and, starting in year five of the new license, proposes to survey Wells Project lands for new terrestrial weed infestations every five years. Douglas PUD implements appropriate weed control actions based on effectiveness of controlling weed growth with least impact to surrounding vegetation.

Douglas PUD does not conduct any broadcast herbicide spray treatment of Project lands. Where herbicide is used, application is with a backpack sprayer and application is to individual weed plants. Calculating acreage treated is therefore difficult. The majority of weed control spray efforts is in uplands along the transmission line ROW, far removed from water. Douglas PUD almost never uses glyphosate, of any formulation, in native habitats due to its nonselective nature and broad spectrum botanical lethality.

Douglas has used an IPM approach to noxious weed control since at least 2000, when Rodeo™ Herbicide spraying of purple loosestrife around the reservoir was discontinued in favor of biological control agents (beetles). Douglas PUD collects beetles annually on public lands in the Columbia Basin, and releases those in loosestrife areas around the reservoir. Biological agents are also collected and dispersed annually by Douglas PUD to control Dalmatian toadflax in the Wells Project.

Douglas PUD will, as required for consistency with the terms of the new operating license, include BMPs for the use of herbicides associated with recreation facilities operation and maintenance contracts.

Objective 7: Consultation.

As part of implementing the WBMP, Douglas PUD will meet with resource agencies and/or tribes when requested to discuss management of wildlife and botanical species on Project lands. All changes to the WBMP must be in writing and made by unanimous consent by all Parties. Any agreed-upon changes to the WBMP will be submitted to the FERC for review and approval.

Wells 230 kV Transmission Line Corridor Avian Protection Plan

The Wells 230 kV Transmission Line Corridor Avian Protection Plan (APP) was developed to reduce the potential for bird collisions with the Wells 230kV transmission lines and structures, and was prepared in consultation with the TRWG including detailed involvement from the WDFW and USFWS. The APP considers both avian migrants interacting with the transmission lines crossing the Columbia River and birds nesting on the transmission line structures.

As part of the APP, Douglas PUD is proposing to implement the following practices during the term of a new license:

1. Reporting Protocol: All avian mortalities found in the transmission line corridor will be reported to the appropriate parties.

2. Nest Management Protocol: Within two years of receiving a license, a nest management protocol will be developed in compliance with Federal and State bird protection laws.

3. Training Protocol: All appropriate utility personnel will be trained to evaluate avian issues when performing maintenance on the transmission lines and corridor.

Under the APP, Douglas PUD is proposing to annually train all appropriate utility personnel (Wildlife Biologist, Linemen and Right of Way workers) to evaluate avian issues when performing maintenance on the transmission lines and corridor. All nest management will be performed in compliance with applicable state and federal laws. All avian mortalities found in the transmission line corridor will be reported to Douglas PUD's Wildlife Biologist.

Recreation Management Plan

The Recreation Management Plan (RMP) establishes a process for developing, planning, and implementing recreation enhancements during the term of the new license. Douglas PUD developed this plan in consultation with the members of the Recreation Resources Work Group (RRWG). Members of the RRWG include representatives from the cities of Pateros, Brewster and Bridgeport, Okanogan and Douglas counties, Washington State Parks and Recreation Commission (State Parks), Washington Recreation and Conservation Office (RCO), WDFW, the National Park Service (NPS), Colville, BLM and Douglas PUD. The RMP replaces the Recreation Action Planning Process used during the initial license period.

The goal of the RMP is to define Douglas PUD's role and responsibilities related to the management of the recreation resources of the Wells Project during the term of a new license. The RMP includes the following measures designed to achieve the RMP goals:

Wells Dam Overlook Interpretive Displays

The Wells Dam Visitor Center, previously located inside the Wells Dam, has been closed to the public since 2001 due to security concerns. Douglas PUD is proposing to construct a new Visitor Interpretation Facility to be located on lands owned by Douglas PUD at the access point to the Wells Dam in the vicinity of the current Wells Dam Overlook. Exhibits to be provided at the new facility may include, but are not limited to, power generation, the history of Wells Dam, benefits of hydropower, fish and wildlife, and recreation. A live video feed of the Wells Project fish ladder will also be provided at the facility.

Marina Park Expansion

Relicensing studies determined that Marina Park in Bridgeport is often filled to capacity during peak recreation season. To accommodate increasing use, Douglas PUD will expand Marina Park to include an additional 10 recreation vehicle (RV) spaces. The park will be expanded to the north along the river within Project Boundary. The expansion will include all facilities needed to accommodate recreation use associated with 10 additional RV spaces, including restroom facilities, lift stations, landscaping and access roads.

All necessary environmental permits would be acquired following license issuance, and prior to implementing this project.

Boat-in Tent Camping and Signage

Relicensing studies identified a need to improve access to the Wells Project for non-motorized boats. As such, Douglas PUD will implement several measures to improve access for non-motorized boaters, including installing Greater Columbia Water Trail Coalition signs and informational material at appropriate Wells Project recreational access facilities; providing information on portaging around Wells Dam; constructing a formal boat-in tent camping facility in the vicinity of the Okanogan River, including restroom and picnic shelter; and designating and providing basic improvements for an informal/rustic boat-in tent camping location on the west side of the river within several miles of Wells Dam.

All necessary environmental permits would be acquired following license issuance, and prior to implementing this project.

Extend Chicken Creek Boat Launch

The Chicken Creek Boat Launch is located on Washburn Pond within the Wells Project Boundary. Lower pond levels are often observed in the fall season, and public access can be restricted due to the short length of the launch. Douglas PUD is proposing to place additional concrete planks at the end of the launch in order to extend the launch for improved access during the fall season.

All necessary environmental permits would be acquired following license issuance, and prior to implementing this project.

Reservoir Navigation Maps

In order to facilitate effective navigation of the reservoir, Douglas PUD will install maps of the reservoir showing areas of the reservoir where shallow waters may be encountered. Maps will be installed at high-use boat launches in Pateros, Brewster, and Bridgeport.

The O&M Program also includes a provision for aquatic plant control at designated swimming areas in Bridgeport, Brewster, and Pateros. Douglas PUD proposes to identify and implement the most feasible measures to manage aquatic plant growth at these three locations. Measures may include but not be limited to harvesting, herbicide application, installation of plastic liners, etc. All necessary environmental permits would be acquired following license issuance, and prior to conducting these activities.

Wildlife Viewing Trail Development Feasibility Study

Douglas PUD's proposed RMP includes a wildlife viewing feasibility study and a trail development feasibility study. The conduct of these studies will not have an impact on ESA-listed species.

Promotion of Recreation Facilities

Douglas PUD is proposing to make available printed and web-based material showing day-use sites, boat launches, wildlife viewing areas, campsites, trails, etc. The promotion of recreation facilities will not impact ESA-listed species.

Recreation Facility Operation, Maintenance and Monitoring Program.

Douglas PUD's proposed RMP includes a Recreation Facility Operation, Maintenance and Monitoring Program. Under this program Douglas PUD will be responsible for ensuring that operation and maintenance (O&M) standards are met at all Wells Project recreation facilities. Activities under the O&M Program include regular maintenance of buildings and restrooms, docks and boat launches, picnic facilities, trash receptacles, access roads and pavement, trails, landscaping and turf. Douglas PUD's recreation use monitoring program will inform future planning related to recreation management during the term of the new license and does not include actions that could affect ESA-listed species.

Historic Properties Management Plan

In November 2005, Douglas PUD formed a Cultural Resource Work Group (CRWG) to conduct consultation as required by Section 106 of the National Historic Preservation Act (NHPA), and to develop studies to identify Project effects. The CRWG was comprised of representatives from the Colville, the Washington Department of Archaeology and Historic Preservation (DAHP), the FERC, the BLM, the Bureau of Indian Affairs (BIA), and Douglas PUD. The CRWG developed a Historic Properties Management Plan (HPMP) to address potential Project-related effects to cultural resources within the area of potential effect (APE).

The purpose of the HPMP is to provide guidelines to Douglas PUD for managing historic properties affected by the operation and maintenance of the Wells Project and complying with the NHPA during the term of the new FERC license. The HPMP includes programs for achieving NHPA compliance through monitoring and protection of historic properties, and through consultation with the DAHP State Historic Preservation Officer (SHPO), CCT Tribal Historic Preservation Officer (THPO) and other interested parties. Table 2.5.1-1 summarizes implementation measures within the HPMP.

Table 2.5.1-1 Historic Properties Management Plan Implementation Measures

Implementation Measure	Description
Designate a HPMP Coordinator	Douglas PUD will appoint a staff HPMP Coordinator responsible for implementation of the HPMP.
Consultation	Douglas PUD will manage historic properties within the Wells Project APE in consultation with the SHPO, THPO, FERC and other agencies as applicable.
Education and Interpretation Program	Douglas PUD will develop an Employee Education Program to inform appropriate staff and contractors on the relevant HPMP programs. Douglas PUD will develop a Public Education and Interpretation Program designed to provide information about historical uses of the Wells Project area.
Management Standards for Historic Properties	For projects that cause ground disturbance or that have other potential effects to cultural resources, Douglas PUD will consult with the THPO, SHPO and other interested parties prior to beginning the project.
Curation and Document Management	Archaeological collections will be curated at the Colville curation facility in Nespelem, WA. Douglas PUD will inventory and index relevant documents, data, drawings, photographs, etc., that are considered historic or of value to historic properties management.
Historic Structures Evaluation	Wells Dam and the associated facilities will be evaluated for historic architectural and engineering significance after the facility turns 50 years old (2017).
Inadvertent Discoveries and Emergencies	For inadvertent discoveries, all activities at the project site will cease and Douglas PUD will consult with the appropriate parties to identify the appropriate measures.
Site Specific Management Measures	Douglas PUD will implement the Archaeological Sites Monitoring Plan as described in Appendix G of the HPMP. This program is summarized below.
Traditional Cultural Properties	Douglas PUD will consult with the THPO and the SHPO for those activities that may have effects on TCPs, and will prepare Determinations of Eligibility for the National Register of Historic Places.

Monitoring and Treatment Program

The HPMP archaeological monitoring program includes five basic components: 1) an archaeological site monitoring program; 2) a site testing program; 3) a monitoring program for inundated sites; 4) an erosion monitoring program; and 5) a site protection program. Sites to be managed under each of these programs include 44 sites to be monitored annually, 211 sites to be monitored every 10 years, 65 inundated sites to be monitored during low reservoir events, 8 sites requiring additional information or site testing, and 6 sites requiring protection measures. Erosion monitoring will be conducted by a professional geomorphologist at a subset of archaeological sites which will be selected based on landform, river environment, and archaeological content.
Each of the sites identified for management were selected and prioritized by the CRWG based on study results and past research. Management measures will be modified as new information becomes available after each monitoring cycle. Each year the CRWG will meet to discuss study results and to modify the monitoring program as appropriate.

Consultation

Consultation with the THPO, SHPO, and other parties as applicable, is a key component of each program within the HPMP. For projects that cause ground disturbance or that have other potential effects to cultural resources, Douglas PUD will consult with the THPO, SHPO and other interested parties prior to beginning the project. Consultation is also required for inadvertent discoveries, traditional cultural properties, education and interpretation, emergency situations, annual monitoring program, and for periodic revisions to the HPMP. The CRWG will review the HPMP every five years to identify whether any potential changes are needed.

Douglas PUD Land Use Policy

The waters and shoreline features of the Wells Project have been designated as critical habitat for several ESA listed species. As it applies to the Wells Project, the goal of the Douglas PUD LUP is to ensure that Project operations are in compliance with the FERC license and other federal and state regulations, including the protection of fish and wildlife habitat, protection of critical habitat for ESA-listed species, protection of significant historical, cultural and natural features and compliance with existing settlement agreements including the Wells HCP. The Douglas PUD Land Use Policy is Douglas PUD’s decision making process for issuing any land use permit for commercial and private use of Wells Project land and waters. The plan, together with the Wells HCP, ASA, other Terrestrial Resource Management Plans, and Off-License Settlement, form the core of the Douglas PUD resource measures.

The use of Wells Project lands will be governed by the Wells Project license and the Douglas PUD Land Use Policy, and must comply with applicable federal and state laws, the Wells HCP and various fish and wildlife settlement agreements. All required environmental permits must be obtained and the proposed use must comply with the FERC license and the Douglas PUD Land Use Policy before Douglas PUD will issue a land use permit. Permits from city, county, state and federal agencies may be required before a permit will be issued.

Terrestrial Resources

Within the Wells Project Boundary, no new ground disturbing activities will be allowed within buffer areas surrounding RTE plant locations, and no new land use permits will be issued for these buffer areas. Ground disturbing activities are not allowed on Douglas PUD owned or controlled lands, within 500 feet in any direction, of any know RTE plants locations mapped by EDAW, Inc. (Douglas PUD 2006a).

Douglas PUD will comply with the guidelines established in the WBMP for the protection of RTE terrestrial species. The guidelines include protection of bald eagle (*Haliaeetus leucocephalus*) perch trees on land owned by Douglas PUD.

Aquatic Resources

The Wells HCP provides for the protection of the reservoir habitat for the HCP Plan Species while making land use permit decisions. Douglas PUD is required to consider the cumulative impact effects of land use decisions, in order to meet the HCP objective of "no net impact". Douglas PUD is also required to notify and consider comments from the various agencies and tribes (Wells HCP signatory parties only) regarding land use permit applications.

Docks provide habitat for piscivorous fish to hide and wait to ambush prey moving past the dock. Docks disrupt the shoreline forcing small fish to leave the shoreline cover and either swim under the dock where the predators wait or out into deeper water and away from cover. Douglas PUD's Land Use Policy limits new boat docks to the city limits of Bridgeport, Brewster and Pateros to ensure high survival of juvenile HCP Plan Species. These restrictions are intended to protect juvenile salmon from predation and meet smolt survival standards required by the Wells HCP.

Large portions of the mainstem Columbia River and lower Methow River are designated as critical habitat under the ESA for either spring Chinook or steelhead. Critical habitat designations further restrict Douglas PUD's ability to grant land use permits along the shoreline of the Columbia and Methow rivers. Section 7 of the ESA prohibits the destruction or adverse modification of critical habitat in connection with actions carried out, funded, or authorized by a federal agency or an entity that has a federal nexus such as funding, permits or FERC license.

Compliance with critical habitat designations requires Douglas PUD to ensure that each permit application has received an exception from critical habitat designation, from either NMFS or USFWS, prior to Douglas PUD issuing a conditional land use permit. Changes in critical habitat designations and regulations are frequent. Douglas PUD will require that applicants for land use permits consult both the NMFS and USFWS prior to submitting a land use permit application.

Cultural Resources

Compliance with the Douglas PUD Land Use Policy ensures the compatibility of public and commercial occupancy of Project land (public land) with project operations, compliance with FERC license articles, and federal and state laws. Significant cultural resource sites on Project lands are subject to protection under Articles 41 and 44 of the Wells FERC License and section 106 of the NHPA.

Under the NHPA, Douglas PUD is required to address potential impacts to cultural resources that may be affected by Project-related activities conducted in compliance with the FERC license. Procedures for addressing cultural resource issues are defined in Douglas PUD's proposed HPMP. Douglas PUD will follow the guidelines of the HPMP prior to issuing any land use permits. If a permit is issued, the proponent will be required to pay for any additional archaeological work related to the proposed land use activity.

Federal law prevents Douglas PUD from disclosing the location of archaeological and cultural sites. Permits for these locations will either not be issued, or will include special conditions to ensure protection of the cultural resource site.

2.5.1.4 Off-License Settlement Agreement

In 2006, the FERC issued a Policy Statement on Hydropower Relicensing Settlements that limits the ability of licensees to include measures lacking sufficient nexus to the project as conditions of a new license. However, the FERC recognized that settling parties are free to enter into "off-license" or "side" agreements with respect to such matters that will not be included in a license. The measures related to the Wells Wildlife Area and rainbow trout program are similar to measures in other relicensing proceedings which the FERC found to lack a sufficient nexus to the project. Therefore, in an effort to continue these programs during the term of the new license consistent with the Policy Statement, WDFW and Douglas PUD entered into an Off-License Agreement.

The Off-License Agreement is an agreement between Douglas PUD and WDFW that is not intended to be included in the new license and therefore is not subject to the FERC's approval. Through this agreement, Douglas PUD agreed to the following responsibilities:

1. Trout Program: Douglas PUD will provide the funds necessary to produce and transport up to 20,000 pounds of rainbow trout equivalents, based on rearing goals set annually with the WDFW. The trout will be either raised at the Wells Fish Hatchery or at another location agreed to by both parties.

2. Wildlife Area Operations and Maintenance Funding: Douglas PUD will provide annual Operations and Maintenance funding for the Wells Wildlife Area in an amount not to exceed $200,000 (2007 dollars).

3. Habitat Restoration Funding: Douglas PUD will provide WDFW with funding to restore Wells Wildlife Area habitat destroyed by fire in an amount not to exceed $50,000 (2012 dollars) over the term of the agreement.

4. Capital Equipment Replacement Funding: Douglas PUD will provide WDFW with funds to replace certain capital equipment used in the maintenance of the Wells Wildlife Area once it has reached the end of its useful life.

Through this agreement, WDFW agreed to the following responsibilities:

1. License Application: WDFW agrees to support the Aquatic and Terrestrial measures proposed in the Wells License Application for the New Operating License.

2. License Term: WDFW agrees to support Douglas PUD's request for a New Operating License for a term of 50 years.

3. Water Quality Certification: WDFW agrees to reference only the goals and objectives contained within the management plans attached to the ASA and the measure(s) contained within the Off-License Agreement when working with Ecology to develop the original conditions of the Clean Water Act § 401 water quality certification for the New Operating License for the Wells Project.

4. FPA Section 10(a) and 10(j): WDFW agrees to refrain from requesting or advocating for additional FPA section 10(a) and 10(j) conditions or measures for Wildlife Resources, Resident Fish, Resident Fish habitat and lost Resident Fish harvest opportunities during the relicensing proceedings related to the issuance of a New Operating License for the Wells Project.

5. Trout Agreement: WDFW will meet with Douglas PUD in April of each year to establish the annual rearing goals and transportation protocols for each year's Trout Program and to determine how to best meet the trout obligation.

6. Wells Wildlife Program: WDFW will provide Douglas PUD with a proposed budget, not exceeding $200,000 (2007 dollars), and will provide a general description of how the proposed budget addresses the goals of the program for the Wells Wildlife Area by March 1st of each year. WDFW will provide complete documentation of all expenditures with each monthly bill. WDFW will not release or propagate any RTE species below the Project Boundary, not currently found within Project Boundary, without written permission from Douglas PUD. To ensure consistency with the Off-License Agreement, WDFW will provide Douglas PUD with an opportunity to review and modify any action that is expected to take place within the Wells Project Boundary.

The Off-License Agreement was effective December 11, 2007, with Douglas PUD's responsibilities commencing on June 1, 2012. The agreement expires upon the expiration of the Wells Project's New Operating License, assuming that an acceptable license is issued to Douglas PUD.

3.0 ENVIRONMENTAL BASELINE

For the purposes of this BA, the action area includes all areas potentially affected directly or indirectly by the Wells Project. This includes both project components that are located within the FERC-approved Project Boundary as well as features and areas located outside of the Project Boundary.

Project components within the FERC Project Boundary include the hydrocombine and associated structures, the reservoir, transmission line, tailrace, recreation facilities and adjacent lands. Project features within the Project Boundary are discussed in greater detail Section 3.2.

ESA-listed species' use of some areas and features located upstream of the Project Boundary could also be potentially affected directly or indirectly by the Wells Project. These features include upper portions of the Methow River located more than 1.5 miles upstream from its confluence with the Columbia River, the Methow River fish hatchery and acclimation pond, an acclimation pond and trapping site on the Twisp River (a tributary to the Methow River), and an acclimation pond on the Chewuch River, another tributary of the Methow River. Additional features located outside of the Project Boundary, include upper portions of the Okanogan River located more than 15.5 miles upstream from its confluence with the Columbia River. Features located outside of the FERC Project Boundary, and potentially affected by Project operations are discussed in Sections 3.3 (upper portions of the Methow and Okanogan river basins) and 3.4 (Methow Hatchery and acclimation ponds).

3.1 OVERVIEW

The Columbia River within the Wells Project lies in a relatively narrow valley comprised of numerous large, dry side canyons and is also joined by two major tributaries: the Methow and Okanogan rivers. Land ownership in the Wells Project area is a mixture of local, state, tribal, federal and private interests, with the majority of land being privately owned and used for agriculture, rangeland, and residences. Agricultural uses include pasture, orchards, nurseries, and dry and irrigated lands used to grow crops. Natural meadow areas and dry shrub-steppe areas are largely used as rangeland for cattle. Residential areas are found primarily around the incorporated cities of Bridgeport, Brewster and Pateros. Major habitats include waterbodies such as the reservoir and associated tributaries; wetlands associated with tributary floodplains and low-lying depressions; riparian areas that form the transition from waterbodies and wetlands into adjacent upland communities; and, the adjacent upland communities that include managed agriculture/pasture lands, shrub-steppe, and forest habitats.

For purposes of outlining the environmental baseline conditions of the Wells Project, related facilities, and general Project setting, this section provides a summary of the environmental conditions of the components within the Project Boundary and those outside of the boundary that could be directly or indirectly affected by the Project (i.e., tributaries outside of the Project Boundary, Methow Fish Hatchery, and acclimation ponds). This section addresses the general site condition of these features and focuses on the use of the areas by the following 16 species:

- Bull trout (threatened, 1998 listing)
- Upper Columbia River spring-run Chinook salmon (endangered, 1999 listing)
- Upper Columbia River Steelhead (endangered, 1997 listing; threatened per 2009 court decision and order)
- Marbled Murrelet (threatened, 1992 listing)
- Greater sage-grouse (candidate, 2008)
- Fisher (candidate, 2004)
- Pygmy rabbit (endangered, 2001 listing)
- Gray wolf (endangered, 1973 listing)
- Grizzly bear (threatened, 1975 listing)
- Canada lynx (threatened, 2000 listing)
- Northern spotted owl (threatened, 1990 listing)
- Washington ground squirrel (candidate, 1999)
- Yellow-billed cuckoo (candidate species, 1982)
- Wenatchee Mountains checkermallow (endangered, 1999 listing)
- Showy stickseed (endangered, 2002 listing)
- Ute ladies'-tresses (threatened, 1992 listing)

These species are described by USFWS or NMFS as those ESA-listed or candidate species that have historically occurred, are known to occur, or have the potential to occur within the counties in which the Wells Project is located (Douglas, Chelan, and Okanogan). In Section 4.0 an evaluation of the habitat preferences, ranges, and likelihood of occurring in the Wells Project is presented for each of these species. Based on this evaluation, only three of these species are expected to occur within the action area with any regularity: bull trout, spring Chinook and steelhead. Grizzly bear and gray wolf are known to inhabit a wide range of habitats, have large territories, and can travel considerable distances to establish their territories (especially young males). Thus, it is possible that individuals may move through the Wells Project area on occasion, but it is highly unlikely they would reside in the Project Area, or be affected by the Project.

3.2 WELLS PROJECT

3.2.1 Project Components

3.2.1.1 Wells Dam

Wells Dam is located at Columbia River Mile 515.6. The design of Wells Dam is unique to the Columbia River with the generating units, spillways, switchyard and fish passage facilities combined into a single structure referred to as the hydrocombine. Adult fish passage facilities are located on both ends of the hydrocombine structure. The hydrocombine itself is 1,130 feet long and 168 feet wide with a top elevation at 795 feet above MSL. Its design includes a series of eleven spillway bays and ten separate generating units. The generating units are isolated in individual silo-like structures with the spaces between the units serving as spillway bays. The turbine draft tubes are located below the spillway bays.

Earth embankments extend from the hydrocombine to the west and east abutments. The west embankment is 2,300 feet long and 40 feet high, with a top elevation of 797 feet MSL. The east embankment is 1,030 feet long with a maximum height of 160 feet above the riverbed. The east embankment also has a top elevation of 797 feet.

3.2.1.2 Reservoir

The body of water formed and directly influenced by Wells Dam is known as Wells Reservoir (Figure 2.1-1). Wells Reservoir consists of portions of three rivers including 29.1 miles of the Columbia River, 1.5 miles of the lower Methow River (Water Resource Inventory Area (WRIA) 48), and 15.5 miles of the lower Okanogan River (WRIA 49). The normal maximum water surface elevation of Wells Reservoir is 781 feet MSL. At this elevation, Wells Reservoir surface area is 9,740 acres, the total storage capacity is 331,200 ac-ft, and the usable storage capacity is 97,985 ac-ft. The Wells Project has an impoundment right of 331,200 ac-ft per year and is authorized to maintain its reservoir level between elevation 781 and 771 feet MSL for power and non-power purposes. The maximum depth of the reservoir under average conditions is >100 feet and the mean depth is 34 feet. The flushing rate varies seasonally with average flushing rates of 0.48 days in June and 2.98 days in January (Douglas PUD 2006b).

The Wells Project is a "run-of-river" hydroelectric project meaning that on average, daily inflow to Wells Reservoir equals daily outflow. The inflow to Wells Reservoir is primarily determined by operations of the Federal Columbia River Power System (FCRPS), which is managed for a number of purposes, including flood control, irrigation, power production, protection of fish resources and recreation. In general, the FCRPS is operated to fill upstream storage reservoirs by the end of June, provide augmented summer flows for fish passage and power production through the summer, draft storage reservoirs to meet power demand and salmon spawning requirements through the fall and winter and, depending on snow accumulations and runoff forecasts, draft for flood control and fill to meet the June refill target through the spring (Douglas PUD 2006b). The FCRPS manages for these objectives using releases from storage at Chief Joseph Dam (USACE) and Grand Coulee Dam (United States Bureau of Reclamation [USBR]), adjusted for inflow from tributary streams above the Wells Project (Okanogan and Methow rivers) and below the Wells Project (Entiat, Wenatchee, Yakima and Snake rivers).

The uppermost five mile section of Wells Reservoir immediately downstream from the Chief Joseph Dam tailrace (RM 540 to RM 544.9) is characteristic of a riverine environment. This section of Wells Reservoir is relatively narrow and fast-flowing with a precipitous shoreline. Dominant substrate in this upper section is characterized by larger sized cobble substrate. The middle 10-mile section between the town of Brewster (RM 530) and just upstream of Chief Joseph State Park (RM 540) is more characteristic of a lacustrine environment. This section of Wells Reservoir is a shallow, relatively broad area containing the confluence of the Okanogan River. Water velocities in this middle section are slower, more of the substrate is composed of fine sediment, and the bathymetry is more gradual than the Upper Wells Reservoir. This section has the highest density of aquatic plant communities and has the largest area of littoral fish habitat compared to the other two sections of Wells Reservoir (Le and Kreiter 2006). The lowermost 15-mile section is relatively narrow and fast flowing, compared to the middle section, but eventually slows and deepens as it nears Wells Dam. Shoreline slopes are steep with a relatively high frequency of rip-rap; substrates in this section tend to be coarse. The exception to these habitat characteristics in the lower section of Wells Reservoir is the area near the confluence of the Methow River (Beak Consultants, Inc and Rensel Associates 1999), which consists of higher levels of fine substrate that has been deposited within Wells Reservoir by the Methow River.

A botanical survey of the Wells Project was conducted in 2005 (Douglas PUD 2006a). The 12,217-acre study area for the Wells Project included the approximately 9,678 acre open water areas of Wells Reservoir and approximately 2,539 acres of land within the Wells Project Boundary. Although the focal area of the survey included the reservoir components and adjacent upland, the major habitat groups identified in the survey are representative of the general habitats found throughout the Wells Project area, including upper portions of the Methow and Okanogan rivers, as well as the area surrounding the hatchery components of the Wells Project. Cover types of the Wells Project area are identified in Table 3.2.1-1.

Table 3.2.1-1 Acreage of Cover Types in Wells Project Study Area.

Community Type	Acres in the Reservoir Component	Percent of Area Surveyed[1]
Conifer	5	0.2
Shrub-steppe	502	19.8
Open - grass	136	5.4
Open - weed	163	6.4
Rocky - upland	12	0.5
Riparian - tree	142	5.6
Riparian - shrub	314	12.5
Emergent wetland	287	11.4
Emergent wetland - pond	46	0.5
Littoral zone	61	2.4
Bare-disturbed-eroded	49	1.9
Agriculture	648	25.5
Developed	175	6.9

1 Excludes open water portion of the reservoir (9,678 acres).

The entire shoreline length is 105 miles long, most of which has a relatively steep topography with banks rising sharply to 20 to 40 feet above the reservoir elevation. Exceptions to this include: shoreline areas near Pateros and Brewster; near the mouth of Okanogan River; at Washburn Island; and at Bridgeport Bar. The reservoir shoreline is diverse and includes stable areas with dense riparian vegetation; unstable and eroding areas; areas of minimal vegetation and exposed bedrock; and areas that are relatively unvegetated and have been stabilized by riprap. There are 142 acres of riparian vegetation with deciduous tree overstory on lands within the Wells Project Boundary (Douglas PUD 2006a). Shrub-steppe, irrigated agriculture, wildlife habitat (e.g., wildlife management areas), recreation lands, and the towns of Pateros, Brewster and Bridgeport, surround the reservoir.

Within the reservoir, native aquatic plant communities (i.e., macrophytes) are dominated by various native species of pondweed (*Potomegeton* spp.) and are most common between depths of 4 to 18 feet (Douglas PUD 2006a and Le and Kreiter 2006). Macrophytes generally were not found at water depths less than 4 feet, which encompasses the area most susceptible to fluctuating reservoir water levels (Le and Kreiter 2006). Invasive species such as Eurasian watermilfoil and curly leaf pondweed (*Potomegeton crispus*) also occur in Wells Reservoir, but at this time are in low proportion relative to the dominant native macrophyte species (Le and Kreiter 2006).

The revised 2006 Washington State WQS identify the aquatic life uses in the WRIA of the Columbia River section (RM 309.3 to 596.6) that includes Wells Reservoir, as salmonid spawning, rearing and migration (Ecology 2006). Other identified uses for Wells Reservoir include recreation (primary contact), water supply uses (domestic, industrial, agricultural, and stock watering) and miscellaneous uses such as wildlife habitat, harvesting, commerce/navigation, boating and aesthetics. In the state WQS, only one category, Category 5, represents the 303(d) listed waters subject to EPA approval and requiring TMDL (Ecology 2008). Water temperature and TDG levels in Wells Reservoir have been known to exceed WQS and were assigned a Category 5 designation, based on measurements reported by the USACE (NMFS 2002a, Ecology 2008). The reach of the Columbia River within the Wells Project was on the State's 303(d) list for temperature impairment in 1996, 1998, 2004 and 2008 (Ecology 2008). The reservoir was also on the 303(d) list for TDG impairment in 1996 and 1998. However, in 2004, this reach of the Columbia River was removed from the 303(d) list for TDG, and assigned a Category 4a designation as a result of implementation of EPA approved TMDLs. The Category 4a designation remains in effect as of 2008 (Ecology 2008). Numerous water quality studies have also been conducted in the reservoir by multiple entities (i.e., Douglas PUD, Ecology, United States Geological Survey (USGS), and USACE), some since the late 1950s. Results indicate that the water found within the Wells Project is of high quality and is in compliance with the WQS for all of the parameters measured, except for seasonal exceedances in water temperature.

Lower Methow River

The Wells Project Boundary includes the Methow River from its confluence with the Columbia River to RM 1.5(Figure 3.1-1). The lower Methow River drainage is a moderately confined alluvial valley with an average gradient of 0.37 percent (NMFS et al. 1998). Shoreline areas in this 1.5 mile section of the river are highly developed, with the southern shoreline dominated by homesteads, boat docks, and lawns, and the northern shoreline bank dominated by rip-rap and the City of Pateros. Water quality in the section of the Methow River within the Project is considered excellent and the substrate is in good condition (Ecology 1992, NMFS et al. 1998). Although water use data is not specifically available for this portion of the river, aquatic life use, recreation, water supply, and other miscellaneous uses in this portion of the Methow are expected to be the same as those identified for the reservoir component (Ecology 2006). Similarly, water quality assessment data are expected to be similar to those of the reservoir and would include a Category 5 designation for temperature exceedances (Ecology 2008). The Methow watershed overall currently supports healthy populations of anadromous summer/fall Chinook, and ESA-listed stocks of spring Chinook, steelhead and bull trout. Aquatic habitat in the lower section of the Methow River is utilized by anadromous salmonids (Chinook, steelhead) and bull trout primarily as an adult migratory corridor to access spawning areas in the upper reaches and by juvenile anadromous salmonids for rearing and as a migration corridor (Ecology 1992).

Lower Okanogan River

The Wells Project Boundary includes the Okanogan River from its confluence with the Columbia River to RM 15.5(Figure 3.1-1). This lower section of river flows through a U-shaped, unconfined alluvial valley, has a gradient of 0.03 percent, and consists of mostly eroded banks and straight and impounded stream types (NMFS et al. 1998). Riparian vegetation is dense, but is not of suitable height to provide adequate shading of the river, which is > 100 feet wide throughout most of the river length (Douglas PUD 2006b, Ecology 2009). The entire Okanogan River drainage is a broad valley composed of deep glacial deposits that are highly erodible. Substrate in the Project area component of the river is primarily gravel and increases in size to primarily cobble substrate heading northward (Ecology 2009). Designated uses for the Okanogan River include salmonid spawning, rearing and migration, recreation (primary contact), water supply uses (domestic, industrial, agricultural, and stock watering), and miscellaneous uses such as wildlife habitat, harvesting, commerce/navigation, boating and aesthetics (Ecology 2006).

The lower portion of the Okanogan River, including the 15.5 miles within the Wells Project Boundary was put on the 303(d) list for DDE, DDD, and PCBs concentrations above standards in 1994 (Ecology 2008). Water quality problems were attributed to irrigation return flows, livestock impacts on bank vegetation and stability, erosion from non-irrigated cropland, and forest harvest practices, such as road construction (NMFS et al. 1998). Subsequent assessments resulted in Ecology removing the Lower Okanogan River within the Wells Project Boundary from the 303(d) list in 2004. However, water temperatures in this portion of the river are known to exceed the WQS during summer months and some sections of the lower Okanogan remain on the 2008 303(d) list (Ecology 2008). Water temperature modeling analysis demonstrated that with Wells Project in place, water temperatures in the Columbia, Okanogan and Methow rivers do not increase by more than 0.3°C compared to ambient without Wells Project conditions anywhere in the reservoir, and that the Wells Project complies with state WQS for temperature. The analysis also showed that the backwater from the Wells Project can significantly reduce the very high summer temperatures observed in the lower Okanogan and Methow rivers. The intrusion of the Columbia River water into the lower 1-2 miles of the Okanogan River and lowest mile of the Methow River can significantly decrease the temperature of warm summer inflows from upstream, and can also moderate the cold winter temperatures by 1-3°C, reducing the extent and length of freezing (Douglas PUD 2008j). Based upon the model, water temperature exceedance both within and upstream of the Wells Project are believed to be a result of natural phenomena (low gradient, low instream flow, natural lake impoundments, arid conditions and solar radiation on the upstream waterbodies) and are not attributed to the presence of the Wells Project (Douglas PUD 2006b). Despite temperatures in exceedance of the WQS in some portions of the river, the Okanogan River watershed currently supports the Columbia Basin's largest run of anadromous sockeye and healthy, harvestable runs of summer/fall Chinook (NMFS et al. 1998). The Okanogan Basin also supports ESA-listed steelhead. Anecdotal reports from the Colville Tribe also suggest bull trout are present seasonally in the Okanogan River and have been detected in the upper reaches at Zosel Dam in Oroville. However, eight years of telemetry monitoring by Douglas PUD only documented straying behavior by bull trout that move briefly into the lower Okanogan River and then leave for the Methow River. The lower section of the Okanogan River within the Wells Project Boundary is utilized by anadromous salmonids primarily as a migratory corridor (NMFS et al. 1998).

3.2.1.3 Tailrace

The Wells Tailrace, as defined in the Wells HCP, is the body of water from the base of Wells Dam to a point 1,000 feet downstream of the dam. The Wells Project Boundary extends beyond the Wells HCP defined Wells tailrace to a point 1.2 miles downstream of the dam. The width of the tailrace at the downstream face of the powerhouse is 1,000 feet. The tailrace width is approximately 1,900 feet at its widest point.

The tailrace begins at the exit of the draft tubes and consists of natural riverbed. Rock riprap lines the immediate left and right banks of the tailrace to prevent erosion caused by currents produced during larger spill events. An excavated rock trap, approximately 13 feet deep and 30 feet wide, runs the length of the hydrocombine, immediately downstream of the draft tube exit sill. The trap was excavated into bedrock during construction of the dam based on the results of hydraulic model testing of tailrace scour during operation of the spillways. High spill volumes during early operations of the project filled the rock trap with riverbed materials as predicted by the model studies. The trap was re-excavated in 1967 to remove the deposited materials. The trap is cleaned out when accumulated debris approaches height in the trap that would create a potential for debris to fall back into the draft tube exits. The rock trap has been excavated twice since 1967, most recently in August 2006. Debris is removed by a barge-mounted crane with a 70 foot arm and a clamshell bucket, and placed on a second barge for removal. Material is deposited offsite in remote upland areas.

The tailwater of the Wells Project is influenced by the reservoir of the Rocky Reach Project, located 42 miles downstream. The tailwater level of the Wells Tailrace is a result of both the flow of water through Wells Dam and the forebay elevation maintained by the Rocky Reach Project. For example, a discharge of 200 kcfs from Wells Dam and a Rocky Reach Reservoir elevation at its normal elevation of 707 feet would result in an approximate tailwater elevation of 718 feet. A lesser discharge of 100 kcfs from Wells Dam and a Rocky Reach Reservoir elevation of 707 feet would result in an approximate tailwater elevation of 711 feet.

3.2.1.4 Wells Hatchery

The Douglas PUD Hatchery Program is designed to mitigate for the construction and continuing impacts to anadromous fish attributed to the operation of the Wells Project. To meet HCP production goals, Douglas PUD owns and provides funding for the operation and maintenance of two hatchery facilities: the Wells Hatchery and the Methow Hatchery. Both the Wells and Methow hatchery programs are funded by Douglas PUD and operated by WDFW.

The Wells Hatchery is located within Project Boundary; the other components of the Hatchery Program are located outside of the Project Boundary, and are discussed in greater detail later in this document. The hatchery programs annually produce approximately 3 million juvenile salmon and steelhead that are released into the Methow, Okanogan and Columbia rivers. The Wells Hatchery is operated to provide compensation for both inundation and passage losses as described in the Wells HCP. The inundation compensation is related to Wells Project construction and includes the production of 300,000 yearling steelhead, 320,000 yearling summer Chinook and 484,000 subyearling summer Chinook. The passage loss compensation provided by the Wells Hatchery is currently set at 48,858 yearling steelhead (3.8 percent).

The Wells Fish Hatchery is located immediately adjacent to the Wells Dam on the west tailrace embankment and produces summer Chinook, steelhead, coho and rainbow trout. Built in 1967, it was originally developed to compensate for the loss of fish production resulting from the inundation of the Columbia River above the dam. The Wells Hatchery, including associated facilities, covers 33 acres and consists of: a 6,100 feet long channel with portions of the channel modified to hold adults and juveniles; numerous above ground and in ground raceways; four large earthen rearing ponds; a centralized incubation, early rearing, cold storage and administration building; vehicle storage building; steelhead spawning building; and a separate set of residences for hatchery personnel.

The four earthen rearing ponds vary in size and purpose. Pond 1 is used for rearing yearling summer Chinook and is connected to the main hatchery outfall channel via a gate and outlet structure. When acclimated and ready for release, the juvenile summer Chinook are allowed access to the main hatchery outfall channel and are volitionally released into the Columbia River below Wells Dam. Pond 2 is the largest pond and has historically been used to raise yearling steelhead or subyearling Chinook. Ponds 3 and 4 are used each year for the rearing of yearling steelhead. Ponds 2, 3 and 4 have volitional collection and transportation facilities located downstream of their outlet structures. The steelhead raised at the Wells Hatchery are volitionally collected at the hatchery and are transported and released by truck or acclimated in the Methow and Okanogan rivers. Currently no juvenile steelhead are released through the hatchery outfall channel.

3.2.1.5 Transmission Line

The Wells Project includes two 230 kV single-circuit transmission lines. Each of the 230 kV transmission lines is capable of transmitting the entire output of the Wells Project. The lines run 41 miles in length from the switchyard atop the hydrocombine to the Douglas Switchyard operated by Douglas PUD. The lines run parallel to each other on 45-85 foot steel towers along a common 235-feet wide right-of-way. The Douglas Switchyard is located in close proximity to the Rocky Reach Switchyard, operated by Chelan PUD and the Sickler Substation, operated by the Bonneville Power Administration (BPA). The 230 kV lines connect to the regional transmission grid at BPA's Sickler Substation.

The habitat in the vicinity of the corridor includes shrub-steppe, small stands of conifer tree dryland wheat fields and fields planted to grass and shrubs under the Conservation Reserve Program. The area supports huntable populations of mule deer and upland game birds including California quail, grey partridge and chukar. Raptors are found hunting the fields in the vicinity of the corridor and nest in the conifer tree stands. Songbirds, owls, ravens and crows are all present in the area (Douglas PUD 2009h).

3.2.2 Species Documented Within the Wells Project

Results from the numerous studies conducted in the Wells Project indicate that the water quality, turbidity, flow, and nutrient levels of the reservoir are all within sufficient limits to support healthy populations of aquatic species and provide ample water uses that include salmonid spawning, rearing and migration, recreation (primary contact), water supply uses (domestic, industrial, agricultural, and stock watering), and miscellaneous uses such as wildlife habitat, harvesting, commerce/navigation, boating and aesthetics (Douglas PUD 2006b, Ecology 2006, 2008). Limnological, macrophyte, and aquatic macroinvertebrate studies of the reservoir by Douglas PUD support these findings (BioAnalysts, Inc. 2006; DTA 2006; Douglas PUD 2006c and 2009h; EES 2006; Le and Kreiter 2006). Water quality studies conducted by Douglas PUD have demonstrated compliance with Washington State numeric criteria for water quality standards associated with TDG, DO, pH, turbidity, water temperature and toxins (Politano et al. 2008, 2009a, 2009b; West Consultants, Inc. 2008; Parametrix, Inc. 2009; CBE 2009; Douglas 2008g). These studies indicate that Wells Reservoir is a healthy run-of-river waterbody with no thermal or chemical stratification; that the reservoir ecosystem is dominated by native fish, macrophyte, and benthic invertebrate communities; and that the reservoir supports healthy populations of numerous other native wildlife species.

The impounded deepwater, shallow shoreline water, and shoreline riparian areas of the reservoir (including the Columbia River and lower potions of the Methow and Okanogan rivers) provide habitat for numerous species that include aquatic invertebrates and fish, wading birds, shore birds and waterfowl, several aquatic furbearers, and terrestrial species that may frequent the reservoir edge for water and foraging opportunities. As presented in the PAD, numerous surveys have been conducted in the Wells Project area for botanical resources, amphibians, fish, mammals, birds, and macroinvertebrates (BioAnalysts, Inc. 2006; Lê, B. and S. Kreiter 2006; Douglas PUD 2006a, c; 2008c, f; Douglas PUD 2009h). Field surveys of Wells Reservoir, the Project transmission line, and the surrounding area have documented 161 bird species, 5 amphibians, 9 reptiles, 29 mammals (Table 3.2.2-1), 27 resident fish species (Table 3.2.2-2), 6 anadromous fish species, and aquatic macroinvertebrates including 17 mollusk species (Table 3.2.2-3). Open water habitat is of particular importance to waterfowl, macroinvertebrates, and aquatic furbearers during much, if not all, of their life cycle. The WDFW considers Wells Reservoir one of the most important waterfowl wintering areas in eastern

Washington (Patterson B., WDFW, pers. comm.). Although Canada geese are the only bird known to nest along the reservoir in any great numbers (Hallet 2005; WDOG 1978; WDOG 1979), many species use the area for foraging and resting activities. Data from aerial surveys show a maximum of 33,912 ducks and geese using Wells Reservoir during the fall migration, and a maximum of 38,909 ducks and geese wintering on the reservoir (Douglas PUD 2006c). In addition to the waterfowl, as shown in Table 3.2.2-1, many birds of prey, shorebirds, rails, and game birds are known to use the reservoir and surrounding upland areas, some in great numbers. Up to 23,150 American coots have been documented at Wells Reservoir during the fall migration and approximately 25,700 coots wintered there between 2001 and 2005 (Douglas PUD 2006c).

Furbearers such as beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), mink (*Mustela vison*), and river otter (*Lutra canadensis*) also rely on open water habitats and associated riparian areas along the reservoir for food and lodging material. The trees and shrubs found along the reservoir edge also provide foraging, and in some cases nesting opportunities, for terrestrial mammals and birds, and also provides food and thermal cover for wildlife species during the winter. Riparian areas typically host higher numbers of both plant and animal species when compared to other habitats in a given area. Twenty-seven percent (43 species) of the bird species detected during the breeding season in the Wells Project area were in riparian habitats along the shoreline of waterbodies and wetlands, more than any other habitat type (Douglas PUD 2006c).

Large mammals such as gray wolf and grizzly bear were not detected on wildlife surveys of the Wells Project (Douglas PUD 2006c, 2009h). These species are unlikely to use the Project with any regularity given the extent of their ranges, lack of suitable habitat, and due to the significant presence of agriculture and developed lands and the proximity of human presence to the Wells Project Boundary. However, these species utilize a wide diversity of habitat types, have large territories, and may cover great distances during their life cycle. Transient wolves and grizzly bear could on rare occasion utilize the Wells Project for brief periods of time.

Table 3.2.2-1 Wildlife Species Detected in the Wells Project Area.

Common Name	Scientific Name
Pelagic Birds and Herons	
Common Loon	*Gavia immer*
Eared Grebe	*Podiceps nigricollis*
Horned Grebe	*Podiceps auritus*
Red-necked Grebe	*Podiceps grisegena*
Western Grebe	*Aechmophorus occidentalis*
Pied-billed Grebe	*Podilymbus podiceps*
American White Pelican	*Pelecanus erythrorhynchos*
Double-crested Cormorant	*Phalacrocorax auritus*
Great Egret	*Ardea alba*
Great Blue Heron	*Ardea herodias*
Waterfowl	
Canada Goose	*Branta canadensis*
Mallard	*Anas platyrhynchos*
Gadwall	*Anas strepera*
American Wigeon	*Anas americana*
Northern Pintail	*Anas acuta*
Blue-winged Teal	*Anas discors*
Green-winged Teal	*Anas crecca*
Cinnamon Teal	*Anas cyanoptera*
Northern Shoveler	*Anas clypeata*
Ruddy Duck	*Oxyura jamaicensis*
Wood Duck	*Aix sponsa*
Redhead	*Aythya americana*
Canvasback	*Aythya valisineria*
Ring-necked Duck	*Aythya collaris*
Scaup spp.	*Aythya spp.*
Barrow's Goldeneye	*Bucephala islandica*
Common Goldeneye	*Bucephala clangula*
Bufflehead	*Bucephala albeola*
Common Merganser	*Mergus merganser*
Hooded Merganser	*Lophodytes cucullatus*
Raptors	
Turkey Vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Golden Eagle	*Aquila chrysaetos*
Bald Eagle	*Haliaeetus leucocephalus*
Red-tailed Hawk	*Buteo jamaicensis*
American Kestrel	*Falco sparverius*
Peregrine Falcon	*Falco peregrinus*
Prairie Falcon	*Falco mexicanus*
Rough-legged Hawk	*Buteo lagopus*
Swainson's Hawk	*Buteo swainsoni*

Table 3.2.2-1 (continued) Wildlife Species Detected in the Wells Project Area.

Gamebirds	
Chukar	*Alectoris chukar*
Ring-necked Pheasant	*Phasianus colchicus*
California Quail	*Callipepla californica*
Dusky Grouse	*Dendragapus obscurus*
Gray Partridge	*Perdix perdix*
Rails, Cranes, & Shorebirds	
Virginia Rail	*Rallus limicola*
American Coot	*Fulica americana*
American Golden Plover	*Pluvialis dominica*
Killdeer	*Charadrius vociferus*
Greater Yellowlegs	*Tringa melanoleuca*
Spotted Sandpiper	*Actitis macularia*
Dowitcher spp.	*Limnodromus spp.*
Common Snipe	*Gallinago gallinago*
Wilson's Phalarope	*Phalaropus tricolor*
Gulls & Terns	
Bonaparte's Gull	*Larus philadelphia*
Ring-billed Gull	*Larus delawarensis*
California Gull	*Larus californicus*
Caspian Tern	*Sterna caspia*
Black Tern	*Chlidonias niger*
Common Tern	*Sterna hirundo*
Doves	
Rock Dove	*Columba livia*
Mourning Dove	*Zenaida macroura*
Owls & Goatsuckers	
Great Horned Owl	*Bubo virginianus*
Short-eared Owl	*Asio flammeus*
Northern Pygmy-Owl	*Glaucidium gnoma*
Common Nighthawk	*Chordeiles minor*
Common Poorwill	*Phalaenoptilus nuttallii*
Hummingbirds & Kingfishers	
Rufous Hummingbird	*Selasphorus rufus*
Black-chinned Hummingbird	*Archilochus alexandri*
Calliope Hummingbird	*Stellula calliope*
Belted Kingfisher	*Ceryl alcyon*
Woodpeckers, Nuthatches, Creepers & Flycatchers	
Northern Flicker	*Colaptes auratus*
Hairy Woodpecker	*Picoides villosus*
Downy Woodpecker	*Picoides pubescens*
Red-naped Sapsucker	*Sphyrapicus nuchalis*
Pygmy Nuthatch	*Sitta pygmaea*
Red-breasted Nuthatch	*Sitta canadensis*
Brown Creeper	*Certhia americana*
Western Wood-Pewee	*Contopus sordidulus*
Olive-sided Flycatcher	*Contopus cooperi*

Table 3.2.2-1 (continued) Wildlife Species Detected in the Wells Project Area.

Willow Flycatcher	*Empidonax traillii*
Dusky Flycatcher	*Empidonax oberholseri*
Least Flycatcher	*Empidonax minimus*
Say's Phoebe	*Sayornis saya*
Eastern Kingbird	*Tyrannus tyrannus*
Western Kingbird	*Tyrannus verticalis*
Corvids, Shrikes & Swallows	
Steller's Jay	*Cyanocitta stelleri*
Clark's Nutcracker	*Nucifraga columbiana*
Black-billed Magpie	*Pica hudsonia*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
Northern Shrike	*Lanius excubitor*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta thalassina*
Cliff Swallow	*Petrochelidon pyrrhonota*
Bank Swallow	*Riparia riparia*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Barn Swallow	*Hirundo rustica*
Chickadees, Wrens, Vireos & Kinglets	
Black-capped Chickadee	*Poecile atricapillus*
Mountain Chickadee	*Poecile gambeli*
House Wren	*Troglodytes aedon*
Canyon Wren	*Catherpes mexicanus*
Marsh Wren	*Cistothorus palustris*
Winter Wren	*Troglodytes troglodytes*
Cassin's Vireo	*Vireo cassinii*
Warbling Vireo	*Vireo gilvus*
Ruby-crowned Kinglet	*Regulus calendula*
Golden-crowned Kinglet	*Regulus satrapa*
Thrashers, Thrushes & Starlings	
Sage Thrasher	*Oreoscoptes montanus*
Gray Catbird	*Dumetella carolinensis*
European Starling	*Sturnus vulgaris*
American Robin	*Turdus migratorius*
Hermit Thrush	*Myadestestownsendi*
American Pipit	*Anthus rubescens*
Mountain Bluebird	*Sialia currucoides*
Western Bluebird	*Sialia mexicana*
Townsend's Solitaire	*Myadestes townsendi*
Waxwings	
Cedar Waxwing	*Bombycilla cedrorum*
Warblers & Tanagers	
Magnolia Warbler	*Dendroica magnolia*
Townsend's Warbler	*Dendroica townsendi*
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Yellow-rumped Warbler	*Dendroica coronata*
Yellow Warbler	*Dendroica petechia*

Table 3.2.2-1 (continued) Wildlife Species Detected in the Wells Project Area.

MacGillivray's Warbler	*Oporornis tolmiei*
Wilson's Warbler	*Wilsonia pusilla*
Common Yellowthroat	*Geothlypis trichas*
Yellow-breasted Chat	*Icteria virens*
Western Tanager	*Piranga ludoviciana*
Sparrows & Icterids	
Spotted Towhee	*Pipilo maculatus*
Chipping Sparrow	*Spizella passerina*
Lark Sparrow	*Chondestes grammacus*
Grasshopper Sparrow	*Ammodramus savannarum*
Savannah Sparrow	*Passerculus sandwichensis*
Lincoln's Sparrow	*Melospiza lincolnii*
Song Sparrow	*Melospiza melodia*
White-crowned Sparrow	*Zonotrichia leucophrys*
Golden-crowned sparrow	*Zonotrichia atrichipilla*
Vesper sparrow	*Pooecetes gramineus*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Red-winged Blackbird	*Agelaius phoeniceus*
Brewer's Blackbird	*Euphagus cyanocephalus*
Brown-headed Cowbird	*Molothrus ater*
Bullock's Oriole	*Icterus bullockii*
Western Meadowlark	*Sturnella neglecta*
Larks, Finches & Allies	
Horned Lark	*Eremophila alpestris*
Dark-eyed Junco	*Junco hyemalis*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Lazuli Bunting	*Passerina amoena*
House Finch	*Carpodacus mexicanus*
Cassin's Finch	*Carpodacus cassinii*
Purple Finch	*Carpodacus purpureus*
Pine Siskin	*Carduelis pinus*
Red Crossbill	*Loxia curvirostra*
American Goldfinch	*Carduelis tristis*
Evening Grosbeak	*Coccothraustes vespertinus*
House Sparrow	*Passer domesticus*
Amphibians	
Pacific Treefrog	*Pseudacris regilla*
Great Basin Spadefoot Toad	*Spea intermontana*
Long-toed Salamander	*Ambystoma macrodactylum*
Tiger Salamander	*Ambystoma tigrinum*
Bullfrog	*Rana catesbeiana*

Table 3.2.2-1 (continued) Wildlife Species Detected in the Wells Project Area.

Reptiles	
Painted Turtle	*Chrysemys picta*
Gopher Snake	*Pituophis catenifer*
Racer	*Coluber constrictor*
Western Terrestrial Garter Snake	*Thamnophis elegans*
Common Garter Snake	*Thamnophis sirtalis*
Western Rattlesnake	*Crotalus viridis*
Sagebrush lizard	*Sceloporus graciosus*
Pygmy Short-horned Lizard	*Phrynosoma douglasii*
Western Skink	*Eumeces skiltonianus*
Mammals	
Deer Mouse	*Peromyscus maniculatus*
Great Basin Pocket Mouse	*Parognathus parvus*
Western Harvest Mouse	*Reithrodontomys megalotis*
Sagebrush Vole	*Lemmiscus curtatus*
Montane Vole	*Microtus montanus*
Meadow Vole	*Microtus pennsylvanicus*
Vagrant/Masked Shrew	*Sorex spp.*
Bushy-tailed Woodrat	*Neotoma cinerea*
House Mouse	*Mus musculus*
Mountain Cottontail	*Sylvilagus nuttallii*
Long-tailed Weasel	*Mustela frenata*
Porcupine	*Erethizon dorsatum*
Northern Pocket Gopher	*Thomomys talpoides*
Yellow-bellied Marmot	*Marmota flaviventris*
Chipmunk spp.	*Tamias spp.*
Douglas squirrel	*Tamiasciurus douglasii*
Beaver	*Castor canadensis*
Muskrat	*Ondatra zibethicus*
Coyote	*Canis latrans*
Raccoon	*Procyon lotor*
Mink	*Mustela vison*
River Otter	*Lutra canadensis*
Striped Skunk	*Mephitis mephitis*
American Badger	*Taxidea taxus*
Black Bear	*Ursus americanus*
Cougar	*Puma concolor*
Bobcat	*Felis rufus*
White-tailed deer	*Odocoileus virginianus*
Mule deer	*Odocoileus hemionus*

Sources: BioAnalysts, Inc. 2006, Douglas PUD 2006c, Douglas PUD 2009h.

The reservoir is made up of several different aquatic habitat types including deepwater, littoral, backwater, and transitional habitats. These unique habitat types are defined by parameters such as velocity, depth, bathymetry, substrate, nutrient availability and overall complexity. The distribution, abundance, and composition of fish species in the reservoir are heavily influenced by the availability and quality of these habitats and include a wide diversity of anadromous and resident, native and non-native, warm and cold water species. Table 3.2.2-2 provides a list of the 27 resident fish species that have been documented in the reservoir (Dell et al. 1975; McGee 1979; Zook 1983; Burley and Poe 1994; Beak Consultants, Inc and Rensel Associates 1999; NMFS 2002a; Wydoski and Whitney 2003; BioAnalyst, Inc. 2004).

Table 3.2.2-2 Native and Non-native Resident Fish Species Documented in Wells Reservoir.

Common Name	Scientific Name
Native Resident Species	
White sturgeon	*Acipenser transmontanus*
Chiselmouth	*Acrocheilus alutaceus*
Longnose sucker	*Catostomus catostomus*
Bridgelip sucker	*Catostomus columbianus*
Largescale sucker	*Catostomus macrocheilus*
Lake whitefish	*Coregonus clupeaformis*
Prickly sculpin	*Cottus asper*
Threespine stickleback	*Gasterosteus aculeatus*
Burbot	*Lota lota*
Peamouth	*Mylocheilus caurinus*
Rainbow trout	*Oncorhynchus mykiss*
Mountain whitefish	*Prosopium williamsoni*
Northern pikeminnow	*Ptychocheilus oregonensis*
Redsided shiner	*Richardsonius balteatus*
Dace	*Rhinichthys spp.*
Bull Trout	*Salvelinus confluentus*
Non-Native Resident Species	
Lake Whitefish	*Coregonus cluepeaformis*
Carp	*Cyprinus carpio*
Black bullhead	*Ictalurus melas*
Brown bullhead	*Ictalurus nebulosus*
Pumpkinseed	*Lepomis gibbosus*
Bluegill	*Lepomis macrochirus*
Smallmouth bass	*Micropterus dolomieu*
Largemouth bass	*Micropterus salmoides*
Yellow Perch	*Perca flavescens*
Black crappie	*Pomoxis nigromaculatus*
Walleye	*Stizostedion vitreum*
Tench	*Tinca tinca*

Sources: Dell et al. 1975, McGee 1979, Zook 1983, Burley and Poe 1994, Beak Consultants, Inc and Rensel Associates 1999, NMFS 2002a, Wydoski and Whitney 2003, BioAnalyst, Inc. 2004.

Six species of anadromous fish are also found in Wells Reservoir and include: spring and summer/fall-run Chinook salmon, sockeye salmon, steelhead, coho salmon, and Pacific lamprey. With the exception of the summer/fall-run ocean-type Chinook salmon, anadromous species utilize Wells Reservoir primarily as a migratory corridor; this differs considerably from some resident species that may depend upon the habitats in the Wells Project for all their life history needs. Summer/fall ocean-type Chinook salmon are known to extensively utilize the mainstem for rearing and migration (Chapman et al. 1994a). All of these species are native to the Columbia River basin and all but Pacific lamprey are considered game fish species. Based on results from previous studies, as further discussed in section 3.3.2 of the draft EA (Exhibit E of the draft license application), the reservoir does not provide suitable spawning habitat for any of the anadromous fish species (Beak Consultants, Inc and Rensel Associates 1999, Douglas PUD 2008i).

The reservoir also hosts a diversity of gastropods and bivalves (i.e., mollusks) which are important as forage for many fish and wildlife (Table 3.2.2-3). In September and October 2005, Douglas PUD conducted an aquatic invertebrate inventory and assessment of RTE aquatic invertebrates within Wells Reservoir (BioAnalysts, Inc. 2006). Documented species from this study include 13 species in the Methow portions of Wells Reservoir, 11 in the Okanogan portion, and nine in the Columbia River portion. The gastropods included eight native species and non-native species and the bivalves included seven native species and one non-native species (BioAnalysts, Inc. 2006). Benthic macroinvertebrate communities appeared to be healthy and abundant, but were scarcer within shallow water areas where daily fluctuations occur (DTA 2006). These water fluctuations may also affect the composition of benthic macroinvertebrate communities along the shoreline.

Table 3.2.2-3 Mollusk Species in the Wells Project Area.

Common Name	Scientific Name
Native Species	
Western pearlshell	*Margaritinopsis falcata*
Striate fingernail clam	*Sphaerium striatinum*
Ridgebeak peaclam	*Pisidium compressum*
Western lake fingernail clam	*Musculium raymondi*
Shortface lanx	*Fisherola nuttalli*
Ashy pebblesnail	*Fluminicola fuscus*
Western floater	*Anodonta kennerlyi*
Ubiquitous peaclam	*Pisidium casertanum*
Golden fossaria	*Fossaria obrussa*
Prairie fossaria	*Fossaria (Bakerilymnaea) bulimoides*
Ash gyro	*Gyraulus parvus*
Three ridge valvata	*Valvata tricarinata*
Rocky Mountain physa	*Physella propinqua propinqua*
Western ridgemussel	*Gonidea angulata*
Fragile ancylid	*Ferrissia californica*
	Physella sp.
	Anodonta sp.
	Corbicula sp.
Non-native Species	
Big-ear radix*	*Radix auricularia*
Asian clam*	*Corbicula fluminea*

* Non-native taxon.
Source: BioAnalysts, Inc. 2006

3.2.3 T & E Species Use of the Wells Project

All three of the ESA-listed species found in the Wells Project (bull trout, spring Chinook salmon, and steelhead) are discussed in greater detail in Section 4 – Species Analysis. Within the Wells Project, telemetry studies have shown that bull trout utilize the mainstem Columbia River and pass through Wells Dam (BioAnalysts, Inc. 2004; LGL and Douglas 2008). Bull trout use of the mainstem of the Columbia River is variable and seasonal. Bull trout use the Columbia and larger tributaries as foraging, migrating and overwintering habitat, but approximately five percent are believed to be year-round residents (BioAnalysts 2004). Most (92%) migratory bull trout leave the Columbia when water temperatures exceed 15 degrees C. It also appears use of the Columbia varies between local populations. For example, radio-telemetry suggests large proportions of the Entiat and Mad River populations utilize the mainstem Columbia River. Bull trout found in the reservoir originate in the Methow River and 90 percent of dam passage occurs between May and June. Only adfluvial bull trout have been documented within

Wells Project and no bull trout have been counted in the Wells fishways during winter count periods (BioAnalysts, Inc. 2004; LGL and Douglas PUD 2008).

From 1998 to 2008 an average of 3,735 spring Chinook salmon migrated through Wells Dam annually (CBFAT 2009, Columbia River DART 2009). As with bull trout, spring Chinook salmon utilize Wells Reservoir primarily as a migration corridor to and from their spawning areas in the upper Methow, Chewuch and Twisp rivers and spend little time rearing in Wells Reservoir (NMFS 2002a). Spawning spring Chinook have been observed in the outfall at the Methow Fish Hatchery although most of these fish are of hatchery origin (NMFS 2002a). Steelhead utilize the mainstem of the Columbia River as they migrate to spawning areas in the Methow River and Okanogan River watersheds. From 1998 to 2008, on average 7,446 steelhead migrated through Wells Dam annually (CBFAT 2009).

None of the other ESA-listed or candidate plants, birds, or mammals examined in this BA have been documented in the study area (McGee 1979; Zook 1983; Chapman et al. 1994a; Beak Consultants, Inc and Rensel Associates 1999; BioAnalysts, Inc. 2006; Hallet 2005; DTA 2006; Douglas PUD 2006a, c, 2008c, 2009h; Le and Kreiter 2006). The habitat found in the Wells Project area includes mostly open water, irrigated agriculture, shrub-steppe, emergent wetland/pond, and riparian shrub vegetation without a tree overstory (Douglas PUD 2006a). Based on the general habitat requirements of the species identified in this BA as potentially occurring within the Wells Project, except for the three salmonid species suitable habitat is very limited to nonexistent. Further, documented distributions for most of the terrestrial species fall outside of the Wells Project.

3.2.4 Critical Habitat Designations in the Wells Project

The mainstem Columbia River from the Wells Tailrace to the confluence of the Columbia and Methow rivers, along with the accessible portions of the Methow River Basin, are included in the critical habitat listed for spring Chinook in the Wells Project area (70 FR 52731) (USFWS 2008).

Critical habitat was designated for the UCR summer-run steelhead ESU by NMFS on September 2, 2005 (70 FR 52630). Critical habitat does occur in the Wells Project area and includes; (1) the mainstem Columbia River from the Wells Tailrace to the confluence of the Columbia and Okanogan rivers, (2) the accessible portions of the Methow River Basin, (3) the accessible portions of the Okanogan River Basin, excluding the Colville Reservation and Salmon Creek (NOAA 2006; USFWS 2008).

Currently there is no designated critical habitat for bull trout found within the Wells Project. On January 14, 2010, the USFWS proposed new critical habitat designations for bull trout (75 FR 2270). Within the Wells Project, the proposal includes 31 miles of the mainstem Columbia River downstream from Chief Joseph Dam and 1.5 miles of the Methow River. USFWS submission of a final bull trout critical habitat designation to the Federal Register is due September 30, 2010.

No upland critical habitats are known to occur within the vicinity of Wells Reservoir components of the Wells Project area (USFWS 2008). The closest known critical habitat is Wenatchee Mountains checker-mallow habitat, located in Chelan County, approximately 40 miles to the southwest of the Wells Project area.

3.3 TRIBUTARIES LOCATED OUTSIDE OF THE PROJECT BOUNDARY THAT MAY BE AFFECTED BY THE PROJECT

3.3.1 Tributary Components

Two tributaries flow into the Wells Reservoir (impounded portion of the Columbia, Okanogan and Methow rivers) and include the Methow and Okanogan rivers above Project Boundary, (Figure 3.1-1). Portions of the lower regions of the Methow and Okanogan rivers are generally impounded and directly influenced by the backwater effects of Wells Dam, and are therefore discussed in the Project Section of this BA (Section 3.2). The section below addresses conditions of these tributaries outside of the Project Boundary.

Based on results from the 2005 botanical survey and a comparison to aerial photography, the habitats documented in the Wells Project area are applicable to the general vicinity of the upper portions of the Methow and Okanogan rivers (Douglas PUD 2006a). However, moving upstream, undisturbed forest, shrub, and riparian habitats tend to increase in coverage, while developed areas and agriculture tend to decrease. (Cover types of the Wells Project area are identified in Table 3.2.1-1.).

3.3.1.1 Upper Methow River

The Methow River originates in the Cascade Mountains and flows southeast to its confluence at Columbia RM 524 near the City of Pateros, approximately 8 miles upstream of Wells Dam. The Methow River has a 1,805 square-mile watershed (Methow Basin Planning Unit 2005). The northern portions of the Methow Basin are located in the Pasayten Wilderness and the Okanogan National Forest. The western portion of the basin is formed by the North Cascade Mountains with the middle and lower portions of the river basin defined by a U-shaped, moderately confined, alluvial valley. The average width of the river is 150 feet with variable depths. The river includes high quality habitat for salmonids, however, significant sections of the Methow above Project Boundary are known to dry up during periods of low water flow and drought. Many of these low water events have resulted in significant fish kills (Ecology 1992).

Elevations range from 781 feet MSL at the river mouth to just under 9,000 feet at the highest upper watershed peaks. Principal tributary watersheds are the 245 square-mile Twisp River and the 525 square-mile Chewuch River. Annual precipitation in the Methow River Basin ranges from 10 inches in the semi-arid region of the valley floor near Pateros to 80 inches per year at higher elevations near the crest of the Cascade Range (Ely 2003). Average annual discharge rates are: 497 cfs near Mazama (USGS station #12447383, RM 63.8); 1,163 cfs near Winthrop (USGS station #12448500, RM 49.8); and 1,533 cfs near Pateros and the river mouth (RM 6.7). Water right certificates allow for numerous withdrawals along the Methow River. During peak usage in 1990, withdrawals accounted for one-third of the August flow along some sections of the river (Williams and Kendra 1990). The total allocated withdrawals and diversions in the basin are about 380,729 ac-ft/yr (340 million gallons per day) (Methow Basin Planning Unit 2005). Irrigation accounts for about 97% of the total annual water use (Methow Basin Planning Unit 2005).

Within the watershed, only approximately 14% of land is privately owned (Methow Basin Planning Unit 2005). Land within one mile of the river includes lands owned/managed primarily by BLM, USFS, or WDFW. Towns along the river include Pateros, located near the mouth of the river, and heading upstream is followed by Methow, Carlton, Twisp, Winthrop, and finally Mazama. Much of the area immediately surrounding the river is dominated by homesteads and ranches, agricultural areas, orchards, and pasture, particularly in the river floodplain (Ecology 2009). Mature forest and dense riparian vegetation is relatively uncommon adjacent to the river south of the Town of Winthrop, but becomes more prevalent heading north, particularly in areas not immediately adjacent to the river edge. The river shoreline is dominated by exposed bedrock, some eroding shoreline in unstable areas, and narrow patches of riparian tree or shrub vegetation (Ecology 2009). Exposed cobble is evident throughout the river channel, particularly during low flow. Within the river, gravel, cobble and some large cobble dominate due to the relatively fast flow of the stream which quickly moves smaller substrate material downstream (Ecology 2009). Pools, runs and riffles are common and provide high quality habitat for numerous fish species and aquatic macroinvertebrates. Aquatic plants are uncommon except in protected areas, due to the relatively high velocity flow and coarse substrate.

Several water quality monitoring stations are located on the Methow River (WRIA 48) upstream of the Wells Project. An Ecology station (#48A070), which has been in operation since 1978, is located at approximately RM 5 and provides the most reliable information for the quality of water entering Wells Reservoir from the Methow watershed upstream. Based on 2006 WQS, this segment of the Methow River was placed on the 303(d) list as an impaired water body for temperature exceedances in 1996 and remains on the list in 2008 (Ecology 2008). All other water quality parameters at this station meet state WQS. Moving upstream from RM 5, three sections of the Methow are currently assigned a Category 4C designation, meaning the section is impaired for non-pollution related reasons. In this case, the listing is due to instream flow levels that are inadequate to support ESA-listed fish species (Ecology 2008). Identified water uses on the river include recreation (primary contact), water supply uses (domestic, industrial, agricultural and stock watering), and other miscellaneous uses (wildlife habitat, harvesting, commerce/navigation, boating and aesthetics). Riparian and stream channel condition along the river appear to have some damage from livestock grazing, agricultural development, and scouring, however the quality of the riverine substrate is in relatively good condition and provides high quality fish habitat (Ecology 1992, NMFS et al. 1998).

3.3.1.2 Upper Okanogan River

The Okanogan River is approximately 115 miles long, including the lower 15.5 miles that are considered part of Wells Reservoir and are discussed in the reservoir section of this BA. The river originates near Armstrong, British Columbia and flows south through a series of lakes, finally entering the Columbia River at RM 534 approximately 18 miles upstream of Wells Dam. The Okanogan watershed covers an area of approximately 8,200 square miles, 2,342 square miles (29 percent) of which occurs in the US. The northern portion of the watershed is in the Okanogan Highlands of the US and Canada. The southern part of the basin, near the river mouth, is in the northwest corner of the Columbia Plateau. Unlike the Methow River, the Okanogan River is wide (> 100 feet throughout most of the river) and relatively slow moving (Ecology 2009). Elevations range from 781 feet MSL at the river mouth to over 8,400 feet at the highest upper watershed peaks. The principal tributary of the Okanogan River is the Similkameen River which accounts for approximately one-half of the drainage area of the entire Okanogan watershed. Annual precipitation in the Canadian portion of the Okanogan Basin ranges from 30 to 40 inches and from 10-15 inches in the US portion the basin (Douglas PUD 2006b). The average annual discharge rate taken from a USGS station (#12439500) located close to where the river enters the US at the outflow of Lake Osoyoos near Oroville (RM 77.3), is 681 cfs, 493,200 ac-ft/year. Data from the USGS station (#12445000) located near Tonasket (RM 50.8) are 2,928 cfs, 2,121,000 ac-ft/year. The average discharge downstream from USGS station #12447200 near Malott (RM 17.0) is 3,038 cfs, 2,201,000 ac-ft/year. The area surrounding the river has steep to rolling hills along the valley walls, with flat to moderate slopes on ancient terraces and along the valley bottoms (NMFS 2002a).

Within the US portion of the river and within 1 mile of the west bank of the river, lands are owned/managed primarily by BLM, DNR, or WDFW (Douglas 2006b). The Colville Indian Reservation is bounded by the east bank of the river from the mouth upstream to the north boundary of Township 34 North, north of the town of Omak. Population centers along the Okanogan are Monse located near the mouth of the river, and heading upstream Malott, Okanogan, Omak, Tonasket, and Oroville, located near Lake Osoyoos. In Canada, the Okanagan River passes through several lakes and the Canadian towns of Oliver and Penticton from its origin at the southern end of Okanagan Lake. Similar to the Methow River, much of the floodplain along the Okanogan River is dominated by towns, homesteads and ranches, and is used for crops and ranching. Mature forest and dense riparian vegetation is relatively uncommon adjacent to the river south of the Town of Oroville, but becomes more prevalent heading north. The river shoreline is dominated by exposed bedrock, some eroding shoreline in unstable areas, and narrow patches of riparian tree or shrub vegetation. Within the upper portions of the river outside of the Project area, cobble substrates dominate and riffles and runs are uncommon (Ecology 2009). Mud and silt substrates are reported at water monitoring station #49A190 located near the outflow of Lake Osoyoos (Ecology 2009).

Portions of the Okanogan River (WRIA 49) were placed on the 303(d) list for exceeding limits for DDD, DDE, and PCBs in 1994 (Ecology 2008). In 2004, the impaired reaches of the Okanogan River were removed from the 303(d) list for these parameters and assigned a Category 4a designation as a result of implementation of EPA approved TMDLs (Ecology 2008). The Category 4a designation remains in effect as of 2008 (Ecology 2008). The portion of the river at USGS station #12447200 near Malott was placed on the 303(d) list for temperature exceedances and remains on the 303(b) list through 2008 (Ecology 2008). Data from long-term water quality monitoring stations located along the length of the Okanogan River, provide a water quality index (WQI) that expresses results relative to levels required to maintain beneficial uses (based on criteria in Washington's WQS, WAC 173-201A). WQI for station #49A070 located near Malott has been consistently rated as moderate since 2003 (Ecology 2009). The WQI for station #49A190 located near Oroville has been ranked consistently as "moderate" since 2006 (Ecology 2009).

3.3.2 T & E Species Use of Tributaries Outside of the Wells Project

All three of the ESA-listed fish species (bull trout, spring Chinook salmon, and steelhead) are known to occur in upper portions of tributaries that connect to the Wells Reservoir (Douglas PUD 2006b, Colville 2008). The USFWS has identified the Methow, Wenatchee and Entiat rivers as core areas for bull trout, with 10 of 19 local populations occurring in the Methow core area (USFWS 2002a). Based on radio-tagging studies conducted between 2001 and 2003, adult bull trout were detected moving upstream through the ladders of Wells Dam, destined for the Twisp River (Douglas PUD 2004). During the 2001-2003 study, and subsequent studies conducted between 2005 and 2008 by Colville Fish and Wildlife (2008) and LGL and Douglas PUD (2008), a majority of bull trout selected the Methow River System (including the Twisp River), and no fish ascended the Okanogan River. However, based on studies in the Lower Okanogan (BioAnalysts 2004), and according to the Colville Tribe, bull trout are known to occasionally use the Okanogan River and have been documented in the upper reaches at

Zosel Dam in Oroville. This behavior may be attributed to opportunistic foraging or possibly straying from the Methow where bull trout are more commonly found year-round.

The primary spawning areas for ESA listed spring Chinook salmon are the mainstem of the Methow River upstream of the Chewuch River confluence, the Twisp, Chewuch, and the Lost rivers, as well as Thirtymile and Lake creeks. Documented spawning sites for spring Chinook in the Methow drainage are located over 50 miles upstream of the Wells Project Boundary (NMFS 2002a). The Okanogan River population segment of the UCR spring-run Chinook population is extinct (WDFW 2005).

The majority of naturally produced steelhead that migrate through the Wells Project spawn in the Methow River watershed with a small population spawning in the Okanogan River watershed (Douglas PUD 2006b). Smolt stages of steelhead, of hatchery and wild origin, have been documented in the Okanogan (Colville 2008). Steelhead use spawning habitat in the mainstem Methow River and eleven of its tributaries located in the mid and upper reaches of the drainage outside of the Wells Project area (NMFS 2002a). A small number of primarily hatchery origin steelhead return to spawn on the lower Similkameen River, a tributary to the Okanogan River near the US-Canada Border also outside of the Wells Project area (NMFS 2002a). The habitat requirements and distribution of these species are discussed in greater detail in Section 4 – Species Analysis.

None of the other plants, birds, or mammals covered in this BA have been documented in the vicinity of the tributaries that could be effected by the Project during previous survey efforts of the Wells Project area (McGee 1979; Zook 1983; Chapman et al. 1994a; Beak Consultants, Inc and Rensel Associates 1999; BioAnalysts, Inc. 2006; Hallet 2005; DTA 2006; Douglas PUD 2006a, b; Le and Kreiter 2006). However, these surveys focused efforts on the Wells Project, including the lower 1.5 miles of the Methow drainage and the lower 15.5 miles of the Okanogan drainages. During the preparation of this BA, few field surveys specific to upper portions of the Methow and Okanogan rivers or Foster Creek, were identified for listed species other than bull trout, spring Chinook, and steelhead.

Based on of the general habitats likely to occur in the wetter and cooler upper portions of the tributaries located outside of the Project Boundary, it is possible that suitable habitat exists to support some of the other RTE species covered by this BA (e.g., in addition to bull trout, spring Chinook salmon, and steelhead). However, as further discussed in Section 4 – Species Analysis, there are no known species records or core habitat areas identified for any of the non-aquatic species covered in this BA in the upper reaches of the Methow and Okanogan rivers that have the potential to be affected by the Wells Project.

3.3.3 Critical Habitat Designations in Tributaries Outside of the Wells Project

On September 26, 2005, the USFWS designated critical habitat for bull trout populations within the Klamath River, Columbia River, Jarbridge River, Coastal-Puget Sound and Saint Mary-Belly River. In the Upper Columbia River Recovery Unit which encompasses the entire Wells Project area, no critical habitat was designated for bull trout (70 FR 56212). On January 14, 2010 the USFWS proposed new critical habitat designations for bull trout in several larger mainstem tributaries (i.e., Wenatchee, Entiat, and Methow) (75 FR 2270). USFWS submission of a final bull trout critical habitat designation to the Federal Register is due September 30, 2010.

Outside of the Wells Project Boundary, the accessible portions of the Methow River Basin are included in the critical habitat listed for spring Chinook (70 FR 52731).

Critical habitat was designated for the UCR summer-run steelhead ESU by NMFS on September 2, 2005 (70 FR 52630). Critical habitat outside the Wells Project Boundary includes the accessible portions of the Methow River Basin, and the accessible portions of the Okanogan River basin, excluding the Colville Reservation and Salmon Creek (NOAA 2006).

No other critical habitats are known to occur within the vicinity of the upper portions of the Methow and Okanogan rivers outside of the Wells Project Boundary (USFWS 2008).

3.3.4 Tributary Features that May be Affected by the Proposed Action

Relicensing of the Wells Project would result in a continuation of current conditions and is not expected to introduce new adverse environmental effects, particularly on areas outside of the Project Boundary such as the upper portions of the Methow and Okanogan rivers and Foster Creek. Continuation of Wells HCP implementation, in particular tributary habitat improvements funded through the Tributary Fund, is likely to positively affect tributary habitat conditions for bull trout, steelhead, and spring Chinook salmon. Hatchery operations are conducted to assist in the recovery of naturally spawning anadromous fish populations.

3.4 HATCHERY PROGRAM FEATURES OUTSIDE OF THE PROJECT BOUNDARY THAT MAY AFFECT LISTED SPECIES

The Douglas PUD Hatchery Program is designed to mitigate for the construction and continuing impacts to anadromous fish, including UCR spring Chinook and steelhead. To meet production goals, Douglas PUD owns and provides funding for the operation and maintenance, and monitoring and evaluation, of two hatchery facilities: the Wells Hatchery and the Methow Hatchery. Douglas PUD also provides funding and support toward the production of yearling summer/fall Chinook at the Carlton Acclimation Pond. All of these hatchery programs are funded by Douglas PUD and operated by WDFW. The Wells Hatchery is located within Project Boundary and has been previously discussed in this document; the other components of the District's hatchery programs are located outside of the Wells Project Boundary. The Douglas PUD Hatchery Program produces approximately 3 million juvenile salmon and steelhead annually that are released into the Methow, Okanogan and Columbia rivers.

3.4.1 Hatchery and Acclimation Pond Components

3.4.1.1 Wells Hatchery

The Wells Fish Hatchery is located within the Wells Project immediately adjacent to the Wells Dam on the west tailrace embankment; however, the Wells Hatchery does plant fish into the Methow and Okanogan rivers located upstream of the Project Boundary. Currently the Wells Hatchery produces compensation fish for both inundation and passage losses as described in the Wells HCP. The inundation compensation is related to Wells Project construction and includes the production of 300,000 yearling steelhead, 320,000 yearling summer Chinook and 484,000 subyearling summer Chinook. The passage loss compensation provided by the Wells Hatchery is currently set at 48,858 yearling steelhead. The steelhead raised at the Wells Hatchery are either transported and released by truck or acclimated in the Methow and Okanogan rivers outside the Project Boundary. The current steelhead program at Wells Dam also raises up to 80,000 smolts for Grant PUD to support compliance with their passage loss obligations. Currently no juvenile steelhead are released through the hatchery outfall channel.

Beyond planting steelhead into the tributaries outside of the Project, the Wells Hatchery does not affect ESA-listed species residing outside the Project Boundary. The surface water intake at the Wells Hatchery is screened.

3.4.1.2 Methow Hatchery

The Methow Fish Hatchery is located approximately 51 miles upstream of the mouth of the Methow River near the town of Winthrop, Washington. Construction of the hatchery was completed in 1992 and is the result of a long-term Fish Settlement Agreement dated October 1, 1990 to mitigate for passage losses at the Wells Project. In 2004, the Wells HCP was approved by the FERC and superseded the 1990 Settlement Agreement. As a result, the terms of the HCP now guide Wells Project activities at the Methow and Wells hatcheries. The Methow Hatchery produces yearling spring Chinook and is dedicated to enhancing spring Chinook salmon in the Methow, Twisp and Chewuch river basins. The Methow Hatchery consists of 12 covered production raceways, three covered adult raceways, a centralized incubation, early rearing, administrative and hatchery maintenance building, one on-site acclimation pond, a satellite acclimation pond on the

Chewuch River, a satellite acclimation pond on the Twisp River, a brood stock collection weir on the Twisp, a brood stock collection trap on the hatchery outfall and three separate houses for hatchery personnel.

All 12 of the production raceways and the on-site Methow acclimation pond are equipped with an outlet channel to the Methow River for releasing juvenile spring Chinook. The Twisp Acclimation Pond is located at RM 11 on the Twisp River, and the Chewuch Acclimation Pond is located at RM 7 on the Chewuch River. All of the surface water intakes for the Methow hatchery facilities are screened. The Methow Hatchery is owned by Douglas PUD and operated by WDFW. The current program raises up to 550,000 yearling spring Chinook each year with fish of equal numbers released at each of the three acclimation ponds. Douglas PUD's current passage loss obligation for spring Chinook is 61,071 smolts. The remaining 489,000 fish (89 percent of the program) are provided to Chelan PUD (288,000 smolts) and Grant PUD (201,000 smolts) to support compliance with their passage loss obligations. The Methow Hatchery is entirely dedicated to raising ESA-listed spring Chinook, and all programs implemented at the Methow Hatchery are covered by the Wells HCP and its associated regulatory instruments.

3.4.1.3 Carlton Acclimation Pond

The Carlton Satellite Facility is located on the Methow River downstream of its confluence with the Twisp River. The facility was constructed in 1990 and consists of one hypalon-lined rearing pond. The water supply is pumped from the Methow River using two 3,345 gpm pumps (Chelan PUD 2005). All water intake pipes are screened. The facility provides an acclimation and release location for Methow summer Chinook.

Douglas PUD’s current passage loss obligation for summer/fall Chinook is 108,570 yearling smolts. Chelan PUD’s Carlton hatchery program produces and releases all of these fish into the Methow River near Carlton. The remaining 291,000 smolts (73 percent of the program) are produced to meet Chelan PUD’s passage loss obligations associated with the Rocky Reach and Rock Island HCPs. WDFW operates the program for Chelan PUD.

3.4.2 T & E Species Use of Hatcheries

The Wells Hatchery is dedicated to rearing and releasing summer Chinook, steelhead, and rainbow trout and the Methow Hatchery is dedicated to rearing and releasing yearling spring Chinook. Bull trout, spring Chinook and steelhead do not spawn within the Wells Project. There are no bull trout hatchery facilities associated with the Wells Project; however, bull trout are known to opportunistically forage on outmigrating smolts in the Wells Hatchery outflow. All hatchery facilities are screened to prevent any potential entrainment.

3.4.3 Critical Habitat Designations in Hatcheries

There are no critical habitat designations assigned to hatcheries or rearing pools (USFWS 2008).

3.4.4 Impacts of Previous Actions on Species and Habitat in the Hatcheries

The effects of Douglas PUD's Hatchery Program are mostly beneficial in that the hatcheries serve to conserve and supplement imperiled populations of spring Chinook and steelhead. Hatchery programs are implemented specifically to mitigate for anadromous fish losses that are attributed to the operation of Wells Dam.

The Wells Hatchery is operated to provide compensation for both inundation and passage losses as described in the Wells HCP. The inundation compensation is related to Wells Project construction and includes the production of 300,000 yearling steelhead for inundation and 48,858 yearling steelhead for compensation for passage losses at the Wells Project (Douglas PUD 2006b). The Methow Hatchery program currently produces up to 61,071 yearling spring Chinook each year to compensate for passage losses at the Wells Project (Douglas PUD 2006b). Douglas PUD's Hatchery Program does not produce bull trout.

Juvenile project survival studies at Wells Dam have shown an average survival rate of 96.2 percent for yearling Chinook and steelhead (Bickford et al. 1999; Bickford et al. 2000; Bickford et al. 2001). Thus, while hatchery operations may serve to supplement, and in some cases sustain anadromous salmonid populations, the current role of Project operation in determining whether the benefits of hatcheries are compensatory or additive, is uncertain (Douglas PUID 2006b). The HCP Hatchery Committee currently guides the operation and monitoring and evaluation of Douglas PUD's hatchery programs with the goal of determining whether or not the currently configured hatchery programs are adequately mitigating for Project impacts while supporting natural reproduction of spring Chinook and steelhead. According to Chapman et al. (1994b) the majority of the steelhead and spring Chinook are of hatchery origin, suggesting these groups of fish may not exist if not for hatchery operations. Results from the Okanogan also found that 99 percent of the smolt stage Chinook and 92 percent of the smolt stage steelhead were of hatchery origin (Colville 2008).

3.4.5 Hatchery Habitat Features that May be Affected by the Proposed Action

Relicensing of the Wells Project would result in a continuation of current conditions and is not expected to introduce new adverse effects on listed or candidate species or designated critical habitat.

4.0 SPECIES ANALYSIS

The following life history and Wells Project activity descriptions provide the foundation for assessing the potential effects of the proposed action. Based upon this information, a determination of potential effects of the proposed action on each species is made. For all fish species, the analysis includes both the effect (life history stage and/or habitat parameter), and the measure that may cause the effect, whether potentially negative or positive. The areas of effect that are addressed include:

- Spawning, incubation and larval development,
- Rearing and migration within the Project,
- Tributary rearing and migration (outside the Project Boundary),
- Passage through Project reservoir and facilities,
- Water Quality,
- Water Quantity, and
- Riparian Cover.

These effect areas provide both a full assessment of life history traits and needed resources for species persistence. In some cases, the effect area does not occur within the Project Boundary, but is still addressed to show completeness of research topics.

Within each of the effect areas, the proposed measures are discussed. The order of the proposed measures is consistent and represented by the Wells HCP (described in Section 2.5.1.1), ASA (described in Section 2.5.1.2), Terrestrial Resources Management Plans (described in Section 2.5.1.3), and the Off-License Settlement Agreement (described in Section 2.5.1.4). Not all measures are pertinent to each area of potential effect and in those cases are stated as not posing a potential effect. An effects matrix at the end of each species analysis summarizes both findings and conclusions.

Research identified little potential for terrestrial ESA species to occur in the area of potential effects; as a result a more brief assessment was undertaken, followed with a dichotomous decision-making assessment to clearly depict how conclusions were made regarding potential effects.

4.1 SPECIES LIST AND CONSULTATION

Lists maintained by the USFWS and NMFS identify a total of three fish species, three plants, and ten wildlife species that are listed or candidates for listing under the ESA and may occur within the counties surrounding the action area (Douglas, Okanogan, and Chelan) (Table 4.1-1). This list is based upon comments provided by the USFWS on January 5, 2009 and comments provided by NMFS on January 16, 2009 (Exhibit E, Appendix E-11). All species potentially occurring in the surrounding counties are addressed below. For each species, a description of regulatory status, life history, and presence in the Wells Project is provided, and an analysis of potential Wells Project effects is made. Effects analyses take into account Wells Project operations, management plans included as part of the proposed action, and the potential for the species to be present. If a species is not believed to have the potential to occur in the action area, a concise determination is made using the USFWS (1998b) designed effects determination dichotomous key. Species known to occur or potentially occurring are provided a more comprehensive assessment, including an effects matrix, to summarize potential effects and findings.

Table 4.1-1 ESA-listed species potentially occurring in Douglas, Okanogan, and Chelan counties.

Listed Species	Scientific name	Listing Status	Listing Authority
Bull Trout	*Salvelinus confluentus*	Threatened	USFWS
Chinook Salmon (Upper Columbia River Spring-run ESU)	*Oncorhynchus tshawytscha*	Endangered	NMFS
Steelhead (Upper Columbia River DPS)	*Oncorhynchus mykiss*	Threatened	NMFS
Marbled Murrelet	*Brachyramphus marmoratus*	Threatened	USFWS
Greater Sage-Grouse (Columbia Basin DPS)	*Centrocercus urophasianus*	Candidate	USFWS
Fisher (West Coast DPS)	*Martes pennanti*	Candidate	USFWS
Pygmy Rabbit (Columbia Basin DPS)	*Brachylagus idahoensis*	Endangered	USFWS
Gray Wolf	*Canis lupus*	Endangered	USFWS
Grizzly Bear	*Ursus arctos horribilis*	Threatened	USFWS
Canada Lynx	*Lynx canadensis*	Threatened	USFWS
Northern Spotted Owl	*Strix occidentalis caurina*	Threatened	USFWS
Washington Ground Squirrel	*Spermophilus washingtoni*	Candidate	USFWS
Yellow-billed Cuckoo	*Coccyzus americanus*	Candidate	USFWS
Wenatchee Mountains Checkermallow	*Sidalcea oregana var. calva*	Endangered	USFWS
Showy Stickseed	*Hackelia venusta*	Endangered	USFWS
Ute Ladies'-tresses	*Spiranthes diluvialis*	Threatened	USFWS

4.2 BULL TROUT

4.2.1 Life History

(The information in this section was provided by the USFWS and incorporated per request; Douglas PUD has not corroborated the references cited in this section.)

The coterminous United States population of bull trout was listed as threatened on November 1, 1999 (64 FR 58910). Bull trout occur from the Klamath River Basin of south-central Oregon and in the Jarbridge River in Nevada, north to various coastal rivers of Washington to the Puget Sound and east throughout major rivers within the Columbia River Basin to the St. Mary-Belly River, east of the Continental Divide in northwestern Montana (Cavender 1978, Bond 1992, Brewin and Brewin 1997, Leary and Allendorf 1997).

Throughout its range, the bull trout is threatened by the combined effects of habitat degradation, fragmentation and alterations associated with: dewatering, road construction and maintenance, mining, and grazing; the blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels; and introduced non-native species (64 FR 58910).

The bull trout was initially listed as three separate Distinct Population Segments (DPSs) (63 FR 31647, 64 FR 17110). The preamble to the final listing rule for the United States coterminous population of the bull trout discusses the consolidation of these DPSs, plus two other population segments, into one listed taxon and the application of the jeopardy standard under section 7 of the ESA relative to this species (64 FR 58910):

> Although this rule consolidates the five bull trout DPSs into one listed taxon, based on conformance with the DPS policy for purposes of consultation under section 7 of the Act, we intend to retain recognition of each DPS in light of available scientific information relating to their uniqueness and significance. Under this approach, these DPSs will be treated as interim recovery units with respect to application of the jeopardy standard until an approved recovery plan is developed. Formal establishment of bull trout recovery units will occur during the recovery planning process.

Please note that consideration of the above recovery units for purposes of the jeopardy analysis is done within the context of making the jeopardy determination at the scale of the entire listed species in accordance with USFWS policy (USFWS 2006b).

The USFWS completed its initial five-year status review of bull trout with two recommendations: (1) Retain threatened status for the species as currently listed throughout its range in the coterminous United States for the time being and (2) evaluate whether distinct population segments (DPSs) exist and merit the Endangered Species Act's protection (USFWS 2005b, 2005c, 2008). The status review considered information that had become available since the time of listing. The analysis to determine whether distinct population segments exist is currently ongoing.

As noted above, in recognition of available scientific information relating to their uniqueness and significance, five segments of the coterminous United States population of the bull trout are considered essential to the survival and recovery of this species and are identified as interim recovery units: 1) Jarbridge River; 2) Klamath River; 3) Columbia River; 4) Coastal-Puget Sound; and 5) St. Mary-Belly River. Each of these segments is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

The conservation needs of the bull trout are often expressed as the need to provide the four "C's": cold, clean, complex, and connected habitat. Cold stream temperatures, clean water that is relatively free of sediment and contaminants, complex channel characteristics (including abundant large wood and undercut banks), and large patches of such habitat that are well connected by unobstructed migratory pathways are all needed to promote conservation of bull trout at multiple scales ranging from the coterminous to local populations. The recovery planning process for the bull trout (USFWS 2002a; 2004a, 2004b, 2006a) has also identified the following conservation needs for the species: 1) maintain and restore multiple, interconnected populations in diverse habitats across the range of each interim recovery unit; 2) preserve the diversity of life-history strategies; 3) maintain genetic and phenotypic diversity across the range of each interim recovery unit; and 4) establish a positive population trend. Recently, it has also been recognized that bull trout populations need to be protected from catastrophic fires across the range of each interim recovery unit (Dunham et al, 2003a; Rieman et al 2007).

Central to the survival and recovery of the bull trout is the maintenance of viable core areas (USFWS 2002a, 2004a, 2004b, 2005a, 2006a). A core area is defined as a geographic area occupied by one or more local bull trout populations that overlap in their use of rearing, foraging, migratory, and overwintering habitat, and in some cases in their use of spawning habitat. Each of the interim recovery units listed above consists of one or more core areas. About 118 core areas are recognized across the United States range of the bull trout (USFWS 2002a, 2004a, 2004b, 2005a, 2006a).

The Columbia River recovery unit currently contains about 90 core areas and 500 local populations. The condition of the bull trout within all 90 core areas varies from poor to good but generally all have been subject to the combined effects of habitat degradation, fragmentation and alterations associated with one or more of the following activities: dewatering; road construction and maintenance; mining and grazing; the blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species. The draft Bull Trout Recovery Plan (USFWS 2002a) identifies the following conservation needs for this unit: maintain or expand the current distribution of the bull trout within core areas; maintain stable or increasing trends in bull trout abundance; maintain/restore suitable habitat conditions for all bull trout life history stages and strategies; and conserve genetic diversity and provide opportunities for genetic exchange. Nineteen local populations, proximal to the Wells Project, were identified in the Methow (10), Wenatchee (7), and Entiat (2) core areas (USFWS 2002a).

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs (Fraley and Shepard 1989, Goetz 1989). Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989, Goetz 1989), or saltwater (anadromous) to rear as subadults or to live as adults (Cavender 1978, McPhail and Baxter 1996, WDFW 1997). Bull trout normally reach sexual maturity in 4 to 7 years, may live longer than 12 years and can be found up to 20 years old in Canada (Goetz 1989). They are iteroparous (they spawn more than once in a lifetime), and both repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Leathe and Graham 1982, Fraley and Shepard 1989, Pratt 1992, Rieman and McIntyre 1996). Some bull trout may spawn less frequently (e.g., 17 of 27 radio tagged bull trout spawned in 1 year, 5 of 27 in two years, and 1 of 27 in 3 years), based on telemetry data (B. Kelly-Ringel, USFWS pers. comm. 2001, Kelly-Ringel and De La Vergne 2008). Downs et al. (2006) describes that in Tresle Creek, in Lake Pend Oreille, Idaho a larger number of bull trout spawn annually and that repeat spawners only comprise a portion of that number, documenting a 2:1 ratio of annual repeat spawners to alternate year spawners.

Growth varies depending upon life-history strategy. Resident adults range in total length from 6 to 12 inches (14-30cm), and migratory adults commonly reach 24 inches (60 cm) or more (Goetz 1989). The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982).

Mortality rates of bull trout life history stages can be high; however, these rates decrease as the size of the fish increases. Egg survival can decrease with stream temperatures and alterations in habitat conditions (USFWS 1998, Pratt and Huston 1993). Egg to fry survival may vary between 3% to 50% depending on speed of growth, age at maturity, and fecundity (Rieman and McIntyre 1993). Fecundity may vary from less than 100 eggs in resident forms to greater than 5,000 eggs in migratory forms (Reiman and McIntyre 1993, Goetz 1989).

Sizes of bull trout vary widely depending on geography, and are likely due to a variety of factors, although water temperatures and diet are thought to play a large role (Pratt 1992, Goetz 1989, Rieman and McIntyre 1993, USFWS 1998). Age and size classification of the migratory bull trout life history form are generally defined as: juveniles: 0-3 years old and ranging in size from less than 1 to about 5 inches (2-13cm) in total length; subadults: 3-4 years old and ranging in size from 5 to13 inches (13 to 33cm) in total length; and migratory adults: 4+ years old and greater than 13 inches (33cm) in total length (pers. comm., S. Spalding, Service, 2006; Goetz 1989; Pratt 1992; Reiman and McIntyre 1993; Kramer 2003; McPhail and Baxter 1996).

Bull trout require year-round, two-way passage, both up and downstream, not only for repeat spawning but also for foraging, rearing, and overwintering. Most fish ladders, however, were designed specifically for anadromous semelparous (fishes that spawn once and then die, and therefore require only one-way passage upstream) salmonids. Therefore, even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a downstream passage route.

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Baxter and Hauer 2000; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Pratt 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), fish should not be expected to simultaneously occupy all available habitats (Rieman et al.1997a).

Migratory corridors are necessary to link seasonal habitats for all bull trout life history forms (USFWS 1998). The ability to migrate is important to the persistence of the bull trout (Rieman and McIntyre 1993; Rieman et al. 1997). Migrations facilitate gene flow among local populations when individuals from different local populations interbreed, or stray, to non-natal streams. Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants. However, it is important to note that the genetic structuring of bull trout indicates that there is limited gene flow among bull trout populations, which may encourage local adaptation within individual populations, and that reestablishment of extirpated populations may take a very long time (Spruell et al. 1999, Rieman and McIntyre 1993).

Cold-water temperatures play an important role in determining bull trout habitat, as these fish are primarily found in colder streams (below 59°F), and spawning habitats are generally characterized by temperatures that drop below 48°F in the fall (Fraley and Shepard 1989, Pratt 1992, Rieman and McIntyre 1993).

Thermal requirements for the bull trout appear to differ at different life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992, Rieman and McIntyre 1993, Baxter and McPhail 1997, Rieman et al. 1997a). Optimum incubation temperatures for bull trout eggs range from 35° to 39°F whereas optimum water temperatures for rearing range from about 46° to 50°F (McPhail and Murray 1979, Goetz 1989, Buchanan and Gregory 1997). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 46° to 48°F, within a temperature gradient of 46° to 60°F. In a landscape study relating bull trout distribution to maximum water temperatures, Dunham et al. (2003b) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 52° to 54°F.

All life history stages of the bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989, Goetz 1989, Hoelscher and Bjornn 1989, Sedell and Everest 1991, Pratt 1992, Thomas 1992, Rich 1996, Sexauer and James 1993, Watson and Hillman 1997). Maintaining bull trout habitat requires stability of stream channels and maintenance of natural flow patterns (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1993). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989, Pratt 1992, Pratt and Huston 1993).

Bull trout typically spawn from August to November during periods of decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989). Redds are often constructed in stream reaches fed by springs or are near other sources of cold groundwater (Goetz 1989, Pratt 1992, Rieman and McIntyre 1996). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992), and after hatching, juveniles remain in the substrate. Time from egg deposition to emergence of fry may surpass 200 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992, Ratliff and Howell 1992).

Less is known about how TDG affects bull trout. The USFWS consultation with EPA (USFWS 2008b) requires the following standards be met to protect salmonids in the mainstems of the Snake and Columbia rivers: (1) TDG must not exceed an average of one hundred fifteen percent (115%) as measured in the forebays of the next downstream dams and must not exceed an average of one hundred twenty percent (120%) as measured in the tailraces of each dam (these averages are measured as an average of the 12 highest consecutive hourly readings in any one day, relative to atmospheric pressure); and (2) A maximum TDG 1-hour average of one hundred twenty-five percent (125%) must not be exceeded during spillage for fish passage.

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987, Goetz 1989, Donald and Alger 1993). Adult migratory bull trout feed on various fish species (Leathe and Graham 1982, Fraley and Shepard 1989, Donald and Alger 1993). In coastal areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) in the ocean (WDFW 1997).

Migration allows bull trout in Washington to access optimal foraging areas and exploit a wider variety of prey resources. Bull trout likely move to or with a food source. For example, some bull trout in the Wenatchee basin, in Washington, were found to consume large numbers of earthworms during spring runoff in May at the mouth of the Little Wenatchee River where it enters Lake Wenatchee (Kelly-Ringle and De La Vergne 2008). In the Wenatchee River, radio-tagged bull trout moved downstream after spawning to the locations of spawning Chinook and sockeye salmon and held for a few days to a few weeks, possibly to prey on dislodged eggs, before establishing an overwintering area downstream or in Lake Wenatchee (Kelly-Ringle and De La Vergne 2008).

4.2.2 Presence in Action Area

Two sets of studies have provided the majority of the information on bull trout migratory behavior in the mid-Columbia River. The first study was the 2001-2004 mid-Columbia radio telemetry study undertaken by the three mid-Columbia PUDs (Chelan, Grant, and Douglas PUD) to evaluate the movement and status of bull trout in their respective project areas at the request of the USFWS. The goal of the study was to monitor the movements and migration patterns of adult bull trout in the mid-Columbia River using radio telemetry. From 2001 to 2003, bull trout were collected from the Wells, Rocky

Reach, and Rock Island dams, radio-tagged, and monitored through 2004. The second series of studies took place during 2005-2008 and were associated with the implementation of the BTMMP. The goals of the 2005-2008 studies included the measurement of incidental take for migratory and sub-adult bull trout passing through the Wells Project and the collection of stock identification information from the Methow River.

Following the FERC's approval of the Wells HCP in 2004, the Wells Project BTMMP was developed in 2005. The BTMMP was prepared and implemented to meet monitoring requirements stipulated in a USFWS BO (USFWS 2004c) regarding implementation of the Wells HCP. The goal of the Wells Project BTMMP was to identify, develop, and implement measures to monitor and address potential Wells Project-related impacts on bull trout associated with the operations of the Wells Project and associated facilities (Douglas PUD 2004). One component of the plan was to conduct additional telemetry assessments from 2005 through 2008 which provided additional information on bull trout movements in the Wells Project and documents rates of incidental take associated with the operation of Wells Dam (LGL and Douglas PUD 2008). Through the implementation of the strategies outlined in the BTMMP, six years of tagging, and eight years of monitoring, Douglas PUD has not identified any project-related impacts to adult or sub-adult bull trout from passage through the Wells Project, nor by stranding/entrapment due to lowering of the reservoir elevation. Douglas PUD has also determined there are no apparent correlations between Project operations and downstream passage events, and that there is no upstream movement of adult bull trout through the Wells Dam fishways during the off-season period of November 16 through April 30. Bull trout captured and tagged at Wells Dam were radio-tracked to the Methow and Entiat Core Areas during spawning periods, and have also demonstrated movement between these systems by successfully passing upstream or downstream through Wells Dam (LGL and Douglas PUD 2008).

Results of the telemetry studies identified several notable bull trout life history characteristics. Within the mid-Columbia Basin, bull trout utilized the mainstem Columbia River as a migratory corridor as data indicated that tagged fish passed through the mid-Columbia projects (BioAnalysts, Inc. 2004). This establishes that bull trout may be in the mainstem Columbia River (i.e., Wells Reservoir) throughout the year.

Within the Wells Project area, the majority of radio-tagged bull trout were destined for the Twisp and Methow rivers located upstream of Wells Dam, however some fish also migrated into the Entiat River, which is located downstream of Wells Dam. Most of the radio-tagged bull trout passed Wells Dam during the months of May and June (BioAnalysts, Inc. 2004). Adults generally concluded spawning in the Methow by late October; some bull trout were observed returning to Wells Reservoir by mid-December. Bull trout did not select the Okanogan River system in both telemetry studies (one bull trout entered the Okanogan for a short period before leaving to enter the Methow system).

In addition to telemetric assessments, bull trout have been observed and counted during passage at Wells Dam since 1998. Bull trout upstream passage in Wells Project fish ladders is monitored from May 1 through November 15. In recent years, Douglas PUD has initiated an experimental winter count for bull trout (November 16 through April 30). To date no bull trout have been observed in the fish ladders during the experimental winter monitoring period. Counts of bull trout from 2000 through 2008 are presented below for the Wells Project and two additional downstream projects (Table 4.2.1-1). The table shows the relatively small number of bull trout passing over Wells Dam as compared to the counts at Rocky Reach Dam.

Table 4.2.1-1 Tabulated Summary of Bull Trout Passage Up Adult Fish Ladders at Three mid-Columbia Projects (CBFAT 2009).

Project	Year											Total	Avg.
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008		
Rocky Reach	83[1]	128[1]	216[1]	204	194	246	161	155	142	77	100	1279	155
Rock Island	67	61	87	82	84	102	114	69	35	46	36	783	71
Wells	17	49	93	108	76	53	47	49	100	65	43	700	64

[1] Unpublished data (Chelan PUD 2003)

4.2.3 Critical Habitat Designations

On September 26, 2005, the USFWS designated critical habitat for bull trout populations within the Columbia River and other locations. No critical habitat for bull trout was designated in the Columbia River drainage in or near the Wells Project. New critical habitat was proposed January 14, 2010 (75 FR 2270) to include all of the Wells Project waters except the Okanogan River. The deadline for the USFWS submittal of a final bull trout critical habitat designation to the federal register is September 30, 2010.

4.2.4 Environmental Measures and Analysis of Effects

On July 30, 1998, Douglas PUD submitted an unexecuted form of an Application for Approval of the Wells HCP to the FERC and to NMFS. To expedite the FERC's formal consultation, biological evaluations of the effects of implementing the Wells HCP on listed species under the jurisdiction of the USFWS were prepared by Douglas PUD.

In a letter to the FERC, the USFWS requested consultation under Section 7 of the ESA regarding the effects of hydroelectric project operations on bull trout in the Columbia River (letter from M. Miller, USFWS, to M. Robinson, FERC, dated January 10, 2000). The request for consultation was based on observations of bull trout in the study area. In its reply to the USFWS, the FERC noted that there was virtually no information on bull trout in the mainstem Columbia River.

On November 24, 2003, Douglas PUD filed an application for approval of the executed Wells HCP. The 2004 application for approval replaced the 1998 application with the executed form of the Wells HCP.

On December 10, 2003, the USFWS received a request from the FERC for formal consultation to determine whether the proposed incorporation of the Wells HCP into the FERC license for operation of the Wells Project was likely to jeopardize the continued existence of the Columbia River DPS of ESA-listed bull trout, or destroy or adversely modify proposed bull trout critical habitat. In response to the FERC request, the USFWS submitted a BO and issued an ITP to Douglas PUD. The FERC incorporated the USFWS bull trout reasonable and prudent measures (RPM) and terms and conditions into the existing Wells Project license, which are represented as license articles 61, 62, and 63.

Article 61 of the license required Douglas PUD to file with the FERC a Bull Trout Plan for implementing the USFWS bull trout RPMs and terms and conditions, which were designed to monitor and limit bull trout take associated with Wells Project operations. Article 61 further required that Douglas PUD prepare the Bull Trout Plan in consultation with the USFWS, NMFS, WDFW, and interested Indian Tribes (Colville and Yakama). Following consultation with these stakeholders, on February 28, 2005, Douglas PUD filed with the FERC the Wells Project BTMMP, 2004-2008 (Douglas PUD 2004). The BTMMP was approved by the FERC on April 19, 2005.

Article 62 of the license requires Douglas PUD to prepare and file with the FERC an annual report describing the activities required by the BTMP. On March 26, 2008 Douglas PUD, with approval from USFWS, filed a request for an extension of time to submit the 2007 annual bull trout monitoring report and to consolidate the 2007 annual report with the final bull trout monitoring report, required to be filed with the FERC by December 31, 2008. On April 16, 2008, the FERC issued an order granting this request. This document summarizes all data collected to meet the BTMMP objectives over the required monitoring period from 2005 to 2008 and is the final monitoring report. This final monitoring report completes radio-telemetry tagging and monitoring objectives outlined in the USFWS bull trout RPMs and terms and conditions, and the Wells Project license articles 61 and 62.

Article 63 was a reservation of authority by the FERC to require the licensee to carry out specified measures for the purpose of participating in the development and implementation of a bull trout recovery plan.

As required by the new license article, Douglas PUD, in concert with the USFWS, developed and implemented the BTMMP for the Wells Project (Douglas PUD 2004). The BTMMP addressed the RPM's defined by the USFWS above.

The BTMMP was intended to monitor and evaluate bull trout presence in Wells Project, quantify incidental take and address, to the extent feasible, potential Project-related impacts on bull trout from Wells Project operations and facilities. Implementation of the BTMMP began in May 2005 and will continue through the existing license term. The specific objectives of the BTMMP are:

Objective 1: Monitor adult upstream and downstream passage at Wells Dam and implement appropriate management plans to monitor any incidental take of bull trout through the use of telemetry studies, analysis of passage timing with operational data, and monitoring of off-season bull trout passage through the adult fishway;

Objective 2: Assess Wells Project-related impacts on upstream and downstream passage of sub-adult bull trout through Passive Integrated Transponder (PIT) tagging and off-season passage monitoring;

Objective 3: Investigate the potential for sub-adult entrapment or stranding in off-channel or backwater areas of Wells Reservoir through the evaluation of reservoir elevation and bathymetric data;

Objective 4: Identify the Core Areas and Local Populations, as defined in the Service Draft Bull Trout Recovery Plan, of those bull trout that utilize the Wells Project area.

In early 2009, Douglas PUD completed the development of a new BTMP which details monitoring and management activities for bull trout during a new license. The BTMP is part of the Aquatic Settlement Agreement for the relicensing of the Wells Project. The goal of the BTMP is to identify, monitor, and address impacts, if any, to bull trout resulting from the Wells Project in a manner consistent with the USFWS Bull Trout Recovery Plan and the terms of the Section 7 ITS. The BTMP is intended to continue the implementation of management activities to protect bull trout during the new license term in a manner consistent with the original BTMMP implemented from 2005 to 2008 (Douglas PUD 2004). The PM&Es presented within the 2009 BTMP are founded upon information collected from 2001 to 2008 and designed to meet the following objectives:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the Wells HCP;

Objective 2: Identify any adverse Wells Project-related impacts on adult and sub-adult bull trout passage;

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate the effectiveness of these measures;

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations;

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan including information exchange and genetic analysis. Should bull trout be delisted, the Aquatic SWG will re-evaluate the needs and objectives of the BTMP;

Objective 6: Identify any adverse impacts of Wells Project-related hatchery operations on adult and sub-adult bull trout.

This BTMP is intended to be compatible with other bull trout management plans and the Upper Columbia Salmon Recovery Plan (UCSRP) in the mainstem Columbia River. Furthermore, this management plan is intended to not conflict with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, of the Washington State WQS.

4.2.4.1 Spawning, Incubation, and Larval Development

Telemetry studies indicate that bull trout utilizing Wells Reservoir spawn in the mainstem Twisp River and upper mainstem Methow River more than 50 miles and 1,500 feet MSL in elevation above the Wells Project Boundary (BioAnalysts, Inc., 2004; BioAnalysts, Inc. 2006). Literature and investigative research did not locate any report documenting spawning habitat within the Wells Project Boundary. Migratory bull trout have been observed passing upstream through Wells Dam in the spring and summer with peak counts in late May and early June. The majority of tagged fish move into the Methow River by the end of June (BioAnalysts, Inc., 2004). For migratory life history types, juveniles rear in tributary streams for 1 to 4 years before migrating downstream into a larger river or lake to mature (Rieman and McIntyre 1993).

Since spawning activity occurs outside of the Project Boundary, no effect on spawning, incubation or larval development was identified for any of the proposed measures.

4.2.4.2 Rearing and Migration Within the Project

Bull trout have the potential to occur in Wells Reservoir year-round. The Wells Reservoir provides a migration corridor, foraging opportunities, rearing habitat, and a relatively stable overwintering area compared to potentially dynamic tributary habitat. During residency within the reservoir the potential for Wells Project operations to have an impact on bull trout may occur by stranding/entrapment due to lowering of the reservoir elevation.

To address the potential for stranding or entrapment, the third objective of the BTMMP required an investigation of off-channel or backwater areas of Wells Reservoir during low reservoir elevations from 2005 through 2008. Field surveys were conducted at potential bull trout stranding sites during reservoir elevations below 774 feet MSL in 2006 and 2008. The stranding sites were identified by assessing high resolution bathymetric information, aerial photography, reservoir elevations, backwater curves, and inflow patterns. The result of the investigations did not identify any bull trout stranding. Surveys were planned in 2005 and 2007, but river operations were not low enough to warrant a survey.

Habitat Conservation Plan

Section 4.3.3 of the Wells HCP requires Douglas PUD to implement a targeted northern pikeminnow, piscivorous bird and piscivorous mammal harassment and control program with the goal of reducing the level of predation upon salmonids migrating through the Wells Project. However, the pikeminnow removal program may also result in the harassment, incidental capture and potential mortality of bull trout.

Northern pikeminnow are native predators of juvenile bull trout. The Northern Pikeminnow Removal Program (NPRP) included a northern pikeminnow bounty program, participation in fishing derbies and tournaments, hook and line fishing by experienced anglers and the use of longline fishing equipment. Currently only longline fishing is being utilized in the Project.

There is a potential for individual bull trout to be caught during northern pikeminnow longline angling. From inception in 1995 through 2007 Douglas PUD's NPRP has captured over 154,000 northern pikeminnow. During that time no bull trout have been incidentally captured during longline fishing.

From 1995-1999, the NPRP implemented by Douglas PUD consisted mainly of experienced anglers using hook and line techniques to remove northern pikeminnow from Wells Project waters. Traditionally, hook and line angling has lacked the ability to target species specifically. Captured bull trout from hook and line sampling were immediately released. Douglas PUD no longer uses angling removal for predator control in the Wells Project.

More recently (2000-present), the NPRP has shifted to a longline fishing system. This new system has proven to be more cost efficient and effective at targeting northern pikeminnow. Longline fishing gear has a low probability of catching bull trout by fishing deeper in the water column using small hooks typically baited with dead crickets. Lines are checked daily in order to release any species other than northern pikeminnow. To date the incidental catch rate of bull trout by longline fishing has been zero.

The NPRP is implemented to benefit listed Columbia River salmonids. The operation of the program is likely to benefit bull trout by increasing juvenile salmonids in the mainstem Columbia, a forage base for bull trout. Increased survival of salmonids will increase the distribution of ocean nutrients into the upper reaches and tributaries of the Columbia River when these fish return from the ocean to spawn and die. The removal of northern pikeminnow is also likely to reduce predation on juvenile adfluvial bull trout entering the mainstem Columbia as they migrate out of their natal tributaries. Pikeminnow removal is also expected to benefit bull trout rearing in the reservoir by reducing competition for prey.

Other lesser threats to bull trout include predation by piscivorous birds and mammals. The focus of managing these species is not removal but hazing and access deterrents. Hazing includes propane cannons, pyrotechnics and the physical presence of hazing staff. Access deterrents include steel wires across the hatchery ponds and tailrace, fencing and covers for hatchery ponds, and electric fencing. When hazing and access deterrents fail, options for removal are also implemented by the US Department of Agriculture (USDA) Animal Control staff hired to conduct the hazing programs. The minor increase in human activity as a result of the avian and mammal predator control measures is unlikely to adversely affect bull trout. Similar to pikeminnow removal, the reduction in predation on salmonids will likely increase the prey base for foraging bull trout.

In Section 4.5.1 of the ASA, Douglas PUD states that if incidental take from the Predator Control Program exceeds allowable levels, Douglas PUD will develop a new plan with the HCP Coordinating Committee and the Aquatic SWG. This plan will address factors contributing to the exceedance and seek a resolution.

Aquatic Settlement Agreement

The ASA includes implementation of the WSMP.

Indirect causes of increased predation may result from the enhancement of white sturgeon which may consume sub-adult bull trout. However, sub-adult bull trout have not been detected in the Wells Reservoir, and white sturgeon are not known to use reaches of the

Project tributaries above Project Boundary, therefore, spatial separation may preclude significant predation. Douglas PUD is required in its WSMP to enhance white sturgeon populations through artificial propagation. The increased number of sturgeon may result in an elevated potential for predation. The WSMP has provisions for adaptive management of supplementation activities should conflicts develop between stocked sturgeon and ESA-listed species. The WSMP includes an intensive monitoring and evaluation program that will be used to adjust the number of juvenile sturgeon stocked in the Wells Project and will be used to inform harvest management for adult sturgeon.

In Section 4.5.1 of the ASA, Douglas PUD states that if incidental take exceeds allowable levels as a result of the implementation of other aquatic resource management plans, Douglas PUD will develop a new plan with the Aquatic SWG. This plan will address factors contributing to the exceedance and seek a resolution.

Terrestrial Resources Management Plans

No potential effects were identified.

Off License Agreement

No potential effects were identified.

4.2.4.3 Tributary Rearing and Migration

Activities associated with the operation of the Wells Project also take place in upper portions of the tributaries above the Project Boundary.

Habitat Conservation Plan

The two primary activities influencing the tributaries outside of the Project Boundary relate to requirements in the TCP and the Hatchery Compensation Plan. These two guiding documents establish necessary activities for Douglas PUD to maintain habitat and artificially enhance existing salmonid populations per obligations identified in the Wells HCP. Activities within these programs are intended to benefit the overall aquatic ecosystem, but may result in some short-term effects to bull trout.

Tributary Conservation Plan

The TCP found in Section 7 of the Wells HCP guides the funding and allocation of dollars from the Plan Species Account. The intended goal of the dollars allocated to the Plan Species Account is to compensate for up to two percent unavoidable adult and/or juvenile mortality for Plan Species passing through Wells Dam. The intent of the Plan Species Account is to provide dollars to protect and restore tributary habitats for Plan

Species within the Wells Project Boundary and within the portions of the Methow and Okanogan rivers that are accessible to Plan Species.

A detailed description of the TCP, the Plan Species Account, and its allowable uses by the Tributary Committee can be found in Section 7 of the HCP. Some direct and indirect effects on bull trout may occur resulting from implementation of actions funded by the TCP. Because of the diverse nature of habitat improvement actions funded by the TCP, separate Section 7 consultations are initiated for actions associated with the TCP.

The Tributary Committee, comprised of various fisheries agencies and the Tribes, will be guided by the general strategy outlined in supporting documents (see TCP) to the Wells HCP. The premise of the TCP is to protect existing productive habitat and restore high priority habitats by enhancing, when practical, natural processes that, over time, will create and maintain suitable habitat conditions without human intervention. The USFWS representative on the Tributary Committee ensures that any take resulting from these activities is minimized to the extent practical.

The TCP funded by Douglas PUD provides money to fund third party conservation efforts in the Methow and Okanogan river basins. Habitat restoration projects and plans to purchase conservation easements or lands in fee are submitted to the Tributary Committee. Examples of projects funded by the TCP may include, but are not limited to, 1) providing access to currently blocked stream sections or oxbows, 2) removing dams or other passage barriers on tributary streams, 3) improving or increasing the hiding and resting cover habitat that is essential for these species during their relatively long adult holding period, 4) improving in-stream flow conditions by correcting problematic water diversion or withdrawal structures, or 5) purchasing (or leasing on a long-term basis) conservation easements to protect or restore important aquatic habitat and shoreline areas. To date, most of the funding allocated through this plan has been focused on purchasing conservation easements, removing dikes and levees in order to restore natural river channel process, reconnecting side channels and oxbow habitats and fixing culverts to restore connectivity to properly functioning habitat.

The Tributary Committee will decide if the projects meet criteria for funding. Restoration and improvement projects have to be reviewed by state and federal agencies to receive permits for construction. Habitat preservation and conservation projects will likely benefit bull trout through the protection of proposed critical habitat found within the Methow River bull trout core areas (USFWS 2002a). Projects that may increase instream flow volume in the Methow Basin will benefit all life stages of bull trout by enhancing migration corridors, pool depth, in-stream cover, and preferred water temperatures.

Habitat restoration projects will require a period of construction that may result in short term disturbances such as noise, increased turbidity, and human presence. These projects are expected to result in long-term positive benefits for bull trout through the protection and enhancement of aquatic habitat and removal of migration barriers.

Some potential activities (e.g., removal of large stream channel blockages or reconnecting side channels, etc.) may produce short-term unavoidable negative effects (e.g., incidental injury or mortality of individual fish, temporary increases in sediment loads and turbidity, etc.) as a result of funding projects in the Methow River. In-stream projects having the potential to disturb bull trout or bull trout habitat will be required to go through a separate ESA Section 7(a)(2) consultation and authorization of incidental take of ESA-listed Permit Species.

In the long-term, any actions designed to remove migration barriers, stabilize stream channels and restore hydraulic equilibrium, increase riparian canopy cover, or increase base flows are expected to far outweigh small short-term impacts and result in beneficial effects for bull trout.

Hatchery Compensation Plan

The operation of hatchery enhancement activities has the potential to create both positive and negative results for bull trout.

The Hatchery Compensation Plan, as described in Section 8 of the Wells HCP, was established to provide hatchery compensation for up to 7 percent unavoidable juvenile passage losses of Plan Species passing through Wells Dam. The goal of the program is to utilize hatchery produced fish to replace unavoidable losses in such a manner that the hatchery fish produced contribute to the rebuilding and recovery of naturally reproducing populations of Plan Species, in their native habitats, while maintaining the genetic and ecological integrity of each stock of Plan Species. Supporting harvest, where appropriate, was also identified as a goal of the Hatchery Compensation Plan.

Actions associated with the Hatchery Compensation Plan are expected overall to be a benefit to bull trout. These activities provide an enhancement of listed and unlisted anadromous salmonids in the Methow and Columbia rivers. Bolstering salmonid populations will indirectly benefit bull trout populations by increasing densities of important prey items (smolts) in both tributary and mainstem habitats.

A direct example of bull trout exploiting Wells Project operations is the notable usage of the Wells Hatchery outfall. The 2001 to 2004 telemetry study suggested that bull trout frequented the outfall in search of prey (BioAnalysts, Inc. 2006). Typical operation at the hatchery is to volitionally release yearling Chinook smolts between 15 and 30 April, and subyearling Chinook smolts in early June. These smolts migrate downstream through the hatchery outfall channel system and then enter the Columbia River. During the 2001 study period, bull trout were observed at the hatchery outfall between 17 May and 27

June. In 2002, detections occurred between 3 June and 20 June. Large numbers of smolts were routinely observed during the period when the bull trout frequented the outflow (Shane Bickford, Douglas PUD, personal communication). Given that bull trout feed opportunistically (Goetz 1989), it is likely that the tagged bull trout were taking advantage of the large concentration of juvenile salmonids within the hatchery outfall system.

Another additional indirect benefit of the Hatchery Compensation Plan for bull trout may occur in both mainstem and tributary habitats as a result of enhanced nutrient availability due to an increased number decaying anadromous fish. Anadromous salmonids are highly important to the nutrient and trophic status of spawning tributaries (Kline et al. 1994; Bilby et al. 1996). By providing a conduit for nutrient transfer from ocean environments, salmon make significant nutrient contributions to the aquatic and terrestrial ecosystems of streams where they spawn (Bilby et al. 2003). The increase in primary and secondary productivity resulting from higher adult salmon returns in bull trout rearing streams may result in greater survival for juvenile bull trout.

One potential negative effect from the hatchery operations could include reduced water quality at the hatchery outfall. Water quality at each facility operates under a National Pollutant Discharge Elimination System (NPDES) permit which specifies discharge requirements, in accordance with finfish culture specifications. The USEPA has delegated responsibility to administer the NPDES permit program to the state of Washington on the basis of RCW 90.48, which defines Ecology's authority and obligations in administering the discharge permit program. Washington has issued a general state NPDES permit, renewed in April, 2000, that sets wastewater limits and sampling requirements for use of fish treatment drugs and chemicals. The permit is subject to revision and renewal every five years, with the next renewal due in 2010. No effects on bull trout are anticipated from water withdrawal or aquaculture practices associated with the Wells and Methow hatcheries and associated rearing facilities.

Another possible effect to bull trout may occur at the Twisp Weir where brood stock trapping occurs. As identified in the BTMP of the ASA, Douglas PUD will address this issue through the assessment of upstream and downstream passage and incidental take of adult, migratory bull trout at off-Project (outside of the Wells Project Boundary) adult salmon and steelhead brood stock collection facilities associated with the Wells HCP. Specifically, beginning in year one of a new license, Douglas PUD will conduct a one-year radio-telemetry study to assess passage and incidental take at off-Project adult collection facilities (i.e., Twisp weir). Douglas PUD will capture and tag up to 10 adult, migratory bull trout (>400 mm) at adult collection facilities and use fixed receiver stations upstream and downstream of collection facilities to examine upstream and downstream passage characteristics and incidental take. Study protocols that have been used during past radio-telemetry assessments at Wells Dam (LGL and Douglas PUD 2008) will be employed for this assessment.

If negative impacts to passage associated with off-Project collection facilities are observed or the authorized incidental take level is exceeded during any one-year period, Douglas PUD will conduct another monitoring study in the succeeding year. If negative impacts to passage continue to be observed or the authorized incidental take level is exceeded in this second year, Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to passage impacts or the exceedance of the allowable level of incidental take.

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.2.4.4 Adult Upstream Passage Through the Project Reservoir and Facilities

Habitat Conservation Plan

Wells Dam has two adult fish ladders, located on the east and west ends of the hydrocombine. These ladders are operated based upon measures identified within the Wells HCP. Bull trout utilize these ladders to pass upstream of the Wells Project. Each of the two fishways contains a single main entrance, a collection gallery, a fish ladder with PIT-tag monitoring stations, an adult count station, trapping facilities, and an exit in the forebay adjacent to the earthen embankment section of the dam.

Fishways are inspected daily to ensure debris accumulations are removed, automated fishway instruments are calibrated properly and lights in the fishway are functioning. Both upstream fishway facilities (located on the west and east shores) are operational year around with maintenance occurring on each fishway at different times during the winter to ensure that one upstream fishway is always operational. Maintenance activities on Wells fishways occur during the winter when bull trout have not been observed passing Wells Dam (Douglas PUD 2008b).

Migratory bull trout have been observed passing upstream through Wells Dam in the spring and summer with peak counts in late May and early June. There have never been any observations from past year-round monitoring of bull trout passing upstream during out of season months (i.e. winter). The majority of tagged fish move back into the Methow River by the end of June (BioAnalysts, Inc., 2004; LGL and Douglas PUD 2008). During the six years of study and eight years of telemetry monitoring from 2001 through 2008, a total of 93 upstream passage events were detected at Wells Dam (79 of which occurred within one year of release and used in take calculations). Out of all 93 upstream passage events recorded, zero bull trout injury or mortality due to passage was observed at the Wells Project.

During the 2005 through 2008 study, 214 adult bull trout were counted passing upstream through Wells Dam. The proportion of the bull trout population at Wells Dam that was radio-tagged was 24 percent (52/214 = 0.24). The study found that Wells Project operations did not appear to influence the movements of adult bull trout. Instead, adult bull trout passage events appeared to be more closely associated with water temperature, photoperiod and time of year with rather predictable patterns of upstream and downstream movement.

Actively migrating bull trout may take additional time to pass through the Wells Dam, although no upstream or downstream passage problems were identified during the 2005 through 2008 study. Passage times upstream through the fishway appeared reasonable relative to the species migration and spawn timing.

Off-season or "winter" (November 16 to April 30) video monitoring of the Wells Dam fishways for adult and sub-adult bull trout was conducted during each of the years of this study including the winter of 2004 and 2005 as required by the BTMMP. Additional off-season counting took place during the winters of 2006, 2007, 2008 and 2009. To date, no adult or sub-adult bull trout have been observed utilizing the fishways at Wells Dam during the winter count season (LGL and Douglas PUD 2008).

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.2.4.5 Adult Downstream Passage Through the Project Reservoir and Facilities

The potential for adult bull trout to fallback is not a clear distinction when compared to other anadromous fishes. Fallback is defined as involuntary movement of a fish downstream past a dam once upstream passage has been achieved. Anadromous salmonids migrating upstream generally do not move downstream unless forced. In contrast, bull trout tend to meander both upstream and downstream to foraging opportunities creating a hazy dichotomy between volitional downstream passage and fallback. Telemetry studies have shown that bull trout have safely passed through spillways and turbines and to date no tagged fish have been injured or killed. Therefore, movement downstream is not referred to as fallback, but rather downstream passage events.

During the six years of study and eight years of telemetry monitoring, a total of 27 downstream passage events took place at Wells Dam, 19 of which occurred within one year of release and therefore used in take calculations. Radio-tagged bull trout passed downstream through the turbines or spillways as no downstream passage events were recorded via the fishways. Out of all the downstream passage events recorded, zero bull trout injury or mortality was observed at the Wells Project.

Habitat Conservation Plan

Operation of the downstream passage facilities for bull trout will be consistent with bypass operations for Plan Species identified in the Wells HCP. Currently the bypass system is operated from April 12 through August 26 of each year. This operating period is consistent with the period of high bull trout and anadromous fish presence at the Wells Project (Douglas PUD 2008b).

Douglas PUD will continue to operate the upstream fishway and downstream bypass at Wells Dam in accordance with the Wells HCP. However, if upstream or downstream passage problems for bull trout are identified (as agreed to by the USFWS and Douglas PUD), Douglas PUD, through the implementation of the BTMP, will identify and implement, in consultation with the Aquatic SWG and HCP Coordinating Committee, reasonable and appropriate options to modify the upstream fishway, downstream bypass, or operations to reduce the identified impacts to bull trout passage (Douglas PUD 2008b).

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.2.4.6 Sub-adult Passage

The second objective outlined in the BTMMP includes an assessment of Project-related impacts on upstream and downstream passage of sub-adult bull trout (fish <400 mm in length) through PIT tagging and off-season passage monitoring. During the development of the BTMMP, stakeholders agreed that because of the inability to collect a sufficient sample size of sub-adult bull trout at Wells Dam, it was not feasible to assess sub-adult passage. However, when encountered at Wells Dam, or in tributary traps, sub-adult bull trout would be PIT tagged. Douglas PUD provided funding, equipment, training, and coordination for the sub-adult bull trout PIT tag program. From 2004 to 2008, 67 sub-adult bull trout were PIT tagged in the Methow River sub-basin during standard tributary smolt trapping operations. Douglas PUD operated PIT tag detection systems year-round within the Wells Dam fishways during the study period (2005 to 2008) and no PIT tagged sub-adult bull trout were detected. Additionally, sub-adult bull trout were to be PIT tagged opportunistically when encountered at the Wells Project; however, no sub-adult bull trout were encountered at Wells Dam during the study period.

No sub-adult bull trout were observed utilizing the fishways at Wells Dam during the 2004-2008 winter count seasons.

Habitat Conservation Plan

Water is purposely spilled through the JBS to facilitate fish outmigration. Constructed in 1989, the JBS utilizes five of eleven spillways equipped with constricting barriers to help guide juvenile migrating fish away from the turbines and through a safe passage route through the dam as required by the Wells HCP. The JBS is in operation annually from mid April until late August; consistent with the period of high bull trout and anadromous fish presence at the Wells Project. This configuration and operation timing has demonstrated exceptionally high levels of protection while utilizing only 6-8 percent of the Columbia River flow. The efficiency and effectiveness of the JBS are important factors in limiting the amount of spill, and therefore TDG, while maximizing fish passage and survival. The JBS has a passage efficiency rate of 92.0 percent for spring migrating salmon and steelhead and 96.2 percent for summer migrating Chinook salmon (Skalski 1993). Douglas PUD has conducted three years of juvenile survival studies at Wells Dam which have shown an average survival rate of 96.2 percent for yearling Chinook and steelhead (Bickford et al. 1999; Bickford et al. 2000; Bickford et al. 2001). This is the highest survival rate for any dam on the Columbia or Snake rivers. It is reasonable to assume that the high survival rates shown for juvenile salmon and steelhead would be similar for juvenile bull trout.

Since most juvenile salmon and steelhead migrate near the surface, with the help of the JBS, they successfully pass Wells Dam and avoid the turbine intakes located deeper in the forebay. Because juvenile bull trout are morphologically similar to anadromous salmonids it is expected that a similarly high proportion of juveniles, if present, would also utilize the JBS. The JBS is in operation annually from mid April until late August. This operating period is consistent with the period of high bull trout and anadromous fish presence at the Wells Project.

Douglas PUD operates the JBS each year to provide a non-turbine passage route through the dam for 95 percent of the spring and summer-run juvenile plan species outmigration. The procedures set forth in the Wells HCP are intended to guide the operating criteria for the JBS. This plan also includes specific operating criteria for the turbines and spillways sufficient to maximize fish use and survival through the JBS (USFWS 2004c). A more detailed description of JBS, spillway and turbine operations may be found in Section 4.3 and Appendix A of the Wells HCP.

Operation of the spillways may result in supersaturated levels of TDG. Supersaturated gases in fish tissues tend to pass from the dissolved state to the gaseous phase as internal bubbles or blisters. This condition, called gas bubble trauma (GBT) or gas bubble disease (GBD), can be debilitating or even fatal. Injury and mortality of bull trout may also occur as a result of contact with spillway structures. It is also likely that if juvenile bull trout pass through the spillway they may be subject to increased susceptibility to predation caused by disorientation or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during spillway passage (USFWS 2004c). While challenges exist, Chapman et al (1994a, b) concluded that spillways are currently the most benign routes for juvenile salmonids to pass the mid-Columbia River dams. Based upon information collected at other hydroelectric projects, juvenile fish survival is estimated to range from 90 to 93 percent for turbines, 98 to 99 percent for bypass systems, and 98 to 99 percent for spillways (NOAA 2003).

Direct or indirect effects on adult and juvenile bull trout may occur as a result of downstream movement through turbines. These effects may include physical injury or mortality from contact with turbine structures including wicket gates, turbine runners, or the spiral case. Indirect effects may include increased susceptibility to predation caused by disorientation following turbine passage or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during turbine passage. However, based on radio-tracking studies at the Wells Dam, there has been no evidence that downstream passage via turbines has negatively affected bull trout (BioAnalysts, Inc. 2006).

Studies have not been conducted to determine the effects and survivability of passage by bull trout through Kaplan turbines. Turbine studies of other species have found that in general smaller fish survive at higher rates than larger fish (Eicher et al. 1987). All 27 downstream passage events of adult radio tagged bull trout that have been recorded at Wells Dam since the inception of telemetry studies occurred through the turbines or spillways as no downstream passage events were recorded via the fishways. Out of all the downstream passage events recorded, zero bull trout injury or mortality was observed at the Wells Project.

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.2.4.7 Water Quality

Bull trout require specific water quality characteristics that include cool water with moderate to high levels of DO. Several studies have assessed the water quality within the Wells Project and all indicate that Wells Reservoir is a healthy, riverine water body with no thermal or chemical stratification (EES 2006). Studies have also demonstrated that the water found within the Wells Project is of high quality and is in compliance with the State WQS for all of the parameters measured. Notable exceptions to meeting the State WQS included seasonal exceedances in water temperature and TDG.

The mainstem Okanogan River within and above the Project Boundary is a relatively low gradient, broad channel that warms in the summer as water slowly moves near the confluence with the reservoir. However, below the SR 97 Bridge, there is significant mixing with Columbia River water. During the very hot summer months, releases from Chief Joseph Dam are significantly cooler than the very warm temperatures upstream in the Okanogan River and serve to lower the temperature of the lower portion of the river relative to non-inundated areas (WEST 2008). This area is not used by bull trout and poses little issue to migratory or foraging species. The few instances of relatively high water temperature within the mainstem reservoir were primarily a result of upstream releases of warm water from Grand Coulee and Chief Joseph dams.

Elevated TDG levels were identified in past studies in the tailrace of the Wells Dam. Each year from 2003-2008 during spring-runoff, Douglas PUD has undertaken spill tests to examine the relationship between water spilled over the dam and the production of TDG. These studies have helped Douglas PUD to modify spill operations and significantly reduce TDG in the Wells tailrace to levels that are in compliance with state water quality criteria for TDG during the fish passage season. Additional studies have also shown that passage survival at the dam is 96.2 percent for juvenile salmon and steelhead. This is the highest survival rate for any dam on the Columbia or Snake rivers and at the same time, the contribution to TDG levels downstream by the juvenile bypass system at Wells Dam is negligible (0-2 percent). Successful passage by juvenile and adult anadromous salmonids suggests that water quality is not posing a notable risk to the survival of bull trout.

No effect was identified that related to any of the proposed measures.

4.2.4.8 Water Quantity

The quantity of water flowing through the Wells Project can create alterations to the reservoir environment that may affect bull trout. These alterations may include fluctuations in reservoir stage that may strand individuals in near shore habitat or possibly increase interaction with predators due to lower water volume.

The Wells Project is a run-of-river project meaning that average daily inflow equals daily outflow. As a result, the limited active storage capacity is only sufficient to regulate flow on a daily basis. Alterations in water volume or reservoir fluctuations are minimal and largely driven by the discharge of water from Chief Joseph Dam and Grand Coulee Dam. Typical operational fluctuations of the Wells Project are gradual, repetitive changes in reservoir stage that occur on a daily basis and generally result in reservoir elevation fluctuations of one to two feet (see Figure 2.3-1). During the five year operation period from 2001 through 2005, the reservoir has typically operated within the upper four feet (781 to 777 feet MSL in elevation) 95.1 percent of the time (DTA 2006). Further, no stranding was observed during stranding surveys for bull trout in 2006 and 2008 (DTA 2006).

No effect was identified that related to any of the proposed measures.

4.2.4.9 Riparian Cover

Riparian cover can provide important habitat for rearing sub-adult bull trout species. Significant riparian cover is found in riverine areas and is limited in lacustrine environments. In general, riparian cover is generally not sought after when bull trout initiate migratory behavior and reside within large rivers and lake systems more similar to the Wells Reservoir. Spawning and rearing habitat occurs in fluvial systems found within the upper Methow River which is outside of the action area and are not affected by the operation of the Wells Project.

The banks of the Wells Project offer limited riparian cover. This is largely a result of the typical lack of riparian cover in natural high desert ecosystems that define the Wells Project.

Habitat Conservation Plan

Additional funds provided by Douglas PUD for restoration measures occurring outside of the Wells Project are detailed in the TCP. Douglas PUD-funded projects will improve habitat and potentially increase riparian cover. The potential for such riparian restoration to occur is contingent upon review and approval by the Wells HCP Tributary Committee.

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.2.4.10 Critical Habitat

Bull trout critical habitat was designated by USFWS in 2005 (70 FR 56212). Designated critical habitat for bull trout does not occur in the Wells Project. However, new critical habitat was proposed January 14, 2010 (75 FR 2270) to include all of the Wells Project waters except the Okanogan River. USFWS submission of a final bull trout critical habitat designation to the federal register is due September 30, 2010. Therefore, the proposed action will have no effect on designated bull trout critical habitat, and should not adversely affect or modify proposed bull trout critical habitat.

4.2.5 Determination of Effects

The following section provides a summary matrix (Table 4.2.5-1) of the potential effects described above and draws an effects determination based upon the dichotomous key developed by USFWS (1998b).

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Table 4.2.5-1 Summary Effects Matrix for Bull Trout within the Wells Project.

Critical Habitat	Project Effect	Upper Columbia River Subbasin Designated Area Affected	Exposure over 50-year Duration of Proposed Action	Response	Limiting to Conservation
Spawning, incubation and larval development	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, Aquatic Settlement actions, and action described in the Terrestrial Resources Management Plans.	The defined Action Area representing Wells Reservoir and surrounding tributaries	Spawning occurs more than 50 miles and 1,500 feet in elevation above the Wells Project Boundary in the upper reaches of the Methow River drainage.	Not significant. The reservoir does not support suitable spawning conditions	No effect
Rearing and migration within the Project	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, predator removal, Aquatic Settlement actions, and action described in the Terrestrial Resources Management Plans.	The defined Action Area representing Wells Reservoir and surrounding tributaries	Migratory life stages have been documented moving into Wells Reservoir for foraging. Sub adults have been documented passing over other mid Columbia projects, but not at the Wells Project.	Radio telemetry studies show that no individuals have been injured during passage through the Well Project. No bull trout have been captured during pikeminnow removal. Implementation of the Aquatic Settlement is not expected to result in incidental take of sub-adult or migratory bull trout.	Unlikely
Tributary rearing and migration (outside PB)	HCP Hatchery and Tributary Projects	The defined Action Area representing the Methow and Okanogan Rivers influenced by hatchery and tributary programs	Sub-adults and migratory life stages pass over brood stock traps and have been documented eating spring Chinook and steelhead released by hatchery programs.	Radio telemetry studies show that no individuals have been injured during passage through the ladder traps at Wells Dam or in passing over the Twisp Weir. For predator control, the potential for take is limited to longline angling, and to date, incidental catch of bull trout is zero. Small dead crickets fished on the bottom of the river with very small hooks has resulted in no bull trout captures while allowing the removal of 154,000 pikeminnow over the past 10 years.	Unlikely
Passage through Project reservoir and facilities	Predator control	Columbia River Corridor	Exposure will only occur during residence in the reservoir.	Not significant - potential for take is limited to longline angling, and to date, incidental catch of bull trout is zero. Small dead crickets fished on the bottom of the river with very small hooks has resulted in no bull trout captures while allowing the removal of 154,000 pikeminnow over the past 10 years.	Unlikely
Passage through Project reservoir and facilities	Adult upstream fish passage	Columbia River Corridor	Entire migration period (May through November)	Not significant - successful passage has been documented in fishways through observation and telemetry. No evidence of injury or incidental take during passage had been observed during more than 7 years of study	Unlikely
	Adult downstream fish passage	Columbia River Corridor	Year Round	Not significant - 27 radio tagged individuals safely navigated downstream without notable injury. Most downstream passage events take place during the operation of the juvenile fish bypass system (April – August. To date 27 migratory-sized bull trout have moved downstream through Wells Dam with no recorded injuries or incidental take. Fallback of upstream migrants has not been observed.	Unlikely

Table 4.2.5-1 (Continued) Summary Effects Matrix for Bull Trout within the Wells Project.

Water Quality	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, Aquatic Settlement actions; actions described in the Terrestrial Resources Management Plans, increased TDG levels, elevated water temperature.	Columbia River Corridor	Exposure takes place during reservoir rearing periods. Most bull trout leave the reservoir during the summer to avoid water temperatures above 15° C and to be on the spawning grounds by September when staging for spawning begins. No sub-adult bull trout have been detected utilizing the Wells Reservoir. The bull trout MP will help identify timing and exposure.	Not significant - Studies indicate that the Wells Project has minimal impact on DO, ph, turbidity and water temperature. TDG levels can be elevated but rarely exceed 120% in the tailrace of Wells Dam. Operations have been tailored to provide conditions sufficient to achieve passage survival standards. Primary influence on water temperature is from Lake Roosevelt storage releases. Implementation of the Water Quality Management Plan is expected to improve water quality in the Wells Project.	Unlikely
Water Quantity	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, Aquatic Settlement actions and actions described in the Terrestrial Resources Management Plans.	Columbia River Corridor	Exposure takes place during reservoir rearing periods.	Not significant - Wells Project is operated in a run-of-river mode, with water quantity largely dependent on incoming river flows. The project is not a consumptive user of water. In general daily inflows from Grand Coulee and Chief Joseph are equal to daily discharge at Wells Dam.	Unlikely
Riparian Cover	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, Aquatic Settlement actions and actions described in the Terrestrial Resources Management Plans.	Columbia River Corridor and tributaries within Project Boundary	Exposure takes place during reservoir rearing periods.	Not significant - proposed action will have no impact on the limited natural riparian cover along the mainstem Columbia River, which is not typically used by migrating fish. Tributary enhancements funded through the HCP Tributary Committee are expected to benefit riparian cover in the Methow River Basin.	Unlikely

Application of USFWS (1998b) decision matrix dichotomous key to determine potential effects on bull trout.

The following is a stepwise assessment of potential effects on bull trout based on a dichotomous key developed by USFWS (1998b)

Step 1. Are there any listed or proposed species present in the watershed?

Yes. Bull trout are a listed species that occur in Wells Reservoir, tailrace and the Methow River watershed. Radio tracking has shown that the Wells Project primarily serves as a migratory corridor. The potential also exists for sub-adult and adult bull trout to be foraging within the mainstem Columbia River (i.e., Wells Reservoir) throughout the year. Releases of juvenile hatchery salmonids have also shown to concentrate adult bull trout in the Wells Hatchery outfall channel, where increased prey availability exists.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

Yes. The proposed action may result in delay, stress or mortality during passage through Wells Project facilities. Sub-adult bull trout may be exposed to increased predation by pikeminnow or white sturgeon during migration. Downstream passage by sub-adults may subject bull trout to injury or mortality through interaction with turbine, spillway, or juvenile bypass system structures. Adults passing through the fish ladder or Twisp weir may exert increased levels of energy. Sub-adults or adults passing through the Wells Project tailrace may experience high levels of TDG, causing stress or injury.

The overall potential for these identified effects to impact the core population of bull trout is low. Bull trout primarily reside in tributary habitat where documented Wells Project effects are absent. The number of bull trout passing through the Wells Project facilities is limited (annual average is 64 total from 1998 – 2008) when compared to other projects such as Rocky Reach (annual average is 155 total from 1998-2008). None of the 67 sub-adult bull trout PIT tagged in the Methow River from 2004 – 2008 were detected at the Wells Dam (Douglas PUD 2008b) and no sub-adult bull trout have been counted by the video fish counting system located in the fish ladders at Wells Dam. Longline predator control efforts have also never captured a bull trout or any other salmonid, displaying the effective selectivity of the control method. From telemetry research, passage at the dam has little documented effect (Douglas PUD 2008b). Passage times were reasonable relative to the species migration and spawn timing. Out of all the adult downstream passage events recorded, zero bull trout injury or mortality was observed at the Wells Project. Wells Project facilities have shown an average survival rate of 96.2 percent for yearling Chinook and steelhead (Bickford et al. 1999; Bickford et al. 2000; Bickford et al. 2001). It is reasonable to expect that the survival rates for juvenile bull trout would be similar to the high survival rates shown for juvenile salmon and steelhead.

Fishway operations and closely monitored spill control measures are expected to further reduce the potential for take and minimize TDG levels. Twisp weir trapping operations for anadromous salmonids are closely monitored, and to date no effects on bull trout have been detected, minimizing potential for take.

The proposed action will also result in positive effects to bull trout that may exceed the potential negative impacts described above. Existing management efforts and the implementation of the BTMP and Wells HCP will provide benefits to bull trout. Predator control efforts will continue to reduce the number of northern pikeminnow. Artificial enhancements through the Hatchery Management Plan will produce increased numbers of salmonids, resulting in a more robust number of prey that may be available to bull trout and an increase in marine derived nutrients in the Methow and Columbia rivers. The Tributary Enhancement Plan will also help to restore habitats used for spawning and rearing outside of the Wells Project area.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

Yes. Although lethal take of bull trout has not been observed at any passage facilities or during other Project-related activities, the operation of any passage facilities is expected to have some potential risk of causing immediate or inevitable mortality. Adverse affects are all other situations that cause a temporary, but not life-threatening impact. The low potential of bull trout mortality, small numbers of bull trout passing the counting facilities and the lack of documented events do not permit an accurate estimation of lethal take. As a conservative estimate, take rates established by USFWS and NMFS for spring Chinook and steelhead represent a combined 91 percent juvenile and adult survival requirement. Applying the same criteria to bull trout would provide a reasonable baseline to research and manage future bull trout passage. The likelihood of utilizing the nine percent take is unlikely as Project- related bull trout mortality has not been documented to date and survival for salmon and steelhead at Wells facilities was estimated based upon mark-recaptures studies at over 96 percent (Bickford et al. 1999; Bickford et al. 2000; Bickford et al. 2001). Additional monitoring and adaptive management within the BTMP will also help to limit the likelihood of lethal take.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. Designated critical habitat for bull trout does not currently occur in the Wells Project area.

Based on application of these criteria, the determination of effects of this proposed action on bull trout is: MAY EFFECT, LIKELY TO ADVERSELY AFFECT bull trout and NO EFFECT on designated critical habitat. The designation of 'likely to adversely affect' is established on the individual bull trout level and not the population level. The primary basis for reaching this determination was to allow for the potential of any situation where documented individual bull trout mortality may occur. Given that bull trout mortality has never been documented in the Wells Project over the eight years of monitoring, the potential is notably low. The more realistic potential effect would likely not exceed temporary harassment from Project operation or possible delay in migration.

Although individual bull trout would be subject to take, the proposed action would not jeopardize the continued existence of the species or DPS. Habitat components for spawning and rearing lie outside of the Wells Project. Further, the TCP will work to protect and restore important spawning grounds. PM&Es provided by the BTMP and ongoing monitoring and adaptive management by Douglas PUD will work to protect and sustain existing bull trout populations.

4.3 SPRING CHINOOK

The NMFS final determination to list the UCR spring-run Chinook salmon as an endangered species under the federal ESA was issued on March 24, 1999 (64 FR 14308); endangered status was reaffirmed on June 28, 2005 (70 FR 37160). The ESU includes all naturally spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington (excluding the Okanogan River), as well as six artificial propagation programs: the Twisp River, Chewuch River, Methow Composite, Winthrop NFH, Chiwawa River, and White River spring-run Chinook hatchery programs (NMFS 2009).

On April 4, 2002, NMFS defined interim abundance recovery targets for each spawning aggregation in this ESU. These numbers are intended to represent the number and productivity of naturally-produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR spring-run Chinook salmon which pass through the Project, the interim recovery level is 2,000 spawners in the Methow River (NMFS 2002b).

4.3.1 Life History

The Ecologically Significant Unit (ESU) for UCR spring-run Chinook salmon includes all naturally reproducing populations in all river reaches accessible to Chinook salmon in the mid-Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam, excluding the Okanogan River. NMFS has initially identified three important spawning populations within this ESU: the Wenatchee, Entiat, and Methow river populations (NMFS 2002a). These populations are genetically and ecologically separate from the summer/fall run populations in the lower parts of many of the same river systems. Hatchery reared Chinook salmon (and their progeny) from the following stocks are considered part of the listed ESU: Chiwawa River, Methow River, Twisp River, Chewuch River, White River, and Nason Creek.

NMFS determined that spring Chinook salmon are at risk of becoming extinct in the foreseeable future, listing them as endangered under the ESA on March 24, 1999 (64 FR 14308). NMFS reaffirmed their listing determination on June 28, 2005 (70 FR 37160). On April 4, 2002, NMFS adopted the Upper Columbia Salmon Recovery Board (UCSRB) Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan as its final recovery plan for upper Columbia spring Chinook and steelhead (UCSRB 2007). This plan defined abundance recovery targets for each spawning aggregation in this ESU. These numbers are intended to represent the number and productivity of naturally produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self sustaining in its natural ecosystem. For spring Chinook salmon, recovery levels are 2,000 spawners in the Wenatchee River, 500 spawners in the Entiat River, and 2,000 spawners in the Methow River (UCSRB 2007).

The construction of Grand Coulee Dam (completed in 1942) blocked anadromous fish access to habitat upstream of RM 596.6 after 1938. The concurrent Grand Coulee Fish Management Plan (GCFMP) influenced the present distribution of the ESU. Production of non listed Carson-origin spring run Chinook salmon has also taken place within the UCR spring-run Chinook salmon ESU. Non listed spring run Chinook salmon hatchery populations contained within this ESU include fish from the Leavenworth, Entiat, and Winthrop National Fish hatcheries.

Methow River spring Chinook salmon exhibit classic stream type life history strategies, emigrating from freshwater as yearling smolts and undertaking extensive offshore ocean migrations. The majority of these fish mature at 4 years of age and return to the Columbia River from March through mid May. In the mid-Columbia River Basin, Chinook salmon passing Wells Dam before June 28 are considered spring Chinook salmon (NMFS 2002a).

After entering the Methow River and other mid-Columbia tributaries, adult spring Chinook salmon hold in the deeper pools and under cover until the onset of spawning. They may spawn near their holding areas or move upstream into smaller tributaries. Spawning generally occurs from late July through September and typically peaks in late August, although the peaks vary among tributaries (Chapman et al. 1995). Spring Chinook salmon eggs hatch in late winter and the fry emerge from gravel in April and May (Chapman et al. 1995). Most of these juveniles (73-193mm in size) rear in tributary headwater streams for 1 year before migrating to the ocean, typically during the months of April, May, and June (Douglas PUD 2002).

4.3.2 Presence in Action Area

Between the years of 1998 and 2007 the number of spring Chinook salmon migrating over Wells Dam has averaged 4,345 adults a year and ranged from 345 adults in 1999 to 10,871 adults in 2001 (Table 4.3.2-1).

Table 4.3.2-1 Annual Count of Spring Chinook Salmon Migrating Over Wells Dam.

Year	Number Counted	Year	Number Counted
		2003	4,702
		2004	4,793
1998	363	2005	4,996
1999	345	2006	4,376
2000	2,587	2007	2,793
2001	10,881	Average	3,735
2002	7,626		

Source: CBFAT 2009

The primary spawning areas for spring Chinook salmon are the mainstem Methow River upstream of the Chewuch River confluence, the Twisp, Chewuch, and the Lost rivers, and Thirtymile and Lake creeks. Spawning is observed occasionally in the Methow Hatchery outfall and Foghorn Ditch as well, but it is likely that the fish spawning here are of hatchery origin. A very limited amount of spawning has also been reported in Early Winters, Wolf, and Gold creeks (NMFS 2002a). Documented spawning sites for spring Chinook in the Methow drainage are located 40 miles upstream of the Wells Project Boundary which extends up to RM 1.5 on the Methow River.

Upon hatching, spring Chinook salmon generally rear in their natal tributary streams for one year prior to migrating to the ocean. Spring Chinook salmon utilize the mainstem Columbia River primarily as a migration corridor and as a result, they spend little time rearing in Wells Reservoir (NMFS 2002a).

4.3.3 Critical Habitat Designations

The mainstem Columbia River from the Wells Tailrace to the confluence of the Columbia and Methow rivers, along with the accessible portions of the Methow River Basin, are included in the critical habitat listed for spring Chinook in the Wells Project area (70 FR 52731).

4.3.4 Environmental Measures and Analysis of Effects

The objective of the Wells HCP is to achieve NNI for each Plan Species (spring Chinook, UCR summer/fall-run Chinook salmon, Okanogan River sockeye salmon, steelhead and coho salmon). The Wells HCP outlines a schedule for meeting and maintaining NNI throughout the 50-year term of the agreement. NNI consists of two components: 1) a 91 percent combined adult and juvenile Wells Project survival standard achieved by Wells Project improvement measures implemented within the geographic area of the Wells Project, and 2) up to 9 percent compensation for unavoidable Wells Project related mortalities. Compensation to meet NNI is provided through a hatchery and a tributary program under which 7 percent compensation is provided through hatchery production and 2 percent compensation is provided through the funding of enhancements to tributary habitats that support Plan Species. The Wells HCP also requires the formation of four committees that are used to implement, monitor and administer the agreement namely a policy, coordinating, hatchery, and tributary committee.

The Wells HCP contains various plans for implementing the components of the agreement. These plans include the Passage Survival Plan (HCP Section 4), Wells Dam Juvenile Dam Passage Survival Plan (HCP Section 4.3), TCP (HCP Section 7), Hatchery Compensation Plan (HCP Section 8), Adult Passage Plan (HCP Section 4.4 and HCP Appendix A) and a Predator Control Program (HCP Section 4.3.3). These plans were developed specifically to enhance populations of Plan Species with particular emphasis placed upon the enhancement and recovery of spring Chinook.

Considerable planning, monitoring, research and action have been implemented to ensure that the Wells Project operates in a manner that is supportive of spring Chinook salmon. Mitigation and operational activities address all critical components of the life history of the species. Each critical component of spring Chinook is addressed below.

4.3.4.1 Spawning, Incubation, and Larval Development

Reproduction and early development of spring Chinook occurs in the surrounding tributaries of the Wells Project. Spawning and larval rearing do not occur in or near the Wells Project reservoir. Tributaries used include: the Methow River upstream of the Chewuch River confluence, the Twisp, Chewuch, and Lost rivers, and Thirtymile and Lake creeks. While Project-related mitigation (hatchery and tributary) activities do occur in select tributaries represented above, the location of the spawning is in the upper regions of the tributaries. As a result, utilized areas lie outside of the Wells Project action area. Therefore, reproduction and early development of spring Chinook will not be affected by Wells Project related activities or operations.

No effect was identified for any of the proposed measures.

4.3.4.2 Rearing and Migration Within the Project

Spring Chinook spend the majority of their early development rearing in Wells Project tributaries above the Wells Project. As these larval fish mature to fry and then yearling smolts, they emigrate downstream through the Wells Project from April through June on their outbound journey to the ocean. Smolt emigration is at a relatively consistent rate that provides little sedentary behavior for feeding or holding in the lower Wells Project tributaries or reservoir. As a result the lower Methow and Wells reservoir serve primarily as a migratory corridor as juveniles pass through.

Smolt exposure to Wells Project effects is for a brief duration and limited extent primarily for fish migrating from the mouth of the Methow River to Wells Dam (a distance of 7 miles). Survival standards set by the HCP ensure that survival will be at or above 93 percent for spring Chinook smolts migrating through the Wells Project. Current monitoring indicates juvenile project survival is greater than 96 percent. Potential effects that may occur during the migration through the Action Area include reservoir stage fluctuation, reservoir impoundment, and predator exposure. The Wells Project has a 10 feet operating range, but typically operates within the upper one to two feet of the reservoir on any given day. During the five year operation period from 2001 through 2005, the reservoir has typically operated within the upper four feet (elevation 781 to 777 feet MSL in elevation) 95.1 percent of the time (DTA 2006). Infrequent operations resulting in fluctuations over four feet in a 24-hour period have occurred 1.1 percent of the time from 2001 through 2005, and are discussed in Section 2.4 (DTA 2006). Reservoir stage fluctuation is a result of the "run-of-river" operations inherent to the multi-reservoir Columbia River projects. Water that is scheduled to arrive from the upstream reservoir is released in the current storage of Wells Reservoir to accommodate receiving capacity.

Reservoir impoundment and predator exposure are linked components of Wells Project effects that result from the reduced velocity and stability of the reservoir environment. The slowed downstream flow velocity within the reservoir increases the smolt travel time from the natal tributary to below the dam. The reservoir environment also favors northern pikeminnow, which are a natural predator to migrating smolts. The increased migratory period within the reservoir and resultant elevated exposure to pikeminnow predation may pose a brief Project effect. To address this issue, a predator removal program was created to reduce the number of pikeminnow in the reservoir and tailrace of Wells Dam. In 1998, NMFS determined that the NPRP resulted in a net benefit to listed anadromous Columbia River salmonids (NMFS 1998).

Habitat Conservation Plan

Increased predator populations in Wells Reservoir may result in increased interaction rates with spring Chinook and unnatural salmon mortality. Conversely, predator removal may also result in harassment, capture and potential mortality of salmon. To address these issues, Section 4.3.3 of the Wells HCP requires Douglas PUD to implement a targeted northern pikeminnow, piscivorous bird and piscivorous mammal harassment and control program to reduce the level of predation upon salmonids in the Wells Project with minimal effect on salmonids.

Northern pikeminnow are native predators of juvenile Chinook salmon, and can rapidly increase in number in the absence of active management efforts. From inception in 1995 through 2007 Douglas PUD's NPRP has captured over 154,000 northern pikeminnow. These efforts are designed to provide an immediate and substantial reduction in the predator populations present within the waters of the Wells Project. There is a potential for individual salmon to be caught during operation of the northern pikeminnow removal program, although in the entire history of the program no Chinook salmon have ever been captured.

The NPRP has included a northern pikeminnow bounty program, participation in fishing derbies and tournaments, hook and line fishing by experienced anglers and the use of longline fishing equipment. Currently only longline fishing and fishing derbies are utilized. From 1995-1999, the NPRP implemented by Douglas PUD consisted mainly of experienced anglers using hook and line techniques to remove northern pikeminnow from Wells Project waters. Traditionally, hook and line angling has lacked the ability to target species specifically.

More recently (2000-present), the NPRP has shifted to a longline fishing system. This system has proven to be more cost efficient and effective at targeting northern pikeminnow. Longline fishing gear has a low probability of catching Chinook by fishing deeper in the water column using small hooks typically baited with dead crickets. Lines are checked daily in order to release any species other than northern pikeminnow. To date the incidental catch rate of all salmon by longline operations is zero.

Aquatic Settlement Agreement

The Aquatic Settlement Agreement includes implementation of the white sturgeon and resident fish management plans associated with and operation of the predator control program.

Increased predation may result from the enhancement of known native predators of UCR spring Chinook. One objective of the WSMP is to enhance white sturgeon populations through artificial propagation. The increased number of sturgeon may result in an elevated potential for predation. The WSMP has provisions for adaptive management of supplementation activities should conflicts develop between stocked sturgeon and ESA-listed species. The WSMP includes an intensive monitoring and evaluation program that will be used to adjust the number of juvenile sturgeon stocked in the Wells Project and will be used to inform harvest management for adult sturgeon.

Other predation threats include piscivorous birds and mammals. The primary focus of managing these species at propagation facilities is not removal but hazing and access deterrents. Hazing includes propane cannons, pyrotechnics and the physical presence of hazing staff. Access deterrents include steel wires across the hatchery ponds and tailrace, fencing and covers for hatchery ponds, and electric fencing. When hazing and access deterrents fail, options for removal are also implemented by the USDA Animal Control staff hired to conduct the hazing programs. The minor increase in human activity as a result of these predator control measures is unlikely to adversely affect salmon.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.3.4.3 Tributary Rearing and Migration

Activities associated with the operation of the Wells Project also take place in upper portions of the tributaries outside of the Project.

Habitat Conservation Plan

The TCP found in Section 7 of the Wells HCP guides the funding and allocation of dollars from the Plan Species Account. The intended goal of the dollars allocated to the Plan Species Account is to compensate for up to two percent unavoidable adult and/or juvenile mortality of Plan Species passing through Wells Dam. The purpose of the Plan Species Accounts is to fund protection and restoration of tributary habitats for Plan Species within the Wells Project Boundary, and within the portions of the Methow and Okanogan rivers that are accessible to Plan Species.

A detailed description of the TCP, the Plan Species Account, and its allowable uses can be found in Section 7 of the Wells HCP. Some direct and indirect effects to spring Chinook may occur resulting from implementation of actions funded by the TCP. A separate Section 7 consultation is initiated for actions associated with the TCP.

The Tributary Coordinating Committee, comprised of various fisheries agencies and the Tribes, is guided by the general strategy outlined in supporting documents (see TCP) to the Wells HCP. The premise of the TCP is to protect existing productive habitat and restore high priority habitats by enhancing, when practical, natural processes that, over time, will create and maintain suitable habitat conditions without human intervention. The NMFS representative on the Tributary Committee ensures that any take resulting from these activities is minimized.

In accordance with the Wells HCP, the TCP provides funding to third-party conservation efforts in the Methow and Okanogan river basins. Habitat restoration projects and plans to purchase conservation easements or land in fee are submitted to the TCP committee. Examples of projects funded by the TCP may include, but are not limited to: 1) providing access to currently blocked stream sections or oxbows; 2) removing dams or other passage barriers on tributary streams; 3) improving or increasing the hiding and resting cover habitat that is essential for these species during their relatively long adult holding period; 4) improving in-stream flow conditions by correcting problematic water diversion or withdrawal structures; or 5) purchasing (or leasing on a long-term basis) conservation easements to protect or restore important aquatic habitat and shoreline areas.

The Tributary Committee decides if the projects meet criteria for funding. Projects must reviewed by state and federal agencies to receive permits for construction projects. Tributary habitat projects will benefit spring Chinook through the protection and enhancement of critical habitat (USFWS 2002a). Projects that increase instream flow volume in the Methow Basin will benefit all life stages of spring Chinook by enhancing migration corridors, pool depth, in-stream cover, and preferred water temperatures.

Habitat restoration projects will require a period of construction that may result in short term disturbances such as noise, increased turbidity, and human presence. These projects are expected to result in positive benefits for spring Chinook by creating additional aquatic habitat or removing upstream migration barriers, allowing spring Chinook access to historically utilized watersheds.

Some potential activities (e.g., removal of large stream channel blockages or reconnecting side channels, etc.), may produce short-term unavoidable negative effects (e.g., incidental injury or mortality of individual fish, temporarily increase sediment loads and turbidity, etc.) as a result of funding restoration projects in the Methow River. In-stream restoration projects that have the potential to disturb spring Chinook or habitat will be required to go through a separate ESA Section 7(a)(2) consultation and authorization of incidental take of ESA-listed Permit Species.

In the long-term, any actions designed to remove migration barriers, stabilize stream channels and restore hydraulic equilibrium, increase riparian canopy cover, or increase base flows are expected to far outweigh small short term impacts and result in beneficial effects for spring Chinook.

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.3.4.4 Adult Upstream Passage Through the Project Reservoir and Facilities

Four specific components of the adult migrations upstream and downstream of the Well's Dam may affect anadromous fish: delay at project fishways, fallback, passage success at project structures, and injuries and mortalities resulting from upstream (via fishways) as well as downstream (via turbines, spillways, or juvenile bypass systems) passage through the Wells Project. Each of these components has the potential to increase pre-spawning mortality (NMFS 2002a). Juvenile anadromous fish may experience increased mortality during their migration to the ocean as a result of passage through the Wells Project.

Upstream passage of adult spring Chinook through the fish ladders at Wells Dam has historically occurred from April through early July. Wells Dam has two adult fish ladders, located on the east and west ends of the hydrocombine. Spring Chinook utilize these ladders to pass upstream of the Wells Project. Each of the two fishways contains a single main entrance, a collection gallery, a fish ladder, an adult count station, trapping facilities, and an exit in the forebay adjacent to the earthen embankment section of the dam.

Fishways are inspected daily to ensure debris accumulations are removed, automated fishway instruments are calibrated properly and lights in the fishway are functioning. Both upstream fishway facilities (located on the west and east shores) are operational year around with maintenance occurring on each fishway at different times during the winter to ensure that one upstream fishway is always operational. Maintenance activities on Wells fishways occur during the winter when spring Chinook are unlikely to pass Wells Dam.

Habitat Conservation Plan

The Passage Survival Plan contained within Section 4 of the Wells HCP provides specific detail regarding the implementation and measurement of unavoidable juvenile and adult losses for each of the Plan Species passing through Wells Dam. This section of the plan also contains specific survival standards that must be achieved within defined time frames in order for Douglas PUD to be considered in compliance with the terms of the Wells HCP (Douglas PUD 2002).

The Adult Passage Plan is a subcomponent within the larger Passage Survival Plan contained within Section 4.4 and Appendix A of the Wells HCP. The Adult Passage Plan is intended to ensure safe and rapid passage for adult Plan Species as they pass through the fish ladders at Wells Dam. The plan contains specific operating and maintenance criteria for the two adult fish ladders and the two adult fish ladder traps, and provides details regarding the implementation of passage studies on adult Plan Species including studies related to passage success, timing, and rates of fallback.

Using available telemetry studies, NMFS (2002a) compared the migration rates of adult Chinook salmon, steelhead, and sockeye salmon through both impounded (dams and reservoirs) and unimpounded reaches of the Snake, mid-Columbia, and Lower Columbia rivers. In each case, migration rates (miles/day) through the mid-Columbia River generally exceeded migration rates through unimpounded reaches of the Snake or Columbia rivers and were very similar to those observed in other impounded reaches (13 to 36 miles/day versus 6 to 19 miles/day in unimpounded reaches or 15 to 40 miles/day in other impounded reaches, respectively). A similar study by English et al. (2006) reached similar conclusions during comparison of migration rates of steelhead through the mid-Columbia River when compared to unimpounded reaches of the Skeena and Fraser rivers.

NMFS (2002a) concluded that this body of information strongly suggests that small delays at mid-Columbia River dams are more than compensated for by faster travel through the reservoir impoundments. In addition, any delays that do occur are more likely to affect species that spawn soon after completing their migration (summer/fall-run Chinook salmon or sockeye salmon are more likely to be affected than those that hold in the rivers or streams for considerable periods of time prior to spawning [i.e., steelhead or spring Chinook salmon]). The effect of delays passing the fishway (hours to a few days) on Permit Species is likely non-existent for currently ESA-listed Plan Species and non-existent to very small for currently unlisted Plan Species. Thus the proposed action should have no effect, or a slight beneficial effect, on upstream migrating adults compared to the migration observed under unimpounded conditions.

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.3.4.5 Adult Downstream Passage Through the Project Reservoir and Facilities

The potential for adult spring Chinook to "fallback" through the dam once they have exited the fish ladder may result in injury due to contact with structural features of the dam (spillways, turbines, juvenile bypass, and fish ladder). Fallback is defined as voluntary or involuntary movement of a fish downstream past a dam once upstream passage has been achieved.

Habitat Conservation Plan

Fallback rates of spring Chinook salmon at the Project are low. Studies indicate that fallback rates at the Wells Project for spring or summer-run Chinook salmon are 3.6 to 5 percent (NMFS 2002a). Survival standards from the Wells HCP ensure that survival will be at or above 98 percent survival. Adult PIT-tag studies demonstrate survival is greater than 98 percent for the project (Douglas PUD and Anchor Environmental, L.L.C. 2009). The majority of fallback takes place through the JBS. Some mortality may occur through turbine and spillway passage, but overall survival is expected to be high with the JBS in operation during the entire spring Chinook migration and fallback time frame.

Passage success and survival at dams using radio telemetry methods cannot be used to isolate specific cause and effect relationships between passage and reproductive success. In addition to possible project related passage problems (inadequate attraction flow, poor design, project operations) numerous non-project related factors can result in failed passage success. Fish that fail to ascend the dam may also be destined for a downstream spawning location or may have been injured prior to reaching the dam (as a result of natural or other effects) or may have been injured or harvested during commercial, ceremonial, and subsistence, or recreational fisheries. Tagging effects or loss of tags can also be manifested in the data set and affect these conclusions, none of which are related to operation of the facilities (NMFS 2002a). As a result, information obtained from radio telemetry studies provides a general rather than cause and effect assessment of passage success over dams, and can be used to develop an index to assess annual improvements in passage (NMFS 2002a).

NMFS has summarized the available radio telemetry studies in order to estimate per project adult survival for each of the ESA-listed species through the mainstem Snake River and Columbia River Federal hydroelectric projects, dams, and reservoirs that are similar to the mid-Columbia hydroelectric projects. NMFS believes that the estimates made for species at these projects are generally applicable to the FERC-licensed projects on the mid-Columbia River for both listed and unlisted Permit Species. Estimates of average per-project mortality rates based on this analysis are 2.4 percent for spring Chinook salmon (NMFS 2000a, based on data in NMFS 2000b). More recently, adult PIT-tag estimates from 2008 indicate survival is greater than 98 percent (Douglas PUD and Anchor Environmental, L.L.C. 2009).

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.3.4.6 Juvenile Passage

Habitat Conservation Plan

The Passage Survival Plan contained within Section 4 of the Wells HCP provides specific detail regarding the implementation and measurement of unavoidable juvenile and adult losses for each of the Plan Species passing through Wells Dam. This section of the plan also contains specific survival standards that must be achieved within defined time frames in order for the licensee to be considered in compliance with the terms of the Wells HCP (Douglas PUD 2002).

Additionally, Section 4.3 of the Wells HCP contains specific criteria directed at the Wells JBS, spillway, and turbine operations. This section of the Wells HCP outlines specific bypass operational criteria, operational timing and evaluation protocols to ensure that at least 95 percent of the juvenile Plan Species passing through Wells Dam are provided a safe, non-turbine passage route around the dam. The operational dates for the bypass are set annually by unanimous agreement of the parties to the Wells HCP. This plan also includes specific operating criteria for the turbines and spillways sufficient to maximize fish use and survival through the juvenile bypass system (USFWS 2004b). The Wells bypass system is an important feature of the Wells Project that contributes significantly to Douglas PUD's ability to achieve the NNI survival standards outlined in the Wells HCP.

The JBS utilizes five of eleven spillways equipped with constricting barriers to help guide juvenile migrating fish. Since most juvenile salmon migrate near the surface, with the help of the bypass system, they successfully pass Wells Dam and avoid the turbine intakes located deeper in the forebay. Over the past several years the HCP committee has agreed to initiate the operation of the bypass system on April 12 and to shut it down on August 26. This operating period is consistent with greater than 95% of juvenile spring Chinook downstream migration.

The JBS serves as an effective method of bypassing fish away from turbines and safely over the dam. This configuration has demonstrated exceptionally high levels of protection while utilizing only 6-8 percent of the Columbia River flow. The efficiency and effectiveness of the bypass system are important factors in limiting the amount of spill, and therefore TDG, while maximizing fish passage and survival.

Operation of the spillways may result in supersaturated levels of TDG. Supersaturated gases in fish tissues tend to pass from the dissolved state to the gaseous phase as internal bubbles or blisters. This condition, GBT or GBD, can be debilitating or even fatal. Injury and mortality of spring Chinook may also occur as a result of contact with spillway or turbine structures. It is also likely that juveniles that successfully pass through the spillway may be subject to increased susceptibility to predation caused by disorientation or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during spillway passage (USFWS 2004c).

Based upon information collected at other hydroelectric projects, juvenile fish survival is estimated to range from 90 to 93 percent for turbines, 98 to 99 percent for bypass systems, and 98 to 99 percent for spillways (NOAA 2003). Some juvenile mortality is associated with all dam passage routes; although the highest levels of mortality typically occur during passage through turbines. Consequently, an important objective of project operations aimed at improving juvenile survival is to route the highest possible proportion of juveniles past the project in a manner that avoids passage through turbines. The proportion of smolts that pass a project through bypasses or over spillways is an important indicator of the effectiveness of fish passage protection measures.

Survival standards outlined in the Wells HCP ensure that survival will be at or above 93 percent. Douglas PUD has conducted three years of juvenile survival studies at Wells Dam which have shown an average survival rate of 96.2 percent for yearling Chinook and steelhead (Bickford et al. 1999; Bickford et al. 2000; Bickford et al. 2001). This is the highest survival rate for any dam on the Columbia or Snake rivers and at the same time, the contribution to TDG levels downstream of Wells Dam from the JBS is negligible (0-2 percent).

The Hatchery Compensation Plan, as described in Section 8 of the Wells HCP, was established to provide hatchery compensation for up to 7 percent unavoidable juvenile passage losses of Plan Species passing through Wells Dam. The operation of Hatchery enhancement activities has the potential to create both positive and negative results for spring Chinook.

The goal of the program is to utilize hatchery produced fish to replace unavoidable passage losses in such a manner that the hatchery fish produced contribute to the rebuilding and recovery of naturally reproducing populations of Plan Species, in their native habitats, while maintaining the genetic and ecological integrity of each stock of Plan Species. Supporting harvest, where appropriate, was also identified as a goal of the Hatchery Compensation Plan.

Douglas PUD owns and provides funding for the operation and maintenance of two fish hatchery facilities, the Wells and Methow hatcheries. Both are operated by WDFW. Of the two hatcheries, spring Chinook are only produced at the Methow Hatchery. The Methow Hatchery is located approximately 51 miles upstream of the mouth of the Methow River near the town of Winthrop, Washington. The Methow Hatchery consists of 12 covered production raceways, three covered adult raceways, a centralized incubation, early rearing, administrative and hatchery maintenance building, one on-site acclimation pond, two satellite acclimation ponds and a separate set of residences for hatchery personnel. A detailed description of the Methow Hatchery is available in Section 2.

Construction of the Methow Hatchery was completed in 1992 and is the result of a long-term Fish Settlement Agreement dated October 1, 1990 (1990 Settlement Agreement) to mitigate for passage losses at the Wells Project. In 2004, the Wells HCP was approved by the FERC and superseded the 1990 Settlement Agreement. As a result, the terms of the Wells HCP now guide activities at the Methow Hatchery. The Methow Hatchery produces yearling spring Chinook and is dedicated to enhancing spring Chinook salmon in the Methow, Twisp and Chewuch river basins.

All 12 of the production raceways and the on-site Methow acclimation pond are equipped with an outlet channel to the Methow River for releasing juvenile spring Chinook. The Twisp Acclimation Pond is located at RM 11 on the Twisp River, and the Chewuch Acclimation Pond is located at RM 7 on the Chewuch River. The Methow Hatchery is owned by Douglas PUD and operated by WDFW. The program currently raises up to 550,000 yearling spring Chinook each year with fish of equal numbers released at each of the three acclimation ponds. Douglas PUD's current passage loss obligation for spring

Chinook is 61,071 smolts. The remaining 489,000 fish (89 percent of the program) are provided to Chelan PUD (288,000 smolts) and Grant PUD (201,000 smolts) to support compliance with their passage loss obligations.

Adult spring Chinook are captured in the Twisp Weir during brood stock collection in April through June. Based on monitoring studies completed in 2008, the newly constructed Twisp Weir was found not to be a migration impediment or a stranding structure for adult spring Chinook. Juvenile spring Chinook are captured during hatchery evaluation actions such as screw trapping. Captured juveniles are released and this type of monitoring is regulated by the HCP Hatchery Committee and governed by the three hatchery ITPs that are the foundation of the HCP agreement.

The BO on Artificial Propagation in the Columbia River (NMFS 1999a), the BO on Effects on Upper Columbia River Spring-run Chinook Salmon Supplementation Program and Associated Scientific Research and Monitoring Conducted by the WDFW and the USFWS (NMFS 2002c), and the BO for 1995-1998 Hatchery Operations in the Columbia River Basin (NMFS 1995) identify 11 general types of potential adverse effects of hatchery operations and production on natural fish populations. These effects include: (1) operation of hatchery facilities, (2) broodstock collection, (3) genetic introgression, (4) disease, (5) competition/density-dependent effects, (6) predation, (7) residualism, (8) nutrient cycling, (9) masking, (10) fisheries, and (11) monitoring and evaluation/research.

NMFS evaluated the above mentioned potential adverse effects in the BOs supporting the issuance of ESA Section 10 ITPs (permit 1395, 1391, 1347, and 1196) in accordance with Section 7 of the ESA. In the BO from NMFS, the agency determined that an annual take of endangered spring Chinook for scientific research and enhancement is not likely to jeopardize the continued existence of spring Chinook. In addition, NMFS concluded that the supplementation programs covered by the permits are expected to provide a survival benefit to spring Chinook by increasing the natural production of the Methow Basin.

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.3.4.7 Water Quality

The distribution of spring Chinook salmon limits the extent of potential water quality issues to the Methow River, Wells Reservoir and the Reservoir tailrace. Several studies have assessed the water quality within the Wells Project and all indicate that Wells Reservoir is a healthy, riverine water body with no thermal or chemical stratification (EES 2006; Ecology 2008, 2009). Studies have also demonstrated that the water found within the Wells Project is of high quality and is in compliance with the State standards for all of the parameters measured. Within the confines of the species extent there are two potential water quality issues that were documented through past research and have or are currently being addressed: water temperature and TDG.

Water temperature issues within the Wells Project primarily occur in the lower Okanogan River. To assess compliance with the State temperature standards, two 2D laterally-averaged temperature models (using CE-QUAL-W2) were developed that represent existing (or "with Project") conditions and "without Project" conditions of the Wells Project including the Columbia River from the Chief Joseph Dam tailrace to Wells Dam, the lowest 15.5 miles of the Okanogan River, and the lowest 1.5 miles of the Methow River. The results were processed to develop daily values of the seven-day average of the daily maximum temperatures (7-DADMax), and then compared for the two conditions (WEST 2008).

The model analyses demonstrated that "with Project" temperatures in the Columbia, Okanogan and Methow rivers do not increase more than 0.3°C compared to ambient ("without Project") conditions anywhere in the reservoir, and that the Project complies with state water quality standards for temperature. The analyses also show that backwater from the Wells Project can reduce the very high summer temperatures observed in the lower Okanogan and Methow rivers. The intrusion of Columbia River water into the lowest 1-2 miles of the Okanogan River and lowest 1.5 miles of the Methow River can significantly decrease the temperature of warm summer inflows from upstream, and can also moderate the cold winter temperatures by 1-3°C, reducing the extent and length of freezing (WEST Consultants, Inc. 2008).

This area is not used by spring Chinook and poses little issue to migratory or foraging species. The few instances of relatively high water temperature within the reservoir were primarily a result of upstream releases from Grand Coulee and Chief Joseph dams.

Each year from 2003-2008, Douglas implemented spill testing activities to examine the relationship between water spilled over the dam and the production of TDG, to better understand TDG production dynamics resulting from spill operations at Wells Dam. These results were subsequently used by IIHR-Hydroscience and Engineering of University of Iowa to develop and calibrate an unsteady state three-dimensional (3D), two-phase flow computational fluid dynamics (CFD) tool to predict the hydrodynamics of gas saturation and TDG distribution within the Wells tailrace. These tools were then used to reliably predict TDG production at Wells Dam and establish how preferred operating conditions and spillway configurations can be used as methods to manage TDG within WQ numeric criteria (Politano et al. 2009). The final model run, performed by Iowa, showed that preferred spillway operating configurations were able to reduce tailrace TDG to levels well within Washington State WQS (< 120%) during a flood flow event equal to 246 kcfs (Politano et al. 2009). As previously addressed above in section 4.3.4.4, studies by Bickford et al. (1999, 2000, 2001) show that passage survival at the dam is 96.2 percent for juvenile salmon and steelhead. Successful passage by early life stages of anadromous salmonids suggest that water quality is not posing a risk to survival.

No effect was identified that related to any of the proposed measures.

4.3.4.8 Water Quantity

The quantity of water flowing through the Wells Project can create alterations to the reservoir environment that may affect spring Chinook. These alterations may include fluctuations in reservoir stage that may strand individuals in nearshore habitat or possibly increase interaction with predators due to lower water volume.

The Wells Project is a run-of-river project meaning that average daily inflow equals daily outflow. As a result, the limited active storage capacity is only sufficient to regulate flow on a daily basis. Alterations in water volume or reservoir fluctuations are minimal and largely driven by the discharge of water from Chief Joseph Dam and Grand Coulee Dam. Reservoir stage fluctuation remains within one to two feet on a daily basis. Reservoir operations below 774 feet occur infrequently (generally no more than one a year) but do have a limited potential to strand fish in off-channel pools. Conditions that could result in stranding were surveyed in 2006 and 2008. During these surveys, no stranding of spring Chinook was observed.

No effect was identified that related to any of the proposed measures.

4.3.4.9 Riparian Cover

Riparian cover can provide important habitat for rearing spring Chinook. Significant riparian cover is found in riverine areas and is limited in lacustrine environments. Riparian cover is generally not sought after when juvenile spring Chinook initiate their seaward migration and leave the Methow River and enter the Wells Reservoir. Spawning and rearing habitat occurs in fluvial systems of the upper Methow River watershed more than 40 miles upstream of the Wells Project, and are not affected by Wells Project operations.

Habitat Conservation Plan

The banks of the Wells Project offer limited riparian cover. This is largely a result of the paucity of riparian cover typical of natural high desert ecosystems that define the Wells Project. Additional funds provided by Douglas PUD for restoration measures occurring outside of the Wells Project are detailed in the TCP. Douglas PUD funded projects will improve habitat and potentially increase riparian cover. The potential for such riparian restoration to occur is contingent upon review and approval by the Wells HCP Tributary Committee.

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.3.4.10 Critical Habitat

The mainstem Columbia River from the Wells Tailrace to the confluence of the Columbia and Methow rivers, along with the accessible portions of the Methow River Basin, are included in the critical habitat listed for UCR spring Chinook in the Wells Project (70 FR 52731).

Habitat components important to spring Chinook and other salmonid species in the Mid-Columbia River include:

- juvenile rearing areas,
- juvenile migration corridors,
- areas for growth and development to adulthood,
- adult migration corridors, and
- spawning habitat.

Within these habitat types, essential features include:

- adequate substrate,
- water quality,
- water quantity,
- water temperature,
- water velocity,
- cover/shelter,
- food,
- riparian vegetation,
- space, and
- safe passage conditions (65 FR 7764).

The diverse needs of spring Chinook are well known by Douglas PUD and effort to manage the Wells Project in light of these needs is consistent throughout the developed management plans and other conservation, management, or recovery actions taken by Douglas PUD. These actions are described throughout this BA and represent Douglas PUD's efforts to operate the Project and reduce or eliminate any potential impacts to spring Chinook critical habitat as a result of the Wells Project. Success of these efforts is demonstrated through achievement of the HCP NNI standard for spring Chinook.

Effects of the proposed action on individual critical habitat elements are addressed in the preceding assessments of potential effects of proposed measures on individual critical habitat elements, the determination of effects in section 4.3.5, and the summary effects matrix for spring Chinook in Table 4.3.5-1.

4.3.5 Determination of Effects

The following section provides a summary matrix (4.3.5-1) of the potential effects described above and draws an effects determination based upon the dichotomous key developed by USFWS (1998b).

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Table 4.3.5-1 Summary Effects Matrix for Spring Chinook within the Wells Project.

Critical Habitat	Project Effect	Upper Columbia River Subbasin Designated Area Affected	Exposure over 50-year Duration of Proposed Action	Response	Limiting to Conservation
Spawning, incubation and larval development	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, Aquatic Settlement Actions and actions described in the Terrestrial Resources Management Plans.	The defined Action Area representing Wells Reservoir and surrounding tributaries	Spring Chinook spawning occurs in the upper and middle Methow drainage over 40 miles upstream of the Wells Project Boundary	NA	No effect
Rearing and migration within the Project	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, HCP, predator control, Aquatic Settlement Actions and action described in the Terrestrial Resources Management Plans.	The defined Action Area representing Wells Reservoir and surrounding tributaries	Brief exposure during migration period. Juveniles migrate downstream from April through June.	Not significant. Survival standards ensure that survival will be at or above 93%. For predator control, potential for take is limited to longline angling. No Chinook have ever been captured in the history of the program. Incidental captures of non-target fish are released immediately.	Unlikely
Tributary Rearing and Migration (outside PB)	HCP Hatchery and Tributary Projects	The defined Action Area representing the Methow River influenced by hatchery and tributary programs	Juvenile spring Chinook are captured during hatchery evaluation actions such as screw trapping. Adult spring Chinook are targeted for brood collection at the Twisp Weir during April through August.	Based upon monitoring in 2008, the newly constructed Twisp Weir is not a migration impediment nor is it a stranding structure for adult spring Chinook.	Unlikely
Passage through Project reservoir and facilities	Adult upstream fish passage	Columbia River Corridor	Brief exposure during migration period. Adults return from April through early July	Not significant - passage times and survival are comparable to conditions without the Project. Survival standards ensure that survival will be at or above 98% survival - Adult PIT-tag studies indicate survival is greater than 98% per project. Fallback rates are low.	Unlikely
	Adult downstream fish passage	Columbia River Corridor	Brief exposure during migration period. Adults return from April through early July	Not significant. Survival standards ensure that survival will be at or above 98% survival - Adult PIT-tag studies indicate survival is greater than 98% per project. Fallback rates are low. Most fallback takes place through the Juvenile Bypass System where survival is high.	Unlikely
	Sub-adult passage	Columbia River Corridor	Brief exposure during migration period. Juveniles migrate downstream from April through June.	Not significant. Survival standards ensure that survival will be at or above 93%. Monitoring indicates greater than 96% survival.	Unlikely
Water Quality	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, and Aquatic Settlement actions; actions described in the Terrestrial Resources Management Plans; increased TDG levels, elevated water temperature.	Columbia River Corridor	Brief exposure during migration period. Adults return from April through early July and juveniles migrate downstream from April through June.	Not significant - Studies indicate that there is no project related impact to DO, ph, turbidity and water temperature. TDG levels can be elevated but rarely exceed 120% in the tailrace of Wells Dam. Operations have been tailored to provide conditions sufficient to achieve passage survival standards. Primary influence on water temperature is from Lake Roosevelt storage releases. Implementation of the Water Quality Management Plan is expected to improve water quality in the Wells Project.	Unlikely

Table 4.3.5-1 (Continued) Summary Effects for Spring Chinook within the Wells Project.

Critical Habitat	Project Effect	Upper Columbia River Subbasin Designated Area Affected	Exposure over 50-year Duration of Proposed Action	Response	Limiting to Conservation
Water Quantity	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, HCP, Aquatic Settlement actions, and actions described in the Terrestrial Resources Management Plans	Columbia River Corridor	Brief exposure during migration period. Adults return from April through early July and juveniles migrate downstream from April through June.	Not significant - Wells Project is operated in a run-of-river mode, with water quantity largely dependent upon flows from upstream federal storage dams. The project is not a consumptive user of water. In general daily inflows from Grand Coulee and Chief Joseph are equal to daily discharge at Wells Dam.	Unlikely
Riparian Cover	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, Aquatic Settlement actions, actions described in the Terrestrial Resources Management Plans and Off-License Agreement.	Columbia River Corridor	Brief exposure during migration period. Adults return from April through early July and juveniles migrate downstream from April through June.	Not significant - proposed action will have no impact on the limited natural riparian cover, which is not typically used by migrating fish. TCP, Douglas PUD Land Use Policy, Aquatic Settlement Agreement and Off-License Agreement will have positive impacts to riparian cover within the Project. The TCP will have beneficial effects on riparian habitat in the tributaries outside of the Project Boundary.	Unlikely

Application of USFWS (1998b) decision matrix dichotomous key to determine potential effects on UCR spring-run Chinook salmon.

The following is a stepwise assessment of potential effects on UCR spring-run Chinook salmon based on a dichotomous key developed by USFWS (1998b).

Step 1. Are there any listed or proposed species present in the watershed?

Yes. Spring Chinook salmon are a listed species that occur in Wells Reservoir, tailrace and the Methow River watershed. The Wells Project area primarily serves as a migratory corridor for outmigrating smolts and returning adults. Usage of the Wells Project area is generally limited to the months of April through June for juveniles and April through early July for adults. Individual fish only spend a few days migrating through the Project. The Project does not contain significant rearing habitat for juvenile spring Chinook.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

Yes. The proposed action may result in delay, stress or mortality during passage through Wells Project facilities. Juvenile Chinook may be exposed to predators such as northern pikeminnow during migration. Returning adults may exert increased levels of energy to pass Project structures and may incur additional energetic costs associated with fallback and a second pass through the ladders. The primary route of fallback by adults and downstream migration by juveniles is through the juvenile bypass system or spillways both of which are typically in operating during April through August of each year. Some fish may also pass via the turbines where injury or mortality through interaction with turbine structures may take place. Juveniles or adults passing through the Wells Project tailrace may experience higher than ambient levels of TDG.

The overall potential for these identified effects to impact the population of spring Chinook salmon is low. Spawning and rearing of spring Chinook occur more than 40 miles upstream of the Project in the Methow River. Sensitive life history stages rear in locations where potential Project effects are absent. The use of the Wells Reservoir is primarily as a migratory corridor. Longline predator control efforts in the reservoir have never captured a salmonid, displaying the effective selectivity of the control method. Passage at the reservoir is efficient, with minimal mortality. NMFS (2002a) concluded that small delays of adult upstream migration at mid-Columbia River projects are more than compensated for by faster travel through the reservoir impoundments. Studies indicate that fallback rates at the Project for spring or summer-run Chinook salmon are low (3.6 to 5 percent, NMFS 2002a). NMFS estimated mortality rates were relatively minimal (2.4 percent) for spring Chinook salmon (NMFS 2000a, based on data in NMFS 2000b). Douglas PUD has conducted three years of juvenile survival studies at Wells

Dam which have shown an average survival rate of 96.2 percent for yearling Chinook (Bickford et al. 1999; Bickford et al. 2000; Bickford et al. 2001). This is the highest juvenile project survival rate for any dam on the Columbia or Snake rivers. More recently, adult PIT-tag estimates from 2008 indicate adult survival passing upstream though the Wells Project is greater than 98 percent (Douglas PUD and Anchor Environmental, L.L.C. 2009).

The proposed action will also result in numerous benefits to spring Chinook, the sum effects of which are expected to exceed the negative impacts described above. Existing management efforts and the implementation of Wells HCP management plans provide numerous benefits to spring Chinook salmon. Currently, the HCP mandates juvenile passage success of 93 percent. Predator control efforts will continue to reduce the number of northern pikeminnow. Artificial enhancements through the hatchery management plan help bolster wild population numbers and provide up to seven percent compensation for unavoidable Wells Project related effects. The Tributary Conservation Plan helps to restore habitats used for spawning and rearing outside of the Wells Project area and provides up to 2 percent compensation for unavoidable Wells Project related effects to adult UCR spring Chinook resulting in NNI.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

Yes. Juvenile mortality of three to seven percent during Project passage will likely continue, some portion of which is attributable to Project effects. Based upon PIT-tag data, take of adults is expected to be less than 2 percent. The Wells Project has achieved NNI for each Plan Species, including spring Chinook through a combination of high juvenile and adult survival through the Project coupled with hatchery compensation and tributary conservation efforts intended to replace the relatively small amounts of unavoidable "take" associated with operating the Wells Project (Douglas PUD and Anchor Environmental, L.L.C. 2009). Various plans to continue the achievement of NNI include the Passage Survival Plan, Wells Dam Juvenile Dam Passage Survival Plan, TCP, Hatchery Compensation Plan, Adult Passage Plan, and Predator Control Program. The standards and actions outlined in these plans will ensure low levels of take and provide measures to ensure that recovery of the species would not be jeopardized.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

Yes. Lower water velocities within Wells Reservoir may pose brief energetic challenges during downstream migration for juveniles. While the reservoir is considered critical habitat, it is used primarily as a migratory corridor. Conversely, the lower velocities require adult fish to expend less effort to reach spawning grounds in the Methow River. Important spawning and rearing grounds are not affected by the Wells Project.

Restoration and protection measures within the TCP of the Wells HCP will improve important spawning and rearing habitat. The Wells HCP provides funding for habitat improvements, as well as establishes a HCP Habitat Committee to prioritize expenditure of designated funds. Over the duration of the Wells HCP, habitat improvements secured by designated HCP Plan Species Account funding is expected to offset 2 percent or greater of the unavoidable project mortality for adult spring Chinook, and contribute to recovery of this species.

Based on this analysis, the determination of effects of this proposed action on spring Chinook salmon is: MAY EFFECT, NOT LIKELY TO ADVERSELY AFFECT spring Chinook or designated critical habitat. Although individual Chinook would be subject to take, the proposed action would not jeopardize the continued existence of the species. Relative to the entire lifecycle, spring Chinook use of Wells Reservoir is minimal and except for functioning as a migration route to the ocean, the reservoir habitat is the least important of all habitat components. Further, continued implementation of Wells HCP measures would offset any take and could result in a net benefit due to population enhancement and habitat restoration.

4.4 UCR SUMMER-RUN STEELHEAD

NMFS considers all summer-run steelhead returning to tributary streams upstream of the confluence of the Yakima River and the Columbia River as belonging to the UCR DPS (NMFS 2008). The UCR summer-run steelhead was listed under the federal ESA as endangered in August 18, 1997 (62 FR 43937). The status of ESA-listed UCR summer-run steelhead was changed to threatened on January 5, 2006 (71 FR 834). This listing was reinstated to endangered status per US District Court decision in June 2007 (NMFS 2008). In March 2009 the Ninth Circuit upheld NMFS decision to list UCR summer-run steelhead as threatened and not endangered, overturning the June 2007 District Court decision. In June 2009 U.S. District Court issued an order upgrading status from endangered to threatened.

NMFS defined abundance recovery targets for each spawning aggregation in this ESU. These numbers are intended to represent the number and productivity of naturally-produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR steelhead, the interim recovery levels are 1,000 spawners in the Methow River, 1,000 spawners in the Wenatchee River and 500 spawners in the Entiat River (UCSRB 2007).

The majority of the steelhead are of hatchery origin (Chapman et al. 1994b). Steelhead hatchery programs that were included into the listing determination include the Wells and Eastbank Fish hatcheries. These programs release listed steelhead into the Okanogan, Similkameen, Methow and Wenatchee rivers.

4.4.1 Life History

The steelhead is an anadromous salmonid spawning in tributaries and migrating through the Columbia River to the ocean. Adult steelhead rear one to two years in the ocean before returning to the Columbia River from March through October. Returning adults typically pass the mid-Columbia River dams from June through October. The adult migration is protracted over a relatively long period. Further, spawning does not occur until the following March through July (Peven 1992). Unlike other anadromous salmonids, steelhead adults (kelts) return to the ocean after spawning and may spawn more than once during their lifetime; however, repeat spawners in the mid-Columbia River region represent only 2.1 percent of the population (Brown 1995).

Steelhead eggs incubate from late March through June, and fry emerge from late spring to August. Their use of tributaries for rearing is variable, depending upon population size, and both weather and flow at any given time. Generally, juveniles rear in tributaries for two to three years (range from one to seven years) before migrating downstream as smolts. Fry and smolts disperse downstream through the Wells Project in late April through June. Some steelhead are thought to residualize and live their entire lives in freshwater (Peven et al. 1994). As a result of their varied length of freshwater residence, their variable ocean residence, and their spatial and temporal spawning distribution within a watershed, steelhead exhibit an extremely complex mosaic of life-history types. Such life history diversity is an effective strategy for ensuring the long-term viability of populations (NMFS 2002a).

4.4.2 Presence in Action Area

The majority of naturally and hatchery produced steelhead that are present in the Wells Project spawn in the Methow River watershed, with a small population spawning and rearing in the Okanogan River watershed. Although steelhead typically feed during their seaward migration, mid-Columbia reservoirs, such as Wells, serve primarily as migration corridors rather than as rearing habitat (Chapman et al. 1994b). Between the years of 1996 and 2005 the number of steelhead migrating upstream of Wells Dam annually has averaged 7,446 adults and ranged from 2,668 adults in 1998 to 18,483 adults in 2001 (Table 4.4.2-1).

Table 4.4.2-1 Annual Count of Migrating Steelhead Over Wells Dam.

Year	Number Counted	Year	Number Counted
1996	4,127	2003	9,963
1997	4,107	2004	9,317
1998	2,668	2005	7,203
1999	3,557	2006	6,674
2000	6,280	2007	7,500
2001	18,483		
2002	9,475	Average	7,446

Source: CBFAT 2009

Steelhead use spawning habitat in the mainstem Methow River and eleven of its tributaries located in the mid and upper reaches of the drainage (NMFS 2002a). Documented spawning sites for steelhead in the Methow drainage are located upstream of the Wells Project Boundary, which extends up to RM 1.5 on the Methow River. A small number of steelhead return to spawn on the lower Similkameen River, a tributary to the Okanogan River near the US-Canada Border (NMFS 2002a). Documented spawning sites for steelhead in the Okanogan drainage are located upstream of the Wells Project Boundary.

4.4.3 Critical Habitat Designations

Critical habitat was designated for the UCR summer-run steelhead ESU by NMFS on September 2, 2005 (70 FR 52630). Critical habitat does occur in the Wells Project area and includes: (1) the mainstem Columbia River from the Wells Tailrace to the confluence of the Columbia and Okanogan rivers, (2) the accessible portions of the Methow River Basin, and (3) the accessible portions of the Okanogan River Basins, excluding the Colville Reservation and Salmon Creek (NOAA 2006).

4.4.4 Environmental Measures and Analysis of Effects

The objective of the Wells HCP is to achieve NNI for each Plan Species (spring Chinook, UCR summer/fall Chinook salmon, Okanogan River sockeye salmon, steelhead and coho salmon). The Wells HCP outlines a schedule for meeting and maintaining NNI throughout the 50-year term of the agreement. NNI consists of two components: 1) a 91 percent combined adult and juvenile Wells Project survival standard achieved by Wells Project improvement measures implemented within the geographic area of the Wells Project, and 2) up to nine percent compensation for unavoidable Wells Project related mortalities. Compensation to meet NNI is provided through a hatchery and a tributary program under which seven percent compensation is provided through hatchery production and two percent compensation is provided through the funding of enhancements to tributary habitats that support Plan Species. The HCP also requires the formation of four committees that are used to implement, monitor and administer the agreement, namely policy, coordinating, hatchery, and tributary committees.

The Wells HCP contains various plans for implementing the components of the agreement. These plans include the Passage Survival Plan (HCP Section 4), Wells Dam Juvenile Dam Passage Survival Plan (HCP Section 4.3), TCP (HCP Section 7), Hatchery Compensation Plan (HCP Section 8), Adult Passage Plan (HCP Section 4.4 and HCP Appendix A) and a Predator Control Program (HCP Section 4.3.3). These plans were developed specifically to enhance populations of Plan Species with particular emphasis placed upon the enhancement and recovery of steelhead.

4.4.4.1 Spawning, Incubation, and Larval Development

Adult steelhead utilize the Wells reservoir as a migration corridor and typically pass through the Project from June through October to access spawning habitat within the Methow and Okanogan basins above the Wells Project area. Spawning occurs primarily in late March, but may extend into July. Steelhead eggs incubate from late March through June, and fry emerge in late spring to August. In the Methow basin, spawning has been documented in the mid and upper mainstem Methow River and eleven of its tributaries located in the mid and upper reaches of the drainage (NMFS 2002a; Mullan et al. 1992). In the Okanogan basin, a small number of steelhead return to spawn on the lower Similkameen River, a tributary to the Okanogan River near the US-Canada Border (NMFS 2002a).

All spawning, incubation, and larval development occurs upstream of the Wells Project Boundary. Spawning and larval rearing does not occur in or near the Wells Project reservoir. While Wells Project-related hatchery activities do occur in the tributaries, these are unlikely to affect reproduction and early development. Therefore, it is unlikely that steelhead spawning, incubation, and larval development would be affected by Wells Project related activities or operations.

No effect was identified for any of the proposed measures.

4.4.4.2 Rearing and Migration Within the Project

Steelhead develop and rear upstream of the Wells Project Boundary in the mainstem and tributaries of the Methow and Okanogan river basins. Their use of tributaries for rearing is variable, depending upon population size, and both weather and flow conditions at any given time. Generally, juveniles rear in tributaries for two to three years (range from one to seven years) before migrating downstream through the mainstem Columbia River in March to early June as smolts (Peven et al. 1994). Juvenile smolts have been observed passing through the Project during April through June. Steelhead smolts typically feed during their seaward migration, although mid-Columbia reservoirs, such as Wells, serve primarily as migration corridors rather than as rearing habitat (Chapman et al. 1994b).

Smolt exposure to Wells Project effects is for a brief duration and limited extent. Survival standards set by the HCP ensure that survival will be at or above 93 percent for steelhead smolts migrating through the Wells Project. Current monitoring indicates juvenile project survival for steelhead is greater than 96 percent. Potential effects that may occur during the migration through the Action Area include reservoir stage fluctuation, reservoir impoundment, and predator exposure. Reservoir stage fluctuation is a result of the "run-of-river" operations inherent to the multi-reservoir Columbia River projects. The reservoir elevation typically fluctuates one to two feet daily. Reservoir operations below 774 feet MSL occur occasionally but are generally rare events unlikely to overlap with the timing of migration. Surveys have been conducted during reservoir elevations below 774 feet MSL and no steelhead stranding was documented (DTA 2006).

The reservoir environment can provide mixed benefits to steelhead depending upon the life stage being exposed. After adult fish migrate upstream past a dam, they must swim through a reach of river that has changed substantially from its historic, free-flowing conditions. The reservoirs have reduced water velocity and increased holding area compared to natural river conditions. These changes could benefit migrating adults by decreasing travel times and adult energy consumption. Inversely, the slower water velocities can also affect the outmigration of juveniles by causing extended travel times and decreased survival rates. The extended travel time and low water velocities, compared to the unimpounded river, may result in greater energy expenditures by juvenile migrating steelhead.

Habitat Conservation Plan

Section 4.3.3 of the Wells HCP includes the requirement that Douglas PUD implement a northern pikeminnow and piscivorous bird harassment and control program to reduce predation on anadromous salmonids in the mid-Columbia Basin. It is expected that the predator control efforts directly benefit steelhead by removing predators that prey on outmigrating juveniles.

The NPRP has included a northern pikeminnow bounty program, participation in fishing derbies and tournaments, hook and line fishing by experienced anglers and the use of longline fishing equipment. Currently only longline fishing is being utilized in the Project. These efforts are designed to provide an immediate and substantial reduction in the predator populations present within the waters of the Wells Project. The continual harvest of northern pikeminnow from these waters will provide additional decreases in predator abundance. Yearly removal efforts will also keep the northern pikeminnow population in a manageable state. In 1998, NMFS determined that the NPRP resulted in a net benefit to listed anadromous Columbia River salmonids (NMFS 1998).

From inception in 1995 through 2007 Douglas PUD's NPRP has captured over 154,000 northern pikeminnow. From 1995-1999, the NPRP implemented by Douglas PUD consisted mainly of experienced anglers using hook and line techniques to remove northern pikeminnow from Wells Project waters. Traditionally, hook and line angling has lacked the ability to target species specifically.

More recently (2000-present), the NPRP has shifted to primarily a longline fishing system. This new system has proven to be more cost efficient and effective at targeting northern pikeminnow. Longline fishing gear has a low probability of catching steelhead by fishing deeper in the water column using small hooks typically baited with dead crickets. Lines are checked daily in order to release any species other than northern pikeminnow. To date the incidental catch rate of steelhead by longline operations is zero.

The NPRP is implemented to benefit listed Columbia River salmonids. Increased survival of salmonids will increase the distribution of ocean nutrients into the upper reaches and tributaries of the Columbia River when these fish return from the ocean to spawn and die.

The other component of the predator control program is the implementation of control measures for piscivorous birds and mammals. The focus of these programs is not removal but hazing and access deterrents. Hazing includes propane cannons, pyrotechnics and the physical presence of hazing staff. Access deterrents include steel wires across the hatchery ponds and tailrace, fencing and covers for hatchery ponds, and electric fencing. When hazing and access deterrents fail, options for removal are also implemented by the USDA Animal Control staff hired to conduct the hazing programs. The minor increase in human activity as a result of these predator control measures is unlikely to adversely affect steelhead.

Aquatic Settlement Agreement

The Aquatic Settlement Agreement includes implementation of the white sturgeon management plan. Increased predation may result from the enhancement of white sturgeon in the Wells Reservoir. For example, Douglas PUD is required in its sturgeon management plan to enhance white sturgeon populations through artificial propagation. The increased number of sturgeon may result in an elevated potential for predation. The WSMP has provisions for adaptive management of supplementation activities should conflicts develop between stocked sturgeon and ESA-listed species. The WSMP includes an intensive monitoring and evaluation program that will be used to adjust the number of juvenile sturgeon stocked in the Wells Project and will be used to inform harvest management for adult sturgeon.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.4.4.3 Tributary Rearing and Migration

Activities associated with the operation of the Wells Project also take place in upper portions of the tributaries outside of the Project Boundary.

Habitat Conservation Plan

The TCP found in Section 7 of the Wells HCP guides the funding and allocation of dollars from the Plan Species Account. The intended goal of the dollars allocated to the Plan Species Account is to compensate for up to two percent unavoidable adult and/or juvenile mortality for Plan Species passing through Wells Dam. The intent of the Plan Species Accounts is to provide dollars to protect and restore tributary habitats for Plan Species within the Wells Project Boundary and within the portions of the Methow and Okanogan rivers that are accessible to Plan Species.

A detailed description of the TCP, the Plan Species Account, and its allowable uses by the Tributary Committee can be found in Section 7 of the HCP. Some direct and indirect effects to steelhead may occur resulting from implementation of actions funded by the TCP. A separate Section 7 consultation is initiated for actions associated with the TCP.

The Tributary Committee, comprised of various fisheries agencies and the Tribes, will be guided by the general strategy outlined in supporting documents (see TCP) to the HCP. The goal of the TCP is to protect existing productive habitat and restore high priority habitats by enhancing, when practical, natural processes that, over time, will create and maintain suitable habitat conditions without human intervention. The NMFS representative on the Tributary Committee ensures that any take of steelhead resulting from these activities is minimized.

The TCP provides funding to third party conservation efforts in the Methow and Okanogan river basins. Habitat restoration projects and plans to purchase conservation easements or land in fee are submitted to the TCP committee. Examples of projects funded by the TCP include, but are not limited to: 1) providing access to currently blocked stream sections or oxbows; 2) removing dams or other passage barriers on tributary streams; 3) improving or increasing the hiding and resting cover habitat that is essential for these species during their relatively long adult holding period; 4) improving in-stream flow conditions by correcting problematic water diversion or withdrawal structures; and 5) purchasing (or leasing on a long-term basis) conservation easements to protect or restore important aquatic habitat and shoreline areas.

The Tributary Committee decides if the projects meet criteria for funding. Projects must be reviewed by state and federal agencies to receive permits for construction projects. Habitat preservation projects will benefit steelhead through the protection and enhancement of critical habitat (USFWS 2002a). Projects that increase instream flow volume in the Methow Basin will benefit all life stages of steelhead by enhancing migration corridors, pool depth, in-stream cover, and preferred water temperatures.

Habitat restoration projects will require a period of construction that may result in short term disturbances such as noise, increased turbidity, and human presence. These projects are expected to result in positive benefits for steelhead by creating additional aquatic habitat or removing upstream migration barriers, steelhead access to historically utilized watersheds.

Some potential activities (e.g., removal of large stream channel blockages or reconnecting side channels, etc.), may produce short-term unavoidable negative effects (e.g., incidental injury or mortality of individual fish, temporarily increase sediment loads and turbidity, etc.) as a result of funding restoration projects in the Methow or Okanogan rivers. In-stream restoration projects that have the potential to disturb steelhead or steelhead habitat will be required to go through a separate ESA Section 7(a)(2) consultation and authorization of incidental take of ESA-listed Permit Species.

In the long-term, any actions designed to remove migration barriers, stabilize stream channels and restore hydraulic equilibrium, increase riparian canopy cover, or increase base flows are expected to far outweigh small short term impacts and result in beneficial effects for adult and juvenile steelhead.

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.4.4.4 Adult Upstream Passage Through Project Reservoir and Facilities

Four specific components of the adult migrations upstream and downstream of Wells Dam may affect anadromous fish species: adult migrational delay at project fishways, fallback, passage success at Project structures and injuries and mortalities from upstream (via fishways) as well as downstream (via turbines, spillways, or JBS) passage through the Wells Project. Each of these components has the potential to increase adult mortality (NMFS 2002a). Juvenile anadromous fish may experience increased mortality during their migration to the ocean as a result of passage through the Wells Project.

Upstream passage of steelhead through the fish ladders at Wells Dam has historically occurred from June through October, with peak passage typically occurring in September. Wells Dam has two adult fish ladders, located on the east and west ends of the hydrocombine. Steelhead utilize these ladders to pass upstream of the Wells Project. Each of the two fishways contains a single main entrance, a collection gallery, a fish ladder, an adult count station, trapping facilities, and an exit in the forebay adjacent to the earthen embankment section of the dam.

Fishways are inspected daily to ensure debris accumulations are removed, automated fishway instruments are calibrated properly and lights in the fishway are functioning. Both upstream fishway facilities (located on the west and east shores) are operational year around with maintenance occurring on each fishway at different times during the winter to ensure that one upstream fishway is always operational. Maintenance activities on Wells fishways occur during the winter when steelhead are unlikely to pass Wells Dam.

Habitat Conservation Plan

The Passage Survival Plan contained within Section 4 of the Wells HCP provides specific detail regarding the implementation and measurement of unavoidable juvenile and adult losses for each of the Plan Species passing through Wells Dam. This section of the plan also contains specific survival standards that must be achieved within defined time frames in order for the licensee to be considered in compliance with the terms of the Wells HCP (Douglas PUD 2002).

The Adult Passage Plan is a subcomponent within the larger Passage Survival Plan contained within Section 4.4 and Appendix A of the Wells HCP. The Adult Passage Plan is intended to ensure safe and rapid passage for adult Plan Species as they pass through the fish ladders at Wells Dam. The plan contains specific operating and maintenance criteria for the two adult fish ladders and the two adult fish ladder traps, and provides details regarding the implementation of passage studies on adult Plan Species including studies related to passage success, timing and rates of fallback.

Numerous telemetry studies conducted on adult steelhead from 1998 through 2002 provide adult passage information on upstream and downstream movements, including passage at Wells Dam. Passage time through the reservoirs is typically faster, and energy expenditures are less than for fish migrating through a normal river setting (NMFS et al. 2002a).

NMFS et al. (2002a) compared the migration rates of adult Chinook salmon, steelhead, and sockeye salmon through both impounded (dams and reservoirs) and unimpounded reaches of the Snake, mid-Columbia, and lower Columbia rivers. In each case, migration rates (miles/day) through the mid-Columbia River generally exceeded migration rates through unimpounded reaches of the Snake or Columbia rivers and were very similar to those observed in other impounded reaches (13 to 36 miles/day versus 6 to 19 miles/day in unimpounded reaches or 15 to 40 miles/day in other impounded reaches, respectively). Similar observations were also found during comparison of migration rates of steelhead through the mid-Columbia River when compared to unobstructed reaches of the Skeena and Fraser River. English et al. 2006 found that the median migration rate through the mid-Columbia River (Priest Rapids tailrace to Wells forebay) was 12.5 miles/day, which exceeds the rates observed in free-flowing reaches of the Skeena River (7.9 to 11.1 miles/day) and the Fraser River (5.3 miles/day).

NMFS et al. (2002a) concluded that this body of information strongly suggests that small delays at these projects are more than compensated for by faster travel through the reservoir impoundments. In addition, any delays that do occur are more likely to affect species that spawn soon after completing their migration (summer/fall-run Chinook salmon or sockeye salmon are more likely to be affected than those that hold in the rivers or streams for considerable periods of time prior to spawning [i.e., steelhead or spring Chinook salmon]). The effect of delays passing the fishway (hours to a few days) on Plan Species is likely non-existent for currently ESA-listed ITP Species and non-existent to very small for unlisted Plan Species. The proposed action should have no temporal effect, or a slight beneficial effect, on upstream migrating adults compared to the migration observed under unimpounded conditions.

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.4.4.5 Adult Downstream Passage Through Project Reservoir and Facilities

The potential for adult steelhead to "fallback" through the dam once they have exited the fish ladder may result in injury due to increased contact with structural features of the dam (spillways, turbines, juvenile bypass, and fish ladder). Fallback is defined as voluntary or involuntary movement of a fish downstream past a dam once upstream passage has been achieved.

Alexander et al. (1998) reported 1 of 20 steelhead (5 percent) fell back below Wells Dam, and English et al. (2001) reported a 6.8 percent fallback rate for steelhead at Wells Dam in 1999. Of the 11 fish that fell back in 1999, 4 re-ascended the ladder, 6 were found in spawning areas downstream of Wells Dam with only 1 fish classified as an involuntary fallback. These fallback rates were consistently lower than the other mid-Columbia River dams (range: 7 to 12 percent). English et al. (2001) also found that 94 percent of the fallback fish were of hatchery origin. In addition, 70 percent of the hatchery fish and 100 percent of the wild steelhead that passed the dam were last detected either upstream of the dam or at known spawning areas. Most of the hatchery fish that remained below Wells Dam overwinter in the Wells Hatchery outfall.

Habitat Conservation Plan

The adult survival standard from the Wells HCP ensures that survival will be at or above 98 percent survival. Adult PIT-tag studies indicate that adult survival has been consistently greater than 98 percent per project since 2004 when the HCP was implemented. The majority of steelhead fallback takes place through the JBS where survival is high.

Steelhead kelts migrating downstream of the Wells Project would pass downstream in the same manner as juvenile downstream migrants. English et al. (2001) estimated a 34 to 69 percent kelting rate for the mid-Columbia River steelhead stocks. Although direct survival information was not developed during this study, it is reasonable to assume that adult survival during fallback and kelt (post-spawning steelhead) passage is higher passing through the JBS rather than through turbines. Most kelts likely use the surface-oriented JBS. Kelts are most likely to be passing downstream of the dam during late April through June when the JBS system is in full operation. Some mortality may occur through the turbines, but overall survival is expected to be high when non-turbine routes of passage are in operations including the JBS or spillways.

Survival rates of adult salmon and steelhead passing through the mid-Columbia River have not been estimated due to the inability to differentiate tag loss, tag failure, and fish loss (NMFS 2002a). It is not presently possible to measure adult survival with existing technology. Although radio telemetry studies provide information on adult passage and apparent spawning distribution, uncertainties associated with the technology, and the inability to determine the ultimate fate or spawning success of radio-tagged fish, result in insufficient data to accurately estimate survival. In addition to the uncertainties related to the survival estimates developed through radio telemetry data, it is not possible to differentiate natural mortality from project-related mortality. However, PIT-tag studies have shown that minimum per-project survival rates exceed 98% per project, demonstrating that adult mortality rates are extremely low, irrespective of cause (Anchor and Douglas PUD 2009).

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.4.4.6 Juvenile Passage

Habitat Conservation Plan

The Passage Survival Plan contained within Section 4 of the Wells HCP provides specific detail regarding the implementation and measurement of unavoidable juvenile and adult losses for each of the Plan Species passing through Wells Dam. This section of the plan also contains specific survival standards that must be achieved within defined time frames in order for the licensee to be considered in compliance with the terms of the Wells HCP (Douglas PUD 2002).

Section 4.3 of the Wells HCP contains specific criteria directed at the operation of the Wells JBS, spillway, and turbine operations. This section of the Wells HCP outlines detailed bypass operational criteria, operational timing and evaluation protocols to ensure that 95 percent of the juvenile Plan Species migration at Wells Dam are provided a safe, non-turbine passage route around the dam. The operational dates for the bypass are set annually by unanimous agreement of the parties to the Wells HCP. This plan also includes specific operating criteria for the turbines and spillways sufficient to maximize fish use and survival through the JBS (USFWS 2004b). The Wells bypass system is an important feature of the Wells Project that contributes significantly to Douglas PUD's ability to achieve the NNI survival standards outlined in the Wells HCP.

The JBS utilizes five of eleven spillways equipped with constricting barriers to help guide juvenile migrating fish. Since most juvenile salmon and steelhead migrate near the surface, with the help of the JBS, they successfully pass Wells Dam and avoid the turbine intakes located deeper in the forebay. Over the past several years the HCP committee has agreed to initiate the operation of the JBS on April 12 and to shut it down on August 26. This operating period is consistent with the 95% passage migration period for juvenile steelhead migrating downstream through the Wells Project.

The JBS serves as an effective method of bypassing fish away from turbines and safely over the dam. This configuration has demonstrated exceptionally high levels of protection while utilizing only 6-8 percent of the Columbia River flow. The efficiency and effectiveness of the JBS are important factors in limiting the amount of spill, and therefore TDG, while maximizing fish passage and survival.

Operation of the spillways may result in supersaturated levels of total dissolved gasses. Supersaturated gases in fish tissues may pass from the dissolved state to the gaseous phase as internal bubbles or blisters. This condition, GBT or GBD, can be debilitating or even fatal. Injury and mortality of steelhead may also occur as a result of contact with spillway structures. It is also likely that juveniles that successfully pass through the spillway may be subject to increased susceptibility to predation caused by disorientation or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during spillway passage (USFWS 2004c). Douglas PUD closely monitors TDG level and as stated within objective 1 of the Water Quality Management Plan, Douglas PUD will implement "reasonable and feasible measures" to ensure that Douglas PUD is in compliance with TDG standards (Douglas PUD 2008g).

Direct or indirect effects on juvenile steelhead are likely to occur as a result of downstream movement through turbines. These effects may include physical injury or mortality from contact with turbine structures including wicket gates, turbine runners, or the spiral case. Indirect effects may include increased susceptibility to predation caused by disorientation following turbine passage or increased susceptibility to infection caused by scale loss or non-lethal wounds incurred during turbine passage.

Based upon information collected at other hydroelectric projects, juvenile fish survival is estimated to range from 90 to 93 percent for turbines, 98 to 99 percent for bypass systems, and 98 to 99 percent for spillways (NOAA 2003). Some juvenile mortality is associated with all dam passage routes, although the highest levels of mortality typically occur during passage through turbines. Consequently, an important objective of project operations aimed at improving juvenile survival is to route the highest possible proportion of juveniles past the project in a manner that avoids passage through turbines.

Survival standards outlined in the HCP ensure that survival will be at or above 93 percent. Douglas PUD has conducted three years of juvenile survival studies at Wells Dam which have shown an average survival rate of 96.2 percent for yearling Chinook and steelhead (Bickford et al. 1999; Bickford et al. 2000; Bickford et al. 2001). This is the highest survival rate for any dam on the Columbia or Snake rivers.

The operation of Hatchery enhancement activities has the potential to create both positive and negative results for steelhead. The Hatchery Compensation Plan, as described in Section 8 of the Wells HCP, was established to provide hatchery compensation for up to 7 percent unavoidable juvenile passage losses of Plan Species passing through Wells Dam. The goal of the program is to utilize hatchery produced fish to replace unavoidable passage losses in such a manner that the hatchery fish produced contribute to the rebuilding and recovery of naturally reproducing populations of Plan Species, in their native habitats, while maintaining the genetic and ecological integrity of each stock of Plan Species. Supporting harvest, where appropriate, is also identified as a goal of the Hatchery Compensation Plan.

Douglas PUD owns and provides funding for the operation and maintenance of two hatchery facilities, the Wells and Methow hatcheries. Both are operated by WDFW. Of the two hatcheries, steelhead are only produced at the Wells Hatchery. The hatchery is located immediately adjacent to Wells Dam on the west tailrace embankment. The steelhead raised at the Wells Hatchery are either transported and released by truck or acclimated in the Methow and Okanogan rivers. No juvenile steelhead are released through the hatchery outfall channel.

The Wells Hatchery is operated to provide compensation for both inundation and passage losses as described in the Wells HCP. The inundation compensation is related to Wells Project construction and includes the production of 300,000 yearling steelhead. The juvenile passage loss compensation provided by the Wells Hatchery is currently set at 48,858 yearling steelhead (3.8 percent) (Douglas PUD 2006b). In addition to the steelhead raised for Douglas PUD, the Wells Fish Hatchery also produces up to 80,000 steelhead smolts for Grant PUD to support compliance with their passage loss obligations.

Natural and hatchery steelhead are collected at the west ladder of Wells Dam. Collections at Wells Dam and FH have provided steelhead to various locations, including Winthrop NFH, Chelan Falls FH, Eastbank FH, and at times, to Ringold Springs FH. Adult steelhead retained at Wells Dam and FH for broodstock are selected by proportional return time (i.e., 20 percent August returns, 30 percent September returns, etc.). Steelhead are spawned at the hatchery from January through early March. In comparison, wild fish spawn in the rivers from March through May. An average of 7.5 percent of the females spawned at Wells FH are wild fish (NMFS 2002a), which typically spawn later in the year than hatchery fish. In addition, Winthrop NFH rears an additional 100,000 Wells stock steelhead smolts for release into the Methow River at Winthrop (NMFS et al. 1998). A description of the Wells and Methow FH hatchery programs are available in Section 3.

Adult steelhead are incidentally captured in the Twisp Weir during brood stock collection for spring Chinook in April through June. Based on monitoring studies completed in 2008, the newly constructed Twisp Weir was found to not be a migration impediment or a stranding structure for adult steelhead and kelts. Juvenile steelhead are captured during hatchery evaluation actions including screw traps and residual steelhead sampling. Captured juveniles are released and this type of monitoring is unlikely to cause a significant impact.

The BO on Artificial Propagation in the Columbia River (NMFS 1999a), the BO on Effects on Upper Columbia River Spring-run Chinook Salmon Supplementation program and associated scientific research and monitoring conducted by the WDFW and the USFWS (NMFS 2002c), and the BO for 1995-1998 Hatchery Operations in the Columbia River Basin (NMFS 1995) identify 11 general types of potential adverse effects of hatchery operations and production on natural fish populations. These effects include: (1) operation of hatchery facilities, (2) broodstock collection, (3) genetic introgression, (4) disease, (5) competition/density-dependent effects, (6) predation, (7) residualism, (8) nutrient cycling, (9) masking, (10) fisheries, and (11) monitoring and evaluation/research.

NMFS evaluated the above mentioned potential adverse effects in the BOs supporting the issuance of ESA Section 10 incidental take permits (permit 1395, 1391, 1347, and 1196) in accordance with Section 7 of the ESA. In the BOs from NMFS, the agency determined that an annual take of endangered steelhead for scientific research and enhancement of steelhead is not likely to jeopardize the continued existence of steelhead and spring Chinook salmon. In addition, NMFS concluded that the supplementation programs covered by the permits are expected to provide a survival benefit to steelhead by increasing the natural production of Wenatchee, Methow, and Okanogan basins.

Aquatic Settlement Agreement

No potential effects were identified.

Terrestrial Resources Management Plans

No potential effects were identified.

Off-License Agreement

No potential effects were identified.

4.4.4.7 Water Quality

Steelhead require specific water quality characteristics that include cool water with moderate to high levels of dissolved oxygen. Several studies have assessed the water quality within the Wells Project and all indicate that Wells Reservoir is a healthy, riverine water body with no thermal or chemical stratification. Studies have also demonstrated that the water found within the Wells Project is of high quality and is in compliance with the State standards for all of the parameters measured. Notable exceptions to meeting the State standards included seasonal exceedances in water temperature and TDG.

Water temperature issues within the Wells Project primarily occur in the lower Okanogan River. To assess compliance with the State temperature standards, two 2D laterally-averaged temperature models (using CE-QUAL-W2) were developed that represent existing (or "with Project") conditions and "without Project" conditions of the Wells Project including the Columbia River from the Chief Joseph Dam tailrace to Wells Dam, the lowest 15.5 miles of the Okanogan River, and the lowest 1.5 miles of the Methow River. The results were processed to develop daily values of the seven-day average of the daily maximum temperatures (7-DADMax), and then compared for the two conditions (West Consultants, Inc. 2008).

The model analyses demonstrated that "with Project" temperatures in the Columbia, Okanogan and Methow rivers do not increase more than 0.3oC compared to ambient ("without Project") conditions anywhere in the reservoir, and that the Project complies with state water quality standards for temperature. The analyses also show that backwater from the Wells Project can reduce the very high summer temperatures observed in the lower Okanogan and Methow rivers. The intrusion of Columbia River water into the lowest 1-2 miles of the Okanogan River and lowest 1.5 miles of the Methow River can significantly decrease the temperature of warm summer inflows from upstream, and can also moderate the cold winter temperatures by 1-3°C, reducing the extent and length of freezing.

The lower Okanogan is utilized by steelhead as a migration corridor to access spawning habitat in the upper reaches and as a result exposure to elevated water temperatures is relatively brief. The few instances of relatively high water temperature within the mainstem Columbia River were primarily a result of upstream releases from Grand Coulee and Chief Joseph dams.

Each year from 2003-2008, Douglas implemented spill testing activities to examine the relationship between water spilled over the dam and the production of TDG, to better understand TDG production dynamics resulting from spill operations at Wells Dam.

These results were subsequently used by IIHR-Hydroscience and Engineering of University of Iowa to develop and calibrate an unsteady state three-dimensional (3D), two-phase flow computational fluid dynamics (CFD) tool to predict the hydrodynamics of gas saturation and TDG distribution within the Wells tailrace. These tools were then used to reliably predict TDG production at Wells Dam and establish how preferred operating conditions and spillway configurations can be used as methods to manage TDG within WQ numeric criteria (Politano et al. 2009). The final model run, performed by Iowa, showed that preferred spillway operating configurations were able to reduce tailrace TDG to levels well within Washington State WQS (< 120%) during a flood flow event equal to 246 kcfs (Politano et al. 2009). These studies have helped Douglas PUD modify spill operations and limit the elevated levels of TDG. As previously addressed above in section 4.4.4.4, studies by Bickford et al. (1999, 2000, 2001) show that passage survival at the dam is 96.2 percent for juvenile salmon and steelhead. Successful passage by these young and sensitive life stages suggests that water quality is not posing a notable issue for survival.

No effect was identified that related to any of the proposed measures.

4.4.4.8 Water Quantity

The quantity of water flowing through the Wells Project can create alterations to the reservoir environment that my affect steelhead. These alterations include fluctuations in reservoir stage that may strand individuals in near shore habitat or possibly increase interaction with predators due to lower water volume.

The Wells Project is a run-of- river project meaning that average daily inflow equals daily outflow. As a result, the limited active storage capacity is only sufficient to regulate flow on a daily basis. Alterations in water volume or reservoir fluctuations are minimal and largely driven by the discharge of water from Chief Joseph Dam and Grand Coulee Dam. Reservoir stage fluctuation remains within one to two feet on a daily basis. Reservoir elevations below 774 feet MSL do not occur very often (generally no more than one a year) but have the potential to strand fish in large off-channel pools. Conditions that could results in stranding were surveyed for steelhead in 2006 and 2008. No stranding was observed (LGL and Douglas PUD 2008).

No effect was identified that related to any of the proposed measures.

4.4.4.9 Riparian Cover

Natural cover can provide important habitat for rearing sub-adult steelhead. Significant riparian cover is found in riverine areas and is limited in lacustrine environments. Cover is generally not utilized when steelhead migrate through Wells Reservoir. Spawning and rearing habitat occurs in the upper Methow River which is outside of the action area and will not be affected by Wells Project operations.

The banks of the Wells Project offer limited riparian cover. This is largely a result of the typical lack of riparian cover in natural high desert ecosystems typical of the Wells Project.

Additional funds provided by Douglas PUD for restoration measures occurring outside of the Wells Project are detailed in the TCP. Douglas PUD funded projects will improve habitat and potentially increase riparian cover. The potential for such riparian restoration to occur is contingent upon project selection by the Tributary Committee.

No effect was identified that related to any of the proposed measures.

4.4.4.10 Critical Habitat

Designated critical habitat for steelhead occurs within the Wells Project, and include: (1) the mainstem Columbia River from the Wells Tailrace to the confluence of the Columbia and Okanogan rivers; (2) the accessible portions of the Methow River Basin; and (3) the accessible portions of the Okanogan River Basins, excluding the Colville Reservation and Salmon Creek (NOAA 2006).

Habitat components important to steelhead in the mid-Columbia River basin include:

- juvenile rearing areas,
- juvenile migration corridors,
- areas for growth and development,
- adult migration corridors, and
- spawning habitat.

Within these habitat types, essential features include:

- adequate substrate,
- water quality,
- water quantity,
- water temperature,
- water velocity,
- cover/shelter,
- food,
- riparian vegetation,
- space, and
- safe passage conditions (65 FR 7764).

The diverse needs of steelhead are well known by Douglas PUD. Efforts to manage the Wells Project consistent with these needs are documented throughout the developed management plans and other conservation, management, and recovery actions taken by the PUD, in coordination with state and federal fish and wildlife agencies. These actions are described throughout this BA and represent Douglas PUD's efforts to operate the Wells Project and eliminate population-level impacts to steelhead critical habitat as a result of the Wells Project. Success of these efforts is demonstrated through achievement of the HCP NNI standard for steelhead.

Effects of the proposed action on individual critical habitat elements are addressed in the preceding assessments of potential effects of proposed measures on individual critical habitat elements, the determination of effects in section 4.4.5, and the summary effects matrix for steelhead in Table 4.4.5-1.

4.4.5 Determination of Effects

The following section provides a summary matrix (Table 4.4.5-1) of the potential effects described above and draws an effects determination based upon the dichotomous key developed by USFWS (1998b).

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Table 4.4.5-1 Summary Effects Matrix for UCR Summer-run Steelhead within the Wells Project

Critical Habitat	Project Effect	Upper Columbia River Subbasin Designated Area Affected	Exposure over 50-year Duration of Proposed Action	Response	Limiting to Conservation
Spawning, incubation and larval development	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, Aquatic Settlement actions, and action described in the Terrestrial Resources Management Plans.	The defined Action Area representing Wells Reservoir and tributaries	All spawning occurs upstream of the Project area. Spawning takes place in the mainstem Methow River and its tributaries. Spawning also occurs in the Lower Similkameen River--a tributary to the upper Okanogan River outside the Project Boundary.	NA	No effect
Rearing and migration within the Project	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, Aquatic Settlement actions, and action described in the Terrestrial Resources Management Plans.	The defined Action Area representing Wells Reservoir and tributaries	Brief exposure during migration period. Steelhead smolts migrate through the project during April through June.	Not significant. Survival standards ensure that survival will be at or above 93%. Monitoring indicates juvenile project survival is greater than 96%. Regarding predator control, potential for take is limited to longline angling. No steelhead have ever been captured in the history of the longline pikeminnow removal program. Any incidentally captured fish are released immediately.	Unlikely
Tributary Rearing and Migration (outside PB)	HCP Hatchery and Tributary Projects	The defined Action Area representing the Methow and Okanogan Rivers influenced by hatchery and tributary programs	Juvenile steelhead are captured during hatchery evaluation actions including screw traps and residual steelhead sampling. Adult steelhead are incidentally captured at the Twisp Weir during brood collection for spring Chinook in April through June.	Based upon monitoring in 2008, the newly constructed Twisp Weir is not a migration impediment nor is it a stranding structure for adult steelhead and kelts.	Unlikely
Passage through Project reservoir and facilities	Adult upstream fish passage	Columbia River Corridor	Brief exposure during migration period. Adults return from June through October	Not significant - passage times and survival are comparable to conditions without the Project	Unlikely
	Adult downstream passage	Columbia River Corridor	Brief exposure during migration period. Adults return from June through October. Kelts (post-spawn steelhead) migrate late April through June.	Not significant. Survival standards ensure that survival will be at or above 98% survival - Adult PIT-tag studies indicate survival is greater than 98% per project. Fallback rates are low. Most fallback takes place through the JBS where survival is high. A limited number of kelts passing downstream during late April through June when the JBS is in full operation. Most kelts likely use surface JBS. Some mortality may occur through turbines and spillway passage, but overall survival is expected to be high with JBS in place.	Unlikely
	Sub-adult passage	Columbia River Corridor	Brief exposure during migration period. Juveniles migrate downstream from April through June.	Not significant. Survival standards ensure that survival will be at or above 93%. Monitoring indicates 96% survival.	Unlikely

Table 4.4.5-1 (Continued) Summary Effects Matrix for UCR Summer-run Steelhead within the Wells Project.

Critical Habitat	Project Effect	Upper Columbia River Subbasin Designated Area Affected	Exposure over 50-year Duration of Proposed Action	Response	Limiting to Conservation
Water Quality	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, Aquatic Settlement actions and actions described in the Terrestrial Resources Management Plans.	Columbia River Corridor	Brief exposure during migration period. Adults return from June through October and juveniles migrate downstream from April through June. Kelts migrate from late April through June.	Not significant - Wells Project is operated in a run-of-river mode, with water quantity largely dependent on incoming river flows. The project is not a consumptive user of water. In general daily inflows from Grand Coulee and Chief Joseph are equal to daily discharge at Wells Dam.	Unlikely
Water Quantity	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, Aquatic Settlement actions and actions described in the Terrestrial Resources Management Plans.	Columbia River Corridor	Brief exposure during migration period. Adults return from June through October and juveniles migrate downstream from April through June. Kelts migrate from late April through June.	Not significant - proposed action will have no impact on the limited natural riparian cover, which is not typically used by migrating steelhead.	Unlikely
Riparian Cover	Project operations, including reservoir impoundment, reservoir fluctuation, maintenance, hydropower generation, Aquatic Settlement actions, actions described in the Terrestrial Resources Management Plans and Off-License Agreement.	Columbia River Corridor	Brief exposure during migration period. Adults return from April through early July and juveniles migrate downstream from April through June.	Not significant - proposed action will have no impact on the limited natural riparian cover, which is not typically used by migrating fish. TCP, Douglas PUD Land Use Policy, Aquatic Settlement Agreement and Off-License Agreement will have positive impacts to riparian cover within the Project. The TCP will have beneficial effects on riparian habitat in the tributaries outside of the Project Boundary.	Unlikely

Application of USFWS (1998b) decision matrix dichotomous key to determine potential effects on UCR summer-run steelhead.

The following is a stepwise assessment of potential effects on UCR summer-run steelhead salmon based on a dichotomous key developed by USFWS (1998b).

Step 1. Are there any listed or proposed species present in the watershed?

Yes. Steelhead are a listed species that occur in Wells Reservoir, tailrace and the Methow and Okanogan river watersheds. The Wells Project primarily serves as a migratory corridor for returning adults and outmigrating smolts and kelts. Usage of the Wells Project area is generally limited the months of April to June for juveniles and kelts and the months of June to October for adults. Individual fish spend a few days migrating through the Project thereby reducing overall exposure and take. The Project does not contain significant rearing habitat for juvenile steelhead.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

Yes. The proposed action may result in delay, stress or mortality during passage through project facilities. Juvenile steelhead may be exposed to predators such as northern pikeminnow during migration. Returning adult steelhead may exert increased levels of energy to pass the dam and may incur additional energetic costs associated with fallback and a second pass through the ladders. The primary route of fallback is through the juvenile bypass system during June through August and through turbines during September and October. The primary route of downstream passage for juvenile and kelt steelhead is through the juvenile bypass system that is in operation during their entire downstream migration (April – June). Less than 5 percent of the downstream migration juvenile steelhead are exposed to injury or mortality through interaction with the turbines. Juveniles or adults passing through the Wells Project tailrace may experience higher than ambient levels of TDG.

The overall potential for these identified effects to impact the population of steelhead is low. Spawning and rearing occur outside of the Project in the upper Methow and Okanogan rivers and tributary streams. Sensitive life history stages rear in locations where Project effects are absent. Use of the lower tributaries and the Wells Reservoir is primarily as a migratory corridor. Longline fishing predator control efforts in the reservoir have never captured a steelhead, displaying the effective selectivity of the control method. Passage at the reservoir is highly efficient and with minimal mortality. NMFS et al. (2002a) concluded that small delays at mid-Columbia River projects are more than compensated for by faster travel through the reservoir impoundments. Alexander et al. (1998) reported 1 of 20 steelhead (5 percent) fell back below Wells Dam, and English et al. (2001) reported a 6.8 percent fallback rate for steelhead at Wells Dam in 1999. Of the 11 radio-tagged steelhead that fell back in 1999, four re-ascended the ladder and six were found in spawning areas downstream of Wells Dam, with only one fish classified as an involuntary fall back. NMFS estimated mortality rates were relatively minimal (3.2 percent) for steelhead (NMFS 2000a, based on data in NMFS 2000b). Douglas PUD has conducted three years of juvenile survival studies at Wells Dam which have shown an average survival rate of 96.2 percent for steelhead (Bickford et al. 1999; Bickford et al. 2000; Bickford et al. 2001). More recently, adult PIT-tag estimates from the 2008 annual HCP report indicate that adult project survival is greater than 98 percent (Douglas PUD and Anchor Environmental, L.L.C. 2009).

The proposed action will also result in numerous benefits to steelhead that are expected to exceed the negative impacts described above. Existing management efforts and the implementation of Wells HCP management plans will provide numerous benefits to steelhead. Currently, the Wells HCP mandates juvenile passage survival of at least of 93 percent. Predator control efforts will continue to reduce the number of northern pikeminnow. Artificial enhancements through the hatchery management plan help bolster wild population numbers and provide up to 7 percent compensation for unavoidable Wells Project related effects. The Tributary Conservation Plan will help to restore habitats used for spawning and rearing outside of the Wells Project area and provide up to 2 percent compensation for unavoidable Wells Project related effects to adult steelhead.

Step 3. Does the proposed action have the potential to result in "take" of any listed or proposed species?

Yes. Juvenile mortality of three to seven percent during Project passage will likely continue, some portion of which is attributable to Project effects. Based upon PIT-tag data, take of adults is expected to be less than 2 percent. The Wells Project has achieved NNI for each Plan Species, including steelhead through a combination of high juvenile and adult survival through the Project coupled with hatchery compensation and tributary conservation efforts intended to replace the relatively small amounts of unavoidable "take" associated with operating the Wells Project (Douglas PUD and Anchor Environmental, L.L.C. 2009). Various plans to continue the achievement of NNI include the Passage Survival Plan, Wells Dam Juvenile Dam Passage Survival Plan, TCP, Hatchery Compensation Plan, Adult Passage Plan, and Predator Control Program. The standards and actions outlined in these plans will ensure low levels of take and provide measures to ensure that recovery of the species would not be jeopardized.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

Yes. Lower water velocities within Wells Reservoir may pose brief energetic challenges during downstream migration of juveniles and kelts. While the reservoir is considered critical habitat, it is used primarily as a migratory corridor. Conversely, the lower velocities require less effort by returning adults. Important spawning and rearing grounds are not affected by the Wells Project. Restoration and protection measures within the TCP of the HCP will improve important spawning and rearing habitat. The HCP provides funding for habitat improvements and establishes an HCP Habitat Committee to prioritize expenditure of designated funds. Over the duration of the HCP, habitat improvements secured by designated HCP Plan Species Account funding is expected to offset 2 percent or greater of the unavoidable project mortality for steelhead, and contribute to recovery of this species.

Based on this analysis, the determination of effects of this proposed action on the steelhead is: MAY EFFECT, NOT LIKELY TO ADVERSELY AFFECT steelhead or designated critical habitat. Although individual steelhead would be subject to take, the proposed action would not jeopardize the continued existence of the species or subsequent ESU's. Relative to the entire life cycle of steelhead, use of Wells Reservoir is minimal and excepting function as a migration corridor, reservoir habitat is the least important of all habitat components. Further, HCP implementation measures would offset any take and could result in a net benefit due to population enhancement and habitat restoration.

4.5 MARBLED MURRELET

The USFWS listed the marbled murrelet as threatened under the ESA on September 28, 1992 (57 FR 45328). In 1997, the USFWS finalized a recovery plan for this species (USFWS 1997b). A five-year review of the marbled murrelet was completed on September 1, 2004 to ensure accuracy of the species' ESA classification (73FR 57314). This review found that the California, Oregon, and Washington marbled murrelet population was not a DPS; however, the USFWS believes the analysis of the discreteness of this population segment was flawed (73 FR 57314). The USFWS initiated a rangewide status review of the marbled murrelet on October 2, 2008 to determine if delisting the California, Oregon, and Washington population is warranted (73 FR 57314).

4.5.1 Life History

The marbled murrelet is a small (9-12 ounces) seabird that spends most of its life in marine environments, but usually nests in forested habitats within 30 miles (but sometimes up to 50 miles) of the Pacific Coast, from Alaska to central California (McShane et al. 2004). Marbled murrelet nesting habitat is typically associated with large core areas of mature and old-growth coniferous forests with low amounts of edge and fragmentation in mesic forest zones (includes "west-side mid-and late-seral conifer and mixed forests in zones below the Mountain Hemlock zone west of the Cascade crest, and Interior Western Hemlock just east of Snoqualmie Pass" [Smith et al 1997]). These forests provide large limbs and natural platforms that these birds use as nest sites.

Typically a single egg is laid in a mossy depression or on dwarf mistletoe on a large-diameter branch; both parents help feed the chick, spending time away from the nest site foraging in nearshore saltwater. Marbled murrelets also sometimes lay eggs on bare talus slopes or cliff edges; there is only one documented occurrence of cliff nesting in Washington (Raphael and Bloxton 2008). These nest sites are common in Alaska where cliffs are more abundant.

Marbled murrelets have occasionally been observed using inland lakes as resting or foraging locations in British Columbia; however, most of these lakes were located within 12 miles of the ocean, and few were as far as 45 miles (Carter and Sealy 1986). The inland lakes appeared to be near mature old-growth nesting areas (Carter and Sealy 1986).

4.5.2 Presence in the Action Area

The Action Area of the Wells Project is well outside of the known range of marbled murrelet and does not contain suitable marbled murrelet habitat. The mature conifer forested areas in the Wells Project area do not consist of large core areas and are generally dominated by ponderosa pine (Douglas PUD 2006a); these forests are outside of the habitat zones for this species (Smith et al. 1997). The Wells Project is located more than 100 miles from the Pacific Coast, which is farther inland than marbled murrelet is known to occur (Whitworth et al. 2000, as cited in McShane et al. 2004). None of the habitats in the Wells Project area correspond to known marbled murrelet nesting habitat (Smith et al. 1997). This species has never been documented in the Wells Project area and was not included on a USFWS list of threatened and endangered species that may be present near the Wells Project (Douglas PUD 2006c).

4.5.3 Critical Habitat Designations

The USFWS designated 32 critical habitat units for the marbled murrelet in California, Oregon, and Washington on June 24, 1996 (61 FR 26256), and proposed to revise the designated critical habitat by removing acreage in California and Oregon on July 31, 2008 (73 FR 44678). No critical habitat for marbled murrelet occurs in Chelan, Douglas, or Okanogan counties (USFWS 2009b). The nearest marbled murrelet critical habitat to the Wells Project area is about 60 miles west of the Wells Project.

4.5.4 Environmental Measures and Analysis of Effects

No suitable marbled murrelet habitat exists in the Wells Project area. Based on the known distribution of this species and the lack of habitat, marbled murrelet are not expected to occur within the Wells Project area. The licensee proposes no changes in operations that would increase or decrease the likelihood of marbled murrelets using the Wells Project.

Step 1. Are there any listed or proposed species present in the watershed?

No. The marbled murrelet is not present in the watershed.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on the marbled murrelet.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to the marbled murrelet.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on marbled murrelet habitat.

4.5.5 Determination of Effects

Based on this analysis, the determination of effects of this proposed action on the marbled murrelet is: NO EFFECT.

4.6 GREATER SAGE-GROUSE

The Columbia Basin DPS of the greater sage-grouse is currently a candidate species under review for ESA listing. The USFWS initiated a status review to determine if the species warrants protection under the ESA in any portion of its range on February 26, 2008 (73 FR 10218). The final decision on whether the greater sage-grouse should be protected under the ESA originally due in May 2009, has been delayed pending new information about the species and its habitat. Publication of this new information is currently expected during the summer of 2009.

4.6.1 Life History

The greater sage-grouse is the largest (3-6 pounds) grouse species in North America. This species is found in a variety of shrub-steppe habitats, and relies heavily on sagebrush for nesting habitat, roosting cover, and food, especially during the winter. In the breeding season, sage-grouse males gather at leks to display to and compete for females. Leks are located on relatively open sites typically surrounded by denser shrub-steppe vegetation that is used for cover, thermal protection and feeding. Leks range in size from 0.1 acre to 90 acres and may be traditional (i.e., used in successive years) (USFWS 2008a). Greater sage-grouse populations in Washington have low reproduction rates and relatively high mortality rates (Hays et al. 1998).

The reduction in sage-grouse numbers and distribution in Washington is primarily attributed to loss and degradation of habitat through conversion to agriculture and other land uses. Before the arrival of early settlers, the climax condition in the shrub-steppe region of eastern Washington consisted of tracts of native sagebrush and bunchgrass species. Agricultural expansion, overgrazing, and sagebrush control through burning, mechanical removal, and chemical control, severely degraded and fragmented sage-grouse habitat. Approximately 40 percent remains of the estimated 4.16 million ha (10.4 million acres) of shrub-steppe that existed in eastern Washington before European settlement, and much of what remains is fragmented. Sage-grouse habitat is a subset of this remaining acreage, and factors affecting occupancy include elevation, slope, soil type, habitat quality, and patch size (Stinson et al. 2004).

4.6.2 Presence in Action Area

Sage-grouse were found throughout the shrub-steppe and meadow steppe vegetation zones before settlement of eastern Washington State (Hays et al. 1998). Based on botanical surveys by Douglas PUD, shrub-steppe comprises 19.8 percent (502 acres) of the 2,539 acres of non-aquatic habitat found in the study area (Douglas PUD 2006a). Although the historical range of the species encompassed the entire Wells Project, the current range is entirely outside the Wells Project Boundary (Schroeder et al. 2000; Hays et al. 1998). Sage-grouse are now confined to two isolated populations, one in Douglas and Grant counties approximately 5-10 miles from the Wells Project area and the other on the Yakima Training Center in Kittitas and Yakima counties over 60 miles from the Wells Project area. The statewide breeding population of sage-grouse in Washington in 1997 was estimated to be approximately 900-1,000 birds. About 600 sage-grouse occur in Douglas County and 300-400 are located in Kittitas and Yakima counties. The closest occupied habitat to Wells Reservoir is situated on the Waterville Plateau in northern Douglas County (Hays et al. 1998). The Wells Project's 230kV transmission lines crosses historically occupied sage-grouse habitat however the surveys for sage grouse conducted during 2008 did not document any occurrences of the species within or adjacent to the Project (Douglas PUD 2009a).

Targeted surveys of the 230kV transmission line and the Wells Project area were conducted in 2008 and revealed no evidence of use by greater sage-grouse (Douglas PUD 2009h). The nearest known sage-grouse lek in the vicinity of the study area is approximately 5 miles east of the transmission line corridor, near the northern end of the route. This lek was last known to be active in 1995; no activity was observed during surveys in 2000 (M. Schroeder, WDFW, personal communication as cited in Douglas PUD 2008a).

4.6.3 Critical Habitat Designation

No critical habitat has been designated for the greater sage-grouse.

4.6.4 Environmental Measures and Analysis of Effects

Although there is approximately 500 acres of shrub-steppe habitat in the Wells Project area, greater sage-grouse populations in Washington State appear to be restricted to locations well outside of the Wells Project area (USFWS 2008a). There is no known information to suggest any effect of the Wells Project on the reduction in sage-grouse numbers and distribution in Washington. The licensee proposes no changes in operations that would increase or decrease the availability of preferred habitat for this species or the likelihood of greater sage-grouse using the Wells Project.

Step 1. Are there any listed or proposed species present in the watershed?

Yes. Greater sage-grouse is a proposed species in the watershed.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on greater sage-grouse.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to greater sage-grouse.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on greater sage-grouse habitat.

4.6.5 Determination of Effects

Based on this analysis, the determination of effects of this proposed action on greater sage-grouse is: NO EFFECT.

4.7 FISHER

The West Coast DPS of the fisher is a candidate species for ESA-listing; listing was found to be warranted but precluded by higher priority actions on April 8, 2004 (68 FR 18770). The determination of "preclusion" is based on the species' listing priority number (LPN; range from 1 to 12) and the listing workload of the USFWS. Preparation of a listing proposal for this species is therefore delayed until higher priority actions are completed. The fisher is assigned a LPN of 6, a moderate priority.

4.7.1 Life History

The fisher is a medium-sized (3-13 pounds), stocky member of the weasel family. It is a generalist predator and inhabits closed-canopy coniferous, deciduous, and mixed forest types with large trees, snags, and large woody debris: characteristics typical of mature and old-growth forests. The fisher is solitary and avoids non-forested and open areas (Powell and Zielinski 1994).

Historically, fisher were widespread in low- to mid-elevation forests (up to 8,200 feet) throughout the Cascades, Olympic Peninsula, and other parts of Washington State (Powell and Zielinski 1994). More recently, fisher have typically been found from 3280 to 7200 feet elevation in the Cascade Range of Washington (Powell and Zielinski 1994). Due to over-trapping and loss of habitat, mostly due to logging, the fisher is currently very rare in the state.

4.7.2 Presence in the Action Area

No suitable mature forest habitat was located near or in the Wells Project area (Johnson and Cassidy 1997). Based on botanical surveys, upland mature closed-canopy forest comprises less than 0.2 percent of the 2,539-acres of non-aquatic habitat found in the study area (Douglas PUD 2006a). However, these forest types in the Wells Project area are dominated by ponderosa pine (Douglas PUD 2006a); and there are no records of fisher using this type of forest (Johnson and Cassidy 1997). The habitat found in the Wells Project area includes mostly open water, irrigated agriculture, shrub-steppe, emergent wetland/pond, and riparian shrub without a tree overstory (Douglas PUD 2006a, b). None of these habitats are preferred by fishers. In addition, mammal surveys conducted in the Wells Project area did not reveal any fisher or evidence of fisher (Douglas PUD 2006c). The fisher is not included in the mammal species that may occur in the transmission line study area (Douglas PUD 2009h).

4.7.3 Critical Habitat Designations

No critical habitat has been designated for the fisher.

4.7.4 Environmental Measures and Analysis of Effects

Less than five acres of ponderosa pine-dominated, forested lands occur in the Wells Project area. These forested areas are typically open stands along the shoreline of the reservoir, or along the Okanogan River (Douglas PUD 2006a). There is no evidence that fisher use ponderosa pine-dominated forest (Johnson and Cassidy 1997). No suitable habitat for the fisher occurs in or near the immediate Wells Project area. Douglas PUD proposes no changes in operations that would increase or decrease the likelihood of fisher using the Wells Project.

Step 1. Are there any listed or proposed species present in the watershed?

Yes. The fisher is a candidate species in the watershed.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on the fisher.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to the fisher.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on fisher habitat.

4.7.5 Determination of Effects

Based on this key, the determination of effects of this proposed action on the fisher is: NO EFFECT.

4.8 COLUMBIA BASIN PYGMY RABBIT

The USFWS listed the Columbia Basin pygmy rabbit, a distinct subpopulation of the pygmy rabbit, as endangered under emergency provisions on November 30, 2001 (66 FR 59734); the listing rule was finalized on March 2003 (68 FR 10388). The USFWS issued a draft recovery plan for the pygmy rabbit in 2007 (USFWS 2007a). On January 8, 2008 the USFWS issued a 90-day finding on a petition to list the pygmy rabbit as threatened or endangered and initiated a status review to determine if listing is warranted (73 FR 1312).

4.8.1 Life History

The pygmy rabbit is the smallest rabbit in North America. It has a relatively small home range during the winter (30 to 100 meters from the burrow), and a larger range during the breeding season: female home ranges average 7 acres, whereas males have an average home range of 50 acres (WDFW 1995; USFWS 2007a; NatureServe 2009). Pygmy rabbits breed from February to June; gestation lasts approximately 22 to 24 days with up to six young per litter, and up to four litters per year. Kits emerge from their burrows after about two weeks (USFWS 2007a).

The pygmy rabbit is an herbivore; its primary food source is sagebrush, particularly during the winter months. Grasses and herbaceous plants supplement the diet during mid-to-late summer. Predation is the main cause of mortality for the pygmy rabbit; predators include badger, long-tailed weasel, coyote, bobcat, great horned owl, long-eared owl, ferruginous hawk, northern harrier, and common raven (USFWS 2007a; NatureServe 2009).

This species occurs throughout most of the semiarid, shrub-steppe biome of the Great Basin and nearby intermountain areas of the western United States. Within this biome, the pygmy rabbit prefers habitat types that include tall, dense stands of sagebrush, which they are highly dependent upon for food and shelter throughout the year. This species is one of only two rabbits in North America that digs its own burrow and is most often found in areas that include relatively deep, loose soils that allow burrowing (USFWS 2007a).

4.8.2 Presence in the Action Area

The historical distribution of the pygmy rabbit includes a core range in the northern Great Basin and a population in the Columbia Basin that has been genetically isolated from the core population for at least 7,000 to 10,000 years, and potentially as long as 115,000 years (Grayson 1987; Lyman 1991; Lyman 2004, as cited in USFWS 2007a). The Columbia Basin population had a broader distribution approximately 7,000 to 3,000 years ago; however, gradual climate change affected the distribution and composition of sagebrush habitat types, causing the range of the pygmy rabbit to shrink around 3,000 years ago (Lyman 1991; Lyman 2004, as cited in USFWS 2007a).

During the early 1900s, the pygmy rabbit was considered rare with local areas of occurrence within the Columbia Basin and was thought to be extirpated from the State of Washington during the mid-1900s. Pygmy rabbits likely occurred in portions of six Washington counties during the first half of the 1900s, including Douglas, Grant, Lincoln, Adams, Franklin, and Benton counties (USFWS 2007a). This species has only been found in southern Douglas and northern Grant counties since the mid-1900s (WDFW 2000, as cited in USFWS 2007a).

Five subpopulations were known in Douglas County (about 30 miles south of the Wells Project area) in 1987-1988 (USFWS 2007a). The largest known population was located at the Sagebrush Flat area in south-central Douglas County. In 1993, this population had an estimated 588 active burrows and fewer than 150 rabbits. A subpopulation was discovered on private land in northern Grant County in 1997 (USFWS 2007a). All known Columbia Basin pygmy rabbit populations experienced drastic declines due to catastrophic fire and other unknown reasons from 1997 to 2004 and are now considered extirpated; this may indicate that the Columbia Basin DPS of the pygmy rabbit is extirpated from the wild (USFWS 2007a).

In 2001, the WDFW initiated a captive breeding program for the Columbia Basin pygmy rabbit (Hays 2003). WDFW reintroduced 20 captive-bred rabbits to historically occupied habitats in the Columbia Basin (about 30 miles south of the Wells Project area) in March of 2007. A high level of predation reduced their numbers to five over the first several weeks (USFWS 2007a).

The Wells Project area contains some shrub-steppe habitat, but it is outside of the historical distribution, potentially occupied habitats, recovery emphasis areas, and the six-mile buffer of the Columbia Basin pygmy rabbit historic range in Douglas County, Washington (USFWS 2007a; Johnson and Cassidy 1997). No evidence of pygmy rabbits was detected during Wells Project baseline or relicensing studies (Douglas PUD 2006c, 2009h).

4.8.3 Critical Habitat Designations

No critical habitat has been designated for the Columbia Basin DPS of the pygmy rabbit due to a lack of information regarding specific habitat features essential to the species (68 FR 10388).

4.8.4 Environmental Measures and Analysis of Effects

The pygmy rabbit is unlikely to occur in the Wells Project area because it is well outside of the known historical population range, recovery emphasis areas, and the six-mile buffer. Douglas PUD proposes no changes in operations that would increase or decrease the availability of suitable habitat or the likelihood of pygmy rabbit using the Wells Project.

Step 1. Are there any listed or proposed species present in the watershed?

Yes. Pygmy rabbit is a listed species in the watershed.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on pygmy rabbit.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to pygmy rabbit.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on pygmy rabbit habitat.

4.8.5 Determination of Effects

Based on this analysis, the determination of effects of this proposed action on pygmy rabbit is: NO EFFECT.

4.9 GRAY WOLF

The USFWS listed the gray wolf as endangered within the contiguous 48 states on January 4, 1974 (39 FR 1171). In April of 2003, the USFWS reclassified the Western DPS of gray wolves as threatened (68 FR 15804). In March 2008, the Northern Rocky Mountains population of the gray wolf was established as a DPS and this species was federally delisted in Idaho, Montana, Wyoming and in far eastern Washington (not including the Wells Project area) and Oregon (73 FR 10514). The western limit of the Northern Rocky Mountain DPS includes lands east of Highway (Hwy) 97 in Okanogan County, north of the junction with Hwy 17; and Hwy 17 to the Oregon Border in Washington State. The Wells Project area lies just west of the western boundary of the Northern Rocky Mountains DPS. Wolves in Washington west of the Northern Rocky Mountains DPS, including the Wells Project area, have been continuously protected under the ESA since 1974.

4.9.1 Life History

Gray wolves are highly territorial, social and live in packs. The pack typically consists of a socially dominant (alpha) pair and its offspring; one or more family groups could be present in a pack. Pack size is highly variable, generally ranging between 4 and 11, although packs with as many as 27 members have been reported (NatureServe 2009; WDFW 2009b). The pack hunts, feeds, travels, and rests together, and also shares pup-rearing responsibilities (WDFW 2009b). Lone wolves are not uncommon and may move through territories of established packs (Natureserve 2009; WDFW 2009b).

The alpha pair breeds between January and March. Litter size ranges from 4 to 10 pups, averaging 6 to 7 pups. Some offspring remain with the pack; others disperse as they mature (NatureServe 2009; WDFW 2009b). Gray wolves are crepuscular or nocturnal. During the fall and winter in northern states, wolves spend a majority of their time sleeping, resting or traveling, with little time feeding (NatureServe 2009).

The gray wolf is a habitat generalist and can be found in a variety of terrestrial environments including alpine, desert, grassland/herbaceous, savanna, shrubland/chaparral, tundra, and conifer, hardwood, and mixed forest and woodland (NatureServe 2009). Agricultural lands, non-forested rangelands, and developed areas are unsuitable for gray wolf persistence due to "high rates of wolf mortality, high densities of livestock compared to wild ungulates, chronic conflict with livestock and pets, local cultural intolerance of large predators, and wolf behavioral characteristics that make them vulnerable to human-caused mortality in open landscapes" (WDFW 2009b). This species predominantly preys on ungulates. When the dominant prey is scarce or seasonally unavailable, wolves will prey on smaller animals, scavenge carrion, and even eat vegetation (NatureServe 2009; WDFW 2009b).

4.9.2 Presence in the Action Area

Gray wolves were common throughout most of Washington prior to 1800. Trapping of wolves as a commercial source of fur began in earnest during the 1820s. Despite the fur trade, wolves remained common in many areas of Washington into at least the 1850s. As ranching and farming became established during the last half of the 1800s, gray wolf populations declined due to trapping, hunting, and poisoning; the species was considered extirpated from Washington by the 1930s (WDFW 2009b).

Reports of wolf sightings and discovery of wolf tracks in Washington have increased since 2002; in most cases, these were individual wolves in Pend Oreille and Stevens counties. In 2007 and 2008, the presence of this species has been reported in Chelan (unconfirmed report), Okanogan, Stevens, Pend Oreille, and Garfield/Asotin counties (WDFW 2009b). A pack with pups was detected in the western part of Okanogan County in 2008. Wolves in northern Washington are likely individuals that have dispersed from Montana, Idaho, or British Columbia.

The WDFW classifies Douglas County as outside of the current range of the gray wolf (WDFW 2008b). While parts of Okanogan and Chelan counties contain suitable habitat, (WDFW 2008b; WDFW 2009b; Johnson and Cassidy 1997), the surrounding agricultural croplands and non-forested rangelands as well as human presence preclude wolf pack persistence in the Wells Project area as these lands are unsuitable for wolves (WDFW 2009b; Johnson and Cassidy 1997). The significant presence of agriculture and developed lands (32 percent of the Study Area; 822 acres) and the proximity of human presence to the Wells Project Boundary (generally within 50 feet of the shoreline) makes the Wells Project area unsuitable for the gray wolf (Douglas PUD 2006a).

The Northern Rocky Mountains DPS includes lands east of Hwy 97 in Okanogan County, north of the junction with Hwy 17; and Hwy 17 to the Oregon Border in Washington State. The Wells Project area lies west of the western boundary of the Northern Rocky Mountains DPS.

4.9.3 Critical Habitat Designation

There is currently no critical habitat designation for the Northern Rocky Mountain grey wolf population.

4.9.4 Environmental Measures and Analysis of Effects

No suitable gray wolf habitat occurs in the Wells Project area. Based on the known distribution of this species and the lack of habitat, gray wolves are not expected to occur within the Wells Project area. The licensee proposes no changes in operations that would increase or decrease the likelihood of the gray wolf using the Wells Project.

Step 1. Are there any listed or proposed species present in the watershed?

Yes. The gray wolf is a listed species in the watershed.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on the gray wolf.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to the gray wolf.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on gray wolf habitat.

4.9.5 Determination of Effects

Based on this analysis, the determination of effects of this proposed action on the gray wolf is: NO EFFECT.

4.10 GRIZZLY BEAR

The USFWS listed the grizzly bear as threatened on July 28, 1975 for the lower 48 states, except where listed as an experimental population or delisted (40 FR 31734). A recovery plan for the grizzly bear was approved in 1982 and finalized on September 10, 1993 (USFWS 1993). In June of 1997, the USFWS finalized a supplement to the grizzly bear recovery plan for the North Cascades ecosystem (USFWS 1997a). In February of 1993, the USFWS found the reclassification of the Selkirk population (in the extreme northeast corner of Washington State) from threatened to endangered unwarranted (58 FR 8250); in June of 1998, the USFWS found the reclassification of populations in the North Cascades from threatened to endangered warranted, but precluded by higher listing priorities (63 FR 30453). On April 18, 2007, the USFWS initiated a 5-year review of this species to ensure that the classification of this species as threatened on the List of Endangered and Threatened Wildlife and Plants is accurate (72 FR 19549).

4.10.1 Life History

Grizzly bears are large (250-600 pounds) and have extensive home ranges (50 to 500 square miles). This species requires large areas of relatively undisturbed habitat with diverse topography and vegetation (USFWS 1993). The grizzly bear is normally solitary in nature, but may congregate in areas with abundant food or when breeding or caring for young. Females typically breed every 2 to 4 years during late spring and early summer. Cubs are born in winter (litter size is 1 to 4) and remain with the mother for the first two winters. Young are born in a den, cave, crevice, hollow tree, hollow dug under a rock, or similar sites (USFWS 1993; NatureServe 2009). Grizzly bears dig their own hibernation den and enter dormancy in October and November; they emerge in the spring, usually in April or May.

Grizzly bears mostly occur in arctic and alpine tundra, and subalpine forests, although historically they occurred in a greater variety of habitats including open prairie, brushlands, riparian woodlands, and semidesert scrub. Preferred habitats are open meadows and avalanche chutes in the spring, and timberlands with berry bushes in later summer and fall. This species is commonly found only where food sources are abundant and concentrated (e.g., salmon runs or caribou calving grounds) (USFWS 1993; NatureServe 2009).

The grizzly bear is an opportunistic omnivore; vegetable matter (green vegetation, wild fruits and berries, insects, nuts, bulbs, and roots) predominates, with the rest of the diet comprised of carrion, fish and sometimes elk or moose calves or other small animals (USFWS 1993; NatureServe 2009).

4.10.2 Presence in the Action Area

In North America, the historical range of the grizzly bear extended from the mid-plains westward to the California coast and south into Texas and Mexico. Between 1800 and 1975, the population in the lower 48 States receded from an estimate of over 50,000 to less than 1,000 individuals (USFWS 1993). Currently, the US range includes Alaska and portions of Montana, Idaho, Wyoming, and Washington; these areas in the lower 48 states support approximately 1,200 to 1,400 individuals. In the latter four states, only five areas in mountainous regions, national parks and wilderness areas contain either self-perpetuating or remnant populations of grizzly bear (USFWS 1993). Recovery zones for the grizzly bear in Washington State include the Selkirk Mountains (2,200 square miles) with approximately 40 to 50 bears in the extreme northeast section of the state and less than 20 bears in the North Cascades (9,500 square miles) (USFWS 1993; USFWS 2009a).

The North Cascades Recovery Area includes the North Cascade National Park, the Wenatchee and Okanogan National Forests, and most of the Mount Baker-Snoqualmie National Forest. The North Cascades Recovery Area includes part of the Methow River upstream of the Wells Project area, but the area does not border the Columbia River and does not include the Wells Project area. Most of the Wells Project area is at low elevations whereas grizzly bears and grizzly bear habitats are likely to be at high elevations.

Douglas County is outside of the grizzly bear distribution and does not contain suitable habitat (WDFW 2008b; Johnson and Cassidy 1997). Portions of Okanogan and Chelan counties potentially support this species, but only in areas outside of the Wells Project area at high elevations (WDFW 2008b).

4.10.3 Critical Habitat Designations

Critical habitat for the grizzly bear was designated on November 5, 1976 (41 FR 48757). In Washington, grizzly bear critical habitat is located in the extreme northeastern corner of the State (41 FR 48757).

4.10.4 Environmental Measures and Analysis of Effects

Grizzly bear distribution and the North Cascade Recovery Area are outside of the Wells Project area. Douglas PUD proposes no changes in operations that would increase or decrease the likelihood of grizzly bears using the Wells Project.

Step 1. Are there any listed or proposed species present in the watershed?

Yes. The grizzly bear is a listed species in the watershed.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on the grizzly bear.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to the grizzly bear.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on grizzly bear habitat.

4.10.5 Determination of Effects

Based on this key, the determination of effects of this proposed action on the grizzly bear is: NO EFFECT.

4.11 CANADA LYNX

The USFWS listed the Canada lynx as threatened under the ESA on March 24, 2000 (65 FR 16051) and began a 5-year review of the Canada lynx population on April 18, 2007 to ensure accuracy of listing status (72 FR 19549).

Seven national forests manage Canada lynx habitat according to a cooperative conservation agreement between the USFS and USFWS (USFS and USFWS 2005).

4.11.1 Life History

The Canada lynx is a medium-sized felid (Adult males average 22 pounds in weight, and females average 19 pounds (McCord, and Cardoza 1982) that occurs in boreal and mountain regions dominated by large stands of mature, uneven-age coniferous or mixed forest with a well-developed understory and abundant large woody debris (Eder 2002).

Lynx in the Okanogan National Forest in Washington State prefer lodgepole pine forests over all other habitats (McKelvey et al. 1999b). This habitat type is associated with higher snowshoe hare densities; snowshoe hares are the primary prey base for lynx. While lynx sometimes enter open forest, rocky areas, and tundra to forage for prey, they are rarely found in dry forests, areas without forest cover, and shrub-steppe habitats (McKelvey et al. 1999a). Long distance foraging and dispersal movements of up to about 150 miles have been recorded, especially when prey is scarce (Saunders 1963; Mech 1980; Ward and Krebs 1985); but most lynx occurrences in non-forested areas are located within 6 miles of a coniferous forest; and dispersals over 62 miles from coniferous forests are extremely rare (McKelvey et al. 1999a). Population density usually is less than 10 per 40 square miles, and is dependent upon prey availability (McCord and Cardoza 1982).

Suitable lynx denning habitat is often found in mature and old-growth forests with substantial amounts of coarse woody debris; however, early successional forests with windthrow and snags may also provide suitable habitat (Aubry et al. 1999). The lower elevation range for lynx in Washington is typically 4,000 feet MSL (Johnson and Cassidy 1997).

4.11.2 Presence in the Action Area

The Wells Project area and surrounding lands, which are all at relatively low elevation (about 770 - 1,400 feet MSL within the Project Boundary; and up to about 4,200 feet MSL along the transmission line), do not constitute suitable lynx habitat. The habitat found in the Wells Project area includes mostly open water, irrigated agriculture, shrub-steppe, emergent wetland/pond, and riparian shrub without a tree overstory (Douglas PUD 2006b; Douglas PUD 2006a). None of these habitats are preferred by lynx. Conifer cover types within the Wells Project area are dominated by ponderosa pine and constitute 5.3 acres, or 0.21 percent, of the study area lands. This cover type, however, is located at elevations 900 feet MSL and lower, which is outside of the range for Canada lynx.

The highest elevations in the Wells Project area could potentially extend into the range of Canada lynx; the transmission line crosses forested land at an elevation of approximately 4,200 feet MSL 6 mi northeast of the Rocky Reach Dam. This forest is a relatively small isolated patch, mostly below 4,000 feet MSL, and surrounds a local peak of 4,254 feet

MSL; therefore it is unlikely to support lynx. This forest is across the Columbia River, and isolated from the Okanogan-Wenatchee National Forest, where lynx have been documented. Additionally, the Canada lynx in not included in the mammal species that may occur in the transmission line study area (Douglas PUD 2009h). A portion of the Wells Project area along the Methow River is 2.5 miles northeast of suitable lynx habitat in the Okanogan-Wenatchee National Forest; this land is approximately 840 feet MSL and is non-forested.

While suitable lynx habitat occurs near the Wells Project area, and lynx could use the site, Project lands could be used only as a travel corridor. The habitats within the Wells Project area are not preferred by lynx. Additionally, small mammal surveys conducted within the Wells Project area show that the primary prey item for lynx (snowshoe hare) is not known to occur in the Wells Project area (Douglas PUD 2006c).

4.11.3 Critical Habitat Designations

On November 9, 2006, the USFWS designated critical habitat for the Canada lynx in three units, including one in the North Cascades National Park in Washington (71 FR 66007). On February 28, 2008, the USFWS proposed a revision to the designated critical habitat for the Canada lynx that would add to the existing critical habitat (73 FR 10859). The nearest current Canada lynx critical habitat to the Wells Project is on lands above 4,000 feet MSL in the North Cascades National Park; located approximately 33 miles northwest of the Wells Project area. The proposed revision to the critical habitat includes lands above 4,000 feet MSL in the Okanogan-Wenatchee National Forest; located approximately 2.5 miles west of the Wells Project area. The Wells Project area is not within designated critical habitat.

The USFS has documented the occurrence of lynx in the Okanogan-Wenatchee National Forest in the higher elevation mountains to the west of the Wells Project; however, the lack of suitable habitat in the immediate Wells Project area suggests that lynx rarely travel within the Wells Project.

4.11.4 Environmental Measures and Analysis of Effects

Preferred lynx habitat does not occur in the Wells Project area and it is unlikely that lynx would occur within the Wells Project area. Douglas PUD proposes no changes in operations that would increase or decrease the likelihood of Canada lynx using the Wells Project.

Step 1. Are there any listed or proposed species present in the watershed?

Yes. Canada lynx is a listed species in the watershed.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on Canada lynx.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to Canada lynx.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on Canada lynx habitat.

4.11.5 Determination of Effects

Based on this key, the determination of effects of this proposed action on Canada lynx is: NO EFFECT.

4.12 NORTHERN SPOTTED OWL

The northern spotted owl was listed as threatened throughout its range in California, Oregon, and Washington on June 26, 1990 (55 FR 26114). The USFWS conducted a 5-year review of the northern spotted owl in April of 2003 (68 FR 19569) and finalized a recovery plan in May of 2008 (USFWS 2008c).

4.12.1 Life History

The northern spotted owl is a medium-sized (1-1.5 pounds) owl that typically nests in old-growth or mature conifer forests; younger stands are sometimes used for foraging and roosting. Typical suitable forests have moderate to high canopy closure, multilayered canopy, abundant large trees with large cavities, broken tops, snags, and large woody debris. This nocturnal species preys primarily on flying squirrels and wood rats. Spotted owls form long-term pair bonds that are maintained throughout the year. Nest sites include natural hollows in large trees with broken tops, artificial nest boxes, mistletoe tangles and old stick nests left from other species; nest sites are reused for many years. Females typically lay 2 eggs, which hatch in 30 days. Spotted owls do not migrate, but may shift their range in order to find prey (e.g., heavy snow may prompt a shift to lower elevations).

4.12.2 Presence in the Action Area

Suitable habitat for the northern spotted owl does not occur within the Wells Project area (Douglas PUD 2006a; Smith et al. 1997). The conifer forest found in the Wells Project area is dry, inland ponderosa pine forest type, which typically does not support spotted owl (Thomas et al. 1990). Pine forests do not usually have structural characteristics necessary for suitable spotted owl habitat, particularly multilayered canopies (Thomas et al. 1990). Terrestrial habitats found in the Wells Project area are mostly irrigated agriculture, shrub-steppe, emergent wetland/pond, and riparian shrub without a tree overstory (Douglas PUD 2006a; Douglas PUD 2006b).

This species was not detected in avian surveys for the Forest Service and was not included in the Wells PAD as it is unlikely to occur in the Wells Project area (Douglas PUD 2006c; Douglas PUD 2006b).

4.12.3 Critical Habitat Designations

Critical habitat for the northern spotted owl was designated in 1992 (57 FR 1796) and revised in 2008 (73 FR 47326). In Washington, there are about 1.8 million acres of critical habitat in six units; the nearest to the Wells Project area is in the Okanogan Unit in the Okanogan National Forest. This critical habitat unit consists of 115,600 acres of Forest Service land and the nearest subunit is located 14.7 miles west of the Wells Project area.

4.12.4 Environmental Measures and Analysis of Effects

No suitable habitat for the northern spotted owl exists in the immediate Wells Project area. Douglas PUD proposes no changes in operations that would increase or decrease the availability of suitable habitat or the likelihood of northern spotted owl using the Wells Project.

Step 1. Are there any listed or proposed species present in the watershed?

Yes. The northern spotted owl is a listed species in the watershed.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on the northern spotted owl.

Step 3. Does the proposed action have the potential to result in the “take” of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to the northern spotted owl.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on northern spotted owl habitat.

4.12.5 Determination of Effects

Based on this analysis, the determination of effects of this proposed action on the northern spotted owl is: NO EFFECT.

4.13 WASHINGTON GROUND SQUIRREL

The Washington ground squirrel was listed as a candidate species by the USFWS in October 25, 1999 throughout its range in Oregon and Washington (64 FR 57533). In Washington, there are currently no formal agreements to protect the species. In Oregon, however, actions have been taken to address agricultural threats to a large portion of Washington ground squirrel habitat and, therefore, the overall threats are not considered imminent, which keeps its federal listing priority at a moderate level (73 FR 75175).

4.13.1 Life History

The Washington ground squirrel occurs in shrub-steppe and grassland habitats of the Columbia Plateau east and south of the Columbia River in Washington and Oregon. This species was historically associated with sagebrush and bluebunch wheatgrass habitats; however, removal and alteration of the native flora on non-agricultural land has allowed cheatgrass and rabbitbrush to proliferate in these habitats (Finger et al. 2007; USFWS 2008d; NatureServe 2009). The establishment of these species alters available cover, food quantity and quality, and increases fire intervals (73 FR 75175).

This small ground squirrel is diurnal and prefers areas of deep, undisturbed soils suitable for burrowing as it spends much of its time underground (Finger et al. 2007; USFWS 2008d; NatureServe 2009). Food sources for this species include herbaceous vegetation, roots, bulbs, seeds, and insects; native plants play an important dietary role (USFWS 2008d; NatureServe 2009).

The Washington ground squirrel breeds once per year, during late January to early February, soon after emergence from hibernation. In Douglas County, at the highest elevation and furthest northern limit of the range, emergence from hibernation occurs a month later, late February to early March. It is assumed other life history events are similarly delayed, compared to published studies which occurred further south and at lower elevations. Initiation of hibernation coincides with senescence of cool season grasses (personal communication, Beau Patterson). Young are born 23 to 30 days after breeding and litter size ranges from 5 to 11. In late May to June, ground squirrels enter their burrows and hibernate for 7 to 8 months. Individuals live alone or in colonies (USFWS 2008d; NatureServe 2009).

The main predator of the Washington ground squirrel is the badger (*Taxidea taxus*); others include northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*Buteo regalis*), Swainson's hawk (*Buteo swainsoni*), prairie falcon (*Falco mexicanus*), long-tailed weasel (*Mustela frenata*), mink, coyote (*Canis latrans*), striped skunk (*Spilogales putorius*), bald eagle, great horned owl (*Bubo virginianus*), black-billed magpie (*Pica pica*), common raven (*Corvus corax*), western rattlesnake (*Crotalus viridus*), and gopher snake (*Pituophis melanoleucus*) (Finger et al. 2007; NatureServe 2009).

This species is highly vulnerable to local extirpation because many extant colonies are small and isolated from other colonies, and land use patterns are not conducive to conservation. The Washington ground squirrel is sometimes considered an agricultural pest and is subject to recreational shooting (USFWS 2008d; NatureServe 2009).

4.13.2 Presence in the Action Area

The Washington ground squirrel is endemic to the Columbia Plateau, east and south of the Columbia River and east of the John Day River. Populations were historically located in Garfield, Spokane, Grant, Adams, Douglas, Franklin, Walla Walla, Lincoln, Columbia, and Whitman counties (Finger et al. 2007; USFWS 2008d). Recent occurrences in Washington are concentrated in Franklin, Lincoln, Walla Walla, Adams, Douglas, and Grant counties (Finger et al. 2007; USFWS 2008d).

In 2004, surveys of historical Washington ground squirrel sites found 47 active burrows in four locations in Douglas County: Foster Coulee, Jameson Lake, Sagebrush Flats, and Duffy Creek (Finger et al. 2007). The nearest active sites were located about 15 miles south and 15 miles east of the Wells Project area.

The Washington State Priority Habitats and Species List data indicates the Washington ground squirrel occurs in Douglas County (WDFW 2008a), south and east of the Wells Project. Suitable habitats are located in southern Douglas County (Johnson and Cassidy 1997). No evidence of Washington ground squirrels was detected during Wells Project baseline or relicensing studies (Douglas PUD 2006c, 2009h).

4.13.3 Critical Habitat Designations

No critical habitat has been designated for the Washington ground squirrel at this time.

4.13.4 Environmental Measures and Analysis of Effects

Washington ground squirrel distribution and known colony locations are outside of the Wells Project area. The licensee proposes no changes in operations that would increase or decrease the likelihood of Washington ground squirrel using the Wells Project.

Step 1. Are there any listed or proposed species present in the watershed?

Yes. The Washington ground squirrel is a listed species in the watershed (Douglas County).

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on the Washington ground squirrel.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to the Washington ground squirrel.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on Washington ground squirrel habitat.

4.13.5 Determination of Effects

Based on this analysis, the determination of effects of this proposed action on the Washington ground squirrel is: NO EFFECT.

4.14 YELLOW-BILLED CUCKOO

The western US DPS of the yellow-billed cuckoo is a candidate for ESA-listing; the USFWS determined that listing of this species as threatened is warranted, but precluded (69 FR 24876). In May of 2005, the USFWS elevated the ESA-listing priority of the yellow-billed cuckoo because threats are ongoing and, therefore, imminent (70 FR 24870).

4.14.1 Life History

The yellow-billed cuckoo is a robin-sized, grayish-brown and white bird with a down-curved bill. The cuckoo breeds in large sections of deciduous woodlands and riparian shrub; nesting sites are typically found in dense understory foliage. Cottonwoods and willows provide important foraging habitat, particularly for the western US population. Yellow-billed cuckoos eat primarily caterpillars and other insects. Young develop rapidly (17 days from egg laying to fledging of young) and both parents participate in brooding. Yellow-billed cuckoos occasionally lay eggs in the nests of other cuckoos or other bird species (USFWS 2008b).

In Washington, the yellow-billed cuckoo was historically fairly common locally along the lower Columbia River (Jewett et al. 1953; Roberson 1980; Marshall 1996, as cited in USFWS 2008b), but rare east of the Cascades. The species is now thought to be extirpated in Washington, Oregon, and British Columbia (USFWS 2008b).

4.14.2 Presence in the Action Area

The yellow-billed cuckoo is not likely to occur in the Wells Project area. Although surveys conducted in 2005 indicate that potentially suitable habitat (riparian deciduous tree cover including willows and cottonwoods) occurs in 141.9 acres (5.6 percent) of the Study Area (Douglas PUD 2006a), this species is believed to be extirpated from Washington and, therefore, it is not likely to be present in the Wells Project area. No cuckoos were detected during avian surveys of the Project area (Douglas PUD 2009h; Douglas PUD 2006c).

4.14.3 Critical Habitat Designations

No critical habitats have been designated for this species.

4.14.4 Environmental Measures and Analysis of Effects

It is unlikely that the yellow-billed cuckoo would occur in the Wells Project area as this species is believed to be extirpated from Washington. Douglas PUD proposes no changes in operations that would increase or decrease the likelihood of yellow-billed cuckoo using the Wells Project.

Step 1. Are there any listed or proposed species present in the watershed?

Yes. Yellow-billed cuckoo is a candidate species in the watershed.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on yellow-billed cuckoo.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to yellow-billed cuckoo.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on yellow-billed cuckoo habitat.

4.14.5 Determination of Effects

Based on this analysis, the determination of effects of this proposed action on yellow-billed cuckoo is: NO EFFECT.

4.15 WENATCHEE MOUNTAINS CHECKER-MALLOW

The USFWS listed the Wenatchee Mountains checker-mallow as federally endangered throughout its range on December 22, 1999 (64 FR 71680). A recovery plan was finalized for this species in 2004 (USFWS 2004a).

4.15.1 Life History

The Wenatchee Mountains checker-mallow, a member of the mallow family (*Malvaceae*), is a perennial herb with a stout taproot that gives rise to several stems 8 to 60 inches high. This species bears pale to bright pink flowers between June and August. The Wenatchee Mountains checker-mallow is endemic to Chelan County and known to occur at only five localities (USFWS 2004a). This species grows in moist meadows with saturated soil or surface water, though it is occasionally found in open conifer stands between elevations of 1970 and 3,300 feet MSL (CPC 2008b).

4.15.2 Presence in Action Area

The Wenatchee Mountains checker-mallow is currently known to occur in only five populations, all 40 to 45 miles southwest of the Wells Project area. Further, the Washington State Natural Heritage Program (WSNHP) database (2007) does not have records of occurrence in areas near the Wells Project area. This species is not described in the PAD because it is unlikely to be present in the Wells Project area. In addition, this species was not encountered during rare plant surveys conducted in the Wells Project area in 2005 (Douglas PUD 2009h; Douglas PUD 2006a).

4.15.3 Critical Habitat

The USFWS has designated 6,135 acres of critical habitat for the Wenatchee Mountains checker-mallow in Chelan County, approximately 40 miles southwest of the Action Area (USFWS 2004a).

4.15.4 Environmental Measures and Analysis of Effects

The Wenatchee Mountains checker-mallow is not known to occur in the Wells Project area. Douglas PUD proposes no changes in operations that would increase or decrease the likelihood of the Wenatchee Mountains checker-mallow occurring in the Wells Project.

Step 1. Are there any listed or proposed species present in the watershed?

Yes. The Wenatchee Mountains checker-mallow is a listed species in the watershed.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on the Wenatchee Mountains checker-mallow.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to the Wenatchee Mountains checker-mallow.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on Wenatchee Mountains checker-mallow habitat.

4.15.5 Determination of Effects

Based on this analysis, the determination of effects of this proposed action on the Wenatchee Mountains checker-mallow is: NO EFFECT.

4.16 SHOWY STICKSEED

The USFWS classified the showy stickseed as federally endangered throughout its range in Washington state on February 6, 2002 (67 FR 5515). A recovery plan for the showy stickseed was finalized by the USFWS in cooperation with the USFS in 2007 (USFWS 2007b).

4.16.1 Life History

Showy stickseed, a member of the borage family (*Boraginaceae*), is a short-statured upland plant (8-16 inches tall) with large, showy, white flowers (CPC 2008a). It is endemic to the Wenatchee Mountains in Washington and grows on steep slopes of granitic sand and rocks in openings within conifer forests that are maintained by periodic wildfires. Showy stickseed is found at elevations from 1600 to 2500 feet MSL (CPC 2008a). According to the USFWS (67 FR 5515), showy stickseed is extant at only one location in Chelan County, Washington, with a population of 150-500 individuals entirely on federal land.

4.16.2 Presence in Action Area

Showy stickseed is not expected to occur in the Wells Project area because the species is only extant at one location near the City of Leavenworth, WA (50 miles southwest of the Wells Project area) (USFWS 2002b; USFWS 2007b). Showy stickseed was also not included in the target list of RTE plant species potentially occurring in the study area (which was developed from USFWS and Washington State DNR lists of RTE species that may be present near the Wells Project), and also was not detected in botanical surveys (Douglas PUD 2006a, 2009h). Further, the WSNHP database (2007) does not indicate any populations of showy stickseed in the general vicinity. This species is not described in the PAD because it is unlikely to be present in the Action Area (Douglas PUD 2006b).

4.16.3 Critical Habitat Designations

No critical habitat has been designated for showy stickseed as it was not deemed to benefit species conservation; rather a designation would likely increase collection and both direct and inadvertent habitat degradation and destruction (67 FR 5515).

4.16.4 Environmental Measures and Analysis of Effects

The one known population of showy stickseed does not occur in the Wells Project area. Douglas PUD proposes no changes in operations that would increase or decrease the likelihood of the presence of this species in the Wells Project area.

Step 1. Are there any listed or proposed species present in the watershed?

Yes. Showy stickseed is a listed species in the watershed.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on showy stickseed.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to showy stickseed.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on showy stickseed habitat.

4.16.5 Determination of Effects

Based on this analysis, the determination of effects of this proposed action on showy stickseed is: NO EFFECT.

4.17 UTE LADIES'-TRESSES

The USFWS listed Ute ladies'-tresses as threatened throughout its range (Colorado, Idaho, Montana, Nebraska, Nevada, Utah, Washington, and Wyoming) on January 17, 1992 (57 FR 2048). In 1995, the USFWS finalized a recovery plan for this species (USFWS 1995). On October 15, 2004, the USFWS began a five-year review process of the Ute ladies'-tresses status to consider delisting the species due to new information about the abundance and distribution of the species (69 FR 60605).

4.17.1 Life History

Ute ladies'-tresses, a member of the orchid family (*Orchidaceae*), is a perennial with 7 to 32 inch stems arising from tuberous roots (USFWS 2004b). The species puts out a spike of white flowers between August and September. Ute ladies'-tresses grows in silty loam alluvial soils associated with wetlands and floodplains of valley streams. There are known extant populations in eight states, including Washington (CPC 2008c).

4.17.2 Presence in Action Area

Rare plant surveys for the Wells ILP found no populations of Ute ladies'-tresses, although potentially suitable habitat was documented at stabilized gravel bars on the Columbia River that are moist throughout the growing season and inundated early in the growing season (Douglas PUD 2006a, 2009h). The WSNHP database (2007) does not indicate any populations in the Action Area, but does include records of populations in the vicinity. The closest recorded population is 4.5 miles downstream of the Wells Dam.

4.17.3 Critical Habitat

At this time, there is no critical habitat designated for Ute ladies'-tresses (CPC 2008c; USFWS 2004b).

4.17.4 Environmental Measures and Analysis of Effects

No populations of Ute ladies'-tresses have been found in the Wells Project area, although suitable habitat is present. Douglas PUD proposes no changes in operations that would increase or decrease the likelihood of Ute ladies'-tresses occurring in the Wells Project area.

Step 1. Are there any listed or proposed species present in the watershed?

Yes. Ute ladies'-tresses is a listed species in the watershed.

Step 2. Will the proposed action have any effect whatsoever (including small effects, beneficial effects, and adverse effects)?

No. The proposed action would have no direct or indirect effects on Ute ladies'-tresses.

Step 3. Does the proposed action have the potential to result in the "take" of any listed or proposed species?

No. The proposed action has no potential to cause any direct or indirect injury or harm to Ute ladies'-tresses.

Step 4. Does the proposed action have the potential to cause any adverse effect on any listed or proposed species habitat?

No. The proposed action has no potential to cause any adverse effect on Ute ladies'-tresses habitat.

4.17.5 Determination of Effects

Based on this analysis, the determination of effects of this proposed action on Ute ladies'-tresses is: NO EFFECT.

5.0 CUMULATIVE EFFECTS

Cumulative effects are defined in 50 CFR §402.02 as "those effects of future state, tribal, local or private actions, not involving federal activities, that are reasonably certain to occur in the action area." Future Federal actions, including the ongoing operation of hatcheries, fisheries, and land management activities, are not considered within the category of cumulative effects for ESA purposes because they require separate consultations under Section 7 of the ESA after which they are considered part of the environmental baseline for future Section 7 consultations. Guidance for determining cumulative effects in the Endangered Species Consultation Handbook (USFWS and NMFS 1998) states the following:

> *"Indicators of actions 'reasonably certain to occur' may include, but are not limited to: approval of the action by State, tribal or local agencies or governments (e.g., permits, grants); indications by State, tribal or local agencies or governments that granting authority for the action is imminent; project sponsors' assurance the action will proceed; obligation of venture capital; or initiation of contracts. The more State, tribal or local administrative discretion remaining to be exercised before a proposed non-Federal action can proceed, the less there is a reasonable certainty the project will be authorized."*

Notable identified activities that meet state, tribal or local agency involvement included the Washington State legislation to enhance salmon recovery through tributary enhancement programs, Washington State TMDL development and implementation, tribal efforts to restore native culturally important fish populations and public land use in the action area.

5.1 WASHINGTON STATE

Several legislative measures have been passed in the State of Washington to facilitate the recovery of listed species and their habitats, as well as the overall health of watersheds and ecosystems. The 1998 Salmon Recovery Planning Act provides the basis for developing watershed restoration projects and establishes a funding mechanism for local habitat restoration projects. The Salmon Recovery Planning Act also created the Governor's Salmon Recovery Office to coordinate and assist in the development of salmon recovery plans.

The Statewide Strategy to Recover Salmon is also designed to improve watersheds, while the 1998 Watershed Planning Act encourages voluntary water resource planning by local governments, citizens, and Tribes in regards to water supply, water use, water quality, and habitat at the WRIA level. The Salmon Recovery Funding Act established a board to approve localized salmon recovery funding activities.

WDFW and Tribal co-managers implemented the Wild Stock Recovery Initiative in 1992 and completed comprehensive management plans that identify limiting factors and habitat restoration activities. These plans also include actions in the harvest and hatchery components.

Although the Washington legislature amended the Shoreline Management Act to increase protection of shoreline fish habitat, a recent court challenge will delay implementation and possibly require additional amendments. Washington State's Forest and Fish Policy is designed to establish criteria for non-Federal and private forest activities that will improve environmental conditions for listed species, primarily to minimize impacts to fish habitat through protection of riparian zones and instream flows.

The State of Washington is under a court order to develop TMDL management plans on each of its 303(d) water-quality-listed streams, which will result in water quality improvements. The State also established an ongoing program in 2000 to buy or lease water rights for instream flow purposes. The mainstem Columbia River was closed by the State to new water rights appropriations in 1995. These programs should improve water quantity and quality in the State over the long term.

In addition to the programs and initiatives identified for Washington, similar programs have been or are being developed in Idaho and Montana. Although these programs would have a greater effect on the Snake River fish populations, they are likely to benefit the mid-Columbia River stocks as they migrate through the Lower Columbia River.

Any activities that may result in changes to the aquatic environment potentially affecting implementation of Douglas PUD's plans, operations or facilities, will require consultation by the acting party with Douglas PUD (if Douglas PUD is not the acting party) and result in consultation with Federal agencies. Alterations to water quality and salmon improvement projects in the action area would all trigger federal consultation and not meet the criteria for a cumulative effect. As a result, the Washington State activities described above are not considered cumulative effects based upon the criteria established by NMFS and USFWS.

5.2 TRIBES

The Nez Perce, Umatilla, Warm Springs, and Yakama Tribes have developed a joint restoration plan for anadromous fish in the Columbia River basin, known as the Wy-Kan-Ush-Mi Wa-Kish- Wit, or Spirit of the Salmon plan (CRITFC 2002). The plan emphasizes the reliance on natural production and healthy river ecosystems, and addresses hydroelectric operations on the mainstem Columbia and Snake Rivers; habitat protection and restoration throughout the basin (including the Columbia River estuary); fish production and hatchery reforms; and in-river and ocean harvest reforms. The plan provides a framework for restoring anadromous or migratory fish stocks (specifically salmon, steelhead, Pacific lamprey, and white sturgeon) in areas upstream of Bonneville Dam. The plan should have positive cumulative effects on anadromous and migratory species and their habitat, and includes the objectives of:

- halting the decline of salmon, lamprey, and sturgeon populations in areas upstream of Bonneville Dam within 7 years;
- rebuilding salmon populations upstream of Bonneville Dam to annual run sizes of 4 million fish within 25 years in a manner that supports Tribal ceremonial, subsistence, and commercial harvests; and
- increasing lamprey and sturgeon populations to naturally sustaining levels within 25 years in a manner that supports Tribal harvests.

In order for the tribes to achieve the objectives identified above, they are working with Douglas PUD to implement relevant activities. Some of these activities are being implemented by Douglas PUD within the HCP, the Aquatic Settlement Agreement and other Resource Management Plans described within this document. Any additional activities outside of the current descriptions would require additional Federal consultation and thus are not considered cumulative effects.

5.3 PUBLIC

Changes in land use activity may occur as a result of public activity or programs being implemented by Douglas PUD. For instance, change of ownership and/or land use may result from tributary conservation efforts to restore or enhance habitat. These restoration planning efforts would require federal consultation before implementation, and if approved would become part of the Project environmental baseline. Effects from public use of the action area would be addressed by Douglas PUD in the project environmental baseline and/or through consultation. Therefore, future public land use activities would not be considered as potential cumulative effects.

5.4 SUMMARY OF CUMULATIVE EFFECTS

Several activities by state, tribal and public entities were identified as reasonably likely to occur within the action area. Activities potentially affecting implementation of Douglas PUD's plans, operations or facilities, would require coordination with Douglas PUD. As a result, these activities would require Douglas PUD to initiate Federal consultation if the activity had not already been addressed in prior consultations. Therefore, no cumulative effects were identified based upon the NMFS and USFWS criteria.

6.0 SUMMARY OF EFFECTS DETERMINATION

A tabular summary of effects determinations for each of the 16 listed or candidate species considered here is provided below. Of the 16 analyzed species, only three fish species were identified as occurring in the action area. The proposed action is determined to have No Effect on 13 of the 16 species analyzed. The Effects Determinations for the three ESA-listed species found within the Wells Project include a Likely to Adversely Affect determination for bull trout and a May Effect, Not Likely to Adversely Affect determination for spring Chinook and steelhead (Table 6.0-1).

Table 6.0-1 Summary of Effects Determination for ESA-listed and Candidate Species.

Listed Species	Effect Determination (Species)	Effect Determination (Critical Habitat)	Comments
Fish Species			
Bull Trout (*Salvelinus confluentus*) Threatened	Likely to adversely affect	Proposed critical habitat serves passage and foraging functions for adult bull trout and would not result in destruction or adverse modification of designated or proposed critical habitat	Resident fish primarily occupy the Methow River (tributary). Passage does occur at Project facilities and some foraging may occur in the Wells Reservoir
Upper Columbia River Spring-run Chinook (*Oncorhynchus tshawytscha*) Endangered	May effect, not likely to adversely affect	Habitat within the Project area primarily serves as a migratory corridor and would not result in destruction or adverse modification of designated or proposed critical habitat	Rearing and spawning occurs in the Methow River (tributary). Lower tributary and reservoir used as a migratory corridor.
Upper Columbia River Summer-run Steelhead (*Oncorhynchus mykiss*) Threatened	May effect, not likely to adversely affect	Habitat within the Project area primarily serves as a migratory corridor and would not result in destruction or adverse modification of designated or proposed critical habitat	Rearing and spawning occurs in the Methow and Okanogan rivers (tributaries). Lower tributary and reservoir used as a migratory corridor.
Wildlife Species			
Marbled Murrelet (*Brachyramphus marmoratus*) Threatened	No effect	Would not result in destruction or adverse modification of designated or proposed critical habitat	Nesting habitat within North Cascades National Park, outside of Project Area
Greater Sage-Grouse (Columbia Basin DPS) (*Centrocercus urophasianus*) Candidate	No effect	Critical habitat not designated	No documented populations within the Project Area
Fisher (West Coast DPS) (*Martes pennanti*) Candidate	No effect	Critical habitat not designated	No documented populations or suitable habitat within or near the Project Area
Pygmy Rabbit (Columbia Basin DPS) (*Brachylagus idahoensis*) Endangered	No effect	Critical habitat not designated	Project Area outside of historical range and recovery emphasis areas
Gray Wolf (*Canis lupus*) Endangered	No effect	Critical habitat not designated	No documented populations or suitable habitat within or near the Project Area

Table 6.0-1 (continued) Summary of Effects Determination for ESA-listed and Candidate Species.

Grizzly Bear (*Ursus arctos horribilis*) Threatened	No effect	Would not result in destruction or adverse modification of designated critical habitat	North Cascades Grizzly Bear Recovery Area includes part of Methow River upstream of Project Area
Canada Lynx (*Lynx canadensis*) Threatened	No effect	Would not result in destruction or adverse modification of designated or proposed critical habitat	Project area not located in Washington State Lynx Management Zones or designated critical habitat
Northern Spotted Owl (*Strix occidentalis caurina*) Threatened	No effect	Would not result in destruction or adverse modification of designated critical habitat	No documented populations or suitable habitat within the Project Area
Washington Ground Squirrel (*Spermophilus washingtoni*) Candidate	No effect	Critical habitat not designated	No documented populations within the Project Area
Yellow-billed Cuckoo (*Coccyzus americanus*) Candidate	No effect	Critical habitat not designated	No documented populations within or near the Project Area
Plant Species			
Wenatchee Mountains Checkermallow (*Sidalcea oregana var. calva*) Endangered	No effect	Would not result in destruction or adverse modification of designated critical habitat	No documented populations within or near the Project Area
Showy Stickseed (*Hackelia venusta*) Endangered	No effect	Critical habitat not designated	No documented populations within or near the Project Area
Ute Ladies'-tresses (*Spiranthes diluvialis*) Threatened	No effect	Critical habitat not designated	No documented populations within or near the Project Area

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APPENDIX A

ESSENTIAL FISH HABITAT

1.0 ESSENTIAL FISH HABITAT

In 1996, Congress added new habitat conservation provisions to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the federal law that governs US marine fisheries management. The Sustainable Fisheries Act of 1996 (Public Law 104-267) mandates the identification of essential fish habitat (EFH) for species regulated under the federal fisheries management plan, as well as the creation of measures to conserve and enhance the habitat necessary for fish to carry out their life cycles. "Essential fish habitat" is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Federal agencies are required to consult with the National Marine Fisheries Service (NMFS) on activities within their jurisdiction that may adversely affect EFH. NMFS must provide conservation recommendations for any Federal action that would adversely affect EFH. The objective of this EFH consultation are to determine whether the proposed action as described in section 2.0 of the BA would adversely affect designated EFH and to recommend conservation measures to avoid, minimize or otherwise offset potential adverse effects to EFH.

The Pacific Fisheries Management Council (PFMC) has designated both freshwater and marine EFH for Chinook salmon (*Oncorhynchus tshawytscha*) (PFMC, 2000). Freshwater EFH supports four major life cycle stages: (1) spawning and incubation; (2) juvenile rearing; (3) juvenile migration; and (4) adult migration and holding. EFH includes all those streams, lakes, ponds, wetlands and other water bodies currently viable. It includes all waters currently or historically accessible to salmon in Washington, Oregon, Idaho and California, except areas upstream of longstanding naturally impassible barriers (i.e., natural waterfalls in existence for several hundred years), the Dworshak Dam and Hells Canyon Complex. Because of the diversity of habitats utilized by the Chinook salmon and inadequate research to date, the PFMC had adopted a more inclusive, watershed-based description of EFH than has been employed for some other species of concerns.

The PFMC's marine EFH supports three life stages: (1) estuarine rearing; (2) ocean rearing; and (3) juvenile and adult migration. Limited and sometimes contrary information is available on the marine areas used by Chinook salmon, including whether populations exist in significant numbers beyond the continental shelf (Fisher and Pearcy, 1995; Fisher et al., 1983, 1984; Myers et al, 1996). As a result, the demarcation of a specific or uniform western boundary would "contain considerable uncertainty" (PFMC, 2000) and so the PFMC established the EFH as all marine waters within the United State's Exclusive Economic Zone (EEZ) north of Port Conception, California and extending to the salmon EFH off the coast of Alaska as set by the North Pacific Fishery Management Council (2005).

1.1 DESCRIPTION OF PROPOSED ACTION

The Proposed Action is FERC's issuance of a new operating license for the existing 774.3 MW Wells Project (FERC No. 2149) for a term of up to 50 years subject to conditions requiring implementation of the Wells HCP, the Aquatic Settlement Agreement and the terrestrial resources management plans discussed in sections 2.5.1.1-2.5.1.3 of the BA. While there are numerous management plans, pertinent plans include the Hatchery Passage Survival Plan, Wells Dam Juvenile Dam Passage Survival Plan, TCP, Hatchery Compensation Plan, Adult Passage Plan, Predator Control Program, and Public Utility District No. 1 of Douglas County's (Douglas PUD) Land Use Policy. The Wells Hydroelectric Project (Wells Project) was constructed between 1963 and 1967; the Wells Reservoir extends 29.7 miles up the Columbia River, from river mile (RM) 515.6 to the tailrace of Chief Joseph Dam at RM 545.3. The action area includes habitats that have been designated as EFH for various life-history stages of spring Chinook salmon and UCR summer/fall-run Chinook salmon. Two fisheries management plans and two terrestrial resource management plans associated with the proposed action will affect EFH: the Wells HCP, the Aquatic Settlement Agreement, Wildlife and Botanical Management Plan and Douglas PUD's Land Use Policy.

1.1.1 Wells HCP

The objective of the Wells HCP is to achieve No Net Impact (NNI) for each Plan Species, including spring and summer/fall Chinook salmon, through a combination of 1) a 91 percent combined adult and juvenile Wells Project survival standard; and 2) up to 9 percent compensation for unavoidable Wells Project-related mortalities. The HCP is intended to constitute the participating parties' terms, conditions and recommendations for these species under the EFH provisions of the Magnuson-Stevens Act. Section 5 of the Wells HCP requires Douglas PUD to manage the reservoir shoreline as habitat for Plan Species. This provision of the HCP provides significant protection to EFH for those lands owned by Douglas PUD within the Wells Project boundary.

1.1.2 Aquatic Settlement Agreement

The Aquatic Settlement Agreement provides for additional management efforts through plans addressing bull trout (*Salvelinus confluentus*), white sturgeon (*Acipenser transmontanus*), Pacific lamprey (*Lampetra tridentata*), aquatic nuisance species and resident fish. In addition, the Aquatic Settlement Agreement includes a Water Quality Management Plan (WQMP) requiring monitoring of key water quality parameters, achieving compliance with numeric water quality standards for Total Dissolved Gas (TDG), temperature, Dissolved Oxygen (DO) and pH, preventing and controlling hazardous materials spills, and participation in regional water quality protection efforts.

1.1.3 Terrestrial Resource Management Plans

Two terrestrial resources measures, the Douglas PUD Land Use Policy and Wildlife and Botanical Management Plan (WBMP), contain complementary measures for the protection of habitat found within the Wells Project. In particular, the 2008 Land Use Policy prohibits the construction of new boat docks outside the city limits of Bridgeport, Brewster and Pateros in order to protect riparian and near shore rearing habitat and in order to maintain NNI for juvenile Plan Species migrating through the Wells Reservoir. The WBMP provides for the protection, enhancement and restoration of native plants found within the Wells Project including riparian and wetland plant communities that are important components of rearing habitat and security cover for juvenile Plan species.

1.2 EFFECTS OF PROPOSED ACTION ON SALMON EFH

1.2.1 Effects on Salmon Habitat

The continued existence and operation of the Project will continue to result in both short- and long-term adverse effects to a variety of habitat parameters. These adverse effects to Chinook salmon and coho salmon (once established) are:

Mainstem Spawning Habitat

• Inundation of mainstem summer/fall-run Chinook salmon spawning habitat upstream of the Project.
• Altered mainstem summer/fall-run Chinook salmon spawning habitat substrate downstream of the Project (reduced proportion of gravels and cobbles downstream of the Project).

Juvenile Rearing Habitat and Juvenile and Adult Migration Corridor

• Altered flow conditions (ramping) that can modify juvenile and adult fish distribution.
• Altered invertebrate (food) sources and production in the mainstem migration corridor for juvenile Chinook and coho salmon.
• Altered water quality, especially TDG resulting from uncontrolled spill at the Project.
• Higher than natural predation rates resulting from the Project enhancing predator habitat or foraging opportunities.
• Altered riparian vegetation which can influence cover, food production, temperature, and substrate.
• Altered juvenile behavior or reduced survival of juveniles migrating through the action area as a result of Project inundation and operations.
• Altered adult behavior or reduced survival or spawning success of adults migrating through the action area as a result of Project operations.

The HCP was developed to mitigate adverse impacts resulting from the existence and operation of the Wells Project on Plan Species, including Chinook salmon and coho salmon (once established). The HCP provides funding for habitat improvements, and establishes a HCP Habitat Committee to prioritize the expenditure of designated funds. Several habitat projects designed to improve conditions within critical habitat occupied by spring Chinook have already been implemented as of this writing. Although the effects of specific habitat projects can not usually be directly measured, it is expected that over the duration of the HCP the habitat improvements secured by designated HCP Plan Species Account funding will offset at least 2 percent of the unavoidable Project mortality for spring Chinook, and contribute to recovery for this species.

Measures prescribed in the WQMP to control TDG downstream of Wells Dam include reducing the frequency and volume of spill (e.g., by minimizing fish passage spill, spill due to maintenance, and spill past unloaded units) and reducing the amount of TDG introduced into the river during spill (e.g., by engaging in fish passage spill management and alternative spillway gate operations). Although limiting spill can avoid high TDG levels that may be harmful to spring Chinook salmon, spill limitations also result in higher proportions of migrating juveniles passing through turbine units potentially resulting in higher mortality rates for juvenile salmon at the dam. All such measures are subject to review and approval by the HCP Coordinating Committee, which is directed to consider how to minimize adverse effects on designated critical habitat.

Other operational plans may also influence salmon EFH. Douglas PUD's Land Use Policy provides protective controls that will produce long term benefits for aquatic species, including spring Chinook and its EFH. Similarly, the HCP established a Plan Species Account to provide funding for tributary habitat protection and restoration projects within the Wells Project Boundary and within the portions of the Methow and Okanogan rivers that are accessible to Plan Species. Any protection or restoration projects requiring in-water work or physical alterations to adjacent lands (riparian habitat or flood-plain) could affect EFH, by temporarily disturbing substrate and juvenile food supplies, temporarily increasing in sediment loads, removing structures providing cover and shelter to both adults and juveniles, or disturbing passage conditions. These effects are expected to be localized and of short duration, with a resulting net improvement in the habitat for juvenile and adult spring Chinook salmon.

1.2.2 Effects on Salmon

The HCP calls for reducing direct passage impacts due to Project operations by implementing HCP actions (such as passage improvements and predation reduction). The HCP implements measures to achieve survival performance standards, with the longer term goal to measure and accomplish survival performance standards. Implementing, monitoring, and evaluating at-Project HCP actions designed to improve survival of spring Chinook is expected to ensure that recovery of spring Chinook is not impeded as a result of the Wells Project relicensing.

The Wells Project may reduce the transport of sediment materials and turbidity, potentially affecting juvenile survival by limiting the ability of juvenile salmon to evade predators. Any effect of reduced turbidity within the Wells Project's reservoir, forebay, and tailrace on juvenile survival will be offset by measures required by the HCP to meet NNI.

The HCP calls for hatchery-based artificial propagation programs for spring Chinook salmon. Hatchery-based artificial propagation techniques may provide benefits to fish populations, potentially accelerating the recovery of populations by increasing abundance in a shorter time frame than may be achieved through natural production. Potential negative effects include influencing the genetics of natural populations, competition for resources between artificially propagated and natural salmonids, predation of natural juvenile salmonids by artificially propagated fish, and the masking of the status of naturally producing stocks.

As part of its Predator Control Plan, the HCP proposes to continue implementing northern pikeminnow (*Ptychochelus oregonensis*), piscivorous bird, and piscivorous mammal control and removal measures to reduce the predation rates on juvenile migrants. The removal of northern pikeminnows, however, may adversely affect small numbers of juvenile and adult spring Chinook salmon, depending on the harvest methods used (e.g., hook and line and longlines). Since inception of the plan, no salmon have been captured during removal operations. Other predator control operations to target birds and mammals are primarily focused on hazing and access deterrents with no risk of take to juvenile and adult spring Chinook. It is expected that the predator removal program will result in overall improvements in spring Chinook salmon survival rates.

1.2.3 Effects on Associated Species, Including Prey Base

The Aquatic Settlement Agreement includes a White Sturgeon Management Plan. The expected increase in the white sturgeon population could adversely affect spring Chinook as white sturgeon are opportunistic predators which feed on a broad variety of aquatic organisms including salmon. Spring Chinook primarily use the Wells Reservoir (where white sturgeon stocking will occur) as a migration corridor; because the smolts of this species tend to migrate rapidly (1-4 days passage time), are surface oriented, and prefer the main channel flow (white sturgeon are typically found on the edges of waterways), the potential for extensive predation on these smolts by white sturgeon is low.

The Aquatic Settlement Agreement also includes two other species management plans for bull trout and Pacific lamprey. Implementation of any physical modifications to passage systems to support movement by these species could adversely affect freshwater migration corridors if the modifications were to reduce the efficacy of the passage systems for Chinook. Again, the HCP Coordinating Committee must approve any such modifications to ensure consistency with passage system criteria established in the HCP for spring Chinook and so there is not likely to be any adverse effect on the migration corridor.

The HCP proposes to continue implementing northern pikeminnow and avian predator control and removal measures to reduce predation on juvenile migrants. Avian control measures consist largely of land-based activities that include gull wires installed across project tailraces and pyrotechnics to discourage predation. In addition, some avian predators are killed most years. These measures should improve juvenile salmon survival by reducing overall predation.

1.3 PROPOSED CONSERVATION MEASURES

Conservation measures that Douglas PUD will undertake to protect and enhance EFH consist of those described in the Wells HCP and Aquatic Settlement Agreement, in addition to other plans (e.g., the Douglas PUD Land Use Policy) included as part of the proposed action.

1.4 CONCLUSIONS

The continued existence and operation of the Project would continue to adversely affect designated EFH for Chinook and coho salmon (once established). However, these adverse affects would be adequately mitigated through continued implementation of the Wells HCP and other measures. Monitoring has shown excellent adult and juvenile passage rates, good water quality, and relatively minimal take. No changes to the current operation of the Wells Project are proposed. Further, the implementation of the policy of NNI in the HCP ensures support of the existing salmon populations. The HCP requires each of its components to include a continuing process of the implementation of enhancement actions, measurement of effectiveness, and as-needed adjustment to ensure that NNI will be achieved and maintained for salmon for the duration of the HCP.

2.0 REFERENCES

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Myers, K.W., K.Y. Aydin, R.V. Walker, S. Fowler, M.L. Dahlberg. 1996. Known ocean ranges of stocks of Pacific salmon and steelhead as shown by tagging experiments, 1956–1995. Document 192, North Pacific Anadromous Fish Commission, Vancouver

North Pacific Fishery Management Council. 2005. Final Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska.

PFMC (Pacific Fishery Management Council). 2000. Amendment 14 to the Pacific Coast Salmon Plan, Appendix A: Identification and Description of Essential Fish Habitat, Adverse Impacts, and Recommended Conservation Measures for Salmon. Pacific Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Awarded Number NA07FC0026.

Appendix E-8

Consultation Records

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Consultation Records

Introduction

In August 2005, Douglas PUD initiated a series of Resource Work Group (RWG) meetings with stakeholders regarding the upcoming relicensing of the Wells Project. This voluntary effort was initiated to provide stakeholders with information about the Wells Hydroelectric Project, to identify resource issues and to develop preliminary study plans that could be included into the Pre-Application Document (PAD). The Notice of Intent (NOI) and PAD were filed with the Federal Energy Regulatory Commission (FERC) on December 1, 2006.

Following the filing of the PAD, the FERC issued Scoping Document 1 (SD1) on January 29, 2007. FERC staff conducted the official project tour on February 27, 2007 and conducted public scoping meetings on February 28, 2007 in the City of East Wenatchee, Washington and the City of Brewster, Washington. On May 15, 2007, the FERC issued a Revised Scoping Document (SD2). The Proposed Study Plan (PSP) Document was filed with the FERC on May 16, 2007. The FERC issued an Addendum to the SD2 on May 16, 2007.

The ILP required Study Plan Meeting was conducted on June 14, 2007. The purpose of the Study Plan Meeting was to provide stakeholders with an opportunity to review and comment on Douglas PUD's PSP Document, to answer questions related to stakeholder study requests and to attempt to resolve any outstanding issues with respect to the PSP Document. On September 14, 2007, Douglas PUD filed a Revised Study Plan (RSP) Document with the FERC. The FERC issued its Study Plan Determination on October 11, 2007, based on its review of the RSP Document and comments from stakeholders.

On October 15, 2008, Douglas PUD filed with the FERC the Initial Study Report (ISR) Document that contained final reports for eight studies and contained interim progress reports for four of the studies. On December 2, 2008, Douglas PUD filed the final Traditional Cultural Property Study for the Wells Project, which was prepared by the Confederated Tribes of the Colville Reservation under a contract with Douglas PUD.

On April 15, 2009, Douglas PUD filed with the FERC the Updated Study Report (USR) Document that contained the four final reports described as interim reports at the time the ISR Document was filed with the FERC. On December 18, 2009, Douglas PUD filed with the FERC the Draft License Application (DLA) that contained 11 management plans and three final settlement agreements. Comments on the DLA were received from the Washington State Department of Ecology and the FERC. Douglas PUD is scheduled to file the Final License Application (FLA) by May 31, 2010.

Exhibit E, Appendix E-8 (Consultation Records) of the FLA references the consultation records supporting the PAD, PSP Document, RSP Document, ISR Document, USR Document, and the DLA (Tables 1-6). Tables 7, 8 and 9 contain the consultation records for the Biological Assessment, Historic Properties Management Plan and Wells FLA, respectively. In addition to the tables and documents included in Appendix E, all of the ILP-related material since the beginning of the relicensing process can be found on the Wells Project Relicensing website at www.douglaspud.org/relicensing.

APPENDIX E
CONSULTATION RECORDS

Table 1 – Consultation Record Supporting the Pre-Application Document (PAD)		
Date	**Consultation Document**	**Source**
August 8, 2005	Information Request Letter	PAD Appendix B – 4
August 31, 2005	Stakeholder Outreach Letter	PAD Appendix B – 10
September 20, 2005	Stakeholder Outreach Letter	PAD Appendix B – 16
Aug – Oct 2005	Responses Received from Information Request Letter	PAD Appendix B – 22
Aug – Oct 2005	Critical Stakeholders Outreach Meetings	PAD Appendix B – 39
Aug – Oct 2005	Thank You Letters to Critical Stakeholders	PAD Appendix B – 41
October 18, 2005	ILP Workshop	PAD Appendix B – 44
October 18, 2005	ILP Workshop Sign-In Sheet	PAD Appendix B – 46
October 18, 2005	RWG Sign-In Sheets	PAD Appendix B – 48
October 24, 2005	Thank You Email after ILP Workshop	PAD Appendix B – 53
November 7, 2005	Meeting Notes from ILP Workshop	PAD Appendix B – 55
Oct 2005 – Oct 2006	RWG Meetings Schedule	PAD Appendix B – 61
November 15, 2005	Aquatic RWG Meeting	PAD Appendix B – 64
November 18, 2005	Cultural RWG Meeting	PAD Appendix B – 81
November 17, 2005	Recreation RWG Meeting	PAD Appendix B – 103
November 16, 2005	Terrestrial RWG Meeting	PAD Appendix B – 119
November 2005	Wells Project Tours and Participants	PAD Appendix B – 134
December 1, 2005	Letter to FERC requesting designation as non-federal representative for ESA consultation	PAD Appendix B – 136
December 7, 2005	Letter to Douglas PUD from FERC granting authorization to conduct day-to-day Section 106	PAD Appendix B – 139
December 7, 2005	Letter to Douglas PUD from FERC designating non-federal representative for ESA	PAD Appendix B – 142
January 9, 2006	Aquatic RWG Meeting	PAD Appendix B – 145
January 12, 2006	Cultural RWG Meeting	PAD Appendix B – 157
January 13, 2006	Recreation RWG Meeting	PAD Appendix B – 165
January 11, 2006	Terrestrial RWG Meeting	PAD Appendix B – 193
February 2, 2006	Aquatic RWG Meeting	PAD Appendix B – 204
February 9, 2006	Cultural RWG Meeting	PAD Appendix B – 243
February 10, 2006	Recreation RWG Meeting	PAD Appendix B – 267
February 8, 2006	Terrestrial RWG Meeting	PAD Appendix B – 282
February 1, 2006	Letter to Douglas PUD from WDFW regarding Relicensing Priorities	PAD Appendix B – 298
February 17, 2006	Letter to WDFW from Douglas PUD regarding Relicensing Priorities	PAD Appendix B – 304
March 2, 2006	Aquatic RWG Meeting	PAD Appendix B – 306
March 10, 2006	Recreation RWG Meeting	PAD Appendix B – 327

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Table 1 – Consultation Record Supporting the Pre-Application Document (PAD)		
February 24, 2006	Terrestrial RWG Meeting	PAD Appendix B – 344
March 22, 2006	Email regarding Wells Project Tour	PAD Appendix B – 366
April 3, 2006	Letter to Douglas PUD from City of Pateros regarding Issue Statements	PAD Appendix B – 368
April 6, 2006	Aquatic RWG Meeting	PAD Appendix B – 370
April 11, 2006	Memo to Cultural RWG regarding Wells Area of Potential Effect (APE)	PAD Appendix B – 383
April 14, 2006	Recreation RWG Meeting	PAD Appendix B – 385
March 23, 2006	Terrestrial RWG Meeting	PAD Appendix B – 396
May 31, 2006	Letter to CCT from FERC regarding Consultation with the CCT	PAD Appendix B – 411
July 18, 2006	Letter to DAHP from Douglas PUD regarding Project Area of Potential Effect	PAD Appendix B – 415
July 18, 2006	Letter to CCT from Douglas PUD regarding Project Area of Potential Effect	PAD Appendix B – 417
July 21, 2006	Aquatic RWG Meeting	PAD Appendix B – 419
July 27, 2006	Cultural RWG Meeting	PAD Appendix B – 468
July 14, 2006	Recreation RWG Meeting	PAD Appendix B – 476
July 20, 2006	Terrestrial RWG Meeting	PAD Appendix B – 521
July 24, 2006	Letter to Douglas PUD from DAHP concurring with Project Area of Potential Effect	PAD Appendix B – 585
July 25, 2006	Letter to BIA from Douglas PUD regarding Section 106 Consultation	PAD Appendix B – 587
August 29, 2006	Aquatic RWG Meeting	PAD Appendix B – 589
September 14, 2006	Aquatic RWG Meeting	PAD Appendix B – 654
September 7, 2006	Cultural RWG Meeting	PAD Appendix B – 673
September 12, 2006	Terrestrial RWG Meeting	PAD Appendix B – 679
Sept - Nov 2006	Wells Project Relicensing Policy Meetings	PAD Appendix B – 738
September 27, 2006	Phone Conversation with the Umatilla Tribes regarding Request for Policy Outreach Meeting	Communication page
September 28, 2006	Cultural RWG Meeting	PAD Appendix B – 747
October 19, 2006	Cultural RWG Meeting	PAD Appendix B – 753
October 25, 2006	Letter to Douglas PUD from CCT concurring with Project Area of Potential Effect	PAD Appendix B – 773

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Table 2 – Consultation Record Supporting the Proposed Study Plan Document (PSP)		
Date	**Consultation Document**	**Source**
December 1, 2006	Douglas PUD files NOI and PAD	Communication page
December 4, 2006	Email regarding Wells Project ILP begins to Aquatic RWG	Communication page
December 12, 2006	Email regarding Wells Project ILP begins to Terrestrial RWG	Communication page
December 12, 2006	Email regarding Wells Project ILP begins to Recreation RWG	Communication page
December 12, 2006	Email regarding Wells Project ILP begins to Cultural RWG	Communication page
December 13, 2006	Email regarding Date change to Cultural RWG	Communication page
December 21, 2006	Email regarding Cultural RWG Meeting Information	Communication page
December 26, 2006	Email regarding Dates for Aquatic RWG Meetings	Communication page
January 10, 2007	Email regarding Cultural Resources Data Review	Communication page
January 12, 2007	Email regarding Cultural Resources Investigation and RWG Agenda	Communication page
January 17, 2007	Cultural RWG Meeting	Meetings page
January 19, 2007	Email regarding Draft Cultural RWG Meeting Notes	Communication page
January 22, 2007	Email regarding Agenda for Terrestrial RWG Meeting	Communication page
January 23, 2007	Email regarding Agenda for Recreation RWG Meeting	Communication page
January 24, 2007	Email regarding Suggested date change for Cultural RWG Meeting	Communication page
January 25, 2007	Email regarding Date changed for Cultural RWG Meeting	Communication page
January 30, 2007	Email regarding White Sturgeon Assessment	Communication page
January 30, 2007	Email regarding FERC issues Scoping Document 1	Communication page
February 2, 2007	Email regarding Final Cultural RWG Meeting Notes	Communication page
February 6, 2007	Terrestrial RWG Meeting	Meetings page
February 7, 2007	Aquatic RWG Meeting	Meetings page
February 8, 2007	Email regarding Draft Terrestrial RWG Meeting Notes	Communication page
February 9, 2007	Email regarding Aquatic Study Plans from PAD	Communication page
February 9, 2007	Recreation RWG Meeting	Meetings page
February 13, 2007	Email regarding Question about Policy Meeting	Communication page
February 13, 2007	Email responding to Question about Policy Meeting	Communication page
February 16, 2007	Email regarding Recreation data question	Communication page
February 16, 2007	Email regarding Response to recreation data question	Communication page
February 16, 2007	Email regarding Final Terrestrial RWG Meeting Notes	Communication page
February 21, 2007	Phone conversation with BLM	Communication page
February 23, 2007	Email regarding Final Recreation RWG Meeting Notes	Communication page
February 23, 2007	Email regarding Final Aquatic RWG Meeting Notes	Communication page

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Table 2 – Consultation Record Supporting the Proposed Study Plan Document (PSP)		
February 27, 2007	Email regarding Agenda for Cultural RWG Meeting	Communication page
February 28, 2007	Letter to FERC from Pateros regarding Comments on PAD and SD1	Communication page
March 1, 2007	Fax regarding Douglas PUD and BIA Meeting Notes	Communication page
March 7, 2007	Phone conversation with USFWS	Communication page
March 7, 2007	Email regarding Cultural Resources Scope of Work	Communication page
March 8, 2007	Cultural RWG Meeting	Meetings page
March 9, 2007	Email regarding Draft Cultural RWG Meeting Notes	Communication page
March 16, 2007	Email regarding Final Cultural RWG Meeting Notes	Communication page
March 19, 2007	Letter to FERC from Betty Wagoner regarding Scoping	Communication page
March 20, 2007	Meeting with WDFW regarding proposed timeline and settlement process	Communication page
March 22, 2007	Email to FERC from Douglas PUD regarding Sharp-tailed grouse	Communication page
March 23, 2007	Meeting with CCT regarding proposed timeline and settlement process	Communication page
March 27, 2007	Email to FERC from Douglas PUD regarding Mule deer	Communication page
March 27, 2007	Meeting with USFWS regarding proposed timeline and settlement process	Communication page
March 29, 2007	Letter to FERC from Friends of Fort Okanogan regarding Comments on relicensing process	Communication page
March 30, 2007	Meeting with Yakama Nation regarding proposed timeline and settlement process	Communication page
March 30, 2007	Letter to FERC from Douglas PUD regarding Comments on Scoping Meeting Transcripts	Communication page
March 30, 2007	Letter to FERC from Douglas PUD regarding SD1	Communication page
March 30, 2007	Letter to FERC from WDOE regarding Comments on PAD and SD1	Communication page
March 30, 2007	Letter to FERC from City of Brewster regarding Comments on PAD and SD1	Communication page
March 30, 2007	Letter to FERC from WDFW regarding Comments on PAD and SD1	Communication page
March 30, 2007	Letter to Douglas PUD from FERC regarding Comments on PAD and Study Requests	Communication page
March 30, 2007	Letter to FERC from City of Pateros regarding Comments on PAD and SD1	Communication page
March 30, 2007	Letter to FERC from USFWS regarding Comments on PAD and SD1	Communication page
April 2, 2007	Letter to FERC from BIA regarding Comments on PAD and SD1	Communication page
April 3, 2007	Letter to FERC from City of Brewster regarding Comments on PAD and SD1 (paper filing)	Communication page
April 4, 2007	Updated Letter to FERC from City of Pateros regarding Comments on PAD and SD1	Communication page
April 5, 2007	Email regarding Agenda for Aquatic RWG Meeting	Communication page
April 5, 2007	Email regarding Agenda for Terrestrial RWG Meeting	Communication page
April 6, 2007	Email regarding Cancellation of Recreation RWG Meeting	Communication page
April 6, 2007	Updated Letter (paper copy to FERC) from WDOE regarding Comments on PAD and SD1	Communication page
April 9, 2007	Email regarding Agenda for Cultural RWG Meeting	Communication page
April 9, 2007	Updated Letter (paper copy to FERC) from USFWS regarding Comments on PAD and SD1	Communication page
April 10, 2007	Email regarding Cultural Resources Investigation	Communication page
April 11, 2007	Phone conversation with National Marine Fisheries Service (NMFS) regarding Wells	Communication page

Table 2 – Consultation Record Supporting the Proposed Study Plan Document (PSP)		
	relicensing update and management plan (MP) discussion	
April 13, 2007	Email regarding Cancellation of Aquatic RWG Meeting	Communication page
April 13, 2007	Email regarding Cancellation of Terrestrial RWG Meeting	Communication page
April 23, 2007	Email regarding Draft Cultural RWG Meeting Notes	Communication page
April 23, 2007	Email to WDFW from Douglas PUD regarding Study Request Meeting	Communication page
April 24, 2007	Letter to FERC from Douglas PUD regarding Reply Comments on SD1 and PAD	Communication page
April 25, 2007	Email regarding Final Cultural RWG Meeting Notes	Communication page
April 27, 2007	Meeting with Washington Department of Ecology (Ecology) regarding proposed timeline and settlement process	Communication page
April 30, 2007	Email to USFWS from Douglas PUD regarding Study Request Meeting	Communication page
April 30, 2007	Email regarding Final Cultural RWG Meeting Notes	Communication page
April 30, 2007	Email to WDOE regarding Agenda for TDG Meeting	Communication page

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Table 3 – Consultation Record Supporting the Revised Study Plan Document (RSP)		
Date	**Consultation Document**	**Source**
May 1, 2007	Summary Notes from Meeting with WDFW regarding Study Requests and Comments on the PAD	RSP Appendix A - 11
May 8, 2007	Meeting with Department of the Interior (DOI) regarding proposed timeline and settlement process	RSP Appendix A - 14
May 16, 2007	Transmittal Letter to FERC from Douglas PUD regarding Proposed Study Plan Document	RSP Appendix A - 15
May 16, 2007	Meeting with WDFW regarding White Sturgeon Management Plan (conference call)	RSP Appendix A - 29
May 29, 2007	Aquatic Settlement Work Group (SWG) Meeting	RSP Appendix A - 30
May 31, 2007	Email to Stakeholders from Douglas PUD regarding Agenda for Study Plan Meeting	RSP Appendix A - 31
June 8, 2007	Wells Dam and Reservoir Tour	RSP Appendix A - 33
June 20, 2007	Aquatic SWG Meeting	RSP Appendix A - 34
June 28, 2007	Email to Stakeholders from Douglas PUD regarding Draft Study Plan Meeting Notes	RSP Appendix A - 35
June 29, 2007	Email to Douglas PUD from City of Brewster regarding Draft Study Plan Meeting Notes	RSP Appendix A - 45
June 29, 2007	Email to City of Brewster from Douglas PUD regarding Draft Study Plan Meeting Notes	RSP Appendix A - 49
June 29, 2007	Email to Douglas PUD from City of Brewster regarding Draft Study Plan Meeting Notes	RSP Appendix A - 57
June 29, 2007	Email to City of Brewster from Douglas PUD regarding Recreation Needs Analysis	RSP Appendix A - 59
June 29, 2007	Email to Douglas PUD from FERC regarding Draft Study Plan Meeting Notes	RSP Appendix A - 61
June 29, 2007	Email to FERC from Douglas PUD regarding Draft Study Plan Meeting Notes	RSP Appendix A - 63
July 2, 2007	Email to FERC from Douglas PUD regarding Updated 230 kV Transmission Line Study Plan	RSP Appendix A - 73
July 2, 2007	Email to Douglas PUD from FERC regarding Draft Study Plan Meeting Notes	RSP Appendix A - 95
July 2, 2007	Email to FERC from Douglas PUD regarding Draft Study Plan Meeting Notes	RSP Appendix A - 105
July 3, 2007	Phone Conversation with WDFW regarding Lamprey Study Plan Methodology	RSP Appendix A - 107
July 3, 2007	Email to Douglas PUD from FERC regarding Updated 230 kV Transmission Line Study Plan	RSP Appendix A - 111
July 3, 2007	Email to FERC from Douglas PUD regarding Updated 230 kV Transmission Line Study Plan	RSP Appendix A - 133
July 9, 2007	Phone Conversation with FERC regarding 230 kV Transmission Line Study Plan	RSP Appendix A - 135
July 9, 2007	Letter to DAHP and CCT from Douglas PUD regarding Triennial Archaeological Monitoring	RSP Appendix A - 137
July 11, 2007	Email to Stakeholders from Douglas PUD regarding Final Study Plan Meeting Notes	RSP Appendix A - 153
July 11, 2007	Email to NPS, City of Brewster, and IAC from Douglas PUD regarding Recreation Needs Analysis	RSP Appendix A - 163
July 11, 2007	Phone Conversation with WDFW regarding Nuisance Wildlife Control Study	RSP Appendix A - 183
July 12, 2007	Letter to Douglas PUD from DAHP regarding Triennial Archaeological Monitoring	RSP Appendix A - 185
July 16, 2007	Letter to Douglas PUD from WDFW regarding White Sturgeon Supplementation Efforts	RSP Appendix A - 187
July 18, 2007	Aquatic SWG Meeting (conference call)	RSP Appendix A - 190
July 23, 2007	Email to Douglas PUD from IAC regarding Recreation Needs Analysis	RSP Appendix A - 191
July 24, 2007	Email to Douglas PUD from NPS regarding Recreation Needs Analysis	RSP Appendix A - 195
July 26, 2007	Phone Conversation with USFWS regarding 230 kV Transmission Line Study Plan	RSP Appendix A - 199

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Table 3 – Consultation Record Supporting the Revised Study Plan Document (RSP)		
July 30, 2007	Phone Conversation with WDFW regarding Downstream Release Location for Tagged Lamprey	RSP Appendix A - 203
August 9, 2007	Aquatic SWG Meeting	RSP Appendix A - 204
August 10, 2007	Email to Douglas PUD from City of Brewster regarding Recreation Needs Analysis	RSP Appendix A - 205
August 10, 2007	Letter to FERC from City of Brewster regarding Comments on Proposed Study Plan	RSP Appendix A - 211
August 14, 2007	Letter to Douglas PUD from Umatilla Tribes regarding Comments on Proposed Study Plan	RSP Appendix A - 213
August 15, 2007	Letter to FERC from City of Pateros regarding Comments on Proposed Study Plan	RSP Appendix A - 221
August 15, 2007	Email to Douglas PUD from WDFW regarding Nuisance Wildlife Control Study	RSP Appendix A - 249
August 16, 2007	Email to Douglas PUD from Oregon State University regarding Tag Technology for Lamprey	RSP Appendix A - 253
August 17, 2007	Email to Douglas PUD from USGS regarding Tags to Evaluate Juvenile Lamprey Passage	RSP Appendix A - 257
August 22, 2007	Phone Conversation with USFWS regarding letter citation from the Umatilla Tribes	RSP Appendix A - 261

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Table 4 – Consultation Record Supporting the Initial Study Report Document (ISR)		
Date	**Consultation Document**	**Source**
September 14, 2007	Transmittal Letter to FERC from Douglas PUD regarding Revised Study Plan Document	ISR Appendix E - 11
September 17, 2007	Letter to FERC from NMFS regarding Filing of HCP as Comprehensive Plan	ISR Appendix E - 27
September 17, 2007	Email to USFWS and Yakima Nation from Douglas PUD regarding 2007 Adult Lamprey Passage Study	ISR Appendix E - 30
September 17, 2007	Email to Douglas PUD from USFWS regarding 2007 Adult Lamprey Passage Study	ISR Appendix E - 32
September 17, 2007	Email to USFWS, Yakima Nation and WDFW from Douglas PUD regarding 2007 Adult Lamprey Passage Study	ISR Appendix E - 34
September 17, 2007	Email to Douglas PUD from USFWS regarding 2007 Adult Lamprey Passage Study	ISR Appendix E - 36
September 20, 2007	Email to Douglas PUD from WDFW regarding 2007 Adult Lamprey Passage Study	ISR Appendix E - 38
September 26, 2007	Aquatic SWG Meeting	ISR Appendix E - 39
October 1, 2007	Letter to FERC from City of Pateros regarding Comments on Revised Study Plan	ISR Appendix E - 40
October 11, 2007	Phone Conversation with USFWS regarding Bull Trout Management Plan (BTMP)	ISR Appendix E - 52
October 11, 2007	Letter to Douglas PUD from FERC regarding Study Plan Determination	ISR Appendix E - 53
October 16, 2007	Letter to NMFS from FERC regarding Filing of HCP as Comprehensive Plan	ISR Appendix E - 63
October 17, 2007	Aquatic SWG Meeting	ISR Appendix E - 64
November 6, 2007	Meeting with Ecology regarding Total Dissolved Gas (TDG) Modeling	ISR Appendix E - 65
November 7, 2007	Letter to FERC from City of Pateros regarding Rehearing Request	ISR Appendix E - 66
November 8, 2007	Aquatic SWG Meeting	ISR Appendix E - 68
November 26, 2007	Letter to FERC from Douglas PUD regarding Objection to Rehearing Request	ISR Appendix E - 69
November 27, 2007	Email to Douglas PUD from WDNR regarding Downgrade of Brittle Prickly-Pear	ISR Appendix E - 73
November 27, 2007	Phone Conversation with WDFW regarding 2008 Adult Lamprey Passage Study	ISR Appendix E - 75
November 27, 2007	Phone Conversation with USFWS regarding 2008 Adult Lamprey Passage Study	ISR Appendix E - 78
November 28, 2007	Phone Conversation with WDFW regarding 2008 Adult Lamprey Passage Study	ISR Appendix E - 82
November 30, 2007	Policy Outreach Meeting with BLM	ISR Appendix E - 83
December 4, 2007	Policy Outreach Meeting with Yakama Nation	ISR Appendix E - 84
December 4, 2007	Policy Outreach Meeting with Ecology	ISR Appendix E - 85
December 10, 2007	FERC Order Granting Rehearing for Further Consideration	ISR Appendix E - 86
December 11, 2007	Policy Outreach Meeting with WDFW	ISR Appendix E - 87
December 18, 2007	Policy Outreach Meeting with USFWS	ISR Appendix E - 88
December 31, 2007	Email from WDFW regarding Sharptails within Wells Project Boundary	ISR Appendix E - 89
January 7, 2008	Email to Cultural RWG regarding Agenda for Cultural RWG Meeting	ISR Appendix E - 90
January 10, 2008	Email to Douglas PUD from Ecology regarding Approval of TDG Model	ISR Appendix E - 91
January 10, 2008	Aquatic SWG Meeting	ISR Appendix E - 92
January 11, 2008	Policy Outreach Meeting with DOI (BIA/USFWS/BLM/NPS)	ISR Appendix E - 93

Table 4 – Consultation Record Supporting the Initial Study Report Document (ISR)		
January 15, 2008	Policy Outreach Meeting with NMFS	ISR Appendix E - 94
January 16, 2008	Email to Colville Tribes from Douglas PUD regarding Okanogan Toxins Study	ISR Appendix E - 95
January 17, 2008	FERC Order Dismissing Rehearing Request	ISR Appendix E - 108
January 21, 2008	Email to Recreation RWG regarding Agenda for Recreation RWG Meeting	ISR Appendix E - 114
January 28, 2008	Email to Cultural RWG regarding Cultural RWG Meeting Materials	ISR Appendix E - 117
January 29, 2008	Email to Ecology from Douglas PUD regarding TDG Study	ISR Appendix E - 123
January 30, 2008	Cultural RWG Meeting	ISR Appendix E - 127
February 4, 2008	Email to Ecology from Douglas PUD regarding TDG Modeling	ISR Appendix E - 136
February 5, 2008	Policy Outreach Meeting with the Colville Tribes	ISR Appendix E - 142
February 7, 2008	Email to Cultural RWG regarding Draft Cultural RWG Meeting Notes	ISR Appendix E - 143
February 14, 2008	Aquatic SWG Meeting	ISR Appendix E - 144
February 19, 2008	Email to Cultural RWG regarding Final Cultural RWG Meeting Notes	ISR Appendix E - 150
February 29, 2008	Recreation RWG Meeting	ISR Appendix E - 162
March 6, 2008	Email to Recreation RWG regarding Draft Recreation RWG Meeting Notes	ISR Appendix E - 180
March 6, 2008	Aquatic SWG Meeting	ISR Appendix E - 182
March 12, 2008	Aquatic SWG Policy/Legal Meeting (conference call)	ISR Appendix E - 184
March 14, 2008	Email to Recreation RWG regarding Final Recreation RWG Meeting Notes	ISR Appendix E - 191
March 21, 2008	Meeting with Ecology regarding Water Quality MP (WQMP) (conference call)	ISR Appendix E - 193
March 31, 2008	Email to Ecology from Douglas PUD regarding the Coastal Zone Management Act	ISR Appendix E - 202
April 10, 2008	Aquatic SWG Meeting	ISR Appendix E - 203
April 24, 2008	Aquatic SWG Policy/Legal Meeting	ISR Appendix E - 204
May 15, 2008	Aquatic SWG Policy/Legal Meeting	ISR Appendix E - 205
May 20, 2008	Aquatic SWG Technical Meeting	ISR Appendix E - 206
May 27, 2008	Email to WDFW from Douglas PUD regarding Lamprey Spawning Study	ISR Appendix E - 207
May 28, 2008	Meeting with Colville Tribes regarding Aquatic Settlement Agreement and Management Plans	ISR Appendix E - 208
June 5, 2008	Email to Cultural RWG regarding Agenda for Cultural RWG Meeting	ISR Appendix E - 209
June 6, 2008	Email to Cultural RWG regarding Draft Historic Properties Management Plan	ISR Appendix E - 212
June 11, 2008	Meeting with USFWS regarding Section 7 Consultation Needs for Wells BTMP	ISR Appendix E - 214
June 17, 2008	Aquatic SWG Policy/Legal Meeting	ISR Appendix E - 215
June 17, 2008	Email to Terrestrial RWG regarding Agenda for Terrestrial RWG Meeting	ISR Appendix E - 216
June 18, 2008	Aquatic SWG Technical Meeting	ISR Appendix E - 217
June 19, 2008	Email to Aquatic RWG regarding Request for Study Plan Update Meeting	ISR Appendix E - 218
June 20, 2008	Aquatic SWG Policy/Legal Meeting (conference call)	ISR Appendix E - 219
June 23, 2008	Email to Aquatic RWG regarding Adult Lamprey Passage Study	ISR Appendix E - 220

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Table 4 – Consultation Record Supporting the Initial Study Report Document (ISR)		
July 1, 2008	FERC Order Approving 2007 Recreation Action Plan	ISR Appendix E - 222
July 8, 2008	Policy/Legal Meeting with Ecology regarding Aquatic Settlement Agreement	ISR Appendix E - 223
July 9, 2008	Policy/Legal Meeting with BLM regarding Aquatic Settlement Agreement	ISR Appendix E - 224
July 11, 2008	Policy/Legal Meeting with Colville Tribes regarding Aquatic Settlement Agreement	ISR Appendix E - 225
July 14, 2008	Aquatic SWG Policy/Legal Meeting (conference call)	ISR Appendix E - 226
July 15, 2008	Aquatic RWG Meeting	ISR Appendix E - 228
July 15, 2008	Aquatic SWG Technical Meeting (conference call)	ISR Appendix E - 230
July 17, 2008	Cultural RWG Meeting	ISR Appendix E - 235
July 21, 2008	Meeting with USFWS regarding BTMP	ISR Appendix E - 237
July 24, 2008	Email to Cultural RWG regarding Draft Cultural RWG Meeting Notes	ISR Appendix E - 243
July 28, 2008	Aquatic SWG Policy/Legal Meeting (conference call)	ISR Appendix E - 245
July 29, 2008	Email to Recreation RWG regarding Agenda for Recreation RWG	ISR Appendix E - 247
July 30, 2008	Email to Terrestrial RWG regarding Date Change for Terrestrial RWG Meeting	ISR Appendix E - 250
August 5, 2008	Email to Cultural RWG regarding Final Cultural RWG Meeting Notes	ISR Appendix E - 253
August 13, 2008	Email to Cultural RWG regarding Agenda for Cultural RWG Meeting	ISR Appendix E - 257
August 19, 2008	Aquatic SWG Technical Meeting (conference call)	ISR Appendix E - 258
August 20, 2008	Email to Aquatic RWG regarding Aquatic RWG Meeting Materials	ISR Appendix E - 260
August 21, 2008	Email to Recreation RWG regarding Recreation RWG Meeting Materials	ISR Appendix E - 338
August 21, 2008	Aquatic RWG Meeting	ISR Appendix E - 359
August 22, 2008	Recreation RWG Meeting	ISR Appendix E - 369
August 25, 2008	Email to DTA/Douglas PUD from RCO regarding Recreational Needs Analysis	ISR Appendix E - 379
August 26, 2008	Terrestrial RWG Meeting	ISR Appendix E - 381
August 28, 2008	Aquatic SWG Technical Meeting (conference call)	ISR Appendix E - 385
August 29, 2008	Email to Recreation RWG regarding Draft Recreation RWG Meeting Notes	ISR Appendix E - 392
August 29, 2008	Email to Cultural RWG regarding Cultural RWG Meeting Materials	ISR Appendix E - 396
September 3, 2008	Cultural RWG Meeting	ISR Appendix E - 401
September 8, 2008	Email to Terrestrial RWG regarding Draft Terrestrial RWG Meeting Notes	ISR Appendix E - 409
September 9, 2008	Email to Aquatic RWG regarding Final Aquatic RWG Meeting Notes	ISR Appendix E - 433
September 10, 2008	Email to Recreation RWG regarding Final Recreation RWG Meeting Notes	ISR Appendix E - 436
September 15, 2008	Email to Terrestrial RWG regarding Revision to Terrestrial RWG Meeting Notes	ISR Appendix E - 440
September 18, 2008	Email to Cultural RWG regarding Final Cultural RWG Meeting Notes	ISR Appendix E - 443
September 22, 2008	Email to USFWS from Douglas PUD regarding revision to Terrestrial RWG Meeting Notes	ISR Appendix E - 447
September 22, 2008	Email to Terrestrial RWG regarding Final Terrestrial RWG Meeting Notes	ISR Appendix E - 449
September 26, 2008	Email to Cultural RWG regarding Agenda for Cultural RWG Meeting	ISR Appendix E – 473

Table 4 – Consultation Record Supporting the Initial Study Report Document (ISR)		
October 9, 2008	Cultural RWG Meeting	ISR Appendix E – 477

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Table 5 – Consultation Record Supporting the Updated Study Report Document (USR)		
Date	**Consultation Document**	**Source**
October 21, 2008	Email regarding Agenda for Initial Study Report Meeting	USR Appendix C - 15
October 28, 2008	Email to RCO from Douglas PUD regarding ISR Meeting Availability	USR Appendix C - 19
October 30, 2008	Initial Study Report Meeting	USR Appendix C - 23
November 3, 2008	Email regarding Final Cultural RWG Field Visit Notes	USR Appendix C - 39
November 5, 2008	Email to WDFW from Douglas PUD regarding Salmon Fishing Data	USR Appendix C - 43
November 7, 2008	Final ISR Meeting Notes Filed with FERC and Sent to Stakeholders	USR Appendix C - 47
November 7, 2008	Comment Letter to FERC from City of Pateros regarding ISR Document	USR Appendix C - 65
November 10, 2008	Colville Tribes Signed Aquatic Settlement Agreement	USR Appendix C - 67
November 17, 2008	ISR Response Letter to Douglas PUD from the City of Brewster	USR Appendix C - 69
November 18, 2008	Ecology Signed Aquatic Settlement Agreement	USR Appendix C -71
November 20, 2008	WDFW Signed Aquatic Settlement Agreement	USR Appendix C - 73
November 24, 2008	Errata to ISR Document Filed with FERC by Douglas PUD	USR Appendix C - 75
November 26, 2008	Email to Ecology from Douglas PUD regarding TDG Gas Volume Fraction	USR Appendix C - 93
December 2, 2008	Traditional Cultural Property Study Filed with FERC by Douglas PUD	USR Appendix C - 97
December 5, 2008	Meeting with Ecology regarding Temperature Model	USR Appendix C - 99
December 18, 2008	Water Trail Meeting	USR Appendix C - 100
January 13, 2009	ISR Response Comments Letter Filed with FERC by Douglas PUD	USR Appendix C - 101
January 14, 2009	Email regarding Agenda for Cultural RWG Meeting	USR Appendix C - 117
January 21, 2009	Email regarding Agenda for Terrestrial RWG Meeting	USR Appendix C - 121
January 27, 2009	Cultural RWG Meeting	USR Appendix C - 125
February 2, 2009	Memorandum to Cultural RWG regarding Submittal of Final Cultural Resources Site Revisit and Inventory Study	USR Appendix C - 131
February 3, 2009	Email regarding Draft Cultural RWG Meeting Notes	USR Appendix C - 135
February 4, 2009	FERC Study Report Determination	USR Appendix C - 139
February 10, 2009	Email regarding Final Cultural RWG Meeting Notes	USR Appendix C - 143
February 12, 2009	Phone Conversation with RCO regarding Update on Recreation Management Plan and ILP	USR Appendix C - 147
February 17, 2009	Email regarding Agenda and Meeting Materials for Cultural RWG Meeting	USR Appendix C - 149
February 17, 2009	Email regarding Agenda and Meeting Materials for Terrestrial RWG Meeting	USR Appendix C - 155
February 20, 2009	Aquatic SWG Meeting	USR Appendix C - 158
February 18, 2009	Terrestrial RWG Meeting	USR Appendix C - 163
February 25, 2009	Email regarding Draft Terrestrial RWG Meeting Notes	USR Appendix C - 171
March 2, 2009	Email from FERC regarding Comments on Wells Wildlife Management Plan	USR Appendix C - 177

Table 5 – Consultation Record Supporting the Updated Study Report Document (USR)		
March 4, 2009	Cultural RWG Meeting	USR Appendix C - 179
March 6, 2009	Letter from Douglas PUD regarding ASWG Party Representation	USR Appendix C - 181
March 9, 2009	Letter from Ecology regarding ASWG Party Representation	USR Appendix C - 183
March 9, 2009	Email from Yakama Nation regarding ASWG Party Representation	USR Appendix C - 184
March 10, 2009	Email regarding Draft Cultural RWG Meeting Notes	USR Appendix C - 185
March 13, 2009	Letter from USFWS regarding ASWG Party Representation (Non-Signature Party)	USR Appendix C - 187
March 16, 2009	Email regarding Final Terrestrial RWG Meeting Notes	USR Appendix C - 189
March 16, 2009	Email regarding Agenda for Terrestrial RWG	USR Appendix C - 193
March 18, 2009	Email regarding Final Cultural RWG Meeting Notes	USR Appendix C - 199
March 23, 2009	Terrestrial RWG Meeting	USR Appendix C - 205
March 24, 2009	Email regarding Draft Terrestrial RWG Meeting Notes	USR Appendix C - 211
March 24, 2009	Email regarding FERC comments on Wildlife and Botanical Management Plan (WBMP) and Avian Protection Plan (APP)	USR Appendix C - 217
March 25, 2009	Letter from WDFW regarding ASWG Party Representation	USR Appendix C - 218
March 26, 2009	Aquatic SWG Meeting	USR Appendix C - 219
March 26, 2009	Email regarding Agenda for Cultural RWG Meeting	USR Appendix C - 221
April 1, 2009	Email regarding Final Terrestrial RWG Meeting Notes	USR Appendix C - 223
April 3, 2009	Email regarding Draft Cultural RWG Meeting Notes	USR Appendix C - 227
April 3, 2009	WDFW comments on Transmission Line APP and WBMP	USR Appendix C - 231

Table 6 – Consultation Record Supporting the Draft License Application (DLA)		
Date	**Consultation Document**	**Source**
January 19, 2009	Douglas PUD signed Aquatic Settlement Agreement	DLA Exhibit E – 973
January 20, 2009	Email from Douglas PUD to ASWG regarding topics of discussion at kick-off meeting	DLA Exhibit E – 981
January 22, 2009	Email from BIA to Douglas PUD regarding revisions to PLMP	DLA Exhibit E – 983
January 22, 2009	Email from Douglas PUD to BIA regarding revisions to PLMP	DLA Exhibit E – 985
February 11, 2009	Email from Douglas PUD to ASWG regarding agenda for ASWG meeting	DLA Exhibit E – 987
February 20, 2009	Aquatic SWG meeting	DLA Exhibit E – 989
February 24, 2009	Yakama Nation signed Aquatic Settlement Agreement	DLA Exhibit E – 993
February 26, 2009	Email from Douglas PUD to ASWG regarding agenda for ASWG meeting	DLA Exhibit E – 995
March 6, 2009	Email from Douglas PUD to ASWG regarding draft meeting notes, notice of party representation and ASWG Chair job announcement	DLA Exhibit E – 999
March 6, 2009	Letter from Douglas PUD regarding ASWG Party Representation	DLA Exhibit E – 1003
March 9, 2009	Letter from Ecology to ASWG regarding ASWG Party Representation	DLA Exhibit E – 1007
March 9, 2009	Email from Yakama Nation to ASWG regarding ASWG Party Representation	DLA Exhibit E – 1009
March 13, 2009	Letter from USFWS to Douglas PUD regarding ASWG Party Representation (Non-Signature Party)	DLA Exhibit E – 1011
March 20, 2009	Email from Douglas PUD to ASWG regarding final meeting notes	DLA Exhibit E – 1015
March 23, 2009	Email from BIA to Douglas PUD regarding timeline for providing comments on the Aquatic Settlement Agreement and the PLMP	DLA Exhibit E – 1017
March 25, 2009	Letter from WDFW to ASWG regarding ASWG Party Representation	DLA Exhibit E – 1019
March 26, 2009	Aquatic SWG meeting	DLA Exhibit E – 1021
April 3, 2009	USFWS Comments on APP and WBMP	DLA Exhibit E – 1029
April 6, 2009	Email from Douglas PUD to Ecology regarding Regression Analysis	DLA Exhibit E – 1033
April 7, 2009	Letter from Colville Tribes to ASWG regarding ASWG Party Representation	DLA Exhibit E – 1037
April 13, 2009	Email from Douglas PUD to Cultural RWG regarding Final Cultural RWG Meeting Notes	DLA Exhibit E – 1041
April 13, 2009	Email from Douglas PUD to ASWG regarding Request for Qualifications for Chair for ASWG meetings	DLA Exhibit E – 1045
April 14, 2009	Meeting with Ecology regarding discussion of Ecology’s comments on the DO, pH and Turbidity Study and TDG Study	DLA Exhibit E – 1047
April 15, 2009	Douglas PUD Filed USR with FERC	DLA Exhibit E – 1051
April 16, 2009	Email from Douglas PUD to ASWG regarding approval of job announcement for Chairman of ASWG	DLA Exhibit E – 1053
April 17, 2009	Email from WDFW to Douglas PUD regarding the possibility of PIT-tagging juvenile lamprey	DLA Exhibit E – 1057
April 17, 2009	Email from Douglas PUD to WDFW regarding PIT-tagging juvenile lamprey	DLA Exhibit E – 1059
April 22, 2009	Email from Douglas PUD to Terrestrial RWG regarding Reminder of USR Meeting	DLA Exhibit E – 1061
April 22, 2009	Email from Douglas PUD to ASWG regarding Reminder of USR meeting	DLA Exhibit E – 1063

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Table 6 – Consultation Record Supporting the Draft License Application (DLA)		
April 22, 2009	Email from Douglas PUD to Cultural RWG regarding Reminder of USR Meeting	DLA Exhibit E – 1067
April 22, 2009	Email from Douglas PUD to Recreation RWG regarding Reminder of USR Meeting	DLA Exhibit E – 1069
April 29, 2009	Conference Call with USFWS to Discuss BIA Comments on PLMP	DLA Exhibit E – 1071
April 30, 2009	USR Meeting	DLA Exhibit E – 1073
May 1, 2009	Email from Douglas PUD to ASWG regarding agenda for ASWG meeting	DLA Exhibit E – 1085
May 4, 2009	Email from Douglas PUD to USFWS regarding FERC Order for Grant PUD in relation to modifications to lamprey plan as requested by CRITFC	DLA Exhibit E – 1089
May 7, 2009	Meeting with Ecology regarding TDG Model	DLA Exhibit E – 1101
May 8, 2009	Email from Douglas PUD to Ecology regarding TDG modeling and minimum spill for TDG modeling	DLA Exhibit E – 1103
May 11, 2009	Letter from USFWS to Douglas PUD regarding Request to Participate in the ASWG	DLA Exhibit E – 1105
May 12, 2009	Meeting with Ecology regarding WQMP Updates	DLA Exhibit E – 1109
May 13, 2009	Aquatic SWG Meeting	DLA Exhibit E – 1111
May 13, 2009	Email from BIA to ASWG members regarding intention to stay involved in the ILP process as a non-signatory party and comments on the PLMP	DLA Exhibit E – 1127
May 14, 2009	Water Trails Meeting	DLA Exhibit E – 1129
May 15, 2009	Email from Douglas PUD to ASWG regarding 10 business days advanced written notice for comments	DLA Exhibit E – 1131
May 18, 2009	Email from BIA to Douglas PUD regarding unavailability to provide comments 10 business days prior to meeting date	DLA Exhibit E – 1133
May 18, 2009	Email from Douglas PUD to BIA regarding acknowledgment of unavailability to provide comments	DLA Exhibit E – 1135
May 19, 2009	Email from Douglas PUD to ASWG regarding meeting to address BIA/USFWS comments	DLA Exhibit E – 1137
May 19, 2009	Email from Douglas PUD to ASWG regarding agenda items for next meeting	DLA Exhibit E – 1139
May 27, 2009	Meeting with Ecology regarding TDG Updates	DLA Exhibit E – 1141
May 29, 2009	Email from Douglas PUD regarding Agenda for Terrestrial RWG Meeting	DLA Exhibit E – 1143
June 5, 2009	Encroachment Information Request from the Corp of Engineers (COE)	DLA Exhibit E – 1149
June 9, 2009	Email from Douglas PUD to ASWG regarding draft meeting minutes	DLA Exhibit E – 1151
June 9, 2009	Email from Douglas PUD to ASWG regarding comments on PLMP from the USFWS and BIA and Chair-elect for ASWG	DLA Exhibit E – 1153
June 10, 2009	Aquatic SWG Meeting	DLA Exhibit E – 1155
June 11, 2009	Email from Douglas PUD to USFWS regarding Bull Trout Standard Language in BA	DLA Exhibit E – 1165
June 11, 2009	Encroachment Documents Request from COE	DLA Exhibit E – 1167
June 12, 2009	Terrestrial RWG Meeting	DLA Exhibit E – 1169
June 12, 2009	Email from Douglas PUD regarding Agenda and Meeting Products for Cultural RWG Meeting	DLA Exhibit E – 1173
June 15, 2009	Email from USFWS to Douglas PUD regarding Bull Trout Standard Language in BA	DLA Exhibit E – 1179
June 16, 2009	Email from Aquatic Chair to ASWG regarding request for agenda items for the next meeting	DLA Exhibit E – 1193

Table 6 – Consultation Record Supporting the Draft License Application (DLA)		
June 16, 2009	Phone conversation with CCT regarding PLMP and BIA	DLA Exhibit E – 1195
June 17, 2009	Email from USFWS to ASWG regarding suggested edits from BIA to the PLMP	DLA Exhibit E – 1197
June 17, 2009	Email from BIA to ASWG regarding comments on the PLMP (attached with edits)	DLA Exhibit E – 1199
June 17, 2009	Email from CRITFC to ASWG requesting to meet with ASWG to discuss PLMP and CRITFC concurs with the BIA comments on the PLMP (attached with edits)	DLA Exhibit E – 1225
June 18, 2009	Email from BIA to ASWG indicating that CRITFC used wrong version of PLMP to make edits and BIA will send out new version	DLA Exhibit E – 1255
June 18, 2009	Email from BIA to ASWG regarding latest version with both BIA and CRITFC edits to the PLMP (attached)	DLA Exhibit E – 1257
June 18, 2009	Email from Douglas PUD to ASWG regarding draft meeting notes	DLA Exhibit E – 1283
June 22, 2009	Email from Aquatic Chair to ASWG regarding allowing BIA/CRITFC to present and discuss BIA concerns on the PLMP at next meeting	DLA Exhibit E – 1285
June 24, 2009	Email from Douglas PUD to ASWG indicating that Douglas PUD does not have any objections to the presentation by BIA/CRITFC	DLA Exhibit E – 1287
June 24, 2009	Email from Aquatic Chair to ASWG requesting agenda items for next meeting or action items from the last meeting	DLA Exhibit E – 1289
June 24, 2009	Email from Aquatic Chair to ASWG regarding revised 5/13/09 meeting notes with edits from Ecology	DLA Exhibit E – 1291
June 24, 2009	Email from Aquatic Chair to ASWG regarding agenda for ASWG meeting	DLA Exhibit E – 1303
June 24, 2009	Email from USFWS to ASWG regarding unavailability of policy representative to participate at the next meeting but giving USFWS technical representative the right to make decisions on behalf of USFWS	DLA Exhibit E – 1307
June 24, 2009	Email from Aquatic Chair to ASWG regarding this one-time exception to make comments on the PLMP by BIA and CRITFC	DLA Exhibit E – 1309
June 24, 2009	Email from BIA TO ASWG regarding PLMP and the Aquatic Settlement Agreement	DLA Exhibit E – 1311
June 30, 2009	Aquatic SWG Meeting	DLA Exhibit E – 1313
July 1, 2009	Cultural RWG Meeting	DLA Exhibit E – 1327
July 1, 2009	Email from Aquatic Chair to ASWG regarding ASWG final meeting minutes from 5/13/09 and 6/10/09 meetings and action items from 6/30/09 meeting	DLA Exhibit E – 1331
July 1, 2009	Email from BIA to ASWG regarding formal request to attend ASWG meetings as a non-voting member	DLA Exhibit E – 1333
July 2, 2009	Email from Aquatic Chair to BIA regarding formal request	DLA Exhibit E – 1335
July 2, 2009	Email from Aquatic Chair to ASWG members regarding formal request from BIA	DLA Exhibit E – 1337
July 2, 2009	Email from Aquatic Chair to ASWG members to add formal request from BIA to next week's meeting agenda	DLA Exhibit E – 1341
July 6, 2009	Email regarding Draft Cultural RWG Meeting Notes	DLA Exhibit E – 1343
July 8, 2009	Aquatic SWG Meeting	DLA Exhibit E – 1347
July 8, 2009	Email regarding Final Terrestrial RWG Meeting Notes	DLA Exhibit E – 1357
July 13, 2009	Email regarding Final Cultural RWG Meeting Notes	DLA Exhibit E – 1363

Table 6 – Consultation Record Supporting the Draft License Application (DLA)		
July 16, 2009	Email from Aquatic Chair via Ecology to ASWG regarding Boundary Project Toxics Assessment Report	DLA Exhibit E – 1367
July 16, 2009	Email from Douglas PUD to Ecology regarding draft turbidity memo	DLA Exhibit E – 1371
July 17, 2009	Email from Douglas PUD to ASWG members regarding scheduled presentation of the Adult Lamprey study plan to the HCP Coordinating Committee meeting	DLA Exhibit E – 1377
July 17, 2009	Email from Douglas PUD to ASWG members regarding updated WQMP	DLA Exhibit E – 1379
July 20, 2009	Email from Yakama Nation to ASWG regarding approval of draft PLMP memo to BIA	DLA Exhibit E – 1383
July 21, 2009	Email to FERC regarding review of Draft BA	DLA Exhibit E – 1385
July 22, 2009	Email from FERC regarding Study Determination Letter is not necessary	DLA Exhibit E – 1387
July 22, 2009	Email and Letter from DOI/USFWS to BIA regarding BIA's comments on the PLMP	DLA Exhibit E – 1389
July 22, 2009	Email from Aquatic Chair to ASWG members regarding draft response to BIA's formal request to attend ASWG meetings as a non-voting member	DLA Exhibit E – 1397
July 22, 2009	Memo from ASWG to BIA regarding draft proposed changes to the PLMP	DLA Exhibit E – 1399
July 24, 2009	Water Trails Meeting	DLA Exhibit E – 1403
July 24, 2009	Email from FERC regarding FERC comments on the BA	DLA Exhibit E – 1405
July 27, 2009	Email from USFWS regarding USFWS comments on the BA	DLA Exhibit E – 1407
August 3, 2009	Email from Douglas PUD to ASWG regarding signing of Aquatic Settlement Agreement by the USFWS	DLA Exhibit E – 1415
August 4, 2009	Email from Aquatic Chair to ASWG members regarding technical memo on turbidity results	DLA Exhibit E – 1419
August 6, 2009	Email from Aquatic Chair to ASWG regarding agenda for ASWG meeting	DLA Exhibit E – 1429
August 12, 2009	Aquatic SWG Meeting	DLA Exhibit E – 1431
August 17, 2009	Email from Douglas PUD to ASWG regarding PLMP redline draft for ASWG review	DLA Exhibit E – 1439
August 17, 2009	Email from Douglas PUD to ASWG regarding final updated WQMP	DLA Exhibit E – 1459
August 19, 2009	Phone Conversation with NMFS regarding NMFS comments on the Draft BA	DLA Exhibit E – 1463
August 21, 2009	Email from Aquatic Chair to BIA regarding request from BIA for ASWG representative	DLA Exhibit E – 1465
August 31, 2009	Email from Douglas PUD to NPS regarding Draft Wells Project Recreation Management Plan (RMP)	DLA Exhibit E – 1469
August 31, 2009	Email from Douglas PUD to Washington State Parks and Recreation (State Parks) regarding Draft Wells Project RMP	DLA Exhibit E – 1471
September 3, 2009	Email to Cultural RWG regarding Draft HPMP	DLA Exhibit E – 1473
September 8, 2009	Email from USFWS regarding reschedule discussion on BA Comments	DLA Exhibit E – 1475
September 9, 2009	Aquatic SWG Meeting	DLA Exhibit E – 1479
September 10, 2009	Letter from DOI to Douglas PUD regarding USFWS not signing agreement on behalf of BIA or DOI	DLA Exhibit E – 1487
September 14, 2009	Email from NPS regarding recommendations to the RMP	DLA Exhibit E – 1489
September 14, 2009	Email from BIA to Aquatic Chair regarding DOI's letter sent to Douglas PUD stating that USFWS is not signing agreement on behalf of BIA or DOI	DLA Exhibit E – 1491
September 15, 2009	Email from Aquatic Chair to BIA regarding ASWG's approval of BIA's attendance at ASWG meetings as a non-voting observer	DLA Exhibit E – 1493

Table 6 – Consultation Record Supporting the Draft License Application (DLA)		
September 28, 2009	Email from BIA to Aquatic Chair wanting clarification of non-voting observer	DLA Exhibit E – 1495
September 28, 2009	Email from Yakama Nation to BIA with their clarification of non-voting observer	DLA Exhibit E – 1497
September 28, 2009	Email from USFWS to BIA asking BIA to define their role and expectations of a non-voting observer	DLA Exhibit E – 1499
September 28, 2009	Email from Ecology to BIA with concurrence of Yakama Nation's clarification of a non-voting observer	DLA Exhibit E – 1501
September 29, 2009	Email to NPS regarding insertion of NPS recommendations into the RMP	DLA Exhibit E – 1503
September 29, 2009	Email regarding Agenda for Cultural RWG Meeting	DLA Exhibit E – 1505
October 8, 2009	Email from NPS regarding insertion of NPS recommendations into the RMP	DLA Exhibit E – 1507
October 9, 2009	Email from BIA to Douglas PUD regarding questions on PLMP edits	DLA Exhibit E – 1509
October 9, 2009	Email from Aquatic Chair to BIA regarding clarification of non-voting observer	DLA Exhibit E – 1513
October 9, 2009	Email from BIA to Aquatic Chair regarding clarification of non-voting observer	DLA Exhibit E – 1515
October 12, 2009	Email from Aquatic Chair to BIA requesting email address for BIA representative	DLA Exhibit E – 1517
October 13, 2009	Email from BIA to Aquatic Chair providing email address for BIA representative	DLA Exhibit E – 1519
October 13, 2009	Email from BIA to Douglas PUD regarding more questions about PLMP edits	DLA Exhibit E – 1521
October 14, 2009	Email from Douglas PUD to ASWG regarding review of BIA's questions on PLMP edits	DLA Exhibit E – 1523
October 14, 2009	Aquatic Settlement Work Group conference call	DLA Exhibit E – 1525
October 15, 2009	Email from Douglas PUD to FERC regarding question on DLA Exhibit E Comparison of Alternatives	DLA Exhibit E – 1531
October 19, 2009	Cultural RWG Meeting	DLA Exhibit E – 1533
October 21, 2009	Email from FERC regarding Question on DLA Exhibit D and Exhibit E Comparison of Alternatives	DLA Exhibit E – 1535
October 22, 2009	Email from Aquatic Chair to BIA regarding clarification of non-voting observer	DLA Exhibit E – 1537
October 22, 2009	Email from BIA to Aquatic Chair regarding clarification of non-voting observer	DLA Exhibit E – 1539
October 22, 2009	Email from Douglas PUD to ASWG regarding mailing of final Aquatic Settlement Agreement	DLA Exhibit E – 1541
October 28, 2009	Email from Douglas PUD to Cultural RWG regarding Draft Cultural RWG Meeting Notes	DLA Exhibit E – 1543
October 29, 2009	Email from Aquatic Chair to ASWG regarding summary of Lamprey Passage Study and video of lamprey at Wells Dam fishway entrances	DLA Exhibit E – 1547
October 29, 2009	Email from Douglas PUD to ASWG regarding draft response letter to BIA's questions on PLMP edits	DLA Exhibit E – 1575
November 4, 2009	Email from Ecology to ASWG regarding discussion of response letter at next meeting	DLA Exhibit E – 1583
November 4, 2009	Email from State Parks to Douglas PUD regarding Draft Wells Project RMP	DLA Exhibit E – 1585
November 5, 2009	Email from Douglas PUD to State Parks regarding adding additional language/measures to RMP	DLA Exhibit E – 1587
November 5, 2009	Email from State Parks to stakeholders regarding status report on RMP	DLA Exhibit E – 1589
November 12, 2009	Aquatic SWG conference call	DLA Exhibit E – 1591
November 12, 2009	Email from Aquatic Chair to ASWG regarding revised draft response letter to BIA's questions on PLMP edits	DLA Exhibit E – 1593
November 12, 2009	Email from Aquatic Chair to ASWG regarding draft table on adult lamprey passage by Project	DLA Exhibit E – 1601
November 12, 2009	Email from Douglas PUD to State Parks regarding proposed new language to the RMP	DLA Exhibit E – 1605
November 13, 2009	BLM signed Aquatic Settlement Agreement	DLA Exhibit E – 1607

APPENDIX E
CONSULTATION RECORDS

Table 6 – Consultation Record Supporting the Draft License Application (DLA)		
November 13, 2009	Email from State Parks to stakeholders regarding suggested edits to RMP	DLA Exhibit E – 1609
November 16, 2009	Letter from BLM regarding ASWG Party Representation	DLA Exhibit E – 1611
November 16, 2009	Email from NPS to Douglas PUD regarding NPS is supportive of the new measures in the RMP	DLA Exhibit E – 1613
November 17, 2009	Email from City of Pateros to stakeholders regarding RMP	DLA Exhibit E – 1615
November 17, 2009	Email from City of Brewster to stakeholders regarding RMP	DLA Exhibit E – 1617
November 17, 2009	Email from WDFW to ASWG regarding approval of revised draft response letter to BIA's questions on PLMP edits	DLA Exhibit E – 1619
November 17, 2009	Email from Yakama Nation to ASWG regarding approval of revised draft response letter to BIA's questions on PLMP edits	DLA Exhibit E – 1621
November 19, 2009	Email from USFWS to ASWG regarding approval of revised draft response letter to BIA's questions on PLMP edits	DLA Exhibit E – 1623
November 20, 2009	Email from Douglas PUD to ASWG regarding Aquatic Settlement Agreement signed by BLM	DLA Exhibit E – 1625
November 20, 2009	Email from Aquatic Chair to BIA regarding response to BIA's questions on the PLMP edits	DLA Exhibit E – 1627
November 23, 2009	Email from BIA to Aquatic Chair regarding response to BIA's questions on the PLMP edits	DLA Exhibit E – 1635

APPENDIX E
CONSULTATION RECORDS

Table 7 – Consultation Record Supporting the Biological Assessment (BA)		
Date	**Consultation Document**	**Source**
March 27, 2007	Meeting with U.S. Fish and Wildlife Service (USFWS) regarding Proposed Timeline and Settlement Process	DLA Exhibit E-1641
April 11, 2007	Phone Conversation with National Marine Fisheries Service (NMFS) regarding Wells Relicensing Update and Management Plan Discussion	DLA Exhibit E-1645
May 8, 2007	Meeting with Department of the Interior (DOI) regarding Proposed Timeline and Settlement Process	DLA Exhibit E-1647
October 11, 2007	Phone Conversation with USFWS regarding Bull Trout Management Plan (BTMP)	DLA Exhibit E-1651
November 9, 2007	Email to USFWS regarding BTMP	DLA Exhibit E-1653
December 18, 2007	Policy Outreach Meeting with USFWS	DLA Exhibit E-1655
December 31, 2007	Email from WDFW regarding Sharptails within Wells Project Boundary	DLA Exhibit E-1657
January 11, 2008	Policy Outreach Meeting with DOI (BIA/USFWS/BLM/NPS)	DLA Exhibit E-1661
January 15, 2008	Policy Outreach Meeting with NMFS	DLA Exhibit E-1663
January 31, 2008	Email from NMFS regarding Biological Assessment (BA) Matrix	DLA Exhibit E-1665
January 31, 2008	Email from NMFS regarding BA Matrix	DLA Exhibit E-1673
January 31, 2008	Email to NMFS regarding BA Matrix	DLA Exhibit E-1675
May 5, 2008	Email from USFWS regarding Comments on BTMP & Pacific Lamprey Management Plan (PLMP)	DLA Exhibit E-1677
May 19, 2008	Email to USFWS regarding Language Added to BTMP per USFWS Comments	DLA Exhibit E-1679
June 16, 2008	Email to USFWS regarding Added Language to BTMP	DLA Exhibit E-1681
June 16, 2008	Phone Conservation with USFWS regarding BTMP	DLA Exhibit E-1683
July 21, 2008	Meeting with USFWS regarding BTMP	DLA Exhibit E-1685
August 4, 2008	Email to USFWS regarding Updated Draft of the BTMP	DLA Exhibit E-1689
August 5, 2008	Email from USFWS regarding Distribution of Draft BTMP	DLA Exhibit E-1691
August 13, 2008	Email to USFWS regarding Progress on the BTMP	DLA Exhibit E-1693
August 14, 2008	Email from USFWS regarding Proposed New Language to the BTMP for Section 7 Bull Trout Consultation	DLA Exhibit E-1695
August 19, 2008	Email to USFWS regarding New Language Now Included in the BTMP for Section 7 Bull Trout Consultation	DLA Exhibit E-1697
September 12, 2008	Hatchery Genetic Management Plan (HGMP) Consultation Letter from NMFS	DLA Exhibit E-1699
January 5, 2009	Email to USFWS regarding Species List for Draft BA	DLA Exhibit E-1703
January 8, 2009	Email to USFWS and NMFS regarding Draft BA	DLA Exhibit E-1707
January 12, 2009	Phone Conversation with USFWS regarding BA Outline	DLA Exhibit E-1713
January 13, 2009	Phone Conversation with NMFS regarding BA Outline	DLA Exhibit E-1715

APPENDIX E
CONSULTATION RECORDS

Table 7 – Consultation Record Supporting the Biological Assessment (BA)		
January 13, 2009	Email from USFWS regarding BA Outline Suggestions	DLA Exhibit E-1717
January 16, 2009	Email to USFWS regarding Tour of Wells East Ladder	DLA Exhibit E-1725
January 16, 2009	Email from NMFS regarding BA for Wells	DLA Exhibit E-1727
January 20, 2009	Email to USFWS regarding Literature Format	DLA Exhibit E-1731
January 22, 2009	Email from USFWS regarding Literature Format	DLA Exhibit E-1733
March 27, 2009	Outreach Meeting with USFWS in Olympia	DLA Exhibit E-1739
May 11, 2009	Letter from USFWS regarding Request to Participate in the Aquatic Settlement Work Group (Aquatic SWG)	DLA Exhibit E-1741
June 11, 2009	Email to USFWS regarding Bull Trout Standard Language in BA	DLA Exhibit E-1745
June 15, 2009	Email from USFWS regarding Bull Trout Standard Language in BA	DLA Exhibit E-1747
June 26, 2009	Email from USFWS regarding Correct References	DLA Exhibit E-1761
July 21, 2009	Email to Federal Energy Regulatory Commission (FERC) regarding Review of Draft BA	DLA Exhibit E-1765
July 24, 2009	Email from FERC regarding FERC Comments on the BA	DLA Exhibit E-1767
July 27, 2009	Email from USFWS regarding USFWS Comments on the BA	DLA Exhibit E-1769
August 19, 2009	Phone Conversation with NMFS regarding NMFS Comments on the Draft BA	DLA Exhibit E-1777
September 8, 2009	Email from USFWS regarding Reschedule Discussion on BA Comments	DLA Exhibit E-1779
September 21, 2009	Phone Conversation with NMFS regarding Additional NMFS Comments on the Draft BA	DLA Exhibit E-1783
October 22, 2009	Information Consultation between Douglas PUD and USFWS regarding Draft BA	DLA Exhibit E-1785
November 6, 2009	Email from Douglas PUD to USFWS regarding request for comments on draft meeting notes	DLA Exhibit E-1789
November 18, 2009	Email from USFWS to Douglas PUD regarding approval of draft meeting notes	DLA Exhibit E-1791
November 19, 2009	Letter from Douglas PUD to USFWS regarding Draft BA - response to comments	DLA Exhibit E-1793

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CONSULTATION RECORDS

Table 8 – Consultation Record Supporting the Historic Properties Management Plan	
Date	**Consultation Document**
August 8, 2005	Letter Requesting Information Pertinent to the Relicensing of the Wells Hydroelectric Project
August 31, 2005	Stakeholder Outreach Letter regarding Informal pre-Notice of Intent (NOI) Meetings
October 4, 2005	Stakeholder Outreach Meeting with Colville Confederated Tribes (CCT)
October 5, 2005	Stakeholder Outreach Meeting with the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation)
October 18, 2005	ILP 101 Meeting
November 2, 2005	Email to Stakeholders from Public Utility District No. 1 of Douglas County (Douglas PUD) regarding Agenda for Cultural Resource Work Group (RWG) Meeting
November 18, 2005	Cultural RWG Meeting
November 18, 2005	Issues List and Action Items from Cultural RWG Meeting
December 1, 2005	Letter to Federal Energy Regulatory Commission (FERC) from Douglas PUD requesting Designation as Non-Federal Representative for Endangered Species Act (ESA) Consultation and Consultation under Section 106 of the National Historic Preservation Act
December 7, 2005	Letter from FERC to Douglas PUD granting Authorization to Conduct Day-to-Day Section 106 Consultation
December 21, 2005	Letter to CCT from Douglas PUD regarding Okanogan River Erosion Evaluation
December 21, 2005	Letter to Department of Archaeology & Historic Preservation (DAHP) from Douglas PUD regarding Okanogan River Erosion Evaluation
December 22, 2005	Letter to CCT from Douglas PUD Proposing Next Steps for Section 106
January 5, 2006	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural RWG Meeting
January 12, 2006	Cultural RWG Meeting
January 12, 2006	Action Items from Cultural RWG Meeting
February 3, 2006	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural RWG Meeting
February 9, 2006	Cultural RWG Meeting
February 9, 2006	Action Items from Cultural RWG Meeting
April 11, 2006	Memo to Cultural RWG regarding Project Maps for Area of Potential Effects (APE)
July 6, 2006	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural RWG Meeting
July 18, 2006	Letter to DAHP from Douglas PUD requesting Concurrence on APE
July 18, 2006	Letter to CCT (Tribal Historic Preservation Officer [THPO]) from Douglas PUD requesting Concurrence on APE
July 24, 2006	Letter from DAHP to Douglas PUD Concurring on APE

APPENDIX E
CONSULTATION RECORDS

Table 8 – Consultation Record Supporting the Historic Properties Management Plan	
Date	**Consultation Document**
July 25, 2006	Letter to Department of Interior (DOI) from Douglas PUD regarding Bureau of Indian Affairs' (BIA) Interest in Participating in Section 106 Process
July 27, 2006	Cultural RWG Meeting
July 27, 2006	Action Items from Cultural RWG Meeting
August 31, 2006	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural RWG Meeting
September 6, 2006	Email to Stakeholders from Douglas PUD regarding Cultural RWG Meeting Materials
September 7, 2006	Cultural RWG Meeting
September 7, 2006	Action Items from Cultural RWG Meeting
September 25, 2006	Email to Stakeholders from Douglas PUD regarding Cultural RWG Meeting Materials
September 28, 2006	Cultural RWG Meeting
September 28, 2006	Action Items from Cultural RWG Meeting
October 3, 2006	Policy Outreach Meeting with CCT
October 5, 2006	Policy Outreach Meeting with Yakama Nation
October 19, 2006	Cultural RWG Meeting
October 19, 2006	Action Items from Cultural RWG Meeting
October 25, 2006	Policy Outreach Meeting with DOI (BIA, U.S. Fish and Wildlife Service [USFWS], Bureau of Land Management [BLM], National Park Service (NPS)
October 25, 2006	Letter from CCT to Douglas PUD Concurring on APE
November 7, 2006	Policy Outreach Meeting with DAHP
December 12, 2006	Email to Stakeholders from Douglas PUD regarding the Filing of the NOI and Pre-Application Document
December 13, 2006	Email to Stakeholders from Douglas PUD regarding Date Change for Cultural RWG
December 21, 2006	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural RWG
January 10, 2007	Letter to CCT regarding Final Cultural Resources Data Review
January 10, 2007	Letter to FERC regarding Final Cultural Resources Data Review
January 10, 2007	Letter to DAHP regarding Final Cultural Resources Data Review
January 12, 2007	Email to Stakeholders from Douglas PUD regarding Draft Scope of Work (SOW) for the Cultural Resources Investigation and Agenda for Cultural RWG
January 17, 2007	Cultural RWG Meeting
January 19, 2007	Email to Stakeholders from Douglas PUD regarding Draft Cultural RWG Meeting Notes
January 25, 2007	Email to Stakeholders from Douglas PUD regarding Date Change for Cultural RWG
January 30, 2007	Email to Stakeholders from Douglas PUD regarding FERC issues Scoping Document 1

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CONSULTATION RECORDS

Table 8 – Consultation Record Supporting the Historic Properties Management Plan	
Date	**Consultation Document**
February 2, 2007	Email to Stakeholders from Douglas PUD regarding Final Cultural RWG Meeting Notes
February 21, 2007	Meeting with BIA providing an Update on Wells Relicensing and Section 106 Process
February 27, 2007	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural RWG
March 1, 2007	Fax Transmittal to BIA regarding Douglas PUD/BIA Meeting Notes
March 7, 2007	Email to Stakeholders from Douglas PUD regarding Final Draft SOW
March 8, 2007	Cultural RWG Meeting
March 9, 2007	Email to Stakeholders from Douglas PUD regarding Draft Cultural RWG Meeting Notes
March 16, 2007	Email to Stakeholders from Douglas PUD regarding Final Cultural RWG Meeting Notes
April 9, 2007	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural RWG
April 10, 2007	Email to Stakeholders from Douglas PUD regarding Final SOW for the Cultural Resources Investigation
April 18, 2007	Cultural RWG Meeting
April 23, 2007	Email to Stakeholders from Douglas PUD regarding Draft Cultural RWG Meeting Notes
April 25, 2007	Email to Stakeholders from Douglas PUD regarding Final Cultural Resources Investigation and Final SOW
April 30, 2007	Email to Stakeholders from Douglas PUD regarding Final Cultural RWG Meeting Notes
May 31, 2007	Email to Stakeholders from Douglas PUD regarding Agenda for Study Plan Meeting
June 14, 2007	Study Plan Meeting
June 28, 2007	Email to Stakeholders from Douglas PUD regarding Draft Study Plan Meeting Notes
July 9, 2007	Letter to DAHP and CCT from Douglas PUD regarding 2007 Triennial Archaeological Monitoring
July 11, 2007	Email to Stakeholders from Douglas PUD regarding Final Study Plan Meeting Notes
July 12, 2007	Letter to Douglas PUD from DAHP regarding 2007 Triennial Archaeological Monitoring
December 4, 2007	Policy Outreach Meeting with Yakama Nation
January 7, 2008	Email to Stakeholders from Douglas PUD regarding Cultural RWG Meeting Materials
January 11, 2008	Policy Outreach Meeting with DOI (BIA, USFWS, BLM, NPS)
January 28, 2008	Email to Stakeholders from Douglas PUD regarding Cultural RWG Meeting Materials
January 30, 2008	Cultural RWG Meeting
February 5, 2008	Policy Outreach Meeting with CCT
February 7, 2008	Email to Stakeholders from Douglas PUD regarding Draft Cultural RWG Meeting Notes
February 19, 2008	Email to Stakeholders from Douglas PUD regarding Final Cultural RWG Meeting Notes
June 3, 2008	Memo to Stakeholders from Douglas PUD regarding Draft Traditional Cultural Properties Study Report
June 5, 2008	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural RWG
June 6, 2008	Email to Stakeholders from Douglas PUD regarding Draft Historic Properties Management Plan (HPMP)

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CONSULTATION RECORDS

Table 8 – Consultation Record Supporting the Historic Properties Management Plan	
Date	**Consultation Document**
July 17, 2008	Cultural RWG Meeting
July 24, 2008	Email to Stakeholders from Douglas PUD regarding Draft Cultural RWG Meeting Notes
July 28, 2008	Memo to Stakeholders from Douglas PUD regarding Draft Cultural Resources Site Revisit and Archaeological Survey Report
August 5, 2008	Email to Stakeholders from Douglas PUD regarding Final Cultural RWG Meeting Notes
August 13, 2008	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural RWG
August 29, 2008	Email to Stakeholders from Douglas PUD regarding Revised Draft HPMP
September 3, 2008	Cultural RWG Meeting
September 10, 2008	Email to Stakeholders from Douglas PUD regarding Draft Cultural RWG Meeting Notes
September 18, 2008	Email to Stakeholders from Douglas PUD regarding Final Cultural RWG Meeting Notes
September 25, 2008	Email to BLM from Douglas PUD regarding BLM sites on Wells Reservoir
September 26, 2008	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural RWG
October 9, 2008	Cultural RWG Wells Reservoir Site Visit
October 15, 2008	Letter to FERC regarding Submittal of Cultural Resources Investigation for Filing
November 3, 2008	Email to Stakeholders from Douglas PUD regarding Cultural RWG Site Visit Notes
December 2, 2008	Letter to FERC regarding Submittal of Traditional Cultural Property Study for Filing
January 14, 2009	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural RWG
January 27, 2009	Cultural RWG Meeting
February 2, 2009	Memo to Stakeholders from Douglas PUD regarding Submittal of Final Cultural Resources Site Revisit and Inventory Study
February 3, 2009	Email to Stakeholders from Douglas PUD regarding Draft Cultural RWG Meeting Notes
February 10, 2009	Email to Stakeholders from Douglas PUD regarding Final Cultural RWG Meeting Notes
February 17, 2009	Email to Stakeholders from Douglas PUD regarding Cultural RWG Meeting Materials
March 4, 2009	Cultural RWG Meeting
March 10, 2009	Email to Stakeholders from Douglas PUD regarding Draft Cultural RWG Meeting Notes
March 18, 2009	Email to Stakeholders from Douglas PUD regarding Final Cultural RWG Meeting Notes
March 26, 2009	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural Technical RWG
March 30, 2009	Cultural Technical RWG Meeting
April 3, 2009	Email to Stakeholders from Douglas PUD regarding Draft Cultural RWG Meeting Notes
April 13, 2009	Email to Stakeholders from Douglas PUD regarding Final Cultural RWG Meeting Notes
April 22, 2009	Email to Stakeholders from Douglas PUD regarding Updated Study Report Meeting

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CONSULTATION RECORDS

Table 8 – Consultation Record Supporting the Historic Properties Management Plan	
Date	**Consultation Document**
April 30, 2009	Updated Study Report Meeting
May 4, 2009	Letter to DAHP from Douglas PUD regarding Submittal of Temporary Site Forms
June 12, 2009	Email to Stakeholders from Douglas PUD regarding Cultural RWG Meeting Materials
July 1, 2009	Cultural RWG Meeting
July 6, 2009	Email to Stakeholders from Douglas PUD regarding Draft Cultural RWG Meeting Notes
July 13, 2009	Email to Stakeholders from Douglas PUD regarding Final Cultural RWG Meeting Notes
September 3, 2009	Email to Stakeholders from Douglas PUD regarding Draft Final HPMP
September 29, 2009	Email to Stakeholders from Douglas PUD regarding Agenda for Cultural RWG
October 19, 2009	Cultural RWG Meeting
October 28, 2009	Email to Stakeholders from Douglas PUD regarding Draft Cultural RWG Meeting Notes
November 6, 2009	Email to Stakeholders from Douglas PUD regarding Final Cultural RWG Meeting Notes and Draft Final HPMP
November 16, 2009	Email to BLM regarding recent correspondence with Cultural RWG and HPMP
November 16, 2009	Phone conversation with BLM regarding the status of the HPMP
November 19, 2009	Email from FERC to Douglas PUD regarding comments on Draft Final HPMP

APPENDIX E
CONSULTATION RECORDS

Table 9 – Consultation Record Supporting the Final License Application (FLA)		
Date	**Consultation Document**	**Source**
December 23, 2009	Email from Aquatic Chair regarding final meeting minutes from 11/12/09 conference call	FLA Exhibit E - 939
January 8, 2010	Phone Conversation with Ecology regarding Ecology's review of water rights table within the DLA	FLA Exhibit E - 945
January 11, 2010	Email from Aquatic Chair to Aquatic SWG regarding agenda for Aquatic SWG meeting on 1/13/10	FLA Exhibit E - 947
January 12, 2010	Email from Douglas PUD to NMFS regarding final ILP Timeline	FLA Exhibit E - 949
January 12, 2010	Email from Douglas PUD to Ecology regarding final ILP Timeline	FLA Exhibit E - 953
January 12, 2010	Email from Douglas PUD to Aquatic SWG regarding final ILP Timeline	FLA Exhibit E - 955
January 12, 2010	Email from Douglas PUD to USFWS regarding final ILP Timeline	FLA Exhibit E - 957
January 12, 2010	Email from Douglas PUD to FERC regarding final ILP Timeline	FLA Exhibit E - 959
January 12, 2010	Email from Douglas PUD to Cultural RWG regarding final ILP Timeline	FLA Exhibit E - 961
January 12, 2010	Email from Douglas PUD to Terrestrial RWG regarding final ILP Timeline	FLA Exhibit E - 963
January 12, 2010	Email from Douglas PUD to Recreation RWG regarding final ILP Timeline	FLA Exhibit E - 965
January 13, 2010	Email from USFWS to Douglas PUD regarding appreciation for sending the revised ILP Timeline	FLA Exhibit E - 967
January 13, 2010	Aquatic SWG conference call	FLA Exhibit E - 969
January 22, 2010	Email from Douglas PUD to DOI regarding final ILP Timeline	FLA Exhibit E - 975
February 17, 2010	Letter from Lake Chelan Sportsman's Association to Douglas PUD regarding appreciation for support of the Lake Chelan Triploid Chinook Program	FLA Exhibit E - 977
February 24, 2010	Letter from Lake Chelan Chamber of Commerce to Douglas PUD regarding appreciation for support of the Lake Chelan Triploid Chinook Program	FLA Exhibit E - 979
February 26, 2010	Email from Douglas PUD to Colville Tribes regarding distribution of White Sturgeon Management Plan to new members of the Aquatic SWG	FLA Exhibit E - 981
March 3, 2010	Email from Aquatic Chair to Aquatic SWG regarding agenda for 3/10/10 meeting and revised minutes from Aquatic SWG conference call on 1/13/10	FLA Exhibit E - 985
March 10, 2010	Aquatic SWG meeting	FLA Exhibit E - 987
March 17, 2010	Letter from Okanogan County Office of Planning and Development to Douglas PUD regarding comments on the Draft License Application	FLA Exhibit E - 993
March 17, 2010	Letter from Ecology to FERC regarding comments on the Draft License Application	FLA Exhibit E - 995
March 18, 2010	Email from Aquatic Chair to Aquatic SWG regarding draft 2009 Aquatic SWG Annual Report and Appendices	FLA Exhibit E - 997
March 29, 2010	Letter from FERC to Douglas PUD regarding comments on the Draft License Application	FLA Exhibit E - 1001
April 12, 2010	Email from Aquatic Chair to Aquatic SWG regarding final meeting minutes from 1/13/10 conference call and the 3/10/10 meeting	FLA Exhibit E - 1007
May 12, 2010	Response from Douglas PUD to FERC regarding comments on the Draft License Application	FLA Exhibit E - 1009

FLA Consultation Records

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Email from Aquatic Chair regarding final meeting minutes from 11/12/09 conference call

From: Ali Wick [awick@anchorqea.com]
Sent: Wednesday, December 23, 2009 2:50 PM
To: bill.towey@colvilletribes.com; JATEFRJJ@DFW.WA.GOV; brose@yakama.com; Brad James; Donella Miller; korthjwk@dfw.wa.gov; Jessi Gonzales; Joe Kelly; joe.peone@colvilletribes.com; Jon Merz; Josh Murauskas; Karen Kelleher; Mary Mayo; Mike Schiewe; Molly Hallock; Pat Irle; Patrick Luke; Patrick Verhey; Paul Ward; Shane Bickford; Steve Lewis; parker@yakama.com; Tony Eldred
Subject: Aq SWG: Final 11/12 Call Minutes
Attachments: 2009_11_12 FINAL Aquatic SWG Call minutes.doc

Hi Aq SWG – Attached please find the final minutes from our 11/12 call.

Merry Christmas!,
-Ali

Ali Wick

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Final Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: December 9, 2009

From: Michael Schiewe (Anchor QEA)

re: Final Minutes of November 12, 2009 Aquatic SWG Conference Call

I. Welcome

1. Mike Schiewe opened the meeting. The revised October 14, 2009, meeting minutes were approved as final.

II. Summary of Decisions

1. There were no decision items at this meeting.

III. Summary of Action Items

1. Josh Murauskas will send the Aquatic Settlement Work Group's (SWG's) revised Bureau of Indian Affairs (BIA) responses out to the Aquatic SWG for final review. The Aquatic SWG will send their concurrence by November 19. Then, Mike Schiewe will send the responses to the BIA on behalf of the Aquatic SWG. These responses will be sent as a PDF by email. (Item IV-1).

IV. Summary of Discussions

1. **Aquatic SWG Responses to Pacific Lamprey Monitoring Plan (PLMP) Questions** – Josh Murauskas summarized the proposed Aquatic SWG's draft responses to the BIA questions regarding the Pacific Lamprey Monitoring Plan (PLMP); the BIA questions had been sent to Douglas PUD by Bob Dach. Prior to today's meeting, Douglas PUD prepared draft responses for consideration and review by the Aquatic SWG. The Aquatic SWG discussed and agreed to the draft responses, with several edits discussed on today's call. These edits will be made to the draft responses and Mr. Murauskas will send these responses to the Aquatic SWG for final review. The Aquatic SWG will send their concurrence to these responses by November 19. Then, Mike Schiewe will send the responses to the BIA on behalf of the Aquatic SWG. These responses will be sent as a PDF by email.

2. **Pacific Lamprey Study Update** – Josh Murauskas said that the Pacific lamprey study is progressing well and he expects that study results will be available by late winter.

3. **Discussion of Changes to Annual TDG Report** – Pat Irle said that she will be meeting soon with Douglas and Chelan PUDs to develop a common format/template for the Annual Total Dissolved Gas (TDG) Reports. This will provide consistency between the TDG reports for these projects.

IV. Next Meetings

1. Upcoming meetings: ***Conference call on December 9; in-person meeting at Douglas PUD on January 13, 2010; conference call on February 10, 2010.***

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Ali Wick	Administrative	Anchor QEA, LLC
Keith Hatch	Observer	Bureau of Indian Affairs
Bill Towey	SWG Technical Rep.	Colville Confederated Tribes
Josh Murauskas	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Bob Rose	SWG Technical Rep.	Yakama Nation
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology
Tony Eldred	SWG Policy Rep.	Washington Department of Fish and Wildlife

Phone Conversation with Ecology regarding Ecology's review of water rights table within the DLA

Wells Project Relicensing
Phone Conversation Summary

Call From:	**Thomas Tebb, Regional Director, Washington State Department of Ecology (Ecology)**
Call To:	**Shane Bickford, Douglas PUD**
Date:	**January 8, 2010**
Time:	**9:39 AM**
Subject:	**Ecology review of water rights table within the Draft License Application for the Wells Project**

Summary:

Mr. Tebb called Mr. Bickford to discuss the accuracy of the water rights table found within Section 3.3.2.1. Mr. Tebb verified that the water rights tables found within the Draft License Application do in fact match with the records on file with Ecology and that the water right described in the application appear to be accurate.

Email from Aquatic Chair to Aquatic SWG regarding agenda for Aquatic SWG meeting on 1/13/10

From: Mike Schiewe [mschiewe@anchorqea.com]
Sent: Monday, January 11, 2010 9:42 AM
To: bill.towey@colvilletribes.com; JATEFRJJ@DFW.WA.GOV; brose@yakama.com; Brad James; Donella Miller; korthjwk@dfw.wa.gov; Jessi Gonzales; Joe Kelly; joe.peone@colvilletribes.com; Jon Merz; Josh Murauskas; Karen Kelleher; Mary Mayo; Mike Schiewe; Molly Hallock; Pat Irle; Patrick Luke; Patrick Verhey; Paul Ward; Shane Bickford; Steve Lewis; parker@yakama.com; Tony Eldred
Cc: Ali Wick
Subject: Jan 13 AqSWG Conference Call Agenda
Attachments: 2010_01_13 Aq SWG Agenda.doc

AqSWG Members – Attached is the Agenda for the January 13 AqSWG conference call. The call in number is 360-407-3780, participant code 407154. The conference line can accommodate up to 15 callers so please if possible “team up” and use only one line to participate.

Thanks…talk to you all on Wednesday.

Mike

Michael H. Schiewe, PhD

ANCHOR QEA, LLC
mschiewe@anchorqea.com
1423 Third Avenue, Suite 300
Seattle, WA 98101

T 206.287.9130
D 206.903.3307
F 206.287.9131
C 360.271.9747

ANCHOR QEA, LLC
www.anchorqea.com

Email from Douglas PUD to NMFS regarding final ILP Timeline

From: Shane Bickford
Sent: Tuesday, January 12, 2010 2:36 PM
To: Keith Kirkendall; bryan.nordlund@noaa.gov; Bruce.Suzumoto@noaa.gov
Cc: Mary Mayo; Josh Murauskas; Tom Kahler; Greg Mackey; Shane Bickford
Subject: Updated Wells ILP schedule
Attachments: ILP Timeline[1-12-2010].pdf

Keith, Bryan and Bruce,

At the relicensing policy outreach meeting back in November 2009 we discuss the tentative Wells relicensing schedule for 2010 and 2011. Since our November meeting I have had an opportunity to discuss the proposed ILP schedule with FERC and now have a final 2010 schedule for the Wells ILP.

Please find attached the final schedule for the Wells ILP for 2010 and beyond. Of interest to you and your organization is FERC's proposed date for issuance of the REA (July 27, 2010), the proposed September due date for Section 18 fishway prescriptions and the expected date for FERC to request ESA consultation for the relicensing of the Wells Project (January 2011 to March 2011).

FERC is still determining whether they will issue a non-draft EA or an EA/EIS for Wells. They likely will not make a final determination until late 2010. This decision will have significant impacts on the schedule attached.

Please let me know if you have any questions, comments or concerns with the attached Wells ILP schedule for the next 12-18 months.

Regards,

Shane Bickford
Natural Resources Supervisor
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497
509.881.2208

Wells Hydroelectric Project
Integrated Licensing Process Timelines

2006	2007	2008	2009	2010		2011	2011-2012
File NOI and PAD	**ILP Initiation and Study Scoping**	**Conduct Studies**		**File License Application**		**Environmental Assessment and Consultation**	**Environmental Consultation & License Issuance**
December 1 File Notice of Intent (NOI) and Pre-Application Document (PAD) No later than 30 days after filing NOI/PAD Initial Tribal Consultation Meeting (May 16, 2006)	January 29 Notice of NOI/PAD and issuance of Scoping Document 1 February 27 & 28 Scoping Meetings and site visit April 2 Comments on PAD, SD1, and Study Requests May 16 File Proposed Study Plan FERC Issues SD2 June 14 Study Plan Meeting August 15 Comments on Proposed Study Plans September 14 File Revised Study Plan Agency reply comments due in 15 days October 1 File reply comments (to Revised Study Plan) October 11 FERC Issues Study Plan Determination November 5 – January 14, 2008 Dispute Resolution (no disputes)	January – December Conduct First Season of Study **October 15** **File Initial Study Report** October 30 Initial Study Report Meeting November 14 File Initial Study Report Meeting Summary and Study Plan Modifications (if necessary) December 15 File Meeting Summary Comments (if necessary) Agencies may file request for study plan modifications – no comments received	January 14 File Responses to Meeting Summary Comments (if necessary) February 4 Study Plan Determination by FERC's Director April 15 File Updated Study Report and NOI to File a Draft License Application April 30 Updated Study Report Meeting May 15 File Updated Study Report Meeting Summary June 15 File Meeting Summary Comments (no comments) June 29 Draft BA and EFHA sent to NMFS, USFWS, and FERC July 15 File Responses to Meeting Summary Comments (no comments) July 22 Study Plan Determination by FERC's Director December 18 File Draft License Application (DLA) including a draft BA, HPMP & EFHA	March 18 Comments on DLA Due May 1 Finalize proof of Exhibit G Notice to Affected Land Owners. May 28 File Final License Application (FLA) including HGMPs – advertise FLA in community newspaper June Draft 401 to Ecology By June 11 *(Within 14 days after FLA)* FERC issues Tendering Notice (TN) By June 25 *(Within 30 days after FLA)* Commission decision on any outstanding pre-filing AIRs By July 27 *(Within 60 days after FERC receives the FLA)* FERC issues Notice of Acceptance (NOA) and Ready for Environmental Analysis (REA) By August 27 *(Within 60 days of REA)* PUD Files Copy of Request for 401 Water Quality Certification and Proof of Date of Receipt by WDOE (401 Request) By September 24 *(Within 60 days after NOA)* FLA Comments and Interventions Due including 10(a), 10(j) Recommendations, 4(e), 18 Preliminary Terms and Conditions and Prescriptions (PT&C)	By October 22 *(Within 30 days after PT&C File)* Parties Submit Alternatives to PT&C (if necessary); or By October 22 *(Within 30 days after PT&C Filed)* Parties Request Trial-type Hearing for PT&C (if necessary) By November 8 *(Within 45 days after FLA Comments)* PUD's FLA and PT&C Reply Comments due By November 5 *(Within 15 days after Parties Request Trial Type Hearing)* Interventions and Response By December 3 *(Within 30 days following Interventions and responses)* Agency Response to Trial Type Hearing (if needed) By December 8 *(Within 5 days of Agency Response to Trial Type Hearing)* Agency Hearing Referral	By January 21 *(Within 75 days after PUD's FLA and PT&C Reply Comments due)* FERC Issues non-Draft EA (NDEA) -OR- **By March 23** ***(Within 135 days after PUD's FLA and PT&C Reply Comments due)*** **FERC Issues Draft Environmental Assessment (DEA)** On January 21 or March 23 *(Concurrent with FERC's issuance of NDEA or DEA)* FERC Requests Formal ESA Consultation - USFWS and NMFS By February 4 *(Within 90 days of agency hearing referral)* Trial Type Hearing Decision By February 18 or March 7 *(Within 30 or 45 days following Issuance of NDEA)* Comments on NDEA due -OR- **By April 22 or May 6** ***(Within 30 or 60 days following Issuance of DEA)*** **Comments on DEA due** May 23, 2011 *(120 days following FERC's issuance of EA)* ESA Section 7 and EFHA Consultation Concluded	By April 19 or July 6 *(Within 60 Days Following Comments on NDEA)* Modified Mandatory Terms and Conditions -OR- **By June 21 or July 19** ***(Within 60 Days Following Comments on DEA)*** **Modified Mandatory Terms and Conditions due following review of any hearing decisions, comments, and proposed alternatives** June 2011 – October 2011 FERC May Refer any Modified Terms and Conditions to FERC's Dispute Resolution Service By July 28, 2011 – *(at least 30 days prior to issuance of final 401)* Draft Water Quality Certification Issued for Comment By August 26, 2011 – *(Within one year after Filing 401 Request)* Final Water Quality Certificate Issued From September 19 to October 17, 2011 *(Within 90 Days Following Mandatory Terms and Conditions)* FERC Issues Final EA Before May 31, 2012 *(Before Wells License Expires)* FERC Issues License Order

Email from Douglas PUD to Ecology regarding final ILP Timeline

From: Shane Bickford
Sent: Tuesday, January 12, 2010 2:52 PM
To: Tom Tebb (gteb461@ecy.wa.gov); 'Pat Irle'; 'Jon Merz'
Cc: Josh Murauskas; Beau Patterson; Mary Mayo; Shane Bickford
Subject: FW: Updated Wells ILP schedule
Attachments: ILP Timeline[1-12-2010].pdf

Tom, Jon and Pat,

At the relicensing policy outreach meeting back in November 2009 we discuss the tentative Wells relicensing schedule for 2010 and 2011. Since our November meeting I have had an opportunity to discuss the proposed ILP schedule with FERC and now have a final 2010 schedule for the Wells ILP.

Please find attached the final schedule for the Wells ILP for 2010 and beyond. Of interest to you and your organization is FERC's proposed date for issuance of the REA (July 27, 2010). The issuance of the REA will initiate the NEPA review of the license application. Based upon comments at the November meeting with Ecology, Douglas PUD is planning on providing Ecology with a draft 401 certification request in June 2010 followed by a final certification request in late August 2010. It is also important to note that FERC is expected issue their EA in the spring/early summer of 2011. FERC's issuance of the EA will make it possible for Ecology to finalize the 401 certification documents, seek public comment and then move to finalize the 401 by late August 2011, within one year of requesting certification. At least that is the current plan.

Please let me know if you have any questions, comments or concerns with the attached Wells ILP schedule. Your comments are always appreciated. Thanks again for the continued coordination on the relicensing of the Wells Project.

Regards,

Shane Bickford
Natural Resources Supervisor
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497
509.881.2208

Email from Douglas PUD to Aquatic SWG regarding final ILP Timeline

Attachments: ILP Timeline[1-12-2010].pdf

From: Josh Murauskas
Sent: Tuesday, January 12, 2010 2:56 PM
To: 'Mike Schiewe'; bill.towey@colvilletribes.com; JATEFRJJ@DFW.WA.GOV; brose@yakama.com; Brad James; Donella Miller; korthjwk@dfw.wa.gov; Jessi Gonzales; Joe Kelly; joe.peone@colvilletribes.com; Jon Merz; Karen Kelleher; Mary Mayo; Molly Hallock; Pat Irle; Patrick Luke; Patrick Verhey; Paul Ward; Shane Bickford; Steve Lewis; parker@yakama.com; Tony Eldred
Cc: Ali Wick
Subject: RE: Jan 13 AqSWG Conference Call Agenda

SWG Members:

Please find attached the most recent version of the ILP timeline for the Wells Hydroelectric Project. An update on the ILP status, along with potential Section 18 discussion from Steve Lewis may arise in our last block of time tomorrow ("Other items").

Thanks, and we'll talk soon!

Josh

Joshua Murauskas, Sr. Aquatic Resource Biologist
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway East Wenatchee, WA 98802
509.881.2323 (v) 509.884.0553 (f)

Email from Douglas PUD to USFWS regarding final ILP Timeline

From: Shane Bickford
Sent: Tuesday, January 12, 2010 2:56 PM
To: 'Jessica_Gonzales@fws.gov'; 'Stephen_Lewis@fws.gov'; Karen Kelleher
Cc: Mark Miller; Josh Murauskas; Mary Mayo; Beau Patterson
Subject: FW: Updated Wells ILP schedule
Attachments: ILP Timeline[1-12-2010].pdf

Jessica, Steve, and Karen,

At the relicensing policy outreach meeting back in November 2009 we discuss the tentative Wells relicensing schedule for 2010 and 2011. Since our November meeting I have had an opportunity to discuss the proposed ILP schedule with FERC and now have a final 2010 schedule for the Wells ILP.

Please find attached the final schedule for the Wells ILP for 2010 and beyond. Of interest to you and your organization is FERC's proposed date for issuance of the REA (July 27, 2010), the proposed September due date for Section 18 fishway prescriptions and the expected date for FERC to request ESA consultation for the relicensing of the Wells Project (January 2011 to March 2011). Based upon feedback from you at the November meeting I inserted a 120 day processing interval between FERC's request for ESA Section 7 consultation and the Service's completed of that work product.

FERC is still determining whether they will issue a non-draft EA or an EA/EIS for Wells. They likely will not make a final determination until late 2010. This decision will have significant impacts on the attached schedule.

Please feel free to give me a call or drop me an e-mail if you have any questions, comments or concerns related to the attached Wells ILP schedule.

Regards,

Shane Bickford
Natural Resources Supervisor
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497
509.881.2208

Email from Douglas PUD to FERC regarding final ILP Timeline

From: Shane Bickford
Sent: Tuesday, January 12, 2010 3:25 PM
To: 'Robert Easton'; 'David Turner'; Patricia Leppert
Cc: Mary Mayo; Beau Patterson
Subject: FW: Updated Wells ILP schedule
Attachments: ILP Timeline[1-12-2010].pdf

Bob, David and Patricia,

Based upon comments from FERC, NMFS, USFWS and Ecology, please find attached the final schedule for the Wells ILP for 2010 and beyond. I fully expect that the individual dates will change particularly given the fact that most of the dates hinge on your actual date of issuance for the REA notice. However, based upon stakeholder requests, we decided that it was better to issue a schedule that is reasonably close to being right than to not issue one at all.

Please note that Ecology has asked Douglas PUD to submit a draft and a final 401 certification request in June and August 2010, respectively. That means that they want to issue the 401 certification by August 2011. They have agreed to issue the 401 certification within one year of receipt provided FERC can issue an EA (either non-draft or draft) by July 2011.

NMFS and the USFWS have similarly agreed to meet a 120 day ESA Section 7 consultation timeline provided that they receive FERC's request for ESA consultation in early 2011 (January 2011).

Please let me know if you have any questions, comments or concerns with the attached Wells ILP schedule.

Regards,

Shane Bickford
Natural Resources Supervisor
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497
509.881.2208

Email from Douglas PUD to Cultural RWG regarding final ILP Timeline

From: Scott Kreiter
Sent: Tuesday, January 12, 2010 3:31 PM
To: Brent Martinez; Camille Pleasants; Chuck James; David Turner; Frank Winchell; Glenn Hartmann (glenn@crcwa.com); Gordon Brett; Guy Moura; John Devine; Karen Kelleher; Margaret Berger (margaret@crcwa.com); Mary Mayo; Richard Bailey; Rob Whitlam; Robert Easton; Scott Kreiter; Shane Bickford; Tim Bachelder
Subject: Updated Wells ILP schedule
Attachments: ILP Timeline[1-12-2010].pdf

Wells Project Cultural Resources Work Group,

For your information, please find attached the revised schedule for the Wells Hydroelectric Project Integrated Licensing Process. Note that the dates following the filing of the Final License Application (May 28, 2010) are approximate and subject to change.

Please contact me if you have any questions regarding the revised schedule.

Thank you.
-Scott

Scott Kreiter
Douglas County PUD
509-881-2327

Email from Douglas PUD to Terrestrial RWG regarding final ILP Timeline

From: Scott Kreiter
Sent: Tuesday, January 12, 2010 3:43 PM
To: Beau Patterson; Bill Towey; Bob Dach; Bob Easton; Brenda Crowell; Dan Trochta; Dave Volsen; David Turner; Dennis Beich; Dinah Demers; Gordon Brett; Jeff Korth; Jim McGee; John Devine; Karen Kelleher; Marc Hallett; Mary Hunt; Mary Mayo; Matt Monda; Patricia Leppert; Patrick Verhey; Scott Kreiter; Shane Bickford; Steve Lewis; Tony Eldred
Subject: Updated Wells ILP schedule
Attachments: ILP Timeline[1-12-2010].pdf

Wells Project Terrestrial Resources Work Group,

For your information, please find attached the revised schedule for the Wells Hydroelectric Project Integrated Licensing Process. Note that the dates following the filing of the Final License Application (May 28, 2010) are approximate and subject to change.

Please contact me if you have any questions regarding the revised schedule.

Thank you.
-Scott

Scott Kreiter
Douglas County PUD
509-881-2327

Email from Douglas PUD to Recreation RWG regarding final ILP Timeline

From: Scott Kreiter
Sent: Tuesday, January 12, 2010 3:44 PM
To: Andy Lampe; Bill Fraser; Bill Towey; Bob Dach; Bob Fateley; Brenda Crowell; David Turner; Dennis Beich; Diane Priebe; Gail Howe; George Brady; Gordon Brett; Jean Hardie; Jim Eychaner; Jim Harris; John Devine; Karen Kelleher; Lee Webster; Mary Hunt; Mary Mayo; Michael Linde; Mike Palmer; Morris Shook; Pat Haley; Pat Irle; Patricia Leppert; Patrick Verhey; Robert Easton; Scott Kreiter; Shane Bickford; Susan Rosebrough; Tony Eldred
Subject: Updated Wells ILP schedule
Attachments: ILP Timeline[1-12-2010].pdf

Wells Project Recreation Resources Work Group,

For your information, please find attached the revised schedule for the Wells Hydroelectric Project Integrated Licensing Process. Note that the dates following the filing of the Final License Application (May 28, 2010) are approximate and subject to change.

Please contact me if you have any questions regarding the revised schedule.

Thank you.
-Scott

Scott Kreiter
Douglas County PUD
509-881-2327

Email from USFWS to Douglas PUD regarding appreciation for sending the revised ILP Timeline

From: Jessica_Gonzales@fws.gov [mailto:Jessica_Gonzales@fws.gov]
Sent: Wednesday, January 13, 2010 2:18 PM
To: Shane Bickford
Cc: Beau Patterson; Josh Murauskas; Mark Miller; Mary Mayo; Stephen_Lewis@fws.gov; Ken_Berg@fws.gov; Kate_Benkert@fws.gov; Douglas_Zimmer@fws.gov; James_Michaels@fws.gov; Jeff_Krupka@fws.gov
Subject: Re: FW: Updated Wells ILP schedule

Thanks for the update, revised schedule, and consideration of our workload needs for consultation, Shane. As DPUD and Steve are working together to begin drafting the fishway prescription now, we should be in good shape for doing tribal gov-to-gov coordination and meeting the REA deadlines. We'll keep watch for the decision on the NEPA document.

I hear some good information is coming thorough the lamprey behavior study and look forward to hearing the preliminary results in March. I will likely attend the ASWG meeting in Feb and for sure in March.

~~~~~~
JESSICA L. GONZALES Assistant Project Leader
US Fish and Wildlife Service, Central Washington Field Office
215 Melody Lane, Wenatchee, WA 98801
Office 509.665.3508 x16 Fax 509.665.3509
~~~~~~

Aquatic SWG conference call

Conference Call Agenda

Aquatic Settlement Work Group

Date: Wednesday, January 13, 2010

Time: 10:00 a.m. to 11:30 a.m.

Location: Conference call line: 360-407-3780;

Participant Code 407154#

I.	**Welcome and Agenda / Minutes Review**	Schiewe
II.	**Update on PUD sturgeon programs**	Rose
III.	**Update on 2009 Pacific Lamprey Study**	Murauskas
IV.	**Any other items for discussion**	SWG

Final Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: April 12, 2010

From: Michael Schiewe (Anchor QEA)

re: Final Minutes of January 13, 2010 Aquatic SWG Conference Call

I. Summary of Decisions

1. There were no decision items at this meeting.

II. Summary of Action Items

1. Josh Murauskas will send the Annual Total Dissolved Gas (TDG) Report to the Aquatic Settlement Work Group (SWG) as an informational item (Item III-1).
2. Josh Murauskas will send video clips showing lamprey behavior at the Wells fish ladder entrances taken during the 2009 lamprey research project (Item III-3).

III. Summary of Discussions

1. **Update on Total Dissolved Gas Annual Report** – Josh Murauskas said that the Department of Ecology and Douglas PUD has worked with the other Mid-Columbia PUDs to develop a new format for the Annual TDG Report. This year, there were no exceedances in TDG attributable to Wells Dam operations. In recent years, there have been multiple exceedances in the Wells forebay due to water quality coming from Chief Joseph Dam. This is a result of the shift in generation to Grand Coulee Dam and spill to Chief Joseph Dam. New "flip lips" were installed at Chief Joseph Dam last year as a means to allow increased spill, which could ultimately result in an increased frequency of out-of-compliance waters entering the Wells Project. Douglas PUD is not held responsible for these exceedances. Mr. Murauskas will distribute this report to the Aquatic SWG.
2. **Notice on PUD White Sturgeon Programs** – Bob Rose updated the group that the Yakama Nation (YN) has begun to work with Washington Department of Fish and Wildlife (WDFW) and Grant and Chelan PUDs on coordinating regional white sturgeon hatchery and future program needs. He also said that there is an opportunity for Douglas PUD to be involved in early implementation of requirements in the Wells Hydroelectric Project White Sturgeon Management Plan. Shane Bickford noted that the implementation schedule in the Settlement Agreement does not include putting

sturgeon in the Wells reservoir until 2013, following the development of a hatchery program, and only after consultation with U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). Steve Lewis indicated that ESA consultation will be required prior to implementation of the Wells sturgeon stocking plan. Mr. Rose said that he brings this discussion to the Aquatic SWG in order to get them involved and keep them updated on the development of these plans.

3. **Update on 2009 Pacific Lamprey Study** – Josh Murauskas said that data from the 2009 Pacific Lamprey Study have been compiled and the report is under development. Josh indicated that because the Columbia River lamprey run was so small last year that the sample size at Wells Dam was lower than expected, statistical inferences will be unachievable; however, several distinct patterns of movement were observed.. Shane Bickford noted that an additional year of study would be necessary in order to achieve scientifically rigorous conclusions. Mr. Bickford said that some initial ideas for a second season of study include elimination of the lowest operating condition (0.5-foot head differential) and focus on testing the 1- and 1.5-foot differential. He suggested that the Aquatic SWG might also want to consider expanding the time of year for study, as well as increase the hours of sampling. Preliminary results show that nighttime operational reductions may have a positive effect on lamprey entrance efficiency and no negative impacts on upstream adult salmon passage. Results from the 2009 lamprey study will be available prior to and presented at the next in-person meeting in March. Prior to that meeting, Mr. Murauskas will send video clips showing lamprey behavior at the Wells fish ladder entrances taken during the 2009 lamprey research project. The group suggested the possibility of adopting a 1 or 1.5 head differential as a longterm solution to improving lamprey passage at the Project.

4. **Wells Integrated Licensing Process Schedule** – Shane Bickford noted that stakeholders were notified yesterday of the schedule for the Wells Integrated Licensing Process (ILP). Comments on the final license application are due on March 18. Douglas PUD will submit final Hatchery Genetic Management Plans (HGMPs) to NMFS in early March and to FERC on May 28. In July, the Federal Energy Regulatory Commission (FERC) will issue their REA notice for National Environmental Policy Act (NEPA) review. In August, Douglas PUD will submit an application for 401 Certification to Washington State Department of Ecology (Ecology). Between January and March of 2011, FERC will issue its environmental assessment, which then triggers the Endangered Species Act (ESA) consultation. The FERC license is expected to be issued by May 2012.

IV. Next Meetings

1. Upcoming meetings: ***Conference call on February 10 (if necessary); in-person meeting on March 10 at Douglas PUD.***

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Ali Wick	Administrative	Anchor QEA, LLC
Keith Hatch	Observer	Bureau of Indian Affairs
Bill Towey	SWG Technical Rep.	Colville Confederated Tribes
Kirk Truscott	CCT Technical	Colville Confederated Tribes
Josh Murauskas	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Bob Rose	SWG Technical Rep.	Yakama Nation
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology
Patrick Verhey	SWG Policy Alternate	Washington Department of Fish and Wildlife
Chad Jackson	WDFW Technical	Washington Department of Fish and Wildlife
Molly Hallock	WDFW Technical	Washington Department of Fish and Wildlife
Tony Eldred	SWG Policy Rep.	Washington Department of Fish and Wildlife

Email from Douglas PUD to DOI regarding final ILP Timeline

From: Shane Bickford
Sent: Friday, January 22, 2010 10:34 AM
To: Preston Sleeger; 'Allison O'Brien'
Cc: Mary Mayo; Josh Murauskas
Subject: FW: Updated Wells ILP schedule
Attachments: ILP Timeline[1-12-2010].pdf

Preston and Allison,

At our last relicensing policy outreach meeting back in the fall of 2009 we discuss the tentative Wells relicensing schedule for 2010 and 2011. Since our November meeting I have had an opportunity to adjust the Wells ILP schedule based upon feedback from the FERC, USFWS, NMFS, and Ecology and now have a final 2010 schedule for the Wells ILP.

Please find attached the final schedule for the Wells ILP for 2010 and beyond. Of interest to you and your organization is FERC's proposed date for issuance of the REA (July 27, 2010), the proposed September due date for Section 18 fishway prescriptions and the expected date for FERC to request ESA consultation for the relicensing of the Wells Project (January 2011 to March 2011). Based upon feedback from NMFS and the USFWS at the November meetings I inserted a 120 day processing interval between FERC's request for ESA Section 7 consultation and the Service's completion of that work product.

FERC is still determining whether they will issue a non-draft EA or an EA/EIS for Wells. They likely will not make a final determination until late 2010. This decision will have significant impacts on the attached schedule.

Please note that these dates are subject to change depending upon when FERC actually issues the REA, DEA and FEA for Wells.

As these events happen, I will update the schedule and send them out to the stakeholders.

Please feel free to give me a call or drop me an e-mail if you have any questions, comments or concerns related to the attached Wells ILP schedule.

Regards,

Shane Bickford
Natural Resources Supervisor
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497
509.881.2208

Letter from Lake Chelan Sportsman's Association to Douglas PUD regarding appreciation for support of the Lake Chelan Triploid Chinook Program

February 17, 2010

Shane Bickford
Douglas County PUD
1151 Valley Mall Parkway
East Wenatchee, WA 98802

Dear Mr. Bickford,

On behalf of the members of the Lake Chelan Sportsman's Association I would like to thank you for your leadership and support of the Lake Chelan Triploid Chinook Program. Our club members have been following and assisting in the program for some time and we are very pleased to see it succeeding. We appreciate your efforts in supporting the Washington State Department of Fish and Wildlife as they work towards meeting their goals and for supporting a program that means so much to our community. For the past 34 years the Lake Chelan Sportsman's Association has had the mission of protecting and enhancing the fish and wildlife habitat of the Lake Chelan Valley. We love seeing the success of a program that shares our goals and values and that helps preserve our fish and wildlife populations for future generations.

Thank you for understanding the value of this program that is a great economic, environmental and recreational asset for our community.

Sincerely,

Jim Martin

Jim Martin
President
Lake Chelan Sportsman's Association
PO Box 1266
Chelan, WA 98816

NOTED
MAR 01 2010
MEM

Letter from Lake Chelan Chamber of Commerce to Douglas PUD regarding appreciation for support of the Lake Chelan Triploid Chinook Program

Lake Chelan Chamber of Commerce
P.O. Box 216 • Chelan, Washington 98816
(509) 682-3503 • Fax (509) 682-3538

February 24, 2010

Shane Bickford
Douglas County PUD
1151 Valley Mall Parkway
East Wenatchee, WA 98802

Dear Mr. Bickford,

I am writing on behalf of the Lake Chelan Chamber of Commerce Board of Directors. We want to thank you for your support of the Lake Chelan Triploid Chinook Program. This program means a great deal to our community. The mission of the Lake Chelan Chamber of Commerce is to support and enhance economic, commercial and cultural progress of the Lake Chelan Valley. We believe this program has great impact in those areas. We appreciate your efforts in support of the Washington State Department of Fish and Wildlife as they work toward their goals in this program.

Again, thank you for your support of this program and the positive impacts it has on our community.

Respectfully,

Mike Steele, Executive Director
Lake Chelan Chamber of Commerce

NOTED
MAR 01 2010
MEM

Email from Douglas PUD to Colville Tribes regarding distribution of White Sturgeon Management Plan to new members of the Aquatic SWG

From: Josh Murauskas
Sent: Friday, February 26, 2010 4:46 PM
To: 'Bret Nine'; 'Kirk Truscott'
Cc: Shane Bickford
Subject: White Sturgeon Management Plan
Attachments: Wells White Sturgeon Management Plan.pdf

Bret and Kirk:

Glad to hear you'll be jumping in our sturgeon discussions. Our meetings typically occur on the second Wednesday of each month and sturgeon has certainly been a hot topic lately.

Please see attached the White Sturgeon Management Plan, and feel free to call with any questions.

We look forward to working with you –

Josh

Joshua Murauskas, Sr. Aquatic Resource Biologist
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway East Wenatchee, WA 98802
509.881.2323 (v) 509.884.0553 (f)

WHITE STURGEON MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

August 2008

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

Email from Aquatic Chair to Aquatic SWG regarding agenda for 3/10/10 meeting and revised minutes from Aquatic SWG conference call on 1/13/10

From: Ali Wick [awick@anchorqea.com]
Sent: Wednesday, March 03, 2010 9:24 AM
To: bill.towey@colvilletribes.com; JATEFRJJ@DFW.WA.GOV; brose@yakama.com; Brad James; Bret Nine; Chad Jackson; Donella Miller; korthjwk@dfw.wa.gov; Jessi Gonzales; Joe Kelly; joe.peone@colvilletribes.com; Jon Merz; Josh Murauskas; Karen Kelleher; Kirk Truscott; Mary Mayo; Mike Schiewe; Molly Hallock; Pat Irle; Patrick Luke; Patrick Verhey; Paul Ward; Shane Bickford; Steve Lewis; parker@yakama.com; Tony Eldred
Cc: Virginia See
Subject: Aq SWG: 3/10 Agenda + important information
Attachments: 2010_03_10 Aq SWG Agenda.doc; 2010_01_13 REVISED Aquatic SWG Call minutes.doc

Hello Aquatic SWG! Four important items to notify you of:

- The SWG will again be meeting in person on next Wednesday 3/10, from 10 am to NLT 2 pm at Douglas PUD. Attached please find the agenda for this meeting, plus the revised minutes that will be approved at the meeting.

- Bob Rose let us know that he will be unable to attend the meeting, so please coordinate with him ahead of time on any items if you need to do so.

- An early heads up that the Aquatic SWG Annual Report will be coming out for your review beginning on 3/12 and extending to 4/12. This will be discussed again at the meeting for your information.

- A reminder that I'll be out of the country 3/8 – 3/22, so please cc Mike on any correspondence and time-sensitive issues. Thank you! Looking forward to seeing you again soon!

Best,
-Ali

Ali Wick

ANCHOR QEA, LLC
awick@anchorqea.com
1423 Third Avenue, Suite 300
Seattle, WA 98101
Front Desk 206.287.9130
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ANCHOR QEA, LLC
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Aquatic SWG meeting

Meeting Agenda

Aquatic Settlement Work Group

Date: Wednesday, March 10, 2010

Time: 10:00 a.m. to NLT 2:00 p.m.

Location: Conference call line: 509.881.2990

Participant Code 327831

I.	**Welcome and Agenda / Minutes Review**	Schiewe
II.	**2009 Lamprey Passage Study Results**	DPUD
III.	**Relicensing Offer of Settlement to FERC**	DPUD
IV.	**Sturgeon Hatchery**	SWG
V.	**Aquatic SWG Annual Report Schedule – SWG review 3/12 – 4/12**	Schiewe

Final Meeting Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: April 12, 2010

From: Michael Schiewe (Anchor QEA)

re: Final Minutes of March 10, 2010 Aquatic SWG Meeting

I. Summary of Decisions

1. Continue the DIDSON Study in 2010, with study modifications intended to increase coverage, and thus sample size.

2. Draft a broodstock plan for sturgeon. After review, the Aquatic SWG will solicit responses to begin the decision process for implementation.

II. Summary of Action Items

1. Josh Murauskas will draft sturgeon broodstock collection protocols for Aquatic Settlement Work Group (SWG) review by July 2010 (Item II-2).

2. Josh Murauskas will prepare a one-page description of the proposed 2010 lamprey study plan to review with the HCP Coordinating Committees and get their approval prior to June 2010 (Item II-3).

3. Josh Murauskas will distribute to the Aquatic SWG the 2009 Lamprey Passage Study Results memo, his PowerPoint presentation, and any short DIDSON clips from the study that are small enough to be emailed (Item II-3).

III. Summary of Discussions

1. **Welcome/Meeting Minute Review** – Mike Schiewe opened the meeting. The revised January 13, 2010, meeting minutes were approved as final.

2. **Sturgeon** – Shane Bickford gave an overview of the current discussions and negotiations regarding the sturgeon hatchery programs that the three PUDs (Douglas, Chelan, and Grant) are responsible for implementing. Both Chelan PUD and Grant PUD are required to implement their programs in the next two years; Douglas PUD is required to implement their stocking program in year 2 of the new license. Required numbers of juvenile sturgeon to be released annually are 5,000 fish for Douglas PUD; 10,000 fish for Grant PUD; and 6,500 fish for Chelan PUD. Mr. Bickford noted that Grant PUD is considering establishing a sturgeon rearing capability at Priest Rapids Hatchery and that

the Yakama Nation (YN) is pursuing expanded use of its facility at Marion Drain. Mr. Bickford indicated that Douglas PUD has had preliminary discussions with the YN about their Marion Drain program and with Grant PUD about their Priest Rapids facility. Bret Nine asked what other options are available—Mr. Bickford said that he is aware of several established or proposed rearing operations/facilities, including Wells Hatchery, Priest Rapids, Marian Drain, Cranebrook, and Columbia Basin. He noted that Douglas PUD will be remodeling the Wells Hatchery facility as part of the new license, so one option will be whether there is enough capacity at Wells Dam for Douglas PUD to fulfill its sturgeon requirement there. Bill Towey suggested that Douglas PUD put together a table that lays out the sturgeon program objectives and then lists all the hatchery options and relevant information about each one, thus giving the Aquatic SWG an all-inclusive look at the possibilities. It was decided that such a table could be populated by soliciting responses to an RFP. The group agreed that the first step is for Douglas PUD to draft a sturgeon broodstock collection and rearing protocol that could be used in preparation of an RFP. The protocol would be based on the previously approved Sturgeon Management Plan. Douglas PUD agreed to prepare a draft protocol document for Aquatic SWG review in July 2010.

3. **2009 Lamprey Passage Study Results** – Josh Murauskas presented results of the 2009 Adult Lamprey Passage Study. As background, he noted that there was a substantial increase in abundance of adult lampreys returning to the Columbia River from 1997-2003 and then a large decrease from 2003-present. Prior to 1997, there were large fluctuations in returns, but there was inconsistent monitoring and reporting during this period. Mr. Murauskas noted that lamprey tend to be smaller and leaner by the time they reach Wells Dam, and that recent studies show poor effectiveness of radio-telemetry tags on fish of this size. Another complication is that at the time of year that the lamprey runs reach Wells Dam—they are showing up just as water temperatures starts dropping off, which can lead to fish deciding to stop and overwinter, making it hard to find fish still in active migration. Lastly, the proportion of adult lampreys passing Bonneville Dam that ultimately arrive at Wells Dam has averaged less than 1% over the past decade, leading to difficulty with obtaining adequate numbers of fish for studies. These inherent difficulties with trapping and radio-telemetry led the SWG to consider alternative technologies that are unobtrusive, un-biased, and less detrimental to the migrating population.

   For the 2009 study, Dual-frequency Identification Sonar (DIDSON) was used to monitor lamprey passage at the Wells Dam fishway entrances under three conditions: 1.5-foot, 1.0-foot, and 0.5-foot head differential. In general, the low numbers of returning lampreys to the Columbia River (Bonneville Dam count was 8,400), and a concomitantly very low number of lamprey arriving at Wells Dam resulted in few observations and limited the ability to statistically evaluate the results. Results were that under the high-flow condition (1.5-foot), 1 of 2 lampreys successfully passed the dam; under the moderate (1.0-foot) condition, 1 of 1 lamprey was successful; and under the low (0.5-foot) condition, 1 of 2 lampreys were successful (for a combined 66% entrance efficiency under reduced conditions). Lamprey passing under the high-flow condition struggled and spent a considerably longer amount of time to negotiate the entrance compared to those passing under the moderate- and low-flow conditions.

The SWG discussed and agreed to continue to conduct a DIDSON study, with some modifications to the study design to enhance coverage, and thus increase sample size. These included testing at two head differentials (1.0 ft and 1.5 ft.), instead of the three tested in 2009, and potentially increasing the sample size through expanded/changed spatial and temporal DIDSON coverage at the fishway entrances. Mr. Murauskas agreed to prepare a one-page description of a proposed 2010 lamprey study plan to review with the HCP Coordinating Committees (HCP-CC) and get their approval prior to June 2010. The HCP-CC will evaluate the study design to ensure minimal impacts to salmon and steelhead passage. Once the HCP-CC approves, then a revised study plan will be reviewed and approved by the Aquatic SWG. Mr. Murauskas agreed to distribute to the Aquatic SWG by email the 2009 Lamprey Passage Study Results memo, his PowerPoint presentation, and any short DIDSON clips from the study that are small enough to be emailed.

4. **Relicensing Offer of Settlement to FERC** – Shane Bickford explained that Douglas PUD is sending in its final license application to the Federal Energy Regulatory Commission (FERC) at the end of May, and the Aquatic Settlement is an important element of that application. Douglas PUD has put together a summary page and a joint approval page for signatures of officials of state and federal agencies, and tribes that are signatories of the Settlement Agreement. Mr. Bickford will be sending these around to the legal departments of the Aquatic SWG agencies to make sure that it's written in a way they approve, and then the goal is to have signatures from everyone by early May.

5. **Aquatic SWG Annual Report Schedule – SWG review 3/15 – 4/15**

IV. Next Meetings

1. Upcoming meetings: ***Conference calls on April 14 and May 12 (if necessary); in-person meeting on June 9 at Douglas PUD (with the possibly of moving the in-person meeting to July).***

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Virginia See	Administrative	Anchor QEA, LLC
Bill Towey	SWG Technical Rep.	Colville Confederated Tribes
Bret Nine	CCT Technical	Colville Confederated Tribes
Josh Murauskas	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Patrick Luke	YN Technical	Yakama Nation
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Molly Hallock	WDFW Technical	Washington Department of Fish and Wildlife
Tony Eldred	SWG Policy Rep.	Washington Department of Fish and Wildlife
Beau Patterson	Observer	Douglas PUD

Letter from Okanogan County Office of Planning and Development to Douglas PUD regarding comments on the Draft License Application

OKANOGAN COUNTY
OFFICE OF PLANNING AND DEVELOPMENT
123 - 5th Ave. N. Suite 130 - Okanogan, WA 98840
(509) 422-7160 • FAX: (509) 422-7349 • TTY/Voice Use 800-833-6388
email: planning@co.okanogan.wa.us

March 17, 2010

Douglas County PUD
Shane Bickford
1151 Valley Mall Pkwy
E. Wenatchee, WA 98802

Dear Mr. Bickford,

I am offering these comments regarding the draft license application for the Douglas County PUD for operation of the Wells Dam Hydro-electric project. By doing Okanogan County does assert standing in future review processes and accompanying discussions and negotiations.

Okanogan County has concerns regarding the loss of recreational and economic opportunity due to the management practices of the Douglas County PUD on the Wells pool. These impacts are exacerbated by the unusual pattern of land ownership implemented by the PUD during the previous license term. The Wells dam pool is a tremendous asset which on-site value has been reduced considerably by these issues. We believe these impacts have not been adequately addressed in the draft license application.

Okanogan County believes consideration should be given to the possibility of off-site mitigation for these impacts. This mitigation could take the form of recreational infrastructure grants or other assistance to offset the impacts of the hydro-electric project. This type of program could be coordinated with a capital facilities plan created in a cooperative effort between the Douglas County PUD, Okanogan County, and the towns and cities impacted by the project.

Okanogan County is working to create two additions to the trail system in the county and has numerous parks under its ownership most of which are under-developed. We would welcome a partnership with the Douglas County PUD to develop these assets through the course of the new license term. Recognizing the need to budget both long and short term expenditures these improvements should be in adherence to the above mentioned capital facilities plan. This type of coordinated effort would not only mitigate impacts caused by the project but would serve as an important element for economic expansion in the county which in turn creates a broader customer base for the PUD.

Okanogan County looks forward to working with FERC and the Douglas County PUD during the subsequent phases of the relicensing effort.

Sincerely,

Perry D Huston

Perry D. Huston,
Director of Planning and Development

Letter from Ecology to FERC regarding comments on the Draft License Application

ORIGINAL

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 W Yakima Ave, Ste 200 • Yakima, WA 98902-3452 • (509) 575-2490

FILED
SECRETARY OF THE COMMISSION
2010 MAR 22 A 10: 19
FEDERAL ENERGY REGULATORY COMMISSION

March 17, 2010

Kimberly D. Bose
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Wells Hydroelectric Project No. 2149
Comments on Draft License Application

Dear Kimberly D. Bose:

The Washington State Department of Ecology (Ecology) has worked closely with Douglas County Public Utility District (PUD), tribes and other federal and state fish management agencies to develop an Aquatic Settlement Agreement. We believe this document to a great extent supports the resources covered under our responsibilities and we intend to use it as the basis of our Clean Water Act Section 401 Certification.

Several small items will need to be addressed:

1) Hatcheries: Any hatcheries required under the License must receive a separate NPDES permit from Ecology in order to be operated.
2) Spills containment: Upgrades to the PUD's spill containment system need to be completed. It is our understanding that this will be done by April 1, 2010, well ahead of issuance of the 401 certification and Final License.
3) Shoreline, Recreation and Wildlife Plans: If FERC requires that the PUD modify or upgrade any of these plans, Ecology should be among the agencies consulted, particularly with respect to water quality standards and the designated uses of aesthetics, aquatic life, recreation, and wildlife.

If you have any questions, please call me at (509) 454-7864.

Sincerely,

Patricia S. Irle
Hydropower Projects Manager
Water Quality Program

By Certified Mail 7009 2250 0004 4956 0124

c: Shane Bickford, Douglas PUD
G. Thomas Tebb, Ecology CRO Regional Director
Charles McKinney, Ecology WQ Manager
Jeff Lewis, Ecology SEA Manager
Clynda Case, Ecology SEA

Email from Aquatic Chair to Aquatic SWG regarding draft 2009 Aquatic SWG Annual Report and Appendices

From: Mike Schiewe [mschiewe@anchorqea.com]
Sent: Thursday, March 18, 2010 9:15 AM
To: bill.towey@colvilletribes.com; JATEFRJJ@DFW.WA.GOV; brose@yakama.com; Brad James; Donella Miller; korthjwk@dfw.wa.gov; Jessi Gonzales; joe.peone@colvilletribes.com; Jon Merz; Josh Murauskas; Mary Mayo; Mike Schiewe; Molly Hallock; Pat Irle; Patrick Luke; Patrick Verhey; Paul Ward; Shane Bickford; Steve Lewis; parker@yakama.com; Tony Eldred
Cc: Ali Wick; Carmen Andonaegui; Virginia See
Subject: Aq SWG Annual Report
Attachments: 2009_draft Aquatic SWG Ann Rpt_031710_toAquaticSWG.DOC; Compiled_Appendices_AquaticSWG_Annual_Report_031710.pdf

Hi Aq SWG -

Attached please find the Draft 2009 Wells Hydroelectric Project Aquatic Settlement Agreement Annual Report and appendices for your review. Comments are due to Ali Wick by Friday, April 16, 2010.

If you have any questions, please contact Ali beginning Tuesday, March 23rd when she returns from a well-earned vacation.

Thanks…

Mike

Michael H. Schiewe, PhD

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ANNUAL REPORT
CALENDAR YEAR 2009
ACTIVITIES UNDER THE AQUATIC SETTLEMENT AGREEMENT

WELLS HYDROELECTRIC PROJECT
FERC LICENSE NO. 2149

Prepared for

Public Utility District No. 1
of Douglas County, Washington
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497

Prepared by

Anchor QEA, LLC
1423 Third Avenue, Suite 300
Seattle, Washington 98101

Draft March 2010

APPENDIX A
AQUATIC SETTLEMENT WORK GROUP MEETING MINUTES AND CONFERENCE CALL MINUTES

Letter from FERC to Douglas PUD regarding comments on the Draft License Application

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
March 29, 2010

OFFICE OF ENERGY PROJECTS

Project No. 2149-131-Washington
Wells Hydroelectric Project
Public Utility District No. 1 of
Douglas County

William C. Dobbins, Manager
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802

Reference: Comments on the Draft License Application for the Wells Hydroelectric Project

Dear Mr. Dobbins:

Pursuant to 18 CFR § 5.16(e), this letter contains staff comments on your Draft License Application (DLA) for the Wells Hydroelectric Project No. 2149, filed on December 18, 2009.

In general, your DLA adequately describes the existing and proposed project facilities and operations, and provides an analysis of the anticipated effects of continued operation of the project with your proposed environmental measures. However, in some instances, the DLA lacks sufficient detail for Commission staff to conduct its required analysis. Specific comments on the DLA are discussed in Appendix A.

If you have any questions, please contact Bob Easton at (202) 502-6045.

Sincerely,

Jennifer Hill, Chief
West Branch 1
Division of Hydropower Licensing

Enclosure: APPENDIX A
cc: Mailing List, Public Files

APPENDIX A
Comments on the Draft License Application

Initial Statement

Page IS-2, Table 5.0-1 indicates that Douglas PUD will apply for a 401 water quality certification (WQC) after the license application is filed. For clarity, it may be helpful to specify that the Douglas PUD will apply for the 401 WQC within 60 days of Commission's issuance of the notice of acceptance and ready for environmental analysis (see CFR 18 §5.23(b)).

The information provided in the Initial Statement addresses several of the requirements included in CFR 18 §4.32(a); however, it appears that the information required by §4.32(a)(4) still needs to be added to the initial statement or another portion of the license application.

Exhibit A

Section 3.0 Fish Hatchery Facilities should be revised to clearly indicate which fish hatchery facilities are project facilities and located within the project boundary.

There is a discrepancy in this exhibit with respect to acreage totals for the three units of the Wells Wildlife Area that fall within the project boundary. Bridgeport Bar (502 acres), Okanogan (91 acres), and Washburn Island (300 acres) total 893 acres, rather than the 823 that is reported on page A-29.

Exhibit D

Table 4.0-1 and Table 4.0-2 should be revised so that the costs provided in the "total" column are broken out and reported as both capital and annual operation and maintenance costs. Also, the word "annualized" should be deleted from the row headings in Table 4.0-2.

Tables 4.0-2, 4.0-3, and 4.0-4 should be revised to clarify if the costs reported under the "Total" column are for each year or the total cost for the entire 30- or 50-year period. For each occurrence in all tables in this exhibit, please explain why total and average costs for some measures are "N/A".

Exhibit E

The environmental exhibit includes many acronyms, including several that are unique to the project or mid-Columbia region; therefore, it would be beneficial to add a list of acronyms in the front section of the document.

The Unavoidable Adverse Effects descriptions in section 3.0 appear to overlook ongoing project effects that would continue even after implementation of the proposed measures. These sections should describe any adverse effects of the project that would continue, even if the effects may be reduced, mitigated for, or offset by the proposed enhancement measures. In other words, if an adverse effect of the project would continue to occur (i.e., it is not eliminated), then it should be described in the Unavoidable Adverse Effects section.

The paragraph indicating that the Habitat Conservation Plan (HCP) has been accepted as a Comprehensive Plan can be deleted from page 116 and page 126 since it is listed as a comprehensive plan in Table 5.5-1.

In section 3.3.2.4, the third full paragraph on page 116 describes the Hatchery and Genetic Management Plans (HGMP) as “new elements” of the HCP. Please clarify if the HGMPs are part of the current relicensing proposal or something that Douglas PUD will address through amendment of the current license. If they are part of the current relicensing proposal, the environmental effects or benefits of the HGMPs should be described and the costs of development and implementation should be provided.

Please clarify if the juvenile sturgeon mentioned in the first sentence on page 141 are the same or different than the 13 fish mentioned in the previous paragraph.

In section 3.3.5.1, you state “Douglas PUD owns approximately 104 of 108 miles of project shoreline in fee title and federal and local agencies own approximately 4 miles of shoreline.” In section 2.3.2 of the Resident Fish Management Plan, you state “Douglas owns approximately 89 miles of shoreline in fee title…” Additionally, in section 2.0 of the Wildlife and Botanical Management Plan, you state “The shoreline of the Wells Reservoir is approximately 105 miles in length.” Please correct these discrepancies regarding the length of shoreline at the project and the amount of the shoreline you own.

Please add a table to section 3.3.5.2 that identifies the total acreages for federal, state, and private lands within the Wells Project boundary and clearly indicate any project boundary modifications. The amount of federal lands reported in this section should be the same as those reported in Exhibit A.

In section 3.3.6.1, expand your definition of the area of potential effects (APE) to include a brief description of the APE within the project boundary. Also include another section with a brief description of past and current archeological research within the project’s APE, and another section to describe a brief account of the area’s pre-contact, ethnographic, and Euro-American background.[1] Include another section to briefly

[1] Use and summarize the existing information from your HPMP.

discuss the consultation history involving your work in complying with the section 106 process for this relicensing.

In section 3.3.6.2, add more specific information about what archeological sites are being affected by project-related effects, and what those effects are.

In section 3.3.6.3, add more specific information on what project measures will be included in the historic properties management plan (HPMP). Use information about the HPMP from your discussion of the HPMP in your Draft Biological Assessment and Essential Fish Habitat Analysis on pages 47-49.

Recreation Management Plan

The recreation management plan (RMP) for the Wells Hydroelectric Project (Appendix E-2), dated November 2009, may require clarification or modification before it can be approved by the Commission. Staff comments on the RMP include:

a. In section 5.1.3, Greater Columbia Water Trail Initiative, the RMP indicates that "camping facilities would be designated for Greater Columbia Water Trail Coalition (GCWT) users only" which would be inconsistent with Commission policy because the public would be excluded from the use of project lands and waters. *See* 18 C.F.R. section 2.7. Also, please indicate the location of the proposed GCWT camping site in relation to the Wells Project boundary; and,

b. In section 5.1.4, you state that by the end of year two of any new license you would initiate a feasibility study for trails in or near population centers within the project. Please discuss the goals and objectives of the feasibility study, provide a cost for this study, and indicate whether the trails would be located within or outside the current project boundary or if they would require modification of the project boundary to be included as part of the project. Also, please identify the 'population centers' that may be affected.

Document Content(s)

Email from Aquatic Chair to Aquatic SWG regarding final meeting minutes from 1/13/10 conference call and the 3/10/10 meeting

From: Ali Wick [awick@anchorqea.com]
Sent: Monday, April 12, 2010 8:56 AM
To: Bao Le; Beau Patterson; bill.towey@colvilletribes.com; JATEFRJJ@DFW.WA.GOV; brose@yakama.com; Brad James; Bret Nine; Chad Jackson; Donella Miller; korthjwk@dfw.wa.gov; Jessi Gonzales; Joe Kelly; joe.peone@colvilletribes.com; Jon Merz; Josh Murauskas; Karen Kelleher; Kirk Truscott; Mary Mayo; Mike Schiewe; Molly Hallock; Pat Irle; Patrick Luke; Patrick Verhey; Paul Ward; Shane Bickford; Steve Lewis; parker@yakama.com; Tony Eldred
Subject: Aq SWG: No mtg this Weds; final 1/13 and 3/10 mins
Attachments: 2010_01_13 FINAL Aquatic SWG Call minutes.doc; 2010_03_10 FINAL Aquatic SWG Mins.doc

Hello Aq SWG: Per the below email, we have not received any comments from folks asking for discussions for a next Aq SWG meeting; therefore, we will defer until next month.

Also, attached are the final 3/10 and 1/13 meeting minutes. The 1/13 minutes were approved at the 3/10 meeting; the 3/10 revised minutes were sent out for last check, and there have been no comments to the revised minutes, and so these are now final.

Best,
-Ali

Ali Wick

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Seattle, WA 98101
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Direct Line 206.903.3333
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Response from Douglas PUD to FERC regarding comments on the Draft License Application

Douglas PUD's Response to FERC Comments on the Draft License Application for the Wells Project

Initial Statement

Page IS-2, Table 5.0-1 indicates that Douglas PUD will apply for a 401 water quality certification (WQC) after the license application is filed. For clarity, it may be helpful to specify that the Douglas PUD will apply for the 401 WQC within 60 days of Commission's issuance of the notice of acceptance and ready for environmental analysis (see CFR 18 §5.23(b)).

We have revised Table 5.0-1 of the Initial Statement to specify that Douglas PUD will apply for the 401 WQC within 60 days of the Commission's issuance of the notice of acceptance and ready for environmental analysis.

The information provided in the Initial Statement addresses several of the requirements included in CFR 18 §4.32(a); however, it appears that the information required by §4.32(a)(4) still needs to be added to the initial statement or another portion of the license application.

We have added the information required by CFR 18 §4.32(a)(4) to the initial statement.

Exhibit A

Section 3.0 Fish Hatchery Facilities should be revised to clearly indicate which fish hatchery facilities are project facilities and located within the project boundary.

We have revised section 3.0 of Exhibit A and sections 3.2.1.4 and 3.4.1.2 of the draft Biological Assessment to indicate the Wells Fish Hatchery is a Project facility located within the Project Boundary and that the Methow Fish Hatchery is a non-Project facility located over 51 miles outside the Project Boundary. Section 3.4.1.2 of the draft Biological Assessment discusses the rational for not including the Methow Fish Hatchery into the Wells Project Boundary.

There is a discrepancy in this exhibit with respect to acreage totals for the three units of the Wells Wildlife Area that fall within the project boundary. Bridgeport Bar (502 acres), Okanogan (91 acres), and Washburn Island (300 acres) total 893 acres, rather than the 823 that is reported on page A-29.

We have corrected the acreage total for the three units of the Wells Wildlife Area that fall within the Project Boundary.

Exhibit D

Table 4.0-1 and Table 4.0-2 should be revised so that the costs provided in the "total" column are broken out and reported as both capital and annual operation and maintenance costs. Also, the word "annualized" should be deleted from the row headings in Table 4.0-2.

We have added clarifying text to the preceding paragraph, revised Tables 4.0-1 and 4.0-2 to identify capital and annual O&M costs, and deleted the word annualized from the row headings in Table 4.0-2.

Tables 4.0-2, 4.0-3, and 4.0-4 should be revised to clarify if the costs reported under the "Total" column are for each year or the total cost for the entire 30- or 50-year period. For each occurrence in all tables in this exhibit, please explain why total and average costs for some measures are "N/A".

Costs reported under the 50-Year Total and 30-Year Total column headings in Tables 4.0-2, 4.0-3 and 4.0-4 are the total costs for the entire 30- or 50-year period. We renamed the row headings to read: Annual Capital Costs, Periodic Capital Costs, Annual O&M Costs, Periodic O&M Costs. We changed "Average" to "Annualized" in these column headings to help clarify the intent of the table.

All occurrences of "N/A" costs in all tables in this exhibit have been explained with footnotes.

Exhibit E

The environmental exhibit includes many acronyms, including several that are unique to the project or mid-Columbia region; therefore, it would be beneficial to add a list of acronyms in the front section of the document.

We have added the list of acronyms to the front section of Exhibit E.

The Unavoidable Adverse Effects descriptions in section 3.0 appear to overlook ongoing project effects that would continue even after implementation of the proposed measures. These sections should describe any adverse effects of the project that would continue, even if the effects may be reduced, mitigated for, or offset by the proposed enhancement measures. In other words, if an adverse effect of the project would continue to occur (i.e., it is not eliminated), then it should be described in the Unavoidable Adverse Effects section.

We updated this section in the FLA to include a description of unavoidable adverse effects where there are documented effects, or their occurrence is reasonably certain.

The paragraph indicating that the Habitat Conservation Plan (HCP) has been accepted as a Comprehensive Plan can be deleted from page 116 and page 126 since it is listed as a comprehensive plan in Table 5.5-1.

This description was intentionally added to the FLA to highlight the fact that the Wells HCP is a comprehensive plan approved by the FERC that covers ESA fish species and has a direct relationship to the relicensing of the Wells Project. Most of the other comprehensive plans have nothing to do with Wells, the Columbia River or hydropower. The Wells HCP was developed specifically to address the relicensing of the Wells Project and as such we decided to highlight its attributes within this section of the FLA.

In section 3.3.2.4, the third full paragraph on page 116 describes the Hatchery and Genetic Management Plans (HGMP) as "new elements" of the HCP. Please clarify if the HGMPs are part of the current relicensing proposal or something that Douglas PUD will address through amendment of the current license. If they are part of the current relicensing proposal, the environmental effects or benefits of the HGMPs should be described and the costs of development and implementation should be provided.

The National Marine Fisheries Service (NMFS) is requiring Douglas PUD to develop and then implement new HGMPs for the Methow spring Chinook and Wells UCR steelhead hatchery programs. Implementation of the two HGMPs is expected to take place on the same timeline as the expected FERC order issuing a new license in 2011-2012. We have added language describing the environmental effects, benefits, and costs of the new HGMPs, and that they are part of the current relicensing proposal. The intent of the plans is to produce hatchery fish that will contribute to recovery of ESA- listed stocks but will also allow for fishing to take place in areas that will not impact recovery.

Please clarify if the juvenile sturgeon mentioned in the first sentence on page 141 are the same or different than the 13 fish mentioned in the previous paragraph.

We have revised this section to indicate presence of subadult and adult sturgeon younger than the project.

In section 3.3.5.1, you state "Douglas PUD owns approximately 104 of 108 miles of project shoreline in fee title and federal and local agencies own approximately 4 miles of shoreline." In section 2.3.2 of the Resident Fish Management Plan, you state "Douglas owns approximately 89 miles of shoreline in fee title…" Additionally, in section 2.0 of the Wildlife and Botanical Management Plan, you state "The shoreline of the Wells Reservoir is approximately 105 miles in length." Please correct these discrepancies regarding the length of shoreline at the project and the amount of the shoreline you own.

Correct information on shoreline ownership was added to all of the applicable sections of the FLA. Following the acquisition of all of the BLM lands within the Project, Douglas PUD now owns 106 of the 108 miles of reservoir shoreline and owns 2,649 acres of the 2,664 total acres within the Project or more than 99% of the land within the Project.

Please add a table to section 3.3.5.2 that identifies the total acreages for federal, state, and private lands within the Wells Project Boundary and clearly indicate any project boundary modifications. The amount of federal lands reported in this section should be the same as those reported in Exhibit A.

This table has been added as requested.

In section 3.3.6.1, expand your definition of the area of potential effects (APE) to include a brief description of the APE within the project boundary. Also include another section with a brief description of past and current archeological research within the project's APE, and another section to describe a brief account of the area's pre-contact, ethnographic, and Euro-American background.[1] Include another section to briefly discuss the consultation history involving your work in complying with the section 106 process for this relicensing.

Section 3.3.6.1 has been expanded to include a detailed description of the APE.

A subsection entitled "Context Overview" has been added which includes a brief description of pre-contact, ethnographic, and Euro-American background.

Additional detail has been included under the "Archaeological Resources" subsection describing past and current archaeological research.

A description of the Section 106 consultation history for the Wells ILP has been added under section 3.3.6.3, "Proposed Environmental Measures".

In section 3.3.6.2, add more specific information about what archeological sites are being affected by project-related effects, and what those effects are.

Additional detail has been included in section 3.3.6.2 describing affects to archaeological sites within the APE.

In section 3.3.6.3, add more specific information on what project measures will be included in the historic properties management plan (HPMP). Use information about the HPMP from your discussion of the HPMP in your Draft Biological Assessment and Essential Fish Habitat Analysis on pages 47-49.

A detailed summary of the HPMP has been added to section 3.3.6.3.

[1] Use and summarize the existing information from your HPMP.

Recreation Management Plan

The recreation management plan (RMP) for the Wells Hydroelectric Project (Appendix E-2), dated November 2009, may require clarification or modification before it can be approved by the Commission. Staff comments on the RMP include:

a. In section 5.1.3, Greater Columbia Water Trail Initiative, the RMP indicates that "camping facilities would be designated for Greater Columbia Water Trail Coalition (GCWT) users only" which would be inconsistent with Commission policy because the public would be excluded from the use of project lands and waters. *See* 18 C.F.R. section 2.7. Also, please indicate the location of the proposed GCWT camping site in relation to the Wells Project boundary; and,

Section 5.1.3 of the RMP, section 2.3 of Exhibit C, section 2.2.1.3 of Exhibit E, Table 4.0-13 of Exhibit D and section 2.1.5.3 of the draft Biological Assessment have been revised to clarify that camping facilities would be designated for all non-motorized boaters, and that facilities would be within the Wells Project Boundary.

b. In section 5.1.4, you state that by the end of year two of any new license you would initiate a feasibility study for trails in or near population centers within the project. Please discuss the goals and objectives of the feasibility study, provide a cost for this study, and indicate whether the trails would be located within or outside the current project boundary or if they would require modification of the project boundary to be included as part of the project. Also, please identify the 'population centers' that may be affected.

The Wildlife Viewing Trail Development section (now section 5.2.2) has been revised to include the objectives for the trail feasibility study and to clarify that proposed measures would be within the Wells Project Boundary. Specific population centers have also been identified. Costs for the study are included in Exhibit D of the FLA.

Appendix E-9

UCR Spring Chinook HGMP

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HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Methow Hatchery Spring Chinook Program
Species or Hatchery Stock:	Upper Columbia River Spring Chinook (*Oncorhynchus tshawytscha*)
Agency/Operator:	Douglas PUD, owner, and their current operator Washington Department of Fish and Wildlife
Watershed and Region:	Methow Sub-basin/Columbia Cascade Province
Date Submitted:	February 12, 2010
Date Last Updated:	February 12, 2010

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ACRONYM LIST

µg/L	micrograms per liter
BAMP	Biological Assessment and Management Plan
BKD	bacterial kidney disease
BY	brood year
CCT	Colville Confederated Tribes
cfs	cubic feet per second
Chelan PUD	Public Utility District No. 1 of Chelan County
CV	Coefficient of Variance
CWT	coded-wire tag
Douglas PUD	Public Utility District No. 1 of Douglas County
ELISA	enzyme-linked immunosorbent assay
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
f/r	fish per redd
FCRPS	Federal Columbia River Power System
FDA	U.S. Food and Drug Administration
FERC	Federal Energy Regulatory Commission
FH	Fish Hatchery
FL	Fork Length
fpp	fish per pound
GCFMP	Grand Coulee Fish Maintenance Project
Grant PUD	Public Utility District No. 2 of Grant County
gpm	gallons per minute
GPS	global positioning system
HxH	hatchery by hatchery
HxW	hatchery by wild
HCP	Habitat Conservation Plan
HETT	Hatchery Evaluation Technical Team
HGMP	Hatchery Genetic Management Plan
HOB	hatchery-origin broodstock
HOR	hatchery-origin recruit
HOS	hatchery-origin spawner
HRR	hatchery replacement rate
HSRG	Hatchery Scientific Review Group
ICTRT	Interior Columbia Basin Technical Recovery Team
IHNV	Infectious Hematopoietic Necrosis Virus
IHOT	Integrated Hatchery Operations Team
INAD	Investigational New Animal Drug
IPNV	Infectious Pancreatic Necrosis Virus
ISEMP	Integrated Status and Effectiveness Monitoring Project
ITS	Incidental Take Statement
JFP	Joint Fisheries Parties
M&E	Monitoring and Evaluation

MaSA	major spawning area
mg/L	milligrams per liter
MGD	millions of gallons per day
ml/L	milliliters per liter
mm	millimeter
MOA	Memorandum of Agreement
MPG	major population group
NFH	National Fish Hatchery
NMFS	National Marine Fisheries Service
NNI	No Net Impact
NOAA	National Oceanic and Atmospheric Administration
NOB	natural-origin broodstock
NOR	natural-origin recruit
NOS	natural-origin spawner
NPDES	National Pollutant Discharge Elimination System
NRR	natural replacement rate
NTTOC	non-target taxa of concern
O&M	operation and maintenance
OD	optical density
OLAFT	Off-Ladder Adult Fish Trap
PFMC	Pacific Fisheries Management Council
pHOS	percent hatchery-origin spawners
pNOB	percent natural-origin broodstock
POH	Posterior Orbit (to) Hypural (plate)
PIT	passive integrated transponder
PNFHPC	Pacific Northwest Fish Health Protection Committee
PNI	Proportionate Natural Influence
PRCC	Priest Rapids Coordinating Committee
PRCC	Priest Rapids Coordinating Committee Hatchery Subcommittee
PRD	Priest Rapids Dam
RCW	Revised Code of Washington
Recovery Plan	Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan
Rkm	river kilometer
RMIS	Regional Mark Information System
Rs	*Renibacterium salmoninarum*
RSRF	Ringold Springs Rearing Pond
S/S	spawner to spawner
SAR	smolt to adult returns
SFH	State Fish Hatchery
SIWG	Species Interaction Work Group
SSA	Salmon and Steelhead Agreement
TL	Total Length
TU	temperature units
UCR	Upper Columbia River
UCRTT	Upper Columbia Regional Technical Team
UCSRB	Upper Columbia Salmon Recovery Board

USFS	U.S. Forest Service
USFWS	U.S Fish and Wildlife Service
USGS	U.S. Geological Survey
VIE	visual implant elastomer
VSP	Viable Salmonid Populations
WxW	wild by wild
WDFW	Washington Department of Fish and Wildlife
Wells HCP	Wells Hydroelectric Project Anadromous Fish Agreement and Habitat Conservation Plan
WRIA	Water Resource Inventory Area
YN	Yakama Nation

SUMMARY

This document is the Hatchery Genetic Management Plan (HGMP) for the Methow Hatchery spring Chinook program funded by Public Utility District No 1 of Douglas County (Douglas PUD), and is submitted as a requirement to support Endangered Species Act (ESA) compliance for the operation of the program. This document includes details about the program facilities and operation, as well as information on the potential effects of the program on ESA-listed fish species and measures to avoid, minimize, or eliminate those various effects. The document is organized as follows:

- Section 1 describes the program, including contact information, justification for the program, and performance standards.
- Section 2 provides information on expected and potential effects on ESA-listed salmonid populations from the program.
- Section 3 relates the program to other management objectives for the species.
- Sections 4 through 10 describe details of fish handling, rearing, collection, and release.
- Section 11 discusses the monitoring and evaluation necessary to maintain the program.
- Section 12 summarizes ongoing or future research related to the program.

The Methow Hatchery spring Chinook program receives long-term ESA coverage under Incidental Take Permits associated with the Wells Hydroelectric Project Anadromous Fish Agreement and Habitat Conservation Plan (HCP) (DCPUD 2002). The decision-making body for hatchery issues under the Wells HCP is the Wells HCP Hatchery Committee, which provides oversight and recommendations for the program as part of the HCP implementation process. Thus, this HGMP is reflective of HCP Hatchery Committee decisions and resultant actions as deemed appropriate and consistent with the Wells HCP. The Hatchery Committee has developed the program described in this HGMP to support the current biological, agency, and program goals. Decisions made by the Hatchery Committee are dynamic and adaptive; thus future updates to this HGMP may be necessary during the ongoing implementation of the HCP.

The goal of the program is the restoration of naturally reproducing populations of spring Chinook in their native habitats using locally adapted broodstock, while maintaining genetic and ecologic integrity, and supporting harvest. The purpose is to meet No Net Impact (NNI) mitigation goals established in the Wells, Rocky Reach, and Rock Island HCPs, and the Priest Rapids Salmon and Steelhead Agreement in a manner consistent with overall objectives of rebuilding natural populations.

Natural and hatchery run-escapement numbers for spring Chinook to the Methow Basin in return years 1996 through 2008 (return years for Methow Hatchery releases) are given in the table below. The estimated run escapement of spring Chinook to the Methow Basin has averaged (geometric means) 681 total (range 31 to 10,971), 436 hatchery-origin (range 12 to 9,139), and 174 natural-origin (range 19 to 1,832) for return years 1992 to 2008. During that period, the proportion of hatchery-origin recruits in the run has increased, while the proportion of natural-origin recruits has declined.

Spring Chinook hatchery- and natural-origin run sizes to the Methow Basin for return years 1996-2008. Data from Snow et al. (2009).

Return Year	HORs	HOR Fraction	NORs	NOR Fraction	Run Size
1996	12	0.387	19	0.613	31
1997	78	0.225	269	0.775	347
1998	21	0.512	20	0.488	41
1999	71	0.612	45	0.388	116
2000	861	0.880	117	0.12	978
2001	9,139	0.833	1,832	0.167	10,971
2002	2,292	0.869	345	0.131	2,637
2003	1,080	0.949	58	0.051	1,138
2004	1,009	0.674	488	0.326	1,497
2005	849	0.617	527	0.383	1,376
2006	1,420	0.812	328	0.188	1,748
2007	813	0.753	266	0.247	1,079
2008	760	0.718	298	0.282	1,058
12-Yr Geomean:	436	0.64	174	0.26	681

The Methow Hatchery spring Chinook program is presented as a two-component program releasing up to 550,000 smolts annually to the Methow Basin as compensation for up to 7% unavoidable passage losses at up to five mid-Columbia hydroelectric facilities (currently Wells is at 3.8% unavoidable loss requiring 61,000 smolts released, Rocky Reach/Rock Island are at 7% requiring 288,000 smolts, and Priest Rapids/Wanapum are at 7% requiring 201,000 smolts). The 550,000 smolts would be released from acclimation facilities on the Twisp River (up to 100,000 Twisp-origin smolts), and Chewuch and Methow rivers (approximately 225,000 each, Methow/Chewuch-origin smolts). The anticipated returns from these releases are as follows:

Program Component (numbers of smolts released)	Anticipated Number of Adults Returned		
	Minimum SAR	Mean SAR	Maximum SAR
Methow/Chewuch (450,000)	100	1,170	2,376
Twisp (100,000)	23	140	362

Broodstock collection for the program will occur at existing traps at Wells Dam, the Twisp River weir, Methow Hatchery outfall, and Winthrop National Fish Hatchery (WNFH) outfall (and elsewhere and by other methods, such as hook-and-line angling and beach seining, as deemed appropriate by the HCP Hatchery Committee); annual total collection is projected at 348 adults (maximum 360), but this number will fluctuate over time with changes in the rate of over-collection for the management of Bacterial Kidney Disease (BKD; see Section 1.8.2.1). The program is separated into two components—the Twisp and the Methow/Chewuch—in recognition of the genetic distinctions between the Twisp-origin and Methow/Chewuch-origin spring Chinook, as well as the presence of a weir on the Twisp River that facilitates management of that component. The 348 (up to 360) broodstock collected for the program includes 63 (up to 64) adults for the Twisp component.

The proposed management of the program components is based on the principles embodied in the recommendations from the Hatchery Scientific Review Group (HSRG 2009). In general, both components of the program will be managed to improve over time the proportionate natural influence (PNI) of the natural population and integrated hatchery program. However, as noted by the HSRG (2009), due to the preponderance of hatchery-origin recruits (HORs) to the Methow Basin and the chronic paucity of natural-origin recruits (NORs), the PNI objectives for a "Primary Population" (PNI $\geq$ 0.67, proportion hatchery-origin spawners [pHOS] < 0.30) are unattainable in the Methow Basin with current hatchery production until the habitat capacity has improved. Thus, the proposed management promotes systematic improvement in PNI in the Methow/Chewuch component, while emphasizing dramatic improvement in PNI in the Twisp component where the weir affords options for controlling pHOS.

The following management rules will apply to the Twisp program component (see Section 1.8.2.4):

- Escapement of NORs will never be restricted.
- Minimum spawner escapement = 50 adults of any origin (NORs preferred), based on ICTRT (2007) quasi-extinction threshold.
- The NOR extraction rate for broodstock will not exceed 0.33 of the resultant natural-origin spawners (NOSs). This rule is intended to increase NOSs, facilitating the management of pHOS, especially when run sizes are too low to allow adult management.
- pNOB will always be $\geq$ 0.50, in accordance with the HSRG principles of maintaining the dominance of natural influence. Consequently, production from the Twisp component of the program will be limited by NOB such that the total broodstock number will never exceed twice the number of the NOB. Increased Methow/Chewuch production will compensate for shortfalls in Twisp production.
- The pHOS target will be a moving-average $\leq$ 0.50 except when insufficient NOSs are available to achieve 50 total spawners.
- Adult management will be used to constrain pHOS when run sizes allow the achievment of a spawner escapement of at least 200 adults. Adult management may also be necessary when spawner escapement is < 200 adults to achieve a moving-average pHOS $\leq$ 0.50.
- NOR extraction rates would be reduced as necessary for run sizes where utilizing the full extraction rate of 0.33 of the NOSs, would cause the total spawner escapement to fall below the minimum of 50 adults. For run sizes where a reduction in the NOR extraction rate would no longer prevent the total spawner escapement from falling below 50 adults, broodstock collection should be terminated to maximize natural production. In such cases the HCP Hatchery Committee must consider all relevant VSP data and provide a recommendation to the JFP regarding the decision to collect Twisp broodstock for that brood year; the JFP will make the final decision.

The following management rules will apply to the Methow/Chewuch program component (Section 1.8.2.4):

- Minimum escapement should not fall below 500 spawners.
- The rate of extraction of natural-origin broodstock by all hatchery programs should never exceed 0.33 of the NORs to the Methow Basin.

- Maximize pNOB in years when spawning escapement will exceed 500 NOSs to the extent that it does not result in increasing pHOS above 0.50.
- Escapement of NORs will never be restricted
- Apply measures for adult management to control pHOS when appropriate. When the natural-origin spawning escapment to the Methow is ≥ 1,140 then the escapement of HORs to the Methow should be minimized (allowing for escapement of broodstock, etc.) and pNOB will be maximized. In run years when the total spawning escapement (including both hatchery and natural origin) is between 500 and 1,140, habitat seeding and genetic concerns must be balanced in the determination by the HCP Hatchery Committee of adult-management measures.

Performance standards, indicators, and monitoring details for the program will follow objectives and goals of the Douglas PUD hatchery Monitoring and Evaluation Plan (M&E Plan; HCP HC 2007) developed (and subject to periodic updates) by the HCP Hatchery Committee.

Roles and responsibilities for the program are as follows: The HCP Hatchery Committee is responsible for determining program adjustments, considering the methodology described in the M&E Plan (HCP HC 2007; Appendix A) and a companion document, the "Analytical Framework" (Hays et al. 2007; Appendix B); approving yearly M&E implementation plans for Douglas PUD (Appendix C); and, assisting the Washington Department of Fish and Wildlife (WDFW) in developing annual broodstock collection protocols and approving those protocols (Appendix D). Douglas PUD funds the following: facility improvements, changes to artificial production programs, monitoring and evaluation of programs as identified in the M&E Plan and the yearly M&E implementation plans, permit(s), and implementation of the HCP. Douglas PUD's designated agent(s) and joint permit holder(s) (currently WDFW) implements the M&E Plan and operates the hatchery facilities at the direction of Douglas PUD and according to the terms of the Wells HCP Section 8 "Hatchery Compensation Plan," the ESA Section 10 permit(s), in consultation with the National Marine Fisheries Service (NMFS), and in coordination with the Rocky Reach and Rock Island HCP Hatchery Committees as necessary. The Public Utility District No. 1 of Chelan County (Chelan PUD) and the Public Utility District No. 2 of Grant County (Grant PUD) are currently co-funders of the hatchery program and also joint permit holders.

Douglas PUD will provide one FTE for adult-management activities (for both steelhead and spring Chinook hatchery programs) associated with Douglas PUD's NNI hatchery compensation. WDFW is responsible for the management of adult spring Chinook returning that exceed program needs or are strays from segregated programs into priority habitats. In addition to funding the removal of excess adults beyond the one FTE that will be provided by Douglas PUD, WDFW shall also be responsible for all adult returns from the point at which fish are placed in a holding container when manually removed or for a conservation fishery (not part of this program or explicitly included in this HGMP). The Co-Managers will determine the disposition of the fish placed in the holding container.

1.0 GENERAL PROGRAM DESCRIPTION

1.1 Name of Hatchery or Program.

Methow Hatchery Spring Chinook Program

1.2 Species and Population (or Stock) under Propagation, and ESA Status

Upper Columbia River Spring Chinook (*Oncorhynchus tshawytscha*)
ESA Status: Endangered

1.3 Responsible Organization and Individuals

Name (and title): William C. Dobbins, General Manager
Agency or Tribe: Public Utility District No. 1 of Douglas County (Douglas PUD)
Address: 1151 Valley Mall Parkway, East Wenatchee, WA 98802
Telephone: (509) 884-7191
Fax: (509) 884-0553
Email: bdobbins@dcpud.org

Name (and title): Phil Anderson, Director
Agency or Tribe: Washington Department of Fish and Wildlife (WDFW)
Address: (main office) Natural Resources Building, 1111 Washington Street, SE, Olympia, WA 98501-2200; (mailing address) 600 Capitol Way N., Olympia, WA, 98501-1091
Telephone: (360) 902-2720
Fax: (360) 902-2947
Email: Philip.anderson@dfw.wa.gov

Douglas PUD (as the owner of the Methow Hatchery and a funder of hatchery facilities, operation and maintenance [O&M] and hatchery program monitoring and evaluation [M&E]) and WDFW (as Douglas PUD's current hatchery operator and implementing contractor for the M&E Plan) are joint permit holders for the Methow Hatchery Spring Chinook Program. Future contractors for Douglas PUD, whether for operating Methow Hatchery or for implementing Douglas PUD's hatchery M&E program would also jointly hold the permit with Douglas PUD. Chelan and Grant PUDs are also joint permit holders because a substantial proportion (currently 89%) of the spring Chinook at the Methow Hatchery is produced specifically to cover the mitigation responsibilities for Chelan and Grant PUDs (who currently co-fund the program generally in proportion to their use of the Methow Hatchery).

Other agencies, tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

- National Marine Fisheries Service: Co-manager; HCP Hatchery Committee representative; Administration of the Endangered Species Act
- U.S. Fish and Wildlife Service: Co-manager; HCP Hatchery Committee representative; Administration of the Endangered Species Act
- Washington Department of Fish and Wildlife: Co-manager; HCP Hatchery Committee representative; current contracted hatchery operator
- Confederated Tribes of the Colville Reservation: Co-manager; HCP Hatchery Committee representative
- Confederated Tribes and Bands of the Yakama Nation: Co-manager; HCP Hatchery Committee representative
- Public Utility District No. 1 of Chelan County: current co-funder of hatchery program
- Public Utility District No. 2 of Grant County: current co-funder of hatchery program

1.4 Funding Source, Staffing Level, and Annual Hatchery Program Operational Costs

The funding source is Douglas PUD; Grant and Chelan PUDs currently reimburse Douglas PUD in proportion to the respective numbers of fish reared for each PUD (as adjusted for species trades with Chelan PUD). The staffing level at Methow Hatchery is 6.3 full-time-equivalent staff. For fiscal year 2009/2010 the budgeted operational, maintenance and study related costs for the Methow Program are $2,485,600. This total includes facility upgrades, repairs, and rehabilitation costs budgeted at $694,000 and contracted spring Chinook M&E activities for spring Chinook budgeted at $447,200.

1.5 Location(s) of Hatchery and Associated Facilities

Table 1-1. Hatchery facility locations associated with the Methow Hatchery spring Chinook program (located in Water Resource Inventory Area [WRIA] 48).

Activity	Facility
Broodstock[1] collection	Wells Dam, Twisp Weir, Methow Hatchery and Winthrop NFH outfalls[2]
Adult holding	Methow, Wells and Winthrop Hatcheries
Spawning	Methow Hatchery
Incubation	Methow Hatchery
Rearing	Methow Hatchery
Acclimation	Twisp, Methow, and Chewuch acclimation facilities, and Methow Hatchery[2]

[1]Broodstock source is as follows:
- Methow/Chewuch spring Chinook Composite (of both hatchery and natural origin)
- Twisp spring Chinook (primarily natural origin, but hatchery origin as necessary)

[2]Other locations as approved by the HCP Hatchery Committees

1.6 Type of Program

This HGMP addresses an Integrated Recovery Program.

1.7 Goal and Purpose of Program

1.7.1 Goal

The goal of the program is the rebuilding of naturally reproducing populations of Methow River spring Chinook in their native habitats using locally adapted broodstock, while maintaining genetic and ecologic integrity, and supporting harvest where and when consistent with recovery objectives.

1.7.2 Purpose

The purpose of this hatchery program is to meet the HCP NNI passage-loss mitigation goals established in the Wells HCP in a manner consistent with overall HCP objectives of rebuilding natural populations. In addition to providing mitigation for passage losses at Wells Dam the Methow Hatchery spring Chinook program also provides NNI mitigation for the Rocky Reach and Rock Island HCPs and for the Priest Rapids Salmon and Steelhead Agreement (SSA). With respect to Douglas PUD, the purpose of this hatchery program is to satisfy the hatchery-compensation terms of the Wells HCP[1], which was executed pursuant to Section 10 of the ESA as a vehicle to permit Douglas PUD to carry out its functions in a manner consistent with the ESA.

1.8 Justification for the Program

The UCR spring Chinook (*Oncorhynchus tshawytscha)* Evolutionarily Significant Unit (ESU) was listed as endangered on March 24, 1999 (50 CFR 14308). The best scientific information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids. In the UCR Region, habitat destruction (e.g., stream channelization, bank armoring, and floodplain disconnection; migration barriers; unscreened diversions; land-use practices), past over-harvest in fisheries, hydropower facilities, and some hatchery practices are the major causes of population declines. Poor ocean conditions prior to 2000 suppressed fish survival, and vastly increased avian predation in the Columbia River estuary further affecting the basin's spring Chinook populations.

[1] Douglas PUD's ESA authorizations consist of two regulatory approval tiers: (1) the general ESA approval of all District operations, which consists of the Section 10 incidental take permits ("ITPs") issued for the District's HCP, and (2) the specific approvals (Section 10(a)(1)(A) permits) issued for each of the District's hatchery programs (such as Permit No. 1196). An overarching adaptive-management framework is relevant to both tiers of Douglas PUD's ESA approval. Under this adaptive-management framework, the HCP Hatchery Committees are required to develop M&E plans and to make relevant management decisions on an ongoing basis (these functions are described in more detail in Section 1.8.1 below). The adaptive-management framework is relevant to the HCP/ITPs because the HCPs specifically establish the terms of the HCP Hatchery Committees' responsibilities. The adaptive-management framework is also relevant to the hatchery permits because, through the HCPs, the HCP Hatchery Committees are charged with incorporating adaptive management into the hatchery-related activities authorized by the hatchery permits. This adaptive-management framework allows for flexible management of hatchery operations under the terms of the HCPs and the Section 10 permits.

The Methow Hatchery spring Chinook program specifically addresses the unavoidable losses of juvenile spring Chinook associated with the operation of Wells Dam, and a portion of the unavoidable losses associated with operation of Rocky Reach, Rock Island, Wanapum and Priest Rapids dams. The program has the potential to contribute to the long-term persistence of ESA-listed UCR spring Chinook through increases in their abundance within the ESU, and is likely necessary to prevent the extinction of the Methow independent population of the ESU until factors limiting the productivity of naturally produced spring Chinook in the region can be improved.

1.8.1 Legal Agreements & Requirements

This HGMP includes actions required of Douglas PUD pursuant to its Wells HCP (and Chelan and Grant PUDs pursuant to their HCPs and SSA, respectively), as well as other adult-management[2] actions that are beyond HCP and settlement agreement obligations of the respective PUDs, but represent important fishery-management activities that may be implemented by WDFW and the other JFPs. This section is intended to provide background and context to aid in the interpretation and application of the terms and obligations of this HGMP. Specifically, this section (1) identifies and describes the purposes and objectives of the Wells HCP relevant to this HGMP, (2) outlines certain responsibilities and obligations of Douglas PUD based on the commitments and assurances provided in the Wells HCP; and (3) describes certain obligations and responsibilities under the terms of this HGMP.

1.8.1.1 Douglas PUD's Wells HCP

Included in the license for the Wells Project (Federal Energy Regulatory Commission [FERC] No. 2149) is an Anadromous Fish Agreement and HCP detailing the long-term adaptive management of Plan Species and their habitat as affected by the Project. Parties to this agreement include the NMFS, the U.S. Fish and Wildlife Service (USFWS), WDFW, and the Confederated Tribes of the Colville Reservation (CCT), the Confederated Tribes and Bands of the Yakama Nation (YN), Douglas PUD and the four Wells Project power purchasers. The overriding goal of the Wells HCP—developed in accordance with the ESA's goals of conserving and facilitating the recovery of natural populations—is to achieve NNI for anadromous salmonids migrating through the Wells Hydroelectric Project. Under the terms of the Wells HCP, the hatchery-compensation component of NNI consists of providing funding and facilities required to provide up to 7-percent hatchery compensation for all Permit Species subjected to unavoidable passage losses at the Wells Hydroelectric Project (compensation for Douglas PUD is currently 3.8 percent as adjusted per the 96.2-percent survival of yearling Chinook and steelhead measured by 3 years of survival studies conducted in 1998, 1999, and 2000). Section 8 of the Wells HCP details the objectives, responsibilities, and requirements of hatchery programs required as mitigation for the operation of the Wells Project, as follows:

[2] The term "Adult Management," as used throughout this document, is defined as the selective removal of excess hatchery-origin spring Chinook by means of harvest, translocation, culling, or other method of physical removal of returning adult fish for purposes other than broodstock collection or HCP Hatchery Committee-approved monitoring and evaluation activities

8.1 Hatchery Objectives[3]
8.1.1 The District shall provide hatchery compensation for all of the Permit Species including; a) spring chinook salmon, b) summer/fall chinook salmon, c) sockeye salmon d) summer steelhead as further described in Section 8 [of the Wells HCP] *(Hatchery Compensation Plan)….*

8.1.2 The District shall implement the specific elements of the hatchery program consistent with overall objectives of rebuilding natural populations, and achieving NNI. Species specific hatchery program objectives developed by the JFP may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest. This compensation may include Measures to increase the off-site survival of naturally spawning fish or their progeny….

1.8.1.2 Adaptive Management and Section 10 Permits

As detailed in Footnote 1 above, Douglas PUD's spring Chinook hatchery program obligations under the HCP are implemented through an adaptive-management process set forth in the HCP and under the direction of the HCP Hatchery Committee. Specifically, the HCP Hatchery Committee may periodically adjust Douglas PUD's hatchery-production levels (see HCP at Sections 8.4.4 and 8.4.5) and make program modifications to achieve program objectives, including changes to facilities, release methods, and rearing strategies necessary to achieve and maintain NNI pursuant to the HCPs (see HCP at Section 8.6). The adaptive-management processes in the HCP are integral to the spring Chinook program described in this HGMP.

Any updated Section 10 permit and associated environmental reviews should incorporate, rely on, and anticipate compliance with the adaptive-management provisions of the HCP as described above. This practice will minimize the need for future modification of the Section 10 permit for normal, ongoing program-oversight decisions of the HCP Hatchery Committee, recognizing that NMFS will play an integral role in determining any future program modifications as a member of the HCP Hatchery Committee.

Douglas PUD HGMP Actions Implementing the HCP

Within this HGMP, the following are Douglas PUD obligations intended to implement the requirement of the HCP. These obligations include the potential need to provide up to 7-percent hatchery compensation for unavoidable passage losses (currently 3.8 percent as adjusted per the 96.2-percent survival of yearling Chinook measured by 3 years of survival studies conducted in 1998, 1999, and 2000, and subject to readjustment):

- Provide water sources and implement risk-aversion measures as described or similar to those described in Section 4 "Water Source."
- Provide facility capacity to rear the fish as described in Section 5 "Facilities."
- Provide broodstock collection facilities—Wells Dam fishways, Methow Hatchery outfall, and the Twisp River weir—and funding for an operator for broodstock

[3] Taken from Page 27 of the Wells HCP.

collection as described in Section 6 “Broodstock Origin and Identity” and Section 7 “Broodstock Collection.”

- Provide funding for an operator to perform the activities described in Section 8 “Mating,” Section 9 “Incubation and Rearing,” and Section 10 “Release.”
- Provide funding for implementation of the hatchery M&E Plan as approved and modified by the HCP Hatchery Committee.
- Provide one FTE for adult-management activities (for both steelhead and spring Chinook hatchery programs) associated with Douglas PUD’s NNI hatchery compensation.
- Under the terms of this HGMP, Douglas PUD via their hatchery operator and/or M&E contractor (currently WDFW) is also obligated to complete and submit all hatchery Section 10 permit reporting associated with Douglas PUD’s hatchery obligations.

WDFW HGMP Actions

WDFW is the funding source for elements of the hatchery program that are not Douglas, Chelan, or Grant PUDs’ obligations under the HCPs or respective hydroelectric licenses. In particular, WDFW is responsible for the management of adults returning that exceed program needs or are strays from segregated programs into priority habitats. In addition to funding the removal of excess adults beyond the one FTE that will be provided by Douglas PUD, WDFW shall also be responsible for all adult returns from the point at which fish are placed in a holding container when manually removed or for a conservation fishery (not part of this program or explicitly included in this HGMP). The Co-Managers will determine the disposition of the fish placed in the holding container.

1.8.2 Program Description

The Methow Hatchery spring Chinook program is described in the subsequent subsections and includes (1) broodstock collection and program size; (2) spawning, incubation, rearing, and release of juvenile spring Chinook; (3) escapement and management of returning adults; (4) annual decision-making regarding broodstock collection and escapement; and (5) monitoring and evaluation.

The Methow Hatchery spring Chinook program is a conservation program intended to rebuild the natural population using a fully integrated broodstock-collection protocol and consists of two components, Twisp River and Methow/Chewuch rivers, that will be managed with distinct strategies. Differences in the proposed management of these two components (as described below) is necessitated by the following: 1) dissimilarity in the proportions of natural- and hatchery-origin recruits (NORs and HORs, respectively) represented in the spawning escapements to the Twisp River versus the remainder of the major spawning areas (MaSAs) within the Methow Basin, and 2) the opportunity to control the proportion of hatchery origin spawners (pHOS) in the Twisp via the Twisp weir, an option unavailable within other MaSAs in the Methow Basin. At the discretion of the HCP Hatchery Committees, the program will release up to 550,000 smolts annually (Table 1-2). A second spring Chinook program (WNFH; separate HGMP) is operated within the Methow River Basin by the USFWS, and proposes to rear up to

600,000 smolts, up to 400,000 of which would be released in the Methow Basin[4]. The proposed WNFH program would be a segregated harvest program, but would "integrate" with the Methow Hatchery spring Chinook program in that 20%-30% of the broodstock will comprise excess HORs from the Methow Hatchery, with the remainder consisting of returns directly to WNFH (WNFH program will not include natural-origin recruits). Anticipated returns from the program were estimated based on the maximum, minimum, and mean smolt-to-adult returns (SARs) from the 11 most recent, complete brood-year returns. The anticipated returns are as follows:

Program Component (numbers of smolts released)	Anticipated Number of Adults Returned		
	Minimum SAR	Mean SAR	Maximum SAR
Methow/Chewuch (450,000)	100	1,170	2,376
Twisp (100,000)	23	140	362

1.8.2.1 Broodstock Collection and Program Size

Although this HGMP is for the Methow Hatchery spring Chinook program, some details of the proposed WNFH segregated harvest program are provided because, in the past, both programs have collected broodstock for each other including swim-in collection at the WNFH and Methow Hatchery outfall, and this practice is expected to continue. Numeric goals for broodstock collection by both programs were developed based on the intended outcome of the release group (conservation or segregated harvest), average fecundity, egg-to-smolt survival, and an assumed equal sex ratio. It is the intent of the co-managers to collect broodstock for the Methow Hatchery spring Chinook program in a manner that achieves mitigation needs and contributes to an increased proportionate natural influence (PNI)[5]. The maximum extraction rate of natural-origin fish collected for broodstock will not exceed 33 percent of the NORs to the Methow Basin or to the Twisp River. In years when natural-origin run size allows a 100% percent natural-origin broodstock (pNOB of 1.0) the actual extraction rate will be lower than 33 percent of the NORs.

The proposed smolt-release numbers (up to 550,000) for the Methow Hatchery spring Chinook program requires the collection of up to 360 adults, which would include a slight over-collection specifically for BKD management. BKD prevalence necessitates collection of additional hatchery-origin fish to allow for culling of gametes from high-titer hatchery-origin females (high-titer defined as enzyme-linked immunosorbent assay [ELISA] optical density [OD] ≥0.12). The most recent Broodstock Collection Protocols (2009) for the existing program called for 359 adults for the Methow Hatchery program, which included 12-percent over-collection to account for BKD-related culling (12 percent was the 5-year [2004-2008] rolling average of the proportion of females in the broodstock with ELISA OD values ≥0.12). However, analyses in

[4] Subject to NMFS approval of the program as proposed in the draft HGMP submitted in July of 2009.
[5] Mathematically, PNI = pNOB /(pHOS + pNOB), where pNOB is the proportion of natural-origin fish in the hatchery broodstock and pHOS is the proportion of hatchery-origin fish on the spawning grounds. Biologically, PNI is an approximation of the relative influences of the natural and hatchery environments on the genetic constitution and mean phenotypic values of hatchery and wild fish when gene flow occurs between them.

support of this HGMP assumed adult collection of 348 adults based on the inclusion of the 2009 ELISA values into the rolling average (now 8.2 percent rather than 12 percent) used to determine rates of over-collection. Finally, in addition to the adult collected for the Methow Hatchery spring Chinook Program an additioanl 360 hatchery-origin adults (some of which would be collected at the Methow Hatchery outfall trap) would be necessary to support the proposed WNFH spring Chinook program (the USFWS draft HGMP for the WNFH program specifies a total of 360, including up to 276 adults to provide eggs for within-basin releases and 84 adults to provide eggs for out-of-basin releases, with a not-to-exceed total of 400; see USFWS [2009]).

Table 1-2. Total Methow Basin broodstock collection necessary to meet production targets for the Methow Hatchery spring Chinook conservation program (assuming 8.2% over-collection) and the proposed Winthrop National Fish Hatchery spring Chinook segregated harvest program.

Program	Release Location	Smolt Objective	Approx. Brood
Methow Hatchery Conservation	Methow	225,000	142[a,b]
	Chewuch	225,000	142[a,b]
	Twisp	100,000	64[a,c]
	Methow Hatchery Total	**550,000**	**348**
WNFH[d] Segregated	Methow (plus out of basin)[d]	400,000 (600,000)[d]	276 (360)[d]

a – All values based on a current, mean Age-4 fecundity of 4,000, an egg-to-smolt survival of 0.90, an 8.2% over-collection allowance for BKD management, a 1:1 male:female ratio, and 95% pre-spawn adult survival.
b –Methow/Chewuch composite origin, preferrably wild-by-wild (WxW) or hatchery-by-wild (HxW) crosses, but could be hatchery-by-hatchery (HxH) crosses, depending on the availability of natural-origin fish.
c – Entirely Twisp-origin broodstock, WxW (preferred) or HxW crosses.
d – USFWS program is not associated with Douglas PUD obligations and is not covered under this HGMP. Numbers in parentheses represent total numbers when including broodstock and smolts necessary for planned out-of-basin releases.

The current (2009) Methow Hatchery spring Chinook program collects both natural- and hatchery-origin broodstock at the Twisp weir, Methow Hatchery and WNFH outfalls, and Wells Dam (Twisp-origin adults collected at Wells Dam are genetically differentiated from Methow/Chewuch spring Chinook). The proposed program would continue to collect natural-origin and/or hatchery-origin broodstock at the locations described above, and may also collect broodstock by other methods such as angling or seining. Methow Hatchery-origin adults that voluntarily enter the WNFH will be transferred to Methow Hatchery until the broodstock-collection goals for the Methow Hatchery program have been satisfied, after which WNFH will retain Methow Hatchery-origin adults for use in their segregated program or for removal to control pHOS. Additionally, Methow Hatchery-origin returns to the Methow Hatchery that exceed broodstock and spawner-escapement needs will be provided to the WNFH for their use as broodstock, until their broodstock needs are met (WNFH target for Methow Hatchery fish is 20%-30% of their broodstock total).

WDFW will annually develop site-based broodstock-collection protocols approved by the HCP Hatchery Committee. These objectives and protocols may be adjusted in season to meet changes in the abundance, composition, and location of adult returns, and to minimize impacts on non-target fish. The protocol described below will be used to facilitate the collection of hatchery broodstock throughout the run while achieving the target extraction rate and ensuring full broodstock collection.

1. Based on forecasted run size, the HCP Hatchery Committee will identify target PNI levels and associated pHOS, pNOB values, and overall broodstock targets for both the Methow/Chewuch and Twisp components of the program. Based on the target PNI levels and broodstock numbers, WDFW will develop weekly broodstock-collection goals. WDFW and the HCP Hatchery Committee will use in-season data (dam counts, PIT-tag detections, PBT to verify pre-season estimates of run size and composition to ensure that the selected PNI, pHOS, and broodstock goals are appropriate, and will modify those goals in-season as necessary.
2. Weekly collection goals will target the collection of broodstock distributed throughout the run.

When in operation, trap facilities will be checked and emptied daily, with broodstock transported to a hatchery facility for holding and spawning, and all other fish either released upstream of the trap(s) or removed to control pHOS.

The following procedures will be employed to minimize potential adverse impacts on spring Chinook associated with broodstock-collection activities:

- All species will be held for a minimal duration in the traps (less than 24 hours).
- Traps and holding areas will be locked or secured against tampering or vandalism.
- All natural-origin spring Chinook in excess of broodstock goals will be released upstream immediately without harm, consistent with run-escapement objectives.
- Spring Chinook will be transferred using water-to-water techniques.
- Hook-and-line collections (if any) will be conducted by, and/or under strict management oversight by WDFW staff.

1.8.2.2 Spawning, Incubation, Rearing and Release of Juvenile Spring Chinook

Spawning will occur at the Methow Hatchery. The spawning facilities are integrated into the broodstock-holding facilities, allowing the sorting of broodstock for sexual maturity followed immediately by spawning. Fertilization, incubation, and rearing also occur at the Methow Hatchery.

A portion of the up to 550,000 pre-smolts from the Methow Hatchery spring Chinook program will be transferred to the Twisp (only Twisp-origin fish; up to 100,000) and Chewuch River (approximately 225,000 non-Twisp fish) acclimation ponds in the spring when air and water temperatures allow (typically mid-March), and be volitionally released as smolts in late April to early May. The balance of the non-Twisp pre-smotls (approximately 225,000) will be acclimated on-site on Methow River water and released as smolts from the Methow Hatchery. In the future, the HCP Hatchery Committees may elect to acclimate in and release fish from additional acclimation sites developed by others, provided that Douglas PUD relinquishes responsibility for and receives mitigation credit (as appropriate) for those fish when they leave Douglas PUD facilities. Examples of such additional acclimation sites are those proposed by the

Yakama Nation in the floodplains of the upper Methow and Twisp rivers (draft proposal submitted for comments to the HCP Hatchery Committees in October 2009).

Any acclimation sites considered by the HCP Hatchery Committees shall meet the minimum flow and density indices, and predator-protection criteria of the HCP Hatchery Committees, and shall be non-consumptive users of water. Additionally, the HCP Hatchery Committees will assess on a case-by-case basis the magnitude of the withdrawal or diversion for each acclimation facility (as appropriate) relative to the instantaneous discharge of the water course to which it is appurtenant, and may reject any facility or condition its use for spring Chinook based upon their assessment of the impacts of that water withdrawal or diversion on Plan Species or non-target taxa of concern. Acclimation sites which by default have a natural flow through design and no means to artificially divert water will not be subject to such an assessment. It is anticipated that a portion of the spring Chinook produced by Douglas PUD at Methow Hatchery for Grant PUD may soon be acclimated at Goat Wall and Biddle ponds; permit coverage for that acclimation will be obtained by Grant PUD via their Methow River Spring Chinook Artificial Propagation Plan. Future acclimation may include other sites described in the Mid-Columbia Coho Restoration Master Plan.

1.8.2.3 Escapement Goals for Natural Spawning Areas

The Methow Hatchery spring Chinook program is intended to increase the number of adults on the spawning grounds to fully seed available habitat. Theoretically, fully seeded habitat should increase the number of naturally produced juvenile fish that migrate to the ocean, thereby increasing the number of adults that return to spawn. However, escapement of hatchery fish to the spawing grounds in excess of biologically sound escapement goals serves no useful purpose and can result in negative impacts on the natural population through density-dependent, ecological, and genetic effects. To achieve the positive benefit of increasing the number of natural spawners without adversely affecting the fitness of the natural population, it will be necessary to manage both the total number of natural-origin spawners (NOSs) and pHOS in the spawning escapement, and the pNOB of the hatchery broodstock.

The ICTRT (2007) classification of the Methow spring Chinook population as “Very Large” is based (in general) on intrinsic habitat potential, and requires a minimum abundance value of 2,000 natural-origin spawners for the Methow Basin in order to be considered a “viable” “Very Large” population. Pre-spawn mortality for Methow Basin spring Chinook has averaged 24% over the last six years (2003-2008; C. Snow, personal communication). An upward adjustment of the spawning-escapement goal by 24 percent to accommodate potential pre-spawn mortality requires a run-escapement goal of 2,480 natural-origin adults. However, the application of the coarse-scale ICTRT abundance threshold to the Methow does not consider any basin-specific analysis that may provide a more accurate estimate of production capacity. Existing data sets report estimates of run escapement to the Methow beginning in 1981 (see Table 1-12 in Section 1.12), and since that time run escapements for NORs have never achieved the goal of 2,480 (maximum of 1,832 in 2001), and even including HORs, the goal has been achieved only twice (10,971 in 2001, and 2,637 in 2002), suggesting that the ICTRT target overestimates basin capacity. Additionally, estimates of the natural replacement rates (NRR) for the years 1992-2002 (see Table 1-14 in Section 1.12) are generally highest during the years with low escapement numbers and lowest in years when escapement was highest, supporting a conclusion that density dependence may render unachievable an abundance target of 2,000 NOSs.

The Hatchery Scientific Review Group (HSRG 2009) provided a capacity estimate for the Methow Basin based on the EDT modeling from the development of the Methow Sub-basin Plan in 2004, and this estimate (NOSs = 240 Twisp and 900 for the remainder of the basin; 1,140 total) provides a better match with existing escapement data. The HSRG goal of 1,140 NOSs has been achieved six times since 1981, and when including HORs, it has been achieved eleven times over that same period (see Table 1-12 in Section 1.12). Empirical observation of spawning habitat utilization in the Methow Basin by Douglas PUD hatchery M&E investigators from WDFW's Twisp Field Office (Charlie Snow and Charles Frady, personal communications) and the relative attainability of run sizes sufficient to meet the basin spawning goal supported the decision to select the HSRG capacity estimate of 1,140 as an interim escapement target (Table 1-3) rather than the ICTRT (2007) target. This goal will be revised as reliable spawner/recruit relationships are developed for each MaSA in the Methow River Basin. The Methow Basin M&E investigators recommended an adjustment in the distribution of the spawner escapement in the basin (based on observed spawner distributions), reducing the Twisp capacity estimate from 240 to 200 (representing ~18% of the spawners) and increasing the capacity for the remainder of the basin from 900 to 940.

Combining pre-spawn mortality (0.24) and broodstock needs for the Methow Hatchery program (348, with 8.2% over-collection) with the HSRG capacity estimates for the Methow (1,140) yields a desired minimum run-escapement value of 1,848. Finally, the WNFH program would require an additional 360 adults, increasing the total run escapement of spring Chinook to the Methow Basin to 2,122 (see Table 1-3).

While the 1,140 HSRG spawner-escapement goal is for natural-origin fish, numbers of NORs in the Methow Basin are inadequate to meet these goals in all but the largest of run sizes. Thus, the targets in Table 1-3 include both NORs and HORs, and will serve as management thresholds beyond which control of HOR abundance may be necessary, and below which control of HOR abundance may preclude full seeding of available habitat. Note that estimates of spawner distribution by MaSA will vary annually and over greater time scales as survival, habitat capacity, and productivity conditions within and outside the Methow basin fluctuate, estimates of pre-spawning mortality are refined, and stock-recruitment models are updated.

Table 1-3. The estimate of habitat capacity for Methow Basin spring Chinook from the HSRG (2009) applied as the minimum spawning escapement, and apportioned to MaSA by the observed distribution of spawners (2001-2009; C. Snow and C. Frady, personal communication). Run-escapement targets assume broodstock collection in the Methow Basin rather than Wells Dam.

Major Spawning Area	Spawning Escapement Target[a]	Run Escapement Target[b]
Methow River	470	1,227[c]
Chewuch River	470	583
Twisp River	200	312[d]
Total Methow Basin	1,140	2,122

[a] NOR escapement will be unrestricted at all run sizes. In some years total escapement may be lower than the listed value so that PNI targets can be achieved. As NOR run sizes increase, pHOS will approach 0.00.
[b] Run escapement is 24% greater than spawning escapement to allow for pre-spawn mortality, straying, etc.
[c] Run escapement to the Methow includes 284 Methow/Chewuch-origin brood for the Methow Hatchery and 360 for the WNFH assuming all of which would be collected from the outfalls for those hatcheries. Collection of brood at Wells Dam would reduce the necessary total run escapement to the Methow and Twisp.
[d] Run escapement to the Twisp includes the 64 brood for the Twisp component of the Methow Hatchery program.

1.8.2.4 Annual Decision-making Regarding Broodstock Collection and Spawning Escapement

The Methow Hatchery spring Chinook program is intended to support the rebuilding of the spring Chinook population in the Methow Basin while also providing mitigation for five Columbia River hydroelectric projects. The spring Chinook population in the Methow Basin is essential to the recovery of the Upper Columbia River spring Chinook ESU, and, as such, it was designated as a “Primary” population by managers during the HSRG (2009) review of hatchery programs in the Columbia Basin. The HSRG established management guidelines for PNI, pHOS, and pNOB to minimize genetic risks of hatchery programs to naturally spawning populations, and for those programs designated as “Primary.” The HSRG recommended that pHOS should be < 0.30, and that pNOB exceed pHOS by at least a factor of two, corresponding to a PNI ≥ 0.67. However, for the Methow Basin achievement of the HSRG-recommended PNI, pNOB, and pHOS values is precluded in most years—whether or not broodstock is collected for hatchery production—because NOR abundance is insufficient and the ratio of HORs to NORs too skewed toward HORs (see Table 1-10 in Section 1.12). Even in the Twisp River where historically the ratio of HORs to NORs has been relatively balanced and a weir permits the control of pHOS, achievement of the HSRG management guidelines for a Primary population is possible only in approximatley 20 percent of the historic run sizes (see Table 1-4). The HSRG (2009) acknowledged this challenge, conceding that despite examining a variety of hatchery scenarios with the current programs in place in the Methow Basin, they had been unable to “significantly increase natural-origin spawning under current habitat conditions” through their modeling efforts. Further, they stated that there were too few NORs in the Methow Basin “to properly integrate the current Winthrop and Methow combined production.”

The HSRG was unable to provide discrete management recommendations for the Methow Hatchery spring Chinook program other than the implementation of a variable “sliding scale” for pNOB and pHOS that floats with variations in NOR abundance. Nevertheless, decisions on the management of Twisp and non-Twisp components of the program should focus on minimizing the genetic risk of the hatchery program while also minimizing the demographic risk to the population. Therefore, we propose management of the Methow Hatchery spring Chinook program according to the genetic principles upon which the HSRG guidelines are based within the context of meeting production objectives and providing demographic buffering (i.e., seeding the habitat). Those prinicples, for an integrated program and especially one intended to contribute to the recovery of an ESA-listed population, can be summarized as follows: to manage the hatchery program to minimize the loss of triats that optimize the fitness of natural-origin fish, or in other words, maximizing the "wildness" of fish produced in both the natural and hatchery environments. In the case of hatchery broodstock, natural influence can only predominate if pNOB exceeds 0.50; in the natural environment, pHOS cannot exceed 0.50 if natural influence is to predominate. In a natural population wherein operates an integrated hatchery program, PNI will never fall below 0.50 when pNOB $\geq$ 0.50 and pHOS $\leq$ 0.50. Holding each of these values at 0.50 would maintain the status quo of the existing phenotypic values and genetic constitution of an integrated hatchery program/natural target population. Long-term, systematic achievement of these targets in the Methow Basin would represent a substantial increase in PNI over the current conditions.

In the existing context of the Methow Basin, where annual returns are dominated by HORs, and escapement targets may not be met in years with poor returns (regardless of whether or not hatchery brood are collected), even the PNI targets of pNOB $\geq$ 0.50 and pHOS $\leq$ 0.50 will often be unachievable. The Twisp component of the Methow Hatchery spring Chinook program offers the best opportunity to achieve and even improve on these status-quo PNI targets (see Table 1-4), provided that hatchery-production targets are flexible and secondary to PNI in priority. Therefore the Twisp and the Methow/Chewuch program components will be managed differently, with the focus for the Twisp component on improving PNI at the expense of hatchery production, with any shortfall in production from the Twisp component shifted to the Methow/Chewuch component commensurate with the shortfall. For both program components, improving PNI will be an objective with the ultimate goal to achieve the PNI objective for a Primary population (0.67) as a moving average over time. Additionally for both program components, the annual forecast (and in-season adjustments) of run size and composition will be the basis for the determination by the HCP Hatchery Committees of the annual targets for broodstock numbers, PNI, pNOB, and pHOS.

The HCP Hatchery Committee will periodically evaluate whether or not the implemented management decisions have been effective at attaining the stated objectives (both PNI and production) of the two hatchery program components. Future adjustment of the objectives and/or management decision rules for the respective program components may be necessary as a result of improved estimates of basin capacity, changes in out-of-basin and/or within-basin factors influencing productivity, failure of the decision rules to achieve PNI and/or production objectives, or changes in production obligations (such as in 2013 to reflect the results of completed survival studies).

Twisp Component Decision Rules

As described above, 200 spawners (from the 1,140 HSRG capacity estimate) will constitute the spawner escapment target for the Twisp. As a target for minimum spawning escapement, the ICTRT (2007) quasi-extinction threshold (50 spawners) was selected. Finally, the broodstock target for the Twisp component is a maximum of 64 (used 63 for this analysis) adults. Within the context of these target parameters, the following management rules will apply to the Twisp program component:

- Escapement of NORs will not be restricted.
- The NOR extraction rate for broodstock will not exceed 0.33 of the resultant natural-origin spawners (NOSs). This rule will maximize NOSs, facilitating the management of pHOS, especially when run sizes are too low to allow adult management. Application of this rule to historic data sets yielded a NOR extraction rate of approximately 0.20 for most run sizes capable of supporting hatchery production (see Table 1-4).
- pNOB will always be $\geq$ 0.50, in accordance with the HSRG principles of maintaining the dominance of natural influence. Consequently, production from the Twisp component of the program will be limited by NOB such that the total broodstock number will never exceed twice the number of the NOB. Increased Methow/Chewuch production will compensate for shortfalls in Twisp production.
- The pHOS target will be a moving-average $\leq$ 0.50
- Adult management will be used to constrain pHOS when run sizes allow the achievment of a spawner escapement of at least 200 adults. Adult management may also be necessary when spawner escapement is < 200 adults to achieve a moving-average pHOS $\leq$ 0.50.
- NOR extraction rates would be reduced as necessary for run sizes where utilizing the full extraction rate of 0.33 of the NOSs, would cause the total spawner escapement to fall below the minimum of 50 adults. For run sizes where a reduction in the NOR extraction rate would no longer prevent the total spawner escapement from falling below 50 adults, broodstock collection should be terminated to maximize natural production. In such cases the HCP Hatchery Committee must consider all relevant VSP data and provide a recommendation to the JFP regarding the decision to collect Twisp broodstock for that brood year; the JFP will make the final decision.

Application of these rules to the spawner escapement data for the Twisp River for the 1992-2008 return years generated average pNOB values of 0.62, pHOS of 0.37, and PNI of 0.61 (Table 1-4). Despite the nearly equal proportions of HORs and NORs historically in the Twisp data, pHOS values exceeded the 0.50 maximum for several of the run-size percentiles, illustrating the difficulty of achieving even the relatively liberal genetic priniciples enforced in this exercise. Achieving the HSRG-recommended target of pHOS $\leq$ 0.30 was only possible via adult management in relatively extreme run sizes.

Table 1-4. Application of the "Twisp Component Decision Rules" to the ranked percentiles of historic, annual estimates of spawning escapement to the Twisp River (1992-2008) (from Snow et al. 2009)

Example - Twisp River Spawning Escapement and Brood Composition Based on Escapement Estimates from 1992-2008

Run-size percentiles (1999-2008)	NORs to Twisp	HORs to Twisp	NOR extraction rate	HOR extraction Rate	NOB[a]	HOB	Total brood	NOS[b]	HOS before pHOS control[c]	HORs removed for pHOS control	HOS after pHOS control	Total Spawners (200 target; 50 min)	pNOB	pHOS	pNOS	PNI	Egg Take pre-culling[d]	Smolts produced w/o culling	Smolt produced w/ culling (8.2%)	Naturally produced eggs
>95%	540	384	0.12	0.00	63	0	63	363	292	292	0	363	1.00	0.00	1.00	1.00	120,000	108,000	99,815	726,000
95%	416	309	0.15	0.00	63	0	63	268	235	235	0	269	1.00	0.00	1.00	1.00	120,000	108,000	99,815	538,000
90%	291	235	0.20	0.03	57	6	63	178	174	152	22	200	0.90	0.11	0.89	0.89	120,000	108,000	99,815	400,000
85%	236	181	0.20	0.09	47	16	63	144	125	70	55	200	0.75	0.28	0.72	0.73	120,000	108,000	99,815	400,000
80%	181	126	0.20	0.21	36	27	63	110	75	0	75	186	0.57	0.40	0.59	0.59	120,000	108,000	99,815	372,000
75%	138	113	0.20	0.24	27	27	54	84	65	0	65	150	0.50	0.44	0.56	0.53	104,000	93,600	86,506	300,000
70%	94	100	0.20	0.19	19	19	38	57	62	0	62	119	0.50	0.52	0.48	0.49	74,000	66,600	61,553	238,000
65%	81	99	0.20	0.16	16	16	32	49	63	0	63	113	0.50	0.56	0.44	0.47	62,000	55,800	51,571	226,000
60%	67	98	0.20	0.14	14	14	28	40	64	0	64	105	0.50	0.61	0.38	0.45	54,000	48,600	44,917	210,000
55%	66	81	0.20	0.16	13	13	26	40	52	0	52	92	0.50	0.56	0.44	0.47	50,000	45,000	41,590	184,000
50%	65	65	0.20	0.19	13	13	26	40	40	0	40	80	0.50	0.49	0.49	0.50	50,000	45,000	41,590	160,000
45%	59	63	0.20	0.18	12	12	24	36	39	0	39	75	0.50	0.52	0.48	0.49	46,000	41,400	38,262	150,000
40%	52	60	0.19	0.16	10	10	20	32	38	0	38	70	0.50	0.54	0.46	0.48	38,000	34,200	31,608	140,000
35%	48	47	0.15	0.15	8	8	16	30	30	0	30	61	0.50	0.49	0.50	0.51	32,000	28,800	26,617	122,000
30%	44	34	0.13	0.16	6	6	12	29	22	0	22	51	0.51	0.42	0.57	0.54	24,000	21,600	19,963	102,000
25%	40	26	0.00	0.00	0	0	0	30	20	0	20	51	0.00	0.39	0.60	0.00	0	0	0	102,000
20%	35	18	0.00	0.00	0	0	0	27	14	0	14	41	0.00	0.33	0.65	0.00	0	0	0	82,000
15%	35	15	0.00	0.00	0	0	0	27	11	0	11	38	0.00	0.30	0.70	0.00	0	0	0	76,000
10%	35	12	0.00	0.00	0	0	0	27	9	0	9	36	0.00	0.25	0.74	0.00	0	0	0	72,000
5%	29	6	0.00	0.00	0	0	0	22	5	0	5	27	0.00	0.17	0.82	0.00	0	0	0	54,000
												Averages	**0.62**	**0.37**	**0.62**	**0.61**				

a - NOB never exceeds 33% of NOS

b - NORs minus broodstock and 24% pre-spawn mortality

c - HORs minus broodstock and 24% pre-spawn mortality

d - Assumptions: survival = 95% pre-spawn, 90% egg-to-release; 4,000 fecundity; 1:1 male:female.

No shading = runs of sufficient size to fill program, achieve spawner-escapement (200), pHOS (< 0.3), pNOB (> pHOS and ≥ 0.5), and PNI (> 0.67) targets (with adult management).

Blue shading = run of sufficient size to achieve the spawning-escapement target (200), but to do so would require a substantial reduction in hatchery production.

Gray shading = run sizes where spawn escapement < 200 target ≥ 50 (ICTRT [2007] quasi-extinction threshold), and brood collection maximized within extraction and pNOB limitations.

Yellow shading = run sizes where run escapement cannot support a hatchery program and provide a minimum total spawning escapement of ≥50.

Methow/Chewuch Component Decision Rules

As described above for the Methow/Chewuch program component, the dissproportionately hatchery-origin composition of the run escapement and the lack of within-basin collection opportunities for controlling pHOS complicates the achievement of acceptable values of spawning escapement, pNOB, pHOS, and PNI, while also achieving production targets. Efforts to develop rules such as those proposed above for management of the Twisp program component have been unsuccessful at systematically achieving all of those management targets. Indeed, for most run sizes, simultaneously achieving more than two of those targets proved difficult. Thus, we do not offer a proposal for a management scheme for the Methow/Chewuch component, but instead recommend that the HCP Hatchery Committees agree on a management regime annually during the development of the annual broodstock collection protocol as described above in Section 1.8.2.1. The following rules should apply to the annual development of broodstock, pHOS, pNOB, PNI, and spawning-escapement targets:

- Minimum escapement should not fall below 500 spawners. Under the ICTRT (2007) viability criteria, no populations are considered viable with fewer than 500 spawners. Hatchery production should be secondary in priority to achieving a spawning escapement of at least 500 spawners.
- The rate of extraction of natural-origin broodstock from all hatchery programs should never exceed 0.33 of the NORs to the Methow Basin.
- Maximize pNOB in years when spawning escapement will exceed 500 NOSs to the extent that it does not result in increasing pHOS above 0.50. Note that in populations where escapement is dominated by HORs and pHOS generally exceeds 0.30, increasing pNOB above 0.50 is relatively ineffective at maintaining PNI > 0.5 compared with reductions in pHOS.
- Escapement of NORs will not be restricted
- Apply measures for adult management to control pHOS when appropriate. When the natural-origin spawning escapement is ≥ 1,140 then the escapment of HORs to the Methow should be minimized (allowing for escapement of broodstock, etc.) and pNOB will be maximized. In return years when the total spawning escapement (including both hatchery and natural origin) is between 500 and 1,140, habitat seeding and genetic concerns must be balanced by the HCP Hatchery Committee in their determination of adult-management measures.

Marking Strategy

All smolts will be marked according to a coordinated marking scheme for spring Chinook releases above Wells Dam, to be determined by the HCP Hatchery Committee, to distinguish specific hatchery crosses and release locations, and to facilitate removal of hatchery-origin fish. See Section 10.1.7 for additional details.

Management of Excess Hatchery Fish

The Methow Hatchery spring Chinook program is critical to the maintenance of the natural population until factors limiting the productivity of natural populations are corrected. However, excess spawning escapement of hatchery fish in relation to wild spawners and habitat capacity pose genetic and ecological risks to the natural population. Ultimately, the most repsonsible and practical means to manage over-escapement of hatchery fish is to reduce hatchery production, but interannual variability in return rates from any given broodyear complicates *a priori* determinations of appropriate hatchery production for future return years. Thus, management of adult returns is necessary to achieve PNI objectives. Escapement of hatchery fish to the Methow basin will be balanced with the goal of adequately seeding available habitat to improve PNI over time and to achieve a moving-average PNI in the Twisp of no less than 0.50, with an ultimate goal of 0.67 or greater over time. In the remainder of the Methow Basin the deisred PNI goals are the same as for the Twisp, but in actuallity, an increasing trend in PNI over time is the first-order objective. To achieve any improvement in PNI will require limitations on the escapement of hatchery fish of Methow Basin origin above Wells Dam, over the Twisp weir, and past hatchery outfalls. Natural-origin spawning escapement will never be limited, and when it meets or exceeds 1,140 (or future improved capacity estimates) in the Methow, the escapement of HORs to the Methow will be reduced to to the lowest extent practicable (considering broodstock needs, etc.).

The HCP Hatchery Committee will annually decide on the magnitude of and methods for the removal of excess hatchery fish based on pre-season natural and hatchery run-size estimates, as adjusted in-season from fishway counts at Columbia River dams. Besides monitoring counts at downstream dams, and especially detections at those dams of PIT-tagged fish originating above Wells Dam, the in-season adjustment of forecasted returns to programs above Wells Dam will be facilitated by the implementation of the Parental Based Tagging (PBT) approach to management of Wenatchee River spring Chinook. Provided the processing of genetic samples is sufficiently rapid, the PIT tagging and genetic sampling of untagged spring Chinook at Priest Rapids Dam should increase the number of known-origin adults traversing the ladders at Wells.

The allowable escapement of hatchery fish will be based on attaining a minimum spawning escapement of 500 spring Chinook (hatchery and natural-origin combined) to the Methow basin to minimize abundance-based extinction risk, and a habitat-seeding spawning escapement of 1,140. The HCP Hatchery Committee will modify this 1,140 spawning-escapment target in response to improved estimates of habitat capacity. When spawning escapements (hatchery + wild) are forecast between 500 and 1,140, the temptation to increase the escapement of hatchery fish must be tempered by genetic concerns that low PNI over time will reduce fitness and reduce the likelihood of recovery. To balance the need to increase escapement while also protecting genetic integrity, pNOB will be ≥ 0.50 for the Twisp component and the number of NOB will not exceed 0.33 of the natural-origin spawners. Additionally, pHOS in the Twisp will not exceed 0.50 except to maintain a minimum spawning escapement of 50 adults. Other than managing HORs at Wells Dam and controlling the number of smolts released, there is no proximate control over pHOS in the remainder of the Methow Basin besides removal of HORs at hatchery outfalls (or a conservation fishery [by others]). Thus, annual trapping in the outfalls of Methow Hatchery and WNFH will continue throughout the spring Chinook run for adult management.

Should improved productivity and abundance of natural-origin spring Chinook result from implementation of the PNI-enhancing management actions in the Twisp River, a greater reduction in the Methow basin escapement of hatchery fish should be implemented. This may temporarily reduce the spawner escapement below the objective of 1,140, but will improve PNI for the entire Methow spring Chinoook population at lower levels of natural-origin spawners.

Wells Dam provides an opportunity to control escapement of hatchery spring Chinook to the Methow, but adult management here also presents several problems: 1) The size of the wild run expected to pass Wells Dam must be estimated in real-time. 2) The proportions of wild fish that will home to the Methow and Okanogan must be estimated to determine the necessary magnitude of adult-management actions. 3) Hatchery fish must be differentially marked for each release location in order to allow escapement of appropriate numbers of hatchery fish specific to each basin. Furthermore, escapement above Wells Dam must account for pre-spawn mortality, fishing mortality, and subsequent broodstock collection removals to achieve desired spawner escapements. Given these challenges, adult management at Wells Dam will require a considerable effort to estimate required information, mark fish, and operate the Wells ladder traps throughout the spring Chinook run. Thus, the initial preferred option for managing excess hatchery-origin adults will be removal at weirs and hatchery volunteer traps (and other locations and methods [e.g., seining] as approved annually by the HCP Hatchery Committee), and removal from the ladders at Wells Dam will be implemented in the future only if these other methods prove unsuccessful and hatchery fish are differentially marked by release location.

Hatchery spring Chinook removed at locations and by methods described above will be provided to WDFW, and WDFW will assume responsibility for their disposition. Options under consideration for these fish include providing harvest opportunities elsewhere, distribution to tribes and public entities, or use for nutrient enhancement in tributaries. Douglas PUD will provide one FTE for adult-management activities (for both steelhead and spring Chinook hatchery programs) associated with Douglas PUD's NNI hatchery compensation.

WDFW is responsible for funding manual adult management activities from the point at which fish are placed in a holding container when manually removed, or for a conservation fishery.

Permit Holder: Although Douglas PUD, as a funder, and WDFW, as a contract operator/implementer, are joint permit holders for the Methow Hatchery spring Chinook program, Douglas PUD is not a fish-management agency with authority over fisheries, or for determining the disposition of fish surplus to program needs, and thus cannot hold a permit for such activities. Thus, WDFW will obtain and hold the necessary permit(s) for manual adult management activities beyond the point at which spring Chinook are removed at Wells Dam, Methow Hatchery, the Twisp River weir, or other Douglas PUD facility where removal of spring Chinook might occur, and placed in holding containers or transport vessels.

Agent: WDFW is designated as the authorized agent under a current contract between Douglas PUD and WDFW and until this contract expires and is not renewed or renegotiated.

Terminal Conservation Fisheries (by others; not included in this HGMP) to Reduce the Proportion of Hatchery Fish on the Spawning Grounds

A conservation fishery is not a component of the proposed modifications to the Methow Hatchery spring Chinook program, and thus is not explicitly included as part of this HGMP. Nevertheless, WDFW has expressed their desire to implement selective harvest through conservation fisheries as a tool to assist in the management of pHOS levels toward improving PNI in the Methow Basin. Adult spring Chinook of hatchery origin returning to the Methow Basin in excess of escapement and broodstock needs may be removed through selective conservation fisheries (implemented by others; not part of this HGMP) as determined on a yearly basis by the JFP. WDFW, in consultation with the JFP, will be responsible for the authorization of non-Tribal fisheries to remove excess hatchery spring Chinook. WDFW intends this management strategy will support recovery and build public support for salmon-recovery efforts in the Methow Basin and other UCR watersheds. While a WDFW conservation fishery may provide a mechanism for the removal of excess HORs, it will also inevitably result in the incidental take of NORs.

In addition to determining annual broodstock, PNI, pHOS, and pNOB targets, pre-season estimates (forecasts) of tributary run size will be used to determine if numbers of HORs are likely to exceed numbers necessary to support recovery of the natural population. In-season updates based on counts at dams, traps, and/or other monitoring locations (e.g., PIT tag detectors), will be used to refine pre-season forecasts. This refinement will be important for determining the disposition of the fish once they reach Wells Dam, and determining the opportunity for a conservation fishery (by others) to remove excess HORs.

WDFW is responsible for funding and conducting the management activities related to terminal and in-river fisheries described above. Accordingly, WDFW will be the permit holder for the harvest activities described above in this sub-section.

Permit Holder: Although Douglas PUD, as a funder, and WDFW, as a contract operator/implementer, are joint permit holders for the Methow Hatchery spring Chinook program, Douglas PUD is not a fish-management agency with authority over fisheries or for determining the disposition of fish surplus to program needs, and thus cannot hold a permit for such activities. Thus, WDFW will obtain and hold the necessary permit(s) for manual adult management activities beyond the point at which spring Chinook are removed at Wells Dam, Methow Hatchery, the Twisp River weir, or other Douglas PUD facility where removal of steelhead might occur, and placed in holding containers or transport vessels.

1.8.2.5 Monitoring and Evaluation

Monitoring and evaluation plays an important role in measuring program results and determining potential future modifications (adaptive management). M&E information is collected directly from, or derived from spawning-ground surveys, broodstock sampling, stock-composition sampling (stock assessment), hatchery juvenile sampling, smolt trapping, passive integrated transponder (PIT) tagging, adipose clipping, genetic sampling, disease sampling, and snorkeling. M&E objectives for this program are detailed in Section 11.1; typical specific actions are detailed in HCP HC (2007) and Hays et al. (2007), and risk aversion measures are detailed in Section 11.2.

Douglas PUD funds (and Chelan and Grant PUDs proportionally co-fund) the M&E activities for this program as agreed to by the HCP Hatchery Committee in accordance with the processes outlined in the HCP, and WDFW is Douglas PUD's current contractor for those activities.

1.9 List of Program "Performance Standards"

See Tables 1-5 and 1-6 in Section 1.10.

1.10 List of Program "Performance Indicators", Designated by "Benefits" and "Risks"

1.10.1 "Performance Indicators" Addressing Benefits

The performance indicators in Table 1-5 are from the M&E Plan for Douglas PUD programs developed and approved by the HCP Hatchery Committees, titled Conceptual Approach to Monitoring and Evaluation for Hatchery Programs funded by Douglas PUD (HCP-HC 2007).

Table 1-5. Performance Indicators Addressing Benefits.

Performance Standards	Performance Indicators	Monitoring and Evaluation
1. Increase the number of naturally spawning and naturally produced adults of the target population relative to a non-supplemented population and the changes in the natural replacement rate (NRR) of the supplemented population (reference population) are similar to that of the non-supplemented population.	Natural Replacement Rate (NRR). Ho: Δ Total spawners $_{\text{Supplemented population}}$ > Δ Total spawners $_{\text{Non-supplemented population}}$ Ho: Δ NOR $_{\text{Supplemented population}} \geq \Delta$ NOR $_{\text{Non-supplemented population}}$ Ho: Δ NRR $_{\text{Supplemented population}} \geq \Delta$ NRR $_{\text{Non-supplemented population}}$	Spawning escapement and spawning origin composition of supplemented and non-supplemented (reference) populations.
2. Maintain run timing, spawn timing, and spawning distribution of endemic populations.	Ho: Migration timing $_{\text{Hatchery}}$ = Migration timing $_{\text{Naturally produced}}$ Ho: Spawn timing $_{\text{Hatchery}}$ = Spawn timing $_{\text{Naturally produced}}$ Ho: Redd distribution $_{\text{Hatchery}}$ = Redd distribution $_{\text{Naturally produced}}$	Monitor and evaluate supplemented and non supplemented (reference) population run-timing, spawn timing and redd distribution.
3. Maintain endemic population genetic diversity, population structure, and effective population size. Additionally, determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.	Ho: Allele frequency $_{\text{Hatchery}}$ = Allele frequency $_{\text{Naturally produced}}$ = Allele frequency $_{\text{Donor pop.}}$ Ho: Genetic distance between subpopulations $_{\text{Year x}}$ = Genetic distance between subpopulations $_{\text{Year y}}$ Ho: Δ Spawning Population = Δ Effective Spawning Population Ho: Age at Maturity $_{\text{Hatchery}}$ = Age at Maturity $_{\text{Naturally produced}}$ Ho: Size at Maturity $_{\text{Hatchery}}$ = Size at Maturity $_{\text{Naturally produced}}$	Periodic (every 5 years) genetic analysis of hatchery and naturally produced adult and juvenile fish in the supplemented population. Monitor and evaluate run timing, spawn timing, redd distribution, size and age at maturity, and effective population size of hatchery- and natural-origin fish.
4. Achieve/maintain adult-to-adult survival (i.e., hatchery replacement rate) that is greater than the natural adult-to-adult survival (i.e., natural replacement rate) and equal to or greater than the program specific HRR expected value based on survival rates listed in the BAMP (1998).	Ho: HRR $_{\text{Year x}} \geq$ NRR $_{\text{Year x}}$ Ho: HRR $\geq$ Expected value per assumptions in BAMP (note that the BAMP is not a definitive standard for comparison)	Monitor and evaluate hatchery and natural adult-to-adult replacement rate in the supplemented populations.

Performance Standards	Performance Indicators	Monitoring and Evaluation
5. Maintain the stray rate of hatchery fish below the acceptable levels to maintain genetic variation between stocks.	Ho: Stray rate $_{\text{Hatchery fish}}$ < 5% of total brood return Ho: Stray hatchery fish < 5% of spawning escapement of other independent populations. Ho: Stray hatchery fish < 10% of spawning escapement of any non-target streams within independent population.	Monitor and evaluate hatchery stray rates and proportional contribution to natural spawning aggregates.
6. Provide release of hatchery fish consistent with programmed size and number.	Ho: Hatchery fish $_{\text{Size}}$ = +/- 10% of Programmed $_{\text{Size}}$ Ho: Hatchery fish $_{\text{Number}}$ = +/- 10% of Programmed $_{\text{Number}}$	Monitor fish size and number at release.
7. Maintain the proportion of hatchery fish on the spawning grounds at a levels that minimize negative affects to freshwater productivity (i.e., number of smolts per redd) of supplemented streams when compared to non-supplemented streams with similar adult seeding levels.	Ho: Δ smolts/redd $_{\text{Supplemented population}}$ > Δ smolts/redd $_{\text{Non-supplemented population.}}$	Monitor and evaluate annual smolt production in supplemented and non-supplemented populations. Monitor and evaluate redd deposition in supplemented and non-supplemented populations.
8. Objective 8 of the M&E Plan is not applicable to the Methow Hatchery spring Chinook program	NA	NA
9. Determine whether BKD management actions lower the prevalence of disease in hatchery fish and subsequently in the naturally spawning population. In addition, when feasible, assess the transfer of Rs infection at various life stages from hatchery fish to naturally produced fish.	Ho: Rearing density has no effect on survival rates of hatchery fish. Ho: Antigen level has no effect on survival rates of hatchery fish. Ho: Interaction between antigen level and rearing density has no effect on survival rates of hatchery fish. Ho: Rs infection is not transferred from hatchery effluent to study fish	This is a regional objective, the implementation of which requires collaboration among all parties to the Wells HCP. Although the HCP Hatchery Committees have reviewed a draft study design, the logistics of implementing the study are sufficiently complicated as to render the study infeasible at present.
10. Minimize adverse impacts to non-target taxa of concern (NTTOC).	Ho: NTTOC abundance $_{\text{Year x through y}}$ = NTTOC abundance $_{\text{Year y through z}}$ Ho: NTTOC distribution $_{\text{Year x through y}}$ = NTTOC distribution $_{\text{Year y through z}}$ Ho: NTTOC size $_{\text{Year x through y}}$ = NTTOC size $_{\text{Year y through z}}$	This is a regional objective, the implementation of which requires collaboration among all parties to the Wells HCP. This collaboration has been initiated, including the complicated process for determining the potential for and magnitude of impacts of target species on NTTOC.

1.10.2 "Performance Indicators" Addressing Risks

Table 1-6. Performance Indicators Addressing Risks.

Performance Standards	Performance Indicators	Monitoring and Evaluation
1. Artificial propagation activities comply with ESA responsibilities to minimize impacts and/or interactions to ESA listed fish	Program complies with Section 10 permit conditions including juveniles are raised to smolt-size (approximately 15 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream. 100% mass mark and CWT fish to identify them from naturally produced fish.	As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional monitoring metrics include, straying, instream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented. Required data are generated through the M & E plan and provided to NOAA Fisheries as required per annual report compliance.
2. Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring.	All facilities meet WDFW water-right permit compliance and National Pollution Discharge Elimination System (NPDES) requirements (NPDES permit No.WAG-5011).	Flow and discharge reported in monthly NPDES reports. Environmental monitoring of total suspended solids, settle-able solids, in-hatchery water temperatures, in-hatchery dissolved oxygen, nitrogen, ammonia, and pH will be conducted and reported as per permit conditions.
3. Water intake systems minimize impacts to listed wild salmonids and their habitats.	Intake screens – designed and operated to assure approach velocities and operating conditions provide protection to wild salmonid species.	Intake system designed to deliver permitted flows. Operators monitor and report as required Hatcheries participating in the programs will maintain all screens associated with water intakes in surface water areas to prevent impingement, injury, or mortality to listed salmonids.
4. Hatchery operations comply with all ESA permit requirements.	Section 10 annual reports are submitted in compliance with permits.	Section 10 annual reports are submitted in compliance with permits.
5. Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including IHOT, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration.	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed.

Performance Standards	Performance Indicators	Monitoring and Evaluation
6. The risk of catastrophic fish loss due to hatchery facility or operation failure is minimized.	Staffing allows for rapid response for protection of fish from risk sources (water loss, power loss, etc.). Backup generators to provide an alternative source of power to supply water during power outages. Protocols in place to test standby generator and all alarm systems on a routine basis. Alarm systems installed and operating at each rearing vessel to detect loss of or reduced flow and reduced operating head in rearing vessels. Densities at minimum to reduce risk of loss to disease. Sanitation – all equipment is disinfected between uses on different lots of fish including nets, crowders, boots, raingear, etc.	Hatchery engineering design and construction accommodate security measures. Operational funding accommodates security measures. Training in proper fish handling, rearing, and biological sampling for all staff. Staff are trained to respond to alarms and operate all emergency equipment on station. Maintenance is conducted as per manufacturer's requirements and according to hatchery maintenance schedules.
7. Broodstock collection and juvenile hatchery releases minimize ecological effects on listed wild fish.	Hatchery spring Chinook reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in streams after release (CV length ≤ 10%, condition factor 0.9 – 1.0). 2. Smolts acclimated and imprinted on surface water from the natal steam to enhance smoltification and reduce residence time in the tributaries and mainstem migration corridors. All spring Chinook encountered in hatchery broodstock collection operations will be held for a minimal duration in the traps; generally less than 24 hrs and follow permit protocols. Spring Chinook trapped in excess of broodstock collection goals will be released upstream or returned to natal streams immediately.	Fish culture and evaluation staff monitor behavior, coefficient of variation in length, and condition. Fish health specialists will certify all hatchery fish before release. Up to three downstream juvenile smolt traps will be used to monitor the outmigration of hatchery and wild fish. Outmigration may also be monitored through PIT tag detection systems at mainstem passage facilities. Broodstock collection protocols developed each season and reviewed by the HCP Hatchery committees.

1.11 Expected Size of Program

1.11.1 Proposed Annual Broodstock Collection Level (maximum number of adult fish)

Broodstock collection will occur at Wells Dam, the Twisp River weir, Methow Hatchery outfall, Winthrop NFH outfall, and potentially from future collection facilities located on the Chewuch and/or Methow rivers, or by other methods such as angling or seining; annual total collection will be up to 360 adults (348 expected) for the combined components of the program: up to 64 for the Twisp component (expect 63), and 296 for Methow/Chewuch releases (expect 285). Additionally, Methow Hatchery-origin returns to the Methow Hatchery that exceed broodstock and spawner-escapement needs will be provided to the WNFH for their use as broodstock, until their broodstock needs are met (WNFH target for Methow Hatchery fish is 20%-30% of 360 adults).

1.11.2 Proposed Annual Fish Release Levels (maximum number) by Life Stage and Location

Table 1-7. Proposed Annual Fish Release Levels by Life Stage and Location. The 100,000 smolts is the maximum for the Twisp River releases.

Life Stage	Release Location	Annual Release Level*
Yearling Smolts	Twisp River	100,000
	Methow River	225,000
	Chewuch River	225,000

*Release levels may be adjusted downward by the HCP Committees to meet specific program objectives on an annual basis. Increased release numbers to the Chewuch and/or Methow rivers may be necessary to compensate for potential shortfalls in the Twisp program.

The current program has generally released fewer than the present 550,000 smolt target[6] during most years since 1994 (Table 1-8). For the 1996 to 2006 brood years, the average number of smolts released per year has been 396,074 (range 248,183 [BY1999] to 493,547 [BY 2002]).

[6] Note that prior to 1996 there was not a targeted number of smolts for annual releases.

Table 1-8. Aggregate number of spring Chinook smolts planted into the Twisp, Chewuch, and Methow Rivers, brood years 2000-2006.

Brood Year	Release Year	Number of Smolts
1992	1994	76,734
1993	1995	611,763
1994	1996	36,166
1995	1997	28,878
1996	1998	371,306
1997	1999	491,957
1998	2000	451,140
1999	2001	248,183
2000	2002	342,096
2001	2003	449,542
2002	2004	493,547
2003	2005	313,443
2004	2006	366,513
2005	2007	417,102
2006	2008	411,990
Mean		396,074

1.12 Current Program Performance, including Estimated Smolt-to-Adult Survival Rates, Adult Production Levels, and Escapement Levels. Indicate the Source of these Data

1.12.1 In-hatchery Survival Measures

Table 1-9. Developmental stage survivals in the hatchery environment for Methow and Twisp Rivers spring Chinook, brood years 2003-2007 (Snow et al. 2008).

Brood year	Collection to spawning		Unfertilized egg-eyed	Eyed egg-ponding	30 d after ponding	100 d after ponding	Ponding to release	Transport to release	Unfertilized egg-release
	Female	Male							
Methow Average 2003-07	99.0	99.1	96.9	96.9	99.6	99.5	90.4	99.6	87.7
Twisp Average 2003-07	100.0	100.0	95.7	98.2	99.6	99.5	99.2	99.9	93.2
Standard	**90.0**	**85.0**	**92.0**	**98.0**	**97.0**	**93.0**	**90.0**	**95.0**	**81.0**

1.12.2 Run Sizes and Escapement

Table 1-10. Spring Chinook hatchery- and natural-origin run sizes to the Methow River Basin for return years 1981-2008. Data from Snow et al. (2008) and Charlie Snow (WDFW unpublished data).

Return Year	HORs	HOR Fraction	NORs	NOR Fraction	Run Size
1981	0	0	476	1	476
1982	0	0	607	1	607
1983	0	0	949	1	949
1984	0	0	891	1	891
1985	0	0	1,303	1	1,303
1986	0	0	897	1	897
1987	0	0	1,545	1	1,545
1988	32	0.02	1,633	0.98	1,665
1989	3	0	1,192	1	1,195
1990	287	0.26	825	0.74	1,111
1991	0	0	620	1	620
1992	337	0.203	1,325	0.797	1,662
1993	423	0.309	947	0.691	1,370
1994	63	0.204	246	0.796	309
1995	10	0.222	35	0.778	45
1996	12	0.387	19	0.613	31
1997	78	0.225	269	0.775	347
1998	21	0.512	20	0.488	41
1999	71	0.612	45	0.388	116
2000	861	0.880	117	0.12	978
2001	9,139	0.833	1,832	0.167	10,971
2002	2,292	0.869	345	0.131	2,637
2003	1,080	0.949	58	0.051	1,138
2004	1,009	0.674	488	0.326	1,497
2005	849	0.617	527	0.383	1,376
2006	1,420	0.812	328	0.188	1,748
2007	813	0.753	266	0.247	1,079
2008	760	0.718	298	0.282	1,058
12-Yr Geomean:	588	0.667	209	0.237	881

1.12.3 Hatchery and Natural Replacement Rates (HRR, NRR) and Smolt-to-Adult Returns (SARs)

Table 1-11. Number of spring Chinook broodstock spawned (including pre-spawn mortalities), smolts released, adult returns, SARs, smolts/adult, and hatchery replacement rate (HRR) by brood year (1993-2002) for the Methow River releases from Methow Hatchery.

Brood year	Number of broodstock	Smolts released	Adult returns	SAR (%)	# Smolts/ adult	HRR
1993	91	210,849	192	0.091	1,098	2.1
1994	2	4,477	1	0.022	4,477	0.5
1995	12	28,878	122	0.422	237	10.2
1996	103	202,947	500	0.246	406	4.9
1997	187	332,484	945	0.284	352	5.1
1998[a]	161	435,670	2,300	0.528	189	14.3
1999	90	180,775	145	0.080	1,247	1.6
2000[a]	147	266,392	852	0.320	313	5.8
2001	69	130,787	508	0.388	257	7.4
2002	81	181,235	599	0.331	303	7.4
Geometric mean	**59**	**124,776**	**250**	**0.200**	**499**	**4.25**

[a]Mixed MetComp group

Table 1-12. Number of spring Chinook broodstock spawned (including pre-spawn mortalities), smolts released, adult returns, SARs, smolts/adult, and hatchery replacement rate (HRR) by brood year (1992-2002) for the Chewuch River releases from Methow Hatchery.

Brood year	Number of broodstock	Smolts released	Adult returns	SAR (%)	# Smolts/ adult	HRR
1992	21	40,881	39	0.095	1,048	1.9
1993	103	284,165	116	0.041	2,450	1.1
1994	12	11,854	2	0.017	5,927	0.2
1995	-	-	-	-	-	-
1996	64	91,672	37	0.040	2,478	0.6
1997	64	132,759	360	0.271	369	5.6
2001	85	261,284	711	0.272	367	8.4
2002	123	254,238	630	0.248	404	5.1
Geometric mean	**53**	**101,545**	**92**	**0.090**	**1,109**	**1.80**

Table 1-13. Number of broodstock spawned (including pre-spawn mortalities), smolts released, adult returns, SARs, smolts/adult, and hatchery replacement rate (HRR) by brood year (1992-2002) for the Twisp River releases from Methow Hatchery.

Brood year	Number of broodstock	Smolts released	Adult returns	SAR (%)	# Smolts/ adult	HRR
1992	18	35,853	21	0.059	1,707	1.2
1993	42	116,749	27	0.023	4,324	0.6
1994	5	19,835	5	0.025	3,967	1.0
1995	-	-	-	-	-	-
1996	43	76,687	278	0.363	276	6.5
1997	15	26,714	67	0.251	399	4.5
1998	10	15,470	23	0.149	673	2.3
1999	32	67,408	61	0.090	1,105	1.9
2000	64	75,704	145	0.192	522	2.3
2001	30	57,471	43	0.075	1,337	1.4
2002	9	20,377	120	0.589	170	13.3
Geometric mean	**21**	**41,654**	**47**	**0.113**	**882**	**2.3**

Table 1-14. Natural Replacement Rate (NRR) summary by Methow River subbasin for brood years 1992 through 2002.

Parent brood	Est. spawning escapement	Return age 1.1	Return age 1.2	Return age 1.3	Total expanded recruits (NOR)	NRR
			Chewuch River			
1992	422	0	28	14	45	0.11
1993	184	3	69	21	95	0.52
1994	63	0	15	3	19	0.30
1995	6	1	12	19	34	5.53
1996	8	0	13	86	102	12.75
1997	123	1	662	55	1,563	12.68
1998	7	11	23	19	89	12.66
1999	21	0	2	0	2	0.11
2000	83	6	47	13	91	1.10
2001	2,493	0	205	49	321	0.13
2002	666	2	91	60	214	0.32
Geomeans	**77**	**0**	**36**	**6**	**76**	**1.00**
			Methow River			
1992	924	0	47	43	55	0.10
1993	760	5	79	37	125	0.17
1994	172	0	26	7	34	0.20
1995	27	1	54	18	78	2.83
1996	15	1	30	230	268	17.89
1997	152	21	348	50	912	5.98
1998	23	16	34	2	86	3.73
1999	70	3	2	0	5	0.07
2000	639	5	197	39	333	0.52
2001	7,588	3	183	36	280	0.04
2002	1,730	0	96	93	264	0.15
Geomeans	**231**	**0**	**55**	**6**	**115**	**0.53**
			Twisp River			
1992	316	0	54	37	96	0.30
1993	426	5	27	20	53	0.13
1994	74	0	15	9	25	0.34
1995	12	0	26	12	39	3.23
1996	8	0	11	56	69	8.64
1997	72	0	460	109	1,237	17.25
1998	11	24	72	21	195	17.75
1999	25	0	7	0	8	0.31
2000	256	37	264	17	441	1.72
2001	890	27	77	20	156	0.18
2002	241	0	47	35	115	0.48
Geomeans	**81**	**0**	**45**	**5**	**94**	**1.16**

1.13 Date Program Started (years in operation) or is Expected to Start

The first year of operation for the Methow Hatchery was 1992. The UCR spring Chinook salmon ESU was listed as endangered on March 24, 1999 (NMFS 1999) with supplementation activities as conditioned by Section 10 permit No. 1196 starting at Methow Hatchery with brood year 2000 fish. The proposed program as described in this HGMP would commence with brood year 2010, pending approval by NMFS.

1.14 Expected Duration of Program

The program is intended to continue for the 50-year term of the Wells HCP, which was accepted by the FERC in 2004. The Wells HCP also stipulates that the production target for artificial propagation will remain constant for 10 years at which time the programs will be reviewed and modified as needed. HCP Hatchery Committee review of the HCP hatchery programs is scheduled for 2013 with any resultant changes implemented thereafter.

1.15 Watersheds Targeted by Program

Methow Sub-basin/Columbia Cascade Province, WRIA 48.

1.16 Indicate Alternative Actions Considered for Attaining Program Goals, and Reasons Why those Actions are not being Proposed

This hatchery program is adaptively managed by the Wells HCP Hatchery Committee, which has agreed to the collective goal of recovery and sustainability of the population within the context of meeting the HCP standard of NNI. The Wells HCP Hatchery Committee therefore aims for a program of adequate size and characteristics to meet this goal. During the development and implementation of the HCP, many alternatives were, and will continue to be considered for this program. The Wells HCP Hatchery Committee has concluded that a larger program would not be consistent with the HSRG's recommendations (HSRG 2009) to reduce artificial production in the Methow Basin, while a smaller or non-existent program may fail to support recovery as described in the Recovery Plan (UCSRB 2007). Thus, the HCP Hatchery Committee developed the program described in this HGMP to meet the current biological, agency, and HCP goals.

2.0 PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS

(USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

2.1 List All ESA Permits or Authorizations In Hand for the Hatchery Program.

2.1.1 Section 10(a)(1)(B) Permit Number 1196 Permit Type

Scientific Research/Enhancement: Artificial production of UCR spring Chinook. Expires Dec 31, 2007 but was amended on January 20, 2004 and expires January 20, 2014. Activities described in the application for this permit have been authorized under terms and conditions of the Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999). WDFW submits annual reports as conditioned by Section 10 permit No. 1196 covering the period from January 1 to December 31 each year. Broodstock retained may be used in the USFWS's Winthrop NFH Methow River programs. Methow Hatchery activities are coordinated with the USFWS spring Chinook program at the Winthrop NFH (ESA Section 10 Permit No.1300).

2.1.2 Wells Habitat Conservation Plan

In 2002, the Wells HCP was signed by WDFW, USFWS, NOAA National Marine Fisheries Service, and the Colville Confederated Tribes, and approved by FERC in June of 2004. The Yakama Nation signed the HCP in March of 2005. The overriding goal of the HCP is to achieve NNI on anadromous salmonids as they pass Wells Dam. One of the main objectives of the hatchery component of NNI is to provide species-specific hatchery programs that may include contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest.

The Wells HCP is intended to be a comprehensive 50-year adaptive management plan for anadromous salmonids and their habitat as affected by the Wells Project. The Wells HCP was designed to address Douglas PUD requirements for relicensing and as such included all of the parties terms, conditions and recommended measures related to regulatory requirements to conserve, protect and mitigate plan species pursuant to ESA, the FPA, the Fish and Wildlife Coordination Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Pacific Northwest Electric Power Planning and Conservation Act and Title 77 RCW of the State of Washington. The HCP also obligates the parties to work together to address water quality issues.

2.2 Provide Descriptions, Status, and Projected Take Actions and Levels for NMFS ESA-Listed Natural Populations in the Target Area

2.2.1 Description of NMFS ESA-listed Salmonid Population(s) Affected by the Program

2.2.1.1 Adult Age Class

Methow Spring Chinook MPG

Most Columbia River adult spring Chinook spend 2 years in the ocean before migrating back to their natal streams (Mullan 1987; Fryer et al. 1992; Chapman et al. 1995; Snow et al. 2008). Both female and male adults sampled from UCR tributaries predominantly spend two years in the ocean, and are four years old. The estimates of age of adult spring Chinook sampled in the UCR comport well with those for fish sampled at Bonneville Dam and other Columbia basin tributaries. These data suggest that more than 50 percent of spring Chinook in the Columbia River basin spend 1 year in fresh water and 2 in salt water (1.2), and from 20 to 40 percent spend 3 years in saltwater before returning to the river. Most stream-type Chinook throughout their geographic range average approximately 4 years of age, except those from the Yukon River, Alaska.

In the Methow River basin, the average age class for naturally produced adults since 2001 has been approximately 7 percent age 3, 56 percent age 4, and 37 percent age 5 (Table 2-1). Age structure does not appear to vary much between major spawning areas, ranging between approximately 3 to 10 percent for age 3, 53 to 57 percent for age 4, and 37 to 40 percent for age 5 (Table 2-1).

Table 2-1. Age structure of Methow Basin spring Chinook salmon per major spawning area (based on Chapter 5 Appendices D-J, Snow et al. 2008).

	Number				Percent		
Subbasin/year	**1.1**	**1.2**	**1.3**	**Total**	**1.1**	**1.2**	**1.3**
Methow							
2001	16	286	292	594	2.7	48.1	49.2
2002	1	21	64	86	1.2	24.4	74.4
2003	5	1	2	8	62.5	12.5	25.0
2004	3	196	0	199	1.5	98.5	0.0
2005	0	182	39	221	0.0	82.4	17.6
2006	0	101	27	128	0.0	78.9	21.1
2007	6	42	104	152	3.9	27.6	68.4
Average	**4**	**118**	**75**	**198**	**10.3**	**53.2**	**36.5**
Chewuch							
2001	8	641	83	732	1.1	87.6	11.3
2002	0	23	55	78	0.0	29.5	70.5
2003	4	2	19	25	16.0	8.0	76.0
2004	0	46	0	46	0.0	100.0	0.0
2005	2	206	11	219	0.9	94.1	5.0
2006	0	86	49	135	0.0	63.7	36.3
2007	1	14	59	74	1.4	18.9	79.7
Average	**2**	**145**	**39**	**187**	**2.8**	**57.4**	**39.8**
Twisp							
2001	18	439	49	506	3.6	86.8	9.7
2002	66	115	181	362	18.2	31.8	50.0
2003	6	4	15	25	24.0	16.0	60.0
2004	16	227	0	243	6.6	93.4	0.0
2005	0	73	14	87	0.0	83.9	16.1
2006	0	45	20	65	0.0	69.2	30.8
2007	2	0	38	40	5.0	0.0	95.0
Average	**15**	**129**	**45**	**190**	**8.2**	**54.4**	**37.4**
Total Basin							
2001	42	1366	424	1832	2.3	74.6	23.1
2002	67	159	300	526	12.7	30.2	57.0
2003	15	7	36	58	25.9	12.1	62.1
2004	19	469	0	488	3.9	96.1	0.0
2005	2	461	64	527	0.4	87.5	12.1
2006	0	232	96	328	0.0	70.7	29.3
2007	9	56	201	266	3.4	21.1	75.6
Average	**22**	**393**	**160**	**575**	**6.9**	**56.0**	**37.0**

Methow Summer Steelhead MPG

Chapman et al. (1994) summarized information for 459 naturally produced adult steelhead collected at Wells Dam, Wells Reservoir, and the Methow River between 1987 and 1993 (Table 2-2). They found that the majority of both males and females had spent 2 years in the ocean (Table 2-2; Figure 2-1). Between 1997 and 2006, 478 naturally produced fish were sampled at Wells Dam. The majority of these fish had spent 1 year in the ocean (see Table 2-2, Figure 2-1). It is uncertain why this inconsistency exists, although saltwater ageing was estimated from otoliths between 1987 and 1993, and with scales between 1997 and 2006.[7] In addition, sample sizes were small in many of the years.

In previous summaries of hatchery-origin age structure (Mullan et al. 1992a; Chapman et al. 1994), most hatchery-origin fish were designated as 1-salt. While this still appears to be true for males, females appear to have shifted to more 2-salt, which is more similar to wild fish between 1987 and 1993 (Table 2-3).

[7] It is unlikely that saltwater age estimation would be affected by the differing methods. However, freshwater age estimation may be underestimated using scales for steelhead (Peven 1990, Mullan et al. 1992a).

Table 2-2. The number and percentage of steelhead by saltwater age and sex from Chapman et al. (1994) for years 1987-1993, and Snow et al. (2008) for years 1997-2006.

Brood year	Male 1-salt #	Male 1-salt %	Male 2-salt #	Male 2-salt %	Female 1-salt #	Female 1-salt %	Female 2-salt #	Female 2-salt %	Total
1987	12	16.9	8	11.3	16	22.5	35	49.3	71
1988	9	13.4	12	17.9	9	13.4	37	55.2	67
1989	16	18.2	25	28.4	16	18.2	31	35.2	88
1990	5	5.7	24	27.3	12	13.6	47	53.4	88
1991	16	22.5	9	12.7	28	39.4	18	25.4	71
1992	2	5.9	8	23.5	1	2.9	23	67.6	34
1993	5	12.5	13	32.5	3	7.5	19	47.5	40
Total	**65**	**14.2**	**99**	**21.6**	**85**	**18.5**	**210**	**45.8**	**459**
1997	18	31.6	10	17.5	14	24.6	15	26.3	57
1998	5	41.7		0.0	4	33.3	3	25.0	12
1999	5	18.5	4	14.8	5	18.5	13	48.1	27
2000	13	31.7	4	9.8	13	31.7	11	26.8	41
2001	14	53.8	2	7.7	7	26.9	3	11.5	26
2002	3	16.7	1	5.6	5	27.8	9	50.0	18
2003		0.0	9	33.3		0.0	18	66.7	27
2004	53	45.3		0.0	55	47.0	9	7.7	117
2005	15	22.7	9	13.6	15	22.7	27	40.9	66
2006	21	24.1	16	18.4	8	9.2	42	48.3	87
Total	**147**	**30.8**	**55**	**11.5**	**126**	**26.4**	**150**	**31.4**	**478**

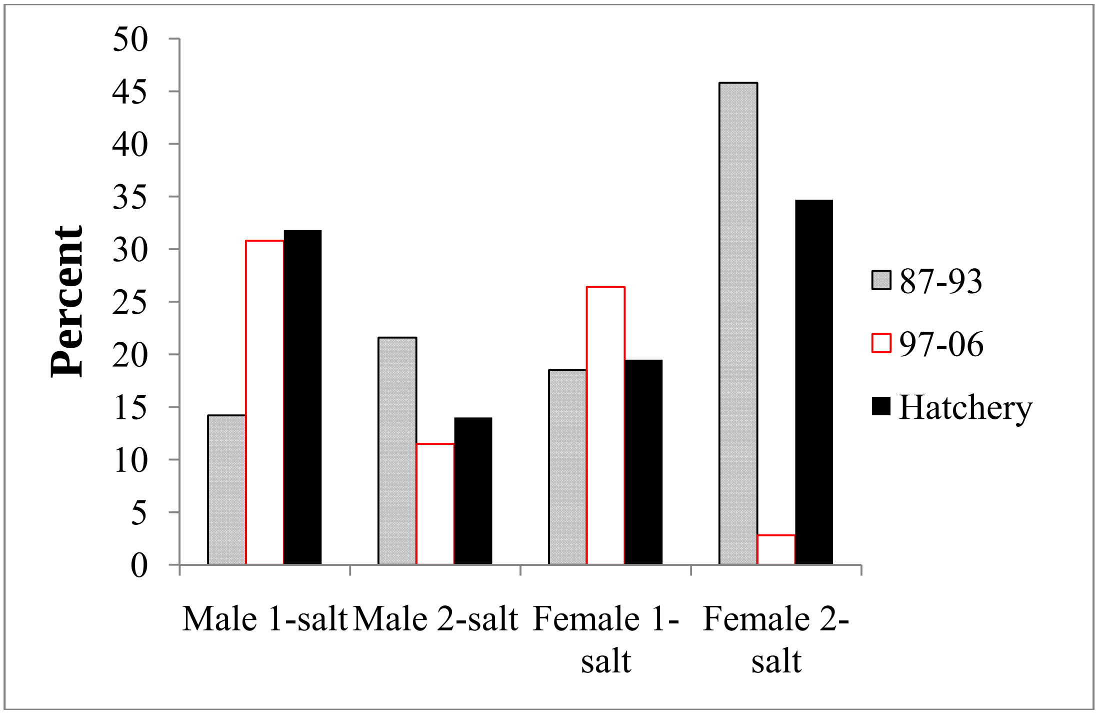

Figure 2-1. **Comparison of saltwater age structure of naturally produced steelhead sampled between1997-2006 and naturally produced and hatchery-origin fish between 1987-1993, based on Table 2 and 3.**

Table 2-3. **Numbers and percentages of steelhead by sex, saltwater age, and origin sampled at Wells Dam between 1997 and 2006 (based on Appendix C, Chapter 1 of Snow et al. 2008).**

Brood year	Male				Female				Total
	1-salt		2-salt		1-salt		2-salt		
	#	%	#	%	#	%	#	%	
1997	145	46.5	20	6.4	94	30.1	53	17.0	312
1998	122	28.2	64	14.8	78	18.0	169	39.0	433
1999	123	33.2	41	11.1	66	17.8	141	38.0	371
2000	113	34.7	28	8.6	87	26.7	98	30.1	326
2001	12	5.7	27	12.8	66	31.3	106	50.2	211
2002	106	28.3	68	18.2	50	13.4	150	40.1	374
2003	30	11.2	89	33.1	17	6.3	133	49.4	269
2004	183	59.0	3	1.0	118	38.1	6	1.9	310
2005	93	29.5	53	16.8	31	9.8	138	43.8	315
2006	98	32.6	58	19.3	22	7.3	123	40.9	301
Total	**1,025**	**31.8**	**451**	**14.0**	**629**	**19.5**	**1,117**	**34.7**	**3,222**

Methow Core Area Bull Trout

Mullan et al. 1992a reported some populations that did not mature until 9 years of age in the Methow Basin. They found that headwater male bull trout (potentially non-migratory ecotype) in the Methow River began to mature at age 5, and were all mature by age 6. Females from the same area began to mature at age 7 and were all mature by age 9. The bull trout that Mullan et al. (1992a) found that did not mature until 9 years of age are the oldest (at first maturity) reported within the literature. The oldest bull trout sampled in the Methow River was 12 years (Mullan et al. 1992a).

2.2.1.2 Sex Ratio

Methow Spring Chinook MPG

Mullan (1987) presented data compiled from Howell et al. (1985) on the number of returning male and female hatchery spring Chinook in the mid-Columbia. From those data, we calculated the sex ratios for Leavenworth, Entiat, and Winthrop populations. The range (female to male) for the three stocks was 1.27:1 to 1.86:1.

Sampling at Wells Dam in 2007 and 2008, estimates of sex ratio ranged (males to females) from 1.5:1 to 1.9:1 for hatchery fish and 1.1:1 to 1.5:1 for wild fish (C. Snow, pers. comm). It is important to note that determining sex of fish from Wells Dam months prior to sexual maturity is not considered accurate for spring Chinook, which may explain the difference between these data and those described above from Chapman et al. (1994).

Methow Summer Steelhead MPG

Based on the most recent information available (Appendix C, Chapter 1 of Snow et al. 2008), the female to male ratio for hatchery-origin and naturally produced fish is 1.2:1 and 1.3:1, respectively. This is similar to what has been reported previously (Mullan et al. 1992a; Chapman et al. 1994).

Methow Core Area Bull Trout

In Mullan et al. (1992a), the overall female to male ratio was 1.11:1, but for mature fish, they found almost twice the percentage of the population of males was mature (14.6 percent of the females and 24.3 percent of the males).

2.2.1.3 Fecundity

Methow Spring Chinook MPG

Fecundity from wild and hatchery spring Chinook salmon has been measured in recent years as part of the hatchery supplementation evaluation program. In the Methow River basin, fecundity (hand-counted) averaged 5,100 (range: 2,600 to 8,100) between 1992 and 1994 (Chapman et al. 1995). Since 2000, four-year-old wild females averaged 4,000 eggs, while 5-year-old wild fish averaged 4,800 eggs (Table 2-4). For hatchery fish, 4-year-old fish averaged 3,800 eggs, and 5-year-old fish averaged 4,400 (Table 2-4). As shown in Table 2-4, there are gaps between years, primarily for wild fish, especially 5-year-olds.

Table 2-4. Fecundity of Methow Basin spring Chinook (from Chapter 1, Appendix D of Snow et al. 2008).

	Age 4		Age 5	
Stock/year	**Wild**	**Hatchery**	**Wild**	**Hatchery**
Met Comp				
2000		3,759		
2001	3,753	3,949		
2002		3,905		3,318
2003		3,795		4,839
2004	3,565	3,510		3,510
2005	3,823	3,475		3,261
Average	3,714	3,732		3,732
Twisp				
2000		3,820		5,292
2001	4,720	3,922	4,941	4,469
2002		4,653		
2003		3,195		5,867
2004	3,811	3,496		
2005	4,216		4,745	4,745
Average	4,249	3,817	4,843	5,093
Average for Basin				
	3,981	3,771	4,843	4,413

<u>Methow Summer Steelhead MPG</u>

For fish sampled at Wells Dam between 2000 and 2006, 1-salt naturally produced fish average fecundity was higher than 1-salt hatchery-origin fish, while for 2-salt fish, hatchery-origin fish had slightly higher fecundity (Table 2-5).

Table 2-5. Mean fecundity by salt-age and origin of 2006 brood summer steelhead sampled at Wells Complex hatchery facilities (Appendix D, Chapter 1 from Snow et al. 2008).

Year	1-salt		2-salt	
	H	**W**	**H**	**W**
2000	4,837	5,760	6,049	
2001	4,356	3,865	6,624	6,714
2002	4,786	4,721	6,744	6,586
2003	4,241		6,545	6,954
2004	4,543	4,517	5,865	4,832
2005	4,547	5,370	6,575	6,627
2006	4,652	4,203	6,858	6,397
Average	**4,566**	**4,739**	**6,466**	**6,352**

Methow Core Area Bull Trout

Fecundity of bull trout varies with size. Fraley and Shepard (1989) found that fecundity averaged almost 5,500 eggs (up to over 12,000 in one individual) for migratory bull trout from the Flathead River. Martin et al. (1992) noted females between 271 and 620 millimeters (mm) long produced 380 to over 3,000 eggs in southeastern Washington streams. Mullan et al. (1992a) found one bull trout that was 300 mm in the Methow Basin had a fecundity of fewer than 200 eggs.

2.2.1.4 Size Range

Methow Spring Chinook MPG

Juveniles

In 2007, wild smolt length averaged just over 100 mm fork length (FL) (Table 6). Wild parr (fall-run) averaged almost 91 mm FL. Little variation occurs between years in smolt length (C. Snow, pers. comm.).

Table 2-6. Summary of length and weight of migrating Chinook juveniles in the Methow River in 2007 (from Chapter 3, Table 1 Snow et al. 2008).

Brood	Origin/stage	Fork length (mm)			Weight (g)			K-factor
		Mean	*N*	SD	Mean	*N*	SD	
2005	Wild smolt	100.7	395	8.6	11.6	393	2.9	1.1
2005	Hatchery smolt	129.9	186	17.5	27.8	186	11.2	1.3
2006	Wild fall parr	90.7	67	10.8	8.9	67	3.1	1.2

Adults

Length measurements (fork length) from wild and hatchery spring Chinook salmon have been measured in recent years as part of the hatchery evaluation program (Table 2-7). There appears to be little difference between streams or between wild and hatchery fish (Table 2-7).

Table 2-7. Mean fork length by age, sex and brood of spring Chinook collected for the Methow Hatchery program, 1998-2005 (from Chapter 1, Appendix C of Snow et al. 2008).

	Age - 3		Age - 4		Age - 5	
Stock/sex/year	**H**	**W**	**H**	**W**	**H**	**W**
Met Comp - male						
1998	54.0	52.0	79.0	74.9	94.0	92.7
1999	52.0		78.0	76.4		100.0
2000	52.1		73.3			
2001	60.0		80.6			
2002	48.3		79.0		100.0	
2003	49.0	51.0			96.7	
2004	48.3		72.0			
2005	52.1		72.3			
Average	*52.0*	*51.5*	*76.3*	*75.7*	*96.9*	*96.4*
Met Comp - female						
1998			76.3	76.1	87.2	89.0
1999			78.0	77.6		86.5
2000			74.5			
2001			76.9			
2002			76.3		87.3	
2003			75.3			
2004			73.4	75.0	76.0	
2005			74.3	71.0	81.0	
Average			*75.6*	*74.9*	*82.9*	*87.8*
Twisp - male						
1998			79.5		87.0	
1999	50.8					
2000	52.0	45.0	71.0			98.0
2001	63.0	52.5	79.3	75.3		
2002	46.3					
2003	50.7	50.0		67.0		
2004	49.0	45.7	72.2	71.6		
2005	49.6			82.0		
Average	*51.6*	*48.3*	*75.5*	*74.0*	*87.0*	*98.0*
Twisp - female						
1998			77.0		90.5	
1999				78.5		89.3
2000			75.1			91.0

	Age - 3		Age - 4		Age - 5	
Stock/sex/year	**H**	**W**	**H**	**W**	**H**	**W**
2001			76.9	79.6	92.5	88.0
2002			75.0			
2003			70.7			93.4
2004			73.0	75.8		
2005				81.0		88.5
Average			*74.6*	*78.7*	*91.5*	*90.0*
Total Basin Average - male						
1998	54.0	52.0	79.3	74.9	90.5	92.7
1999	51.4		78.0	76.4		100.0
2000	52.1	45.0	72.2			98.0
2001	61.5	52.5	80.0	75.3		
2002	47.3		79.0		100.0	
2003	49.9	50.5		67.0	96.7	
2004	48.7	45.7	72.1	71.6		
2005	50.9		72.3	82.0		
Average	*52.0*	*49.1*	*76.1*	*74.5*	*95.7*	*96.9*
Total Basin Average - female						
1998			76.7	76.1	88.9	89.0
1999			78.0	78.1		87.9
2000			74.8			91.0
2001			76.9	79.6	92.5	88.0
2002			75.7		87.3	
2003			73.0			93.4
2004			73.2	75.4	76.0	
2005			74.3	76.0	81.0	88.5
Average			*75.3*	*77.0*	*85.1*	*89.6*

<u>Methow Summer Steelhead MPG</u>

Juveniles

In the Upper Columbia Basin, naturally produced steelhead smolts sampled at Rock Island Dam have averaged between 163-188 mm FL (Peven and Hays 1989; Peven et al.1994). In the Methow Basin, smolt trapping has been ongoing since the mid 1990s, and in general length frequency of juveniles does not vary greatly between years (C. Snow, pers. comm.), and averages between from approximately 130 to 180 mm FL (this includes “transitional” juveniles that may or may not be smolting; Table 2-8).

Table 2-8. **Mean length and weight at migration age of wild transition and smolt summer steelhead captured at the Methow (A) and Twisp (B) smolt traps in 2007 (Tables 2 and 4, respectively, from Chapter 3 of Snow et al. 2008).**

A

Age	N (%)	Fork (mm)			Weight (g)			K-factor
		Mean	N	SD	Mean	N	SD	
1	6 (4.3)	138.7	6	17.8	32.6	6	14.4	1.2
2	122 (86.5)	175.2	122	20.1	55.3	117	20.1	1.0
3	12 (8.5)	181.5	12	22.4	58.4	10	22.7	1.0
4	1 (0.7)	174.0	1	- -	51.3	1	- -	0.9

B

Age	N (%)	Fork (mm)			Weight (g)			K-factor
		Mean	N	SD	Mean	N	SD	
1	7 (2.4)	128.6	7	14.6	24.3	6	7.8	1.1
2	231 (80.8)	162.2	229	17.4	42.7	226	12.9	1.0
3	43 (15.0)	180.6	43	20.5	58.6	43	17.7	1.0
4	5 (1.7)	177.2	5	9.6	56.8	5	11.1	1.0

Adults

Chapman et al. (1994) reported that female steelhead sampled at Wells from 1982 to 1992 ranged from 57 to 81 centimeters (cm) and 67 to 75 cm for fish spending 1 and 2 years in the ocean, respectively. Males ranged from 59 to 66 cm and 69 to 77 for 1 and 2 ocean fish.

The length frequency of broodstock captured in 2006 for the Wells steelhead program comports well with previous sampling at Wells Dam above (Table 2-9). In general, hatchery-origin fish are similar in size to naturally produced fish.

Table 2-9. Mean fork length (cm) by saltwater age, sex, and origin for broodstock sampled at Wells Hatchery Complex facilities, 1997-2006 (Chapter 1, Appendix C from Snow et al. 2008).

	Male				**Female**			
Brood	**1-salt**		**2-salt**		**1-salt**		**2-salt**	
year	**H**	**W**	**H**	**W**	**H**	**W**	**H**	**W**
1997	64.2	63.8	76.6	74.5	62.3	61.6	71.9	74.3
1998	64.8	65.6	79.3		62.1	64.0	75.3	74.3
1999	63.3	64.0	80.0	80.8	62.3	61.8	74.3	73.8
2000	63.4	62.9	77.8	76.0	61.4	62.5	73.8	76.8
2001	61.2	60.9	76.1	82.5	60.2	59.4	72.9	73.3
2002	64.3	63.7	78.3	76.0	62.9	63.8	73.6	74.7
2003	61.9		78.6	81.6	60.4		74.7	75.8
2004	60.9	64.2	73.0		60.1	62.2	67.5	73.4
2005	60.4	62.1	74.0	75.6	59.4	62.5	71.8	73.4
2006	60.3	65.2	75.6	77.4	59.7	61.4	70.9	72.7
Average	**62.5**	**63.6**	**76.9**	**78.1**	**61.1**	**62.1**	**72.7**	**74.3**

Methow Core Area Bull Trout

Juveniles

Length at age of bull trout found in Methow River tributaries by Mullan et al. (1992a) were the shortest by age group of any other lengths reported in the literature (Goetz 1989; Wydoski and Whitney 2003). Table 2-10 shows the age range of all bull trout sampled by Mullan et al. (1992a) in the 1980s. Considering that males began maturing at age 5 and females by age 7 (see above), all lengths shown in Table 2-10 for fish aged 5 and younger can be considered juveniles, and all of those older than that may be juveniles or adults (assume that older than age 8 would be adults). Juvenile mean length ranged from and averaged between 51 and 195 mm FL.

Table 2-10. Mean fork length[8] (mm) of bull trout sampled in the Methow Basin (Mullan et al. 1992a).

	Age											
Stream	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Methow R				188.	257.							
Gold Cr					230.							
Wolf Cr	58.	86.		168.	199.		229.	250.				
Early Winters	52.	89.	124.	136.	174.	198.	200.	186.	210.	188.		205.
Lake Cr	49.				152.							
WF Methow R	50.	82.			190.		207.					
Chewuch R						255.						
EF Buttermilk	48.	87.	112.	130.	204.	231.				324.		
Monument Cr	42.				179.							
Lost Cr				195.								
Cedar Cr	51.				172.							
Twisp R	58.	97.	120.	163.								
South Cr			116.									
Average	*51.*	*88.*	*118.*	*163.*	*195.*	*228.*	*212.*	*218.*	*210.*	*256.*		*205.*

Adults

BioAnalysts (2002) compared a sample of resident and fluvial fish from the Methow subbasin and found that the fluvial fish were two to three times larger than resident fish of the same age. BioAnalysts (2004) tagged adult migratory bull trout at Rock Island, Rocky Reach, and Wells Dam in 2001 to 2003. For fish tagged in 2002 at Wells Dam, bull trout averaged 57.3 cm FL. Most of the fish tagged at Wells Dam eventually headed to the Methow River basin (some fish tagged at both Rocky Reach and Rock Island also headed in some years to the Methow Basin).

2.2.1.5 Migration Timing

<u>Methow Spring Chinook MPG</u>

Mainstem Columbia River

Adult spring Chinook destined for areas upstream from Bonneville Dam (upriver runs) enter the Columbia River beginning in March and reach peak abundance (in the lower river) in April and early May (WDF and ODFW 1994). Fifty percent of the spring Chinook run passes Priest Rapids and Rock Island dams by mid-May, while most pass Wells Dam somewhat later (Howell et al. 1985; Chelan and Douglas PUD, unpublished data). Chinook that pass Rock Island Dam are considered "spring-run" fish from the beginning of counting (mid-April) through approximately the third week of June (French and Wahle 1965; Mullan 1987).

[8] Mullan et al. (1992a) reported bull trout length in Appendix K (their Table 4) by temperature units, so there may be multiple measurements per age class per stream. This table combined (averaged) each age class per stream.

Methow River

The Methow basin spring Chinook migrate past Wells Dam and enter the sub-basin in May and June, peaking after mid-May. Differences in migration timing have been observed between, but not within, age classes. Hatchery 3-year-olds migrated to Wells Dam later than hatchery 4- and 5-year-olds, as well as wild 5-year-olds (Snow et al. 2008), which has likely contributed to a decline in 5-year-old returns because the fishery below Bonneville Dam routinely commences during the earliest part of the run.

<u>Methow Summer Steelhead MPG</u>

Mainstem Columbia River

Adults return to the Columbia River in the late summer and early fall. A portion of the returning run over-winters in the mainstem reservoirs, passing over the UCR dams in April and May of the following year.

In 2006, naturally produced fish began their migration earlier than hatchery-origin fish (Table 2-11). The run timing observed in 2006 followed a typical beginning (July) and ending (October) for a calendar year. However, it is important to reiterate that a portion of the fish that spawned upstream of Wells Dam pass the dam in the following spring after over-wintering in the mainstem Columbia River.

Table 2-11. Migration of hatchery and wild steelhead to Wells Dam between 31 July and 26 October, 2006 (Table 6, Chapter 4 from Snow et al. 2008).

Origin	*N*	Cumulative migration date			
		25%	50%	75%	100%
Hatchery	6,002	7-Sept	19-Sept	28-Sept	26-Oct
Wild	489	27-Aug	11-Sept	28-Sept	26-Oct

Methow River

There is no Methow-specific information on run timing, but steelhead are known to enter the river in late summer (August), through the following May, based on observations from trout and steelhead fisheries and radio telemetry studies (English et al. 2001, 2003).

<u>Methow Core Area Bull Trout</u>

The focus of this discussion is migratory (not resident) bull trout.

Bull trout were tagged by BioAnalysts (2004) between May 1 and the first week of June in this 3-year study. Most bull trout entered the Methow by the end of June and were found in possible spawning locations (usually in August) well before the initiation of spawning. Most tagged trout left tributary streams by late November.

During the study period (2001 to 2003) bull trout entered Mid-Columbia tributaries from April to September but most (94 percent) entered tributaries during May, June, and July. At the time bull trout entered tributary streams, the mean daily temperatures in the mainstem Columbia River varied from 5.4°C to 19.6°C. Similarly, tributary mean daily temperatures ranged from 7.5°C to 17.2°C. Most bull trout (92.3 percent) entered tributaries before the Columbia River reached a mean temperature of 15°C.

2.2.1.6 Spawning Range

Methow Spring Chinook MPG

Methow Basin spring Chinook spawn primarily in the upper reaches of the Chewuch, Twisp, and Methow rivers, including the Lost River, Early Winters, and Wolf Creek tributaries; in order of decreasing redd numbers: the mainstem Methow, Twisp, Chewuch, Lost Rivers, and Early Winters Creek. No significant differences have been detected in the distribution of hatchery and wild carcasses (females) within each subbasin (Snow et al. 2008).

Methow Summer Steelhead MPG

In the Methow River, steelhead currently spawn in the Twisp River, mainstem Methow River, Early Winters Creek, Lost River, Chewuch River, Beaver Creek, Black Canyon Creek, Lost River, Buttermilk, Boulder, Eight-Mile, Suspension, and Little Suspension, and Lake Creeks (Snow et al. 2008).

Methow Core Area Bull Trout

Bull trout are currently known to spawn in Lost, Chewuch, West Fork Methow, and Twisp Rivers, Little Bridge, Early Winters, Goat, Wolf, East Fork Buttermilk, Blue Buck (in Beaver Creek watershed), Gold, and Lake Creeks (Gene Shull, pers. comm.).

2.2.1.7 Spawning Timing

Methow Spring Chinook MPG

Spawning occurs late July through mid-September. There have been no significant differences in spawn timing between hatchery and wild fish (females) within or among sub-basins, although it appears hatchery fish spawn earlier than wild fish (Snow et al. 2008).

Methow Summer Steelhead MPG

Spawning occurs in the late spring of the calendar year following entry into the river, and usually ranges from mid-late March through May. Spawn timing within the index areas shows that the peak spawn timing in 2007 in the Chewuch sub-basin occurred during the week of April 15. Peak spawning in the remaining three sub-basins all occurred between April 15 and 30. Differences in spawn timing between hatchery and wild fish has not been assessed because many hatchery fish do not possess an externally visible mark (i.e., ad-clip[9]), thus confounding the surveyors ability to determine the origin of spawning adults (Snow et al. 2008).

Methow Core Area Bull Trout

Bull trout are strongly influenced by water temperature during all life stages and for all ecotypes. Most bull trout spawn from mid-September through October, with timing related to declining water temperatures. Spawning sites are commonly found in areas of ground water interchange, both from the subsurface to the river, and from the river to the subsurface. Association with areas of ground water interchange can promote oxygen exchange and mitigate severe winter temperatures including the formation of anchor ice.

Within the Methow Basin, spawning begins in headwater streams in late September and continues through October, with commencement closely tied to water temperature between 9 and 11°C (Brown 1992). After spawning, fluvial and adfluvial kelts return to their more moderate environments, while resident forms seek winter refuge. In Methow drainage tributaries, bull trout spawning and early rearing is confined to streams cold enough (less than 1,600°C annual temperature units) to support them in areas below barrier falls (Mullan et al. 1992a). In most cases, such reaches are very short (less than 5 miles).

2.2.1.8 Juvenile Life History Strategy

Methow Spring Chinook MPG

Fry emerge the spring following spawning, and are assumed to smolt as yearlings, although fall parr migrations from upper reaches have been observed (Hubble 1993; Hubble and Harper 1999; Snow et al. 2008), although where these fall migrants rear prior to smolting the next spring is still unknown.

Fryer et al. (1992) summarized age information of spring Chinook sampled at Bonneville Dam from 1987 through 1991. They found no adult scales with two stream annuli (2.x), although in every year there were some fish estimated to have entered the ocean in their first year of life (0.x; probably from the Snake River basin). Adults sampled in the UCR tributaries have shown no 0.x or 2.x life histories.

Individuals that never migrated to the sea make up some portion of the spawning population (Healey 1991; Mullan et al. 1992a). Mullan et al. (1992a) indicate that precocious maturation of male spring Chinook is common in the mid-Columbia basin and is characteristic of both hatchery and wild stocks. Generally the largest males show evidence of early maturity (Rich 1920). This may explain why large numbers of hatchery fish mature precociously, since they are typically larger at age than their wild counterparts.

[9] All hatchery-origin fish are externally marked, but a portion have only elastomer tags, which would not be readily visible to surveyors. It is also important to note that since steelhead are iteroparous, and they spawn during a period of increasing stream discharge, examination of carcasses, as in the case of spring Chinook salmon, is not possible.

The proportion of males that mature precociously is mostly unknown. Mullan et al. (1992a) examined 20,000 wild juvenile Chinook in tributaries of the mid-Columbia River during 1983 to 1988 and found that precocious males made up about 1 percent of the sample. However, if jacks (age-2 males that return after 1 year in the ocean) are included, the percentage of males that mature precociously would be much greater than 10 percent.

The extent that precocious males contribute to reproduction is unknown. In the Upper Columbia Basin, males that mature in freshwater during their first or second summer may contribute to reproduction, and may contribute more than jacks under certain conditions. For example, Leman (1968) and Mullan et al. (1992b) observed only precocious males attending large female Chinook in small headwater streams that were accessible only at high water. In Marsh Creek and Elk Creek, Idaho, precocious males occurred most frequently where there was active spawning (Gebhards 1960). These fish usually lay within the depression of the redd with an adult female, or male and female pair. Gebhards (1960) reports seeing between 4 and 30 precocious males within redds. Apparently these fish frequent spawning areas to reproduce, not to forage on eggs. Gebhards (1960) analyzed the stomach contents of several precocious males and found that only 5 percent had consumed eggs. Furthermore, most (85.1 percent) of the dead precocious males that he found were partly or completely spent.

The mechanism that dictates the life history tactic of Chinook is not well understood (Gross 1991), however, recent studies have indicated that growth rate can be a large factor determining the incidence of precocial and residualism rates in hatchery fish (Larsen et al. 2004, 2006; Sharpe et al. 2007). In the wild, juvenile size is determined by many variables, such as genotype, egg size, time of hatching, water flow, water temperature, territory quality, stream productivity, predation pressure, and population density. Changes in these variables may therefore affect the life history of Chinook.

Precocious males may play a significant role in reproduction in the Upper Columbia Basin, spawning successfully not only as "sneakers" in the presence of older males, but as the sole male present in some areas and in some years when spawner numbers are very low. They probably play a greater role in spawning in years such as 1994 and 1995, when numbers of spawners were so low that adult females were widely dispersed.

Methow Summer Steelhead MPG

The life-history pattern of steelhead in the Upper Columbia Basin is complex (Chapman et al. 1994). In the Upper Columbia region, Peven et al. (1994) observed smolt ages ranging from 1 to 7 years, with the highest percentages at ages 2 and 3. Female smolts (63 percent of fish sampled) were older and larger for most age classes than males.

Steelhead can residualize in tributaries and never migrate to sea, thereby becoming resident rainbow trout. Conversely, progeny of resident rainbow trout can migrate to the sea and thereby become steelhead. This dynamic expression of life-history characteristics makes *O. mykiss* very challenging to understand and manage. It is difficult to summarize one life history strategy (anadromy) without due recognition of the other (non-migratory). The two strategies co-mingle on some continuum with certain stream residency at one end, and certain anadromy on the other.

Upstream distribution is limited by low heat budgets (about 1,600 temperature units) (Mullan et al 1992a). The response of steelhead/rainbow complex in these cold temperatures is residualism, presumably because growth is too slow within the time window for smoltification. However, these headwater rainbow trout contribute to anadromy via emigration and displacement to lower reaches, where warmer water improves growth rate and subsequent opportunity for smoltification.

Methow Core Area Bull Trout

Migratory juveniles usually rear in natal streams for 1-4 years before emigration (Goetz 1989; Fraley and Shepard 1989; Pratt 1992). Methow Subbasin juvenile bull trout rear in the coldest headwater locations until they reach a size that allows them to compete with other fish (75 to 100 mm; Mullan et al. 1992a). Non-migratory forms above barrier falls probably contribute a limited amount of recruitment downstream, nevertheless, this recruitment contributes to fluvial and adfluvial productivity. The fluvial forms migrate to the warmer mainstem Methow and Columbia rivers (e.g., Twisp River, Wolf Creek), while the adfluvial populations (e.g., Lake Creek, Cougar Lake) migrate to nearby lakes.

2.2.1.9 Smolt Emigration Timing

Methow Spring Chinook MPG

Smolt trapping has occurred in the Methow Basin since the mid 1990s as part of the hatchery evaluation program. In general, yearling spring Chinook (smolts) migrate down the Methow River between early March and the end of May to early June. The peak of the migration in 2007 appeared later in the Twisp River compared to the Methow River site (Figures 2-2 and 2-3), although trap efficiencies and periods when traps are inoperable may influence the absolute numbers of fish caught on a given date.

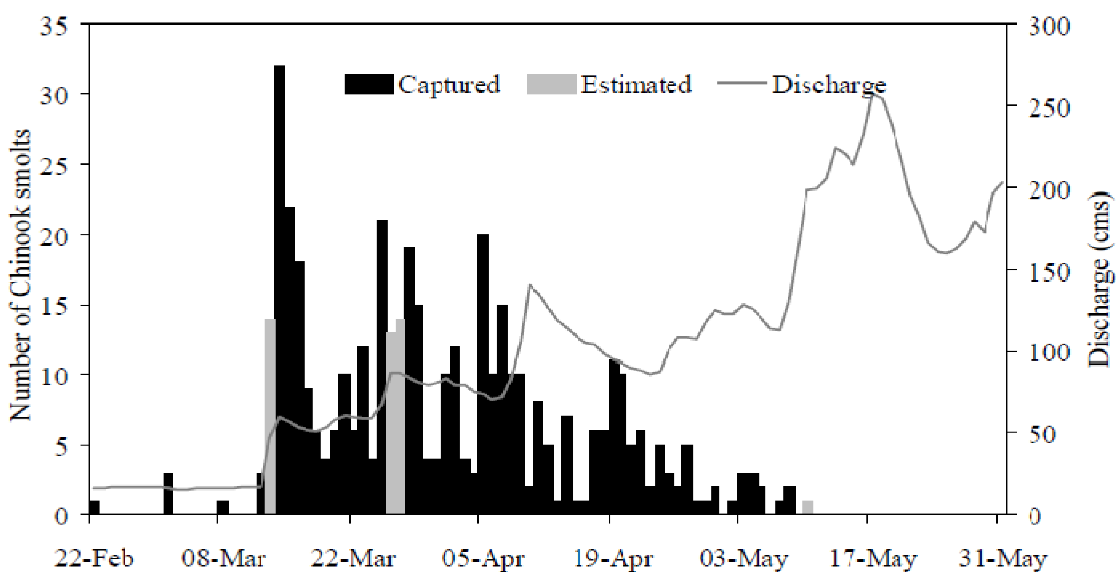

Figure 2-2. Daily capture of wild Chinook salmon smolts from the Methow River trap in 2007 (Figure 3, Chapter 3 from Snow et al. 2008).

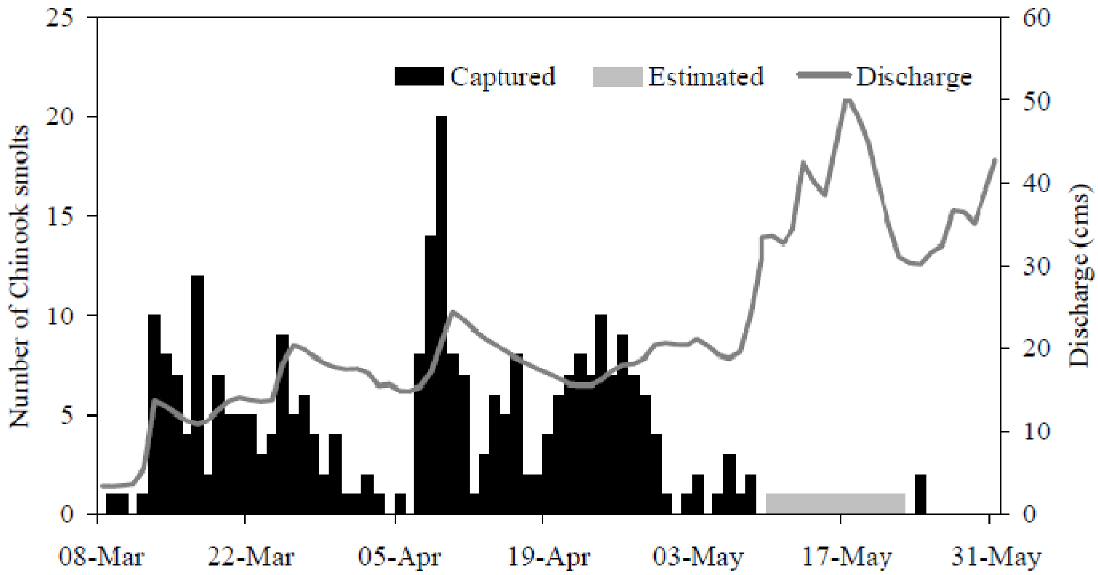

Figure 2-3. **Daily capture of wild Chinook salmon smolts from the Twisp River trap in 2007 (Figure 6, Chapter 3 from Snow et al. 2008).**

As previously stated, a substantial parr migration occurs within the Methow Basin, and appears in two main phases—throughout the summer and then again in the fall (Figure 2-4).

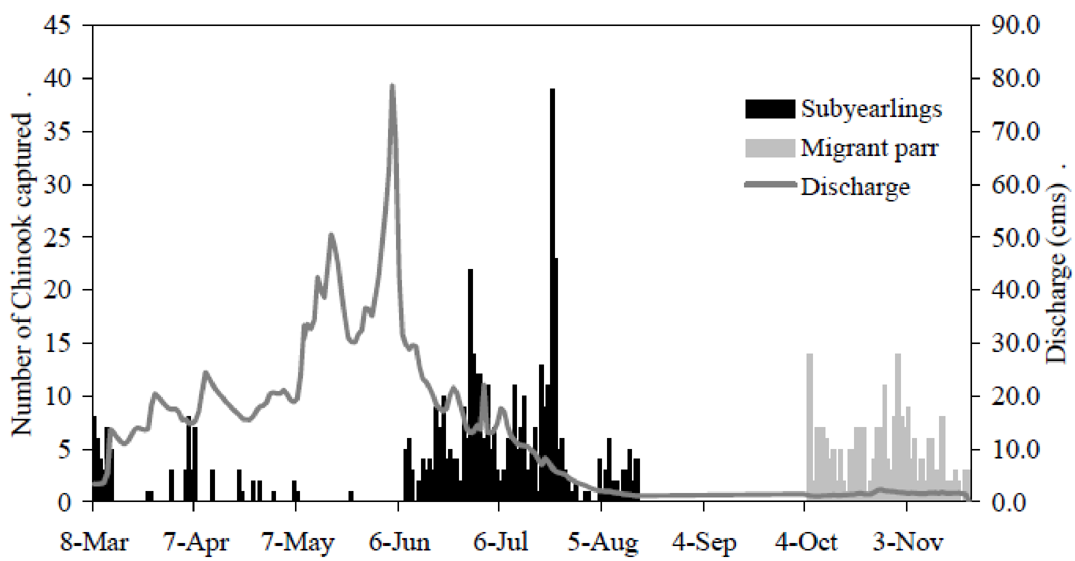

Figure 2-4. **Daily capture of sub-yearling wild spring Chinook and migrant parr at the Twisp River trap in 2007 (Figure 7, Chapter 3 from Snow et al. 2008).**

Methow Summer Steelhead MPG

Smolt trapping has occurred in the Methow Basin since the mid 1990s as part of the hatchery evaluation program. In general, *O. mykiss* juveniles[10] migrate down the Methow River between early March and the end of May to early June. The peak of the migration in 2007 appeared later in the Twisp River compared to the Methow River site (Figures 2-5 and 2-6), although trap efficiencies and periods when traps are inoperable may influence the absolute numbers of fish caught on a given date.

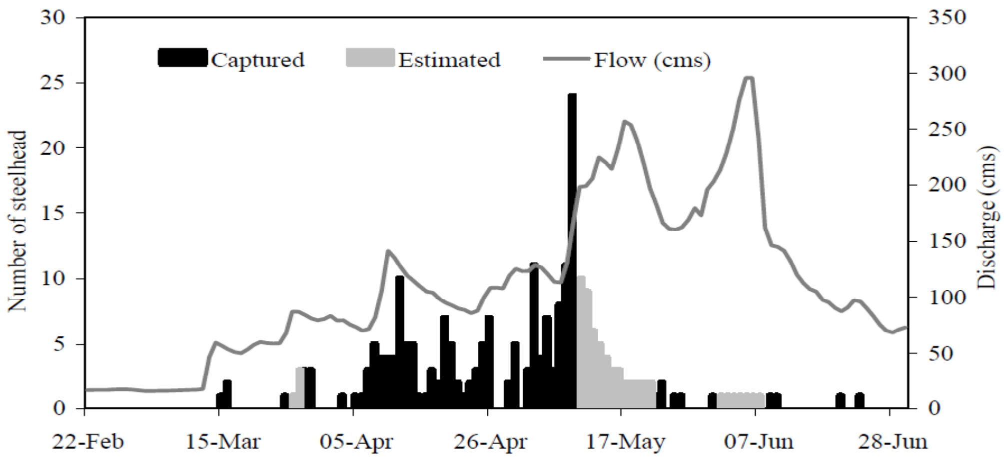

Figure 2-5. Daily capture of wild steelhead smolts and transitional parr from the Methow River trap in 2007 (Figure 5, Chapter 3 from Snow et al. 2008).

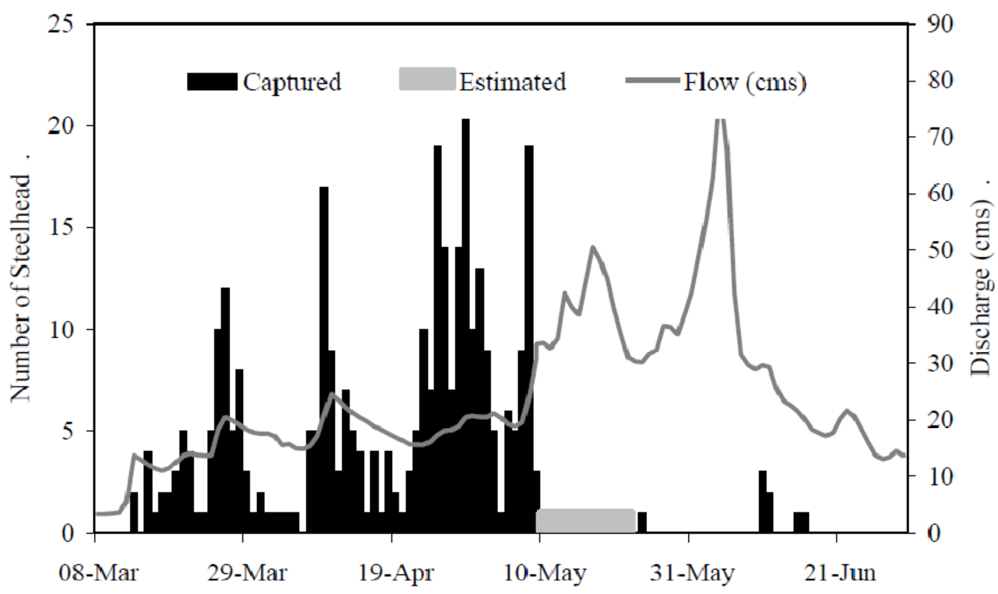

Figure 2-6. Daily capture of wild steelhead smolts and transitional parr from the Twisp River trap in 2007 (Figure 8, Chapter 3 from Snow et al. 2008).

[10] Because it is not possible to determine whether juvenile *O. mykiss* are "trout" or "steelhead", we refer to them by their scientific nomenclature.

As previously stated, a substantial parr migration occurs within the Methow Basin, and appears in two main phases—throughout the summer and then again in the fall (Figure 2-7).

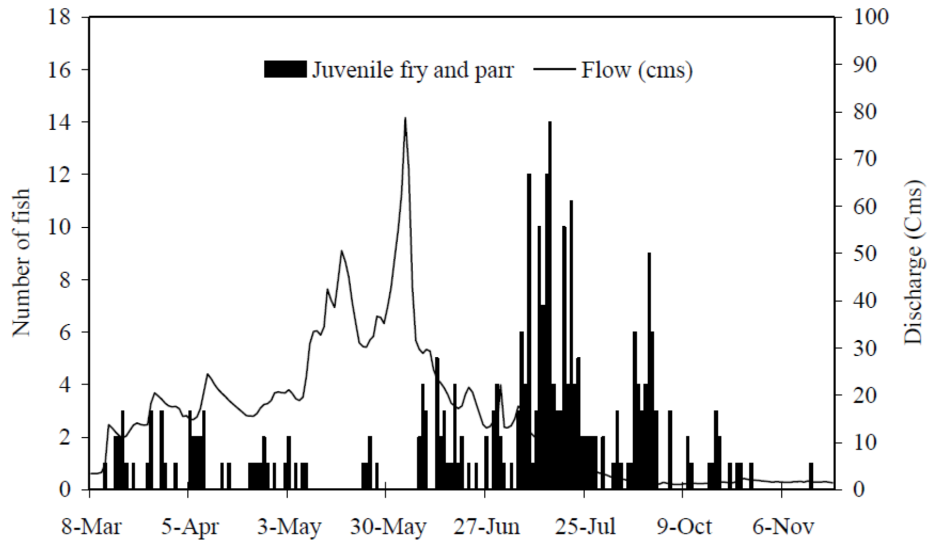

Figure 2-7. Daily capture of natural-origin steelhead fry and parr at the Twisp River trap in 2007 (Figure 9, Chapter 3 from Snow et al. 2008).

Methow Core Area Bull Trout

All of the fish that BioAnalysts (2004) tagged in their 3-year study appeared to have spent at least three years in their natal stream prior to migrating to the Columbia River.

2.2.1.10 Spatial And Temporal Distribution of Spawners in Relation to Fish Release Location

Methow Spring Chinook MPG

Snow et al. (2008) found no significant differences in spawn timing between hatchery and natural-origin fish (females) within or among sub-basins. However, hatchery fish tended to spawn earlier than naturally produced fish, except in the Twisp River (which had the lowest proportion of hatchery-origin spawners).

Snow et al. (2008) found no significant differences were detected in the distribution of hatchery and natural-origin carcasses (females) within each major spawning area either). However, hatchery fish tended to spawn lower in each of the spawning areas than naturally produced fish.

Methow Hatchery spring Chinook salmon are typically released in three locations in the Methow River basin. All of the acclimation sites use surface water for rearing prior to release to increase homing fidelity. Despite this, an estimated 49 percent of the Twisp-released fish spawning in the Methow Basin spawned in areas other than the Twisp River. However, because abundance of

Twisp-stock fish is relatively low, their prevalence typically comprises a small proportion of the escapement within other spawning areas (i.e., Methow and Chewuch rivers). Similarly, an estimated 60 percent of the Chewuch-released fish spawned in areas other than the Chewuch River, but because release numbers are much greater, contribution of these fish to other spawning areas can be high. Conversely, an estimated 28 percent of Methow-released fish spawned in areas other than the Methow River (Snow et al. 2008).

Methow Summer Steelhead MPG

Because there is currently no way to differentiate steelhead by origin on the spawning grounds, there is no information to fill in for this subheading. The lack of this ability (to determine origin on the spawning grounds) has been identified by the Upper Columbia Regional Technical Team as an important data gap.

Methow Core Area Bull Trout

There are currently no hatchery programs for bull trout in the Methow River.

2.2.1.11 Identify the NMFS ESA-listed Population(s) that will be Directly Affected by the Program

Methow Spring Chinook MPG

Common Name	Endangered Species Act	Natural population targeted for integration
Spring Chinook salmon (UCR)	Endangered	Methow spring Chinook

Methow Summer Steelhead MPG

Common Name	Endangered Species Act	Natural population targeted for integration
Steelhead trout (UCR)	Threatened	Methow River summer steelhead

Methow Core Area Bull Trout

There are currently no hatchery programs for bull trout in the Methow River.

2.2.1.12 Identify the NMFS ESA-listed Population(s) that may be Incidentally Affected by the Program

Methow Spring Chinook MPG

Common Name	Endangered Species Act
Spring Chinook salmon (UCR)	Endangered
Steelhead trout (UCR)	Threatened
Bull trout (Columbia River)	Threatened

Methow Summer Steelhead MPG

Common Name	Endangered Species Act
Spring Chinook salmon (UCR)	Endangered
Steelhead trout (UCR)	Threatened
Bull trout (Columbia River)	Threatened

Methow Core Area Bull Trout

There are currently no hatchery programs for bull trout in the Methow River.

2.2.2 Status of NMFS ESA-listed Salmonid Population(s) Affected by the Program

2.2.2.1 Describe the Status of the Listed Natural Population(S) Relative to "Critical" and "Viable" Population Thresholds (see definitions in "Attachment 1")

Methow Spring Chinook MPG

The ICTRT (2007) has classified the Methow River spring Chinook as a "Very Large" population in size based on its historic habitat potential. A "Very Large" population is one that requires a minimum abundance of 2,000 natural-origin spawners and an intrinsic productivity of greater than 1.75 spawner to spawner (S/S) to be viable. The Recovery Plan (UCSRB 2007) incorporated the abundance goal of 2,000 naturally produced spawners (geometric mean over 12 years), but incorporated an earlier recommendation from the ICTRT of an intrinsic productivity of 1.2.

Regardless of which productivity metric is used, the Methow spring Chinook currently are considered to have a greater than 25 percent chance of becoming extinct within 100 years.

Methow Summer Steelhead MPG

The ICTRT (2007) has classified the Methow River summer steelhead as an "Intermediate" population in size based on its historic habitat potential. An "Intermediate" population is one that requires a minimum abundance of 1,000 natural-origin spawners and an intrinsic productivity of greater than 1.1 S/S to be viable. The Recovery Plan (UCSRB 2007) incorporated the abundance goal of 1,000 naturally produced spawners (geometric mean over 12 years) and an intrinsic productivity of 1.1.

Methow summer steelhead are currently considered to have a greater than 25 percent chance of becoming extinct within 100 years.

Methow Core Area Bull Trout

Because of a lack of detailed information on the population dynamics of bull trout in the Upper Columbia Basin, a different approach was used to estimate Viable Salmonid Population (VSP) parameters for bull trout in UCSRB (2007). Bull trout abundance was estimated as the number of redds times 2.0 to 2.8 fish per redd. This approach provided a range of abundance estimates for bull trout within each core area (USFWS 2004, 2005). Productivity was based on trends in redd counts, while diversity was based on general life-history characteristics of bull trout (resident, fluvial, and adfluvial) within each core area. Although these parameters were less rigorous than the parameters used to estimate status of spring Chinook and steelhead, they provide relative indices of abundance, productivity, and diversity.

In the final listing rule (63 FR 31647), USFWS identified eight bull trout sub-populations in the Entiat, Wenatchee, and Methow River basins (USFWS 1998). USFWS identified eight sub-populations within this recovery unit: Lake Wenatchee, Ingalls Creek, Icicle Creek, Entiat system, Methow River, Goat Creek, Early Winters Creek, and Lost River. USFWS considered half of these to be "at risk of stochastic extirpation" due to: a) their inability to be re-founded, b) presence of a single life history form, c) limited spawning areas, and c) relatively low abundance.

In the 5-year review (USFWS 2008), the USFWS determined that the Methow core area was at high risk of extinction.

2.2.2.2 Provide the Most Recent 12 Year (e.g., 1988-Present) Progeny-to-Parent Ratios, Survival Data by Life-Stage, or Other Measures of Productivity for the Listed Population. Indicate the Source of these Data.

Methow Spring Chinook MPG

During the period 1960 to 1999, returns per spawner for spring Chinook in the Methow sub-basin ranged from 0.05 to 5.21 (UCSRB 2007). The 12-year geometric mean of returns per spawner during this period ranged from 0.41 to 1.02. The geometric mean at the time of listing (1999) was 0.51.

Since 1999, the natural replacement rate (the number of recruits from successive return years that originated from the same brood year, and dividing the sum by the number of spawners for that brood year) has varied, but remains low, especially in the Methow River spawning area (Table 2-12). The most recent geometric mean of productivity remains near 0.51, which it was at the time of listing for the Chewuch and Twisp spawning areas, but approximately half that amount in the Methow spawning area, which coincidentally has the highest proportion of hatchery-origin spawners.

Table 2-12. The natural replacement rate of Methow River basin spring Chinook between the 1992 and 2001 brood years (data from Chapter 5, Appendix A from Snow et al. 2008).

	NRR		
Year	**Chewuch**	**Methow**	**Twisp**
1992	0.11	0.10	0.30
1993	0.52	0.17	0.13
1994	0.30	0.20	0.34
1995	5.53	2.83	3.23
1996	12.75	17.89	8.64
1997	12.68	5.98	17.25
1998	12.66	3.73	17.75
1999	0.11	0.07	0.31
2000	1.10	0.52	1.72
2001	0.13	0.04	0.18
2002	0.32	0.15	0.48
Geometric mean	*1.00*	*0.53*	*1.16*

Methow Summer Steelhead MPG

In UCSRB (2007), the returns per spawner were expressed as either a hatchery spawner effectiveness of 100 percent or 0 percent. The geometric mean of returns per spawner is 0.09 if hatchery spawner effectiveness was 100 percent, and 0.84 if hatchery spawner effectiveness was 0 percent up to the 1996 brood.

More recently, Snow et al. (2008) estimated that the total (not accounting for hatchery spawner effectiveness) average return per spawner as 0.30 for brood years 1996 to 2001 (Table 2-13). This value is in between the two reported in UCSRB (2007).

Table 2-13. The natural replacement rate of Methow River basin steelhead between the 1996 and 2001 brood years (data from Chapter 4, Table 16 from Snow et al. 2008).

Parent Brood	Recruits	NRR
1996	315	0.56
1997	684	0.28
1998	730	0.30
1999	167	0.11
2000	848	0.40
2001	595	0.16
Average	***557***	***0.30***

Methow Core Area Bull Trout

Numbers of redds counted in the Methow sub-basin appear to have increased since the mid-1990s. This reflects both an actual increase in redds and an artifact of improved survey methods. Looking at recent years (2000 to 2007), when survey methods were similar, there is an increasing trend in redds, ranging from 147 in 2000 to 231 in 2007 (see below).

2.2.2.3 Provide the Most Recent 12 Year (e.g., 1988-1999) Annual Spawning Abundance Estimates, or any Other Abundance Information. Indicate the Source of these Data.

Methow Spring Chinook MPG

From 1960 to 2003, abundance of age 3+ naturally produced spring Chinook in the Methow sub-basin ranged from 33 to 9,904 adults. During this period the 12-year geometric mean of spawners in the sub-basin ranged from 480 to 2,231 adults. The 12-year geometric mean at the time of listing (1999) was 480 spawners (UCSRB 2007).

More recently (1992-2008), the estimated escapement of naturally produced spring Chinook has ranged from approximately 58 (2003) to 1,832 fish (2001), with a geometric mean of 363 (Table 2-14).

Table 2-14. Estimated escapement of spring Chinook in the Methow River, 1992-2007 (based on Appendices A and D, Chapter 5, from Snow et al. 2008 and unpublished 2009 WDFW data).

Return	Estimated Escapement							
	Chewuch		Methow		Twisp		Total	
Year	H	W	H	W	H	W	H	W
1992		422		924		316		1,662
1993		184		537		426		1,147
1994		63		172		74		309
1995		6		27		12		45
1996								
1997		123		155		72		350
1998								
1999		21		70		25		116
2000	52	83	546	611	235	256	833	950
2001	1,761	732	6,994	594	384	506	9,139	1,832
2002	588	78	1,644	86	60	181	2,292	345
2003	465	25	597	8	18	25	1,080	58
2004	289	46	622	199	98	243	1,009	488
2005	289	219	526	221	34	87	849	527
2006	378	135	942	128	100	65	1,420	328
2007	203	74	545	152	65	40	813	266
2008	166	86	468	172	126	40	760	298
Geometric mean	***310***	***84***	***873***	***158***	***86***	***92***	***1,342***	***363***

Methow Summer Steelhead MPG

Between 1988 and 2007, the run of naturally produced steelhead returning to the Methow River has ranged from 66 (1995) to 669 (2004). The most recent 12-year average (1996 to 2007) geometric mean is estimated at 329 fish (Table 2-15).

Table 2-15. Estimated return of naturally produced steelhead to the Methow River, 1988-2009. Information based on UCSRB (2007) and Snow et al. (2008) and unpublished WDFW data.

Return year	Estimated naturally produced return	12-year running geometric mean of return
1988	316	116
1989	401	126
1990	315	160
1991	552	184
1992	252	242
1993	130	240
1994	165	275
1995	128	250
1996	222	247
1997	96	224
1998	186	221
1999	350	229
2000	436	236
2001	702	247
2002	651	262
2003	847	272
2004	638	294
2005	558	331
2006	472	362
2007	762	420
2008	898	472

Methow Core Area Bull Trout

Bull trout redd surveys in the Methow sub-basin began in the early 1990s. Total numbers of redds within the sub-basin have ranged from 4 to 231 (Table 2-16). Following the UCSRB (2007), using 2.0 and 2.8 fish per redd equates to a range of abundance between 22 and 647 fish per year in the Methow Basin (Table 2-17).

Table 2-16. Bull trout redds from the Methow Basin between 1992 and 2007 (pers. comm., Barb Kelly and Gene Shull, USFWS and USFS, respectively).

Stream/ watershed	Methow River Basin															
	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Lower Methow watershed					2	2	1	0		0	1	0		14	4	4
Twisp watershed	4	5	4	25	0	2	86	101	105	76	93	86	101	87	89	108
Chewuch watershed				22	13	9	8	0	18	31	22	20	10	43	54	46
Upper Methow watershed	7			28	29	18	40	30	42	47	79	21	58	71	63	73
Redd Total:	**11**	**5**	**4**	**75**	**44**	**31**	**135**	**131**	**165**	**154**	**195**	**127**	**169**	**215**	**210**	**231**
Miles Surveyed Total:				**18.7**	**25.6**	**20.2**	**26.7**	**27.8**	**22.9**	**42.5**	**28.7**	**30.6**	**30.7**	**33.3**	**32.3**	**32.8**

Note: Not all bull trout redd counts were complete, and length of stream surveyed has varied between some surveys, in many cases with new survey reaches being added in recent years. Please refer to the annual spawning survey reports for more complete information.

Lower Methow includes Crater Creek; Middle Methow includes Wolf and Goat Creeks; and Upper Methow includes the upper mainstem basin, Early Winters basin, and lower Lost River basin.

Table 2-17. The number of bull trout estimated to spawn in the Methow Basin between 1992 and 2007, based on Table 2-16 and using either 2.0 fish per redd (f/r) or 2.8.

Year	Total Redds	Fish @ 2.0 f/r	Fish @ 2.8 f/r
1992	11	22	31
1993	5	10	14
1994	4	8	11
1995	75	150	210
1996	44	88	123
1997	31	62	87
1998	135	270	378
1999	131	262	367
2000	165	330	462
2001	154	308	431
2002	195	390	546
2003	127	254	356
2004	169	338	473
2005	215	430	602
2006	210	420	588
2007	231	462	647

2.2.2.4 Provide the Most Recent 12 Year (e.g., 1988-1999) Estimates of Annual Proportions of Direct Hatchery-Origin and Listed Natural-Origin Fish on Natural Spawning Grounds, if Known

Methow Spring Chinook MPG

The percentage of hatchery-origin fish on the spawning grounds has been rising since 2001, and in particular in the Chewuch and Methow spawning areas since 2005 (Table 2-18). Except for 2007, the percentage of hatchery-origin fish spawning in the Twisp has remained consistently below 30 percent (Table 2-18).

Table 2-18. Percentages of hatchery-origin spring Chinook spawners in the Methow Basin, based on Table 2-14.

	Percentages							
	Chewuch		Methow		Twisp		Total	
Return Year	H	W	H	W	H	W	H	W
2001	41.4	58.6	48.0	52.0	30.1	69.9	42.1	57.9
2002	46.9	53.1	48.7	51.3	24.9	75.1	45.7	54.3
2003	48.7	51.3	49.7	50.3	29.5	70.5	51.4	48.6
2004	46.9	53.1	48.7	51.3	19.9	80.1	43.0	57.0
2005	56.9	43.1	70.4	29.6	28.1	71.9	61.7	38.3
2006	86.3	13.7	75.8	24.2	28.7	71.3	65.4	34.6
2007	73.3	26.7	78.1	21.9	61.9	38.1	69.5	30.5
2008	65.9	34.1	73.1	26.9	75.9	24.1	71.8	28.2
Average	*58.3*	*41.7*	*61.6*	*38.4*	*37.4*	*62.6*	*56.3*	*43.7*

Methow Summer Steelhead MPG

Using the percentage of natural-origin fish sampled at Wells Dam as a surrogate for the percentage of natural-origin fish on the spawning grounds shows that the percentage of hatchery steelhead on the spawning grounds is typically greater than 90 percent (Figure 2-8). The long-term average percentage of naturally produced fish sampled at Wells Dam is approximately 8 percent (Figure 2-8).

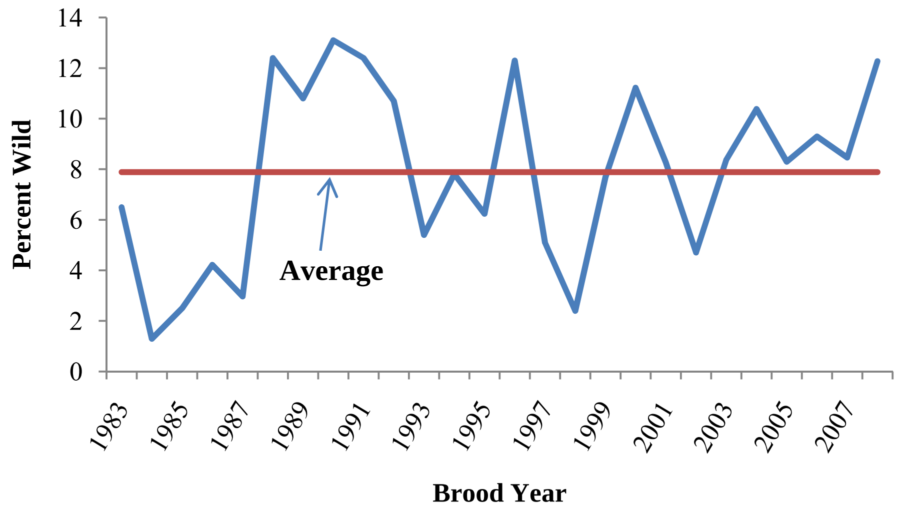

Figure 2-8. Percent of naturally-produced steelhead sampled in the run at large at Wells Dam for the 1983-2008 brood years. Data from UCSRB (2007) and C. Snow, pers. comm.

<u>Methow Core Area Bull Trout</u>

There are currently no hatchery programs in the Methow Basin.

2.2.3 Describe Hatchery Activities, Including Associated Monitoring, Evaluation and Research Programs, that May Lead to the Take of ESA Listed Fish in the Target Area, and Provide Estimated Annual Levels of Take

See Tables 2-19 and 2-20 for estimated levels of annual take.

2.2.3.1 Hatchery Program Activities

Hatchery program activities include:

- Collection of broodstock (up to 360 adults, includes up to 64 Twisp-origin) through trap operations at Wells Dam, the Twisp River weir, Methow Hatchery outfall, Winthrop NFH outfall, and potentially from future collection facilities located on the Chewuch, Twisp, and/or Methow rivers, or by other methods such as angling or seining (as approved by the HCP Hatchery Committees) for Methow River Basin-origin spring Chinook salmon. See Sections 1.8.2.1 and 1.11.1.
- Transfer of hatchery-origin adults and fertilized eggs between the Methow Hatchery and the Winthrop NFH; holding and artificial spawning of collected adults at the Methow Hatchery.
- Incubation and propagation from the fertilized egg through the smolt life stage at Methow Hatchery.
- Holding and artificial spawning of collected adults at the Methow Hatchery.

- Transfer of fingerlings and pre-smolts from the Methow Hatchery for rearing in acclimation facilities on the Methow, Twisp, and Chewuch rivers (and other locations as approved by the HCP Hatchery Committees; see Section 1.8.2.1 and 1.11.2).
- Release of up to 550,000 smolts into the Methow Basin (split between the Methow, Chewuch, and Twisp rivers) from the Methow Hatchery and acclimation facilities in those systems, and any future acclimation facilities as approved by the HCP Hatchery Committees.
- Monitoring of the programs in the hatchery environment using standard techniques such as growth and health sampling.
- Monitoring of the programs in the natural environment using standard techniques such as juvenile fish traps, adult spawner surveys, etc., as described in detail in the M&E Plan (Appendix A), Analytical Framework (Appendix B), and annual M&E Implementation plans (Appendix C, current version). Each of these documents is subject to periodic (or annual) revisions by the HCP Hatchery Committees.

Adult Management Activities

Take of hatchery and natural origin spring Chinook may also occur as a result of adult management of hatchery spring Chinook to meet spawn escapement objectives (abundance and hatchery/origin composition on the spawning grounds).

Responsibilities

The funding, permit holder, and agent for the activities discussed in this section are as follows:

Harvest

Funding: WDFW

Permit Holder WDFW

Agent: WDFW

Adult Removal at Trapping Facilities

Funding: Douglas PUD will provide funding for one FTE (for both steelhead and spring Chinook hatchery programs) for adult management activities associated with Douglas PUD's NNI hatchery compensation. This funding includes manual adult management activities up to the point at which spring Chinook are removed at Douglas PUD's trapping facilities and placed in holding containers.

WDFW is responsible for coordinating the funding for manual adult management activities from the point at which fish are placed in holding containers when manually removed and/or for a conservation fishery. The Co-managers will determine the disposition of the fish placed in the holding containers.

Permit Holder: Douglas, Chelan, and Grant PUDs and WDFW will be co-permit holders for manual adult management activities up to the point at which spring Chinook are removed at from Douglas PUD's trapping facilities and placed in holding containers. WDFW will be the permit holder for manual adult management activities, including any conservation fishery, from the point at which fish are placed in holding containers.

Agent: For Douglas PUD's permit, WDFW is designated as the authorized agent under a current contract between Douglas PUD and WDFW and until this contract expires and is not renewed or renegotiated.

Table 2-19. Estimated levels of take of UCR Spring Chinook by hatchery activity.

Listed species affected: UCR Spring Chinook ESU/Population: Methow Population Activity: Implement Hatchery Program				
Location of hatchery activity: Methow Hatchery, Twisp and Chewuch Acclimation Ponds, Wells Dam, Twisp & Methow screw traps and other M&E activities/locations Dates of activity: Broodstock collection: May-August; screw traps spring thaw to ice up. Hatchery program operator: Currently WDFW				
Type of Take	**Annual Take of Listed Fish By Life Stage (*Number of Fish*)**			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)			Up to 100%	Up to 100%
Collect for transport b)			Up to 360	
Capture, handle, and release c)		Up to 550,000 hatchery smolts		
Capture, handle, tag/mark/tissue sample, and release d)		Trap up to 20% nat. and hat. population from any tributary	Up to 100% of the natural. and hatchery returns	100%
Removal (e.g. broodstock) e)			Up to 360	
Intentional lethal take f)	Up to 12% of total egg take for BKD management		Up to 360 hat. & nat. broodstock; up to 100% hat. for pHOS control	
Unintentional lethal take g)	Up to 10%		Up to 18 (10% of broodstock)	
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Table 2-20. Estimated levels of take of UCR Summer Steelhead by hatchery activity.

Listed species affected: UCR Summer Steelhead ESU/Population: Methow and Okanogan Populations Activity: Implement Hatchery Program

Location of hatchery activity: Methow Hatchery, Wells Dam, Twisp and Methow rivers screw traps and other M&E activities/locations, Dates of activity: Broodstock collection: May-August; screw traps spring thaw to ice up. Hatchery program operator: Currently WDFW

Type of Take	Annual Take of Listed Fish By Life Stage (*Number of Fish*)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			Up to 100 adults	
Capture, handle, tag/mark/tissue sample, and release d)		Trap up to 20% nat. and hat. population from any tributary	Trap up to 20% hat. & nat. population from any tributary	
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)			Up to 9 adults; not exceed 1% of trapped steelhead	
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

3.0 RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1 Describe Alignment of the Hatchery Program with any ESU-Wide Hatchery Plan or other Regionally Accepted Policies. Explain any Proposed Deviations from the Plan or Policies

The objectives of the Methow Hatchery spring Chinook artificial propagation program are established in the Wells HCP and described above in Section 1. Implementation of the HCP is a cornerstone of recovery efforts for the UCR Spring Chinook and as such, has been imbedded in the Recovery Plan (UCSRB 2007). The Upper Columbia Salmon Recovery Board lead the development of the Recovery Plan which was adopted by NMFS as a final ESA recovery plan for UCR spring Chinook and steelhead on October 9, 2007. The UCSRB coordinates recovery planning in the UCR region with funding from the Washington State Governor's Salmon Recovery Office. A link to the NMFS webpage describing the plan is at http://www.nwr.noaa.gov/Salmon-Recovery-Planning/Recovery-Domains/Interior-Columbia/Upper-Columbia/Index.cfm.

Section 5.3.1 of the Recovery Plan describes the hatchery programs currently being implemented in the Upper Columbia ESU. Implementing Entities include CCT, YN, USFWS, WDFW, and Douglas County, Chelan County, and Grant County PUDs. Coordinating and technical bodies have been established to guide implementation of Douglas, Chelan and Grant County PUDs' hatchery programs (Coordinating Committees and Hatchery Committees), required by the PUD HCPs and by Grant County PUD's Biological Opinion (2008). The HCP and Priest Rapids coordinating and hatchery committees include participation by the relevant PUD(s) and CCT, YN, USFWS, NOAA, and WDFW. This HGMP will also be consistent with the direction provided by the HRSG on UCR spring Chinook artificial supplementation programs (HSRG 2009). Such modifications will be reflected in the program production size and duration, monitoring and evaluation, and in the artificial production strategies.

3.1.1 HSRG – Upper Columbia Review

The HSRG, as part of the Pacific Salmon Hatchery Reform Project, has completed a review of 178 hatchery programs and 351 salmonid populations in the Columbia River Basin. The project was conducted by the Columbia River HSRG, composed of 14 members, nine of whom were affiliated with agencies and tribes in the Columbia River Basin. The remaining five members were unaffiliated biologists. The objective was to produce recommendations that are based on broad policy agreements and are supported by consistent technical information about hatcheries, habitat, and harvest. The Upper Columbia Hatchery Programs Regional Review began in April 2008, and the final HSRG recommendations were published January 31, 2009 in Appendix E to the Columbia River Hatchery Reform System-Wide Report (HSRG 2009). The principles of the HSRG recommendations (specifically as elaborated in White Paper No. 1 of Appendix A of the HSRG Final Systemwide Report for the Columbia Basin) form the basis of the management decision rules proposed in Section 1.8.2.4.

3.2 List All Existing Cooperative Agreements, Memoranda of Understanding, Memoranda of Agreement, or other Management Plans or Court Orders under which the Program Operates

3.2.1 Wells Habitat Conservation Plans

In April 2002, pursuant to section 10(a)(1)(B) of the ESA, negotiations on the Anadromous Fish Agreement and Habitat Conservation Plan Wells Hydroelectric Project FERC License No. 2149 with Douglas PUD for the operation of Wells Dam (HCP, DPUD 2002) were concluded. A Biological Opinion with incidental take statements (ITSs) on the operation of the Wells Hydroelectric Project was issued consistent with the HCP (NMFS 2003a, 2003b, 2003c). The amended Incidental Take Permit No.1196 (NMFS 2004) added Douglas PUD to the permit as a joint permit holder with WDFW and Chelan PUD in accordance with Douglas PUD's HCP Agreement reached between Douglas PUD, NMFS, USFWS, WDFW, CCT, YN, and the Power Purchasers[11]. The artificial propagation activities of this program are included within Douglas PUD's HCP; see Sections 1.7 and 1.8 for more detailed information regarding the HCPs. The production levels specified in the HGMP are identical to those of the HCP; therefore this HGMP is consistent with the Wells HCP.

3.2.2 2008-2017 / United States v. Oregon / Management Agreement

The purpose of this Management Agreement is to provide a framework within which the signatory fishery co-managers can use their authorities to protect, rebuild, and enhance UCR fish runs while fairly sharing harvestable fish between Treaty and non-Treaty fisheries. The Management Agreement specifies harvest limits and artificial production measures for stocks of salmon and steelhead originating above Bonneville Dam. The hatchery production goal for the Wells Complex Methow spring Chinook facilities as shown in Appendix B Table B1 of the Management Agreement is 550,000 yearling juveniles incubated and reared at the Methow Hatchery.

These production programs are implemented and/or adjusted based on modifications to productions levels through processes established under the mid-Columbia HCPs, the Priest Rapids Salmon and Settlement Agreement, and discussions associated with Part III.H. of the Management Agreement. The current program involves the release of smolts from the Methow Hatchery, and some Methow Hatchery production is also acclimated at ponds located in the Twisp and Chewuch watersheds. The Management Agreement is entered as an order of the 7th US District Court in /*US v. Oregon*/ and, as such, its terms are binding on the parties. The mitigation production levels specified in this HGMP are identical to those of the Management Agreement; therefore this HGMP is consistent with *US v. Oregon*.

This program does not affect the management, assessment, or goals of fisheries that occur outside of the Methow River basin. Low numbers of Methow spring Chinook are harvested in ocean fisheries. Impacts of ocean fisheries are regulated under authority of the Pacific Salmon

[11] Entities that have executed long-term power sales contracts with Douglas PUD, specifically Puget Sound Energy, Inc., Portland General Electric, PacifiCorp., and Avista Corp.

Commission and the Pacific Fishery Management Council. Fisheries under these jurisdictions have been reduced in recent years in response to ESA listings. Mainstem Columbia River fisheries are regulated under a co-management framework pursuant to litigation in *US v Oregon*. The *2008-2017 United States v Oregon Management Agreement* provides the harvest management framework for spring Chinook fisheries below McNary Dam. The harvest schedule is designed to allow some level of harvest while protecting the great majority of ESA-listed NOR adults passing through the fisheries. Allowable harvest rates are scaled to the abundance of the total run projected to pass Bonneville Dam and the abundance of NOR spring Chinook projected to enter the Snake River. The allowable harvest rates for Treaty and non-Treaty fisheries are designed to achieve a 50/50 sharing of harvestable fish in the non-selective tribal fisheries and mark-selective non-tribal fisheries in accordance with treaty fishery case-law standards. Total allowable fishery impacts in combined mainstem fisheries range from less than 5.5 percent on total runs of less than 27,000 fish to a maximum of 17 percent on runs of 488,000 fish or more. Nevertheless, lower-mainstem commercial and recreational fisheries annually commence prior to confirmation of the forecasted run-size by actual fish counts at Bonneville Dam, potentially resulting in a disproportionate harvest of the early returning component of the UC spring Chinook run, which historically comprised older, more-fecund fish (i.e., Age-5 fish).

Fisheries in the UCR basin are currently limited by the need to protect ESA-listed UCR spring Chinook salmon and UCR steelhead. Fisheries in the migration corridor and ocean are also limited to protect these populations, and to minimize harvest impacts on other listed salmon and steelhead returning to other Columbia River basin and Snake River basin areas as noted above. NMFS evaluates and authorizes annual fisheries proposed by the co-managers in the action area each year through separate Section 7 biological opinions.

Until the spring of 2000—when a relatively large run of hatchery spring Chinook salmon returned and provided a small commercial Tribal fishery in the lower Columbia River—no commercial season for spring Chinook salmon had taken place since 1977. Present Columbia River harvest rates are very low compared with those from the late 1930s through the 1960s (NMFS 2008).

Harvest actions outside the action area, such as in the ocean, mainstem Columbia River and other basin areas will be managed through the *U.S. v Oregon* and Pacific Fisheries Management Council (PFMC) planning and management processes, with guidance from NMFS. Proposed releases of spring Chinook salmon, summer Chinook salmon, sockeye salmon, and coho salmon juveniles into the UCR basin are not expected to create any substantial harvest complications with listed species. NMFS involvement with the co-managers in the PFMC and *U.S. v Oregon* fishery planning processes will adequately limit harvest effects on listed salmon and steelhead. Proposals for future fisheries will continue to be addressed by NMFS through separate Section 7 consultation processes.

3.3 Describe Fisheries Benefiting from the Program, and Indicate Harvest Levels and Rates for Program-Origin Fish for the Last Twelve Years (1998-09), if Available

There have been no recreational fisheries on Methow spring Chinook in the Methow River since the stock was listed in 1999. Neither formal creel survey nor punch card data were available to estimate total catch or effort in fisheries prior to 1999. Any future fisheries that may occur in the Methow Basin prior to spring Chinook recovery would be by others (WDFW) for conservation purposes only, specifically to assist in pHOS control when the natural-origin run could tolerate a small percentage of incidental hooking mortality. Implementation of a conservation fishery is not the purview of Douglas PUD and is thus not explicitly included in this HGMP. The ultimate goal of the hatchery program is stock recovery that would then enable annual harvest (recreational) fisheries.

3.4 Relationship to Habitat Protection and Recovery Strategies

Although habitat in much of the upper reaches of the Methow basin is in near pristine condition, habitat complexity, connectivity, water quantity, and riparian function have been compromised due to human activities in other parts of the Methow basin, including portions where the majority of spring Chinook spawn. The Recovery Plan (UCSRB 2007) details specific objectives and actions for habitat protection and restoration necessary for the recovery of UCR salmon and steelhead populations. These habitat actions are occurring at the same time as hatchery programs are supplementing natural production, while preserving important genetic resources. Douglas PUD is actively coordinating with its cooperators to ensure that hatchery actions do not impact the ability to monitor the effectiveness of habitat restoration activities.

Douglas PUD also provides funding for projects for the protection and restoration of HCP Plan Species habitat, including the Methow and Okanogan watersheds and the Columbia River watershed (from Chief Joseph Dam tailrace to Wells Dam tailrace). Douglas PUD provides this funding as a requirement of the Wells HCP to compensate for up to two percent unavoidable project mortality. This HCP requirement, combined with the survival standards and hatchery compensation, effectively mitigates for passage losses due to the operation of Wells Dam. The goal of this tributary program is to protect and restore habitat, a goal that is shared with the recently signed 10-Year Memoranda of Agreement (MOAs) between the Federal Columbia River Power System Action Agencies and four tribes that provides for habitat improvements in the Columbia basin (FCRPS/Three Treaty Tribes MOA 2008; FCRPS/CCT MOA 2008). A recovered spring Chinook population will occupy improved and re-opened habitat that will likely follow implementation and completion of these initiatives. The Wells HCP Tributary and Hatchery committees are managing both the habitat and hatchery programs so that they provide VSP benefits that will trend toward recovery of UCR spring Chinook.

3.5 Ecological Interactions

Potential effects of the Methow Hatchery spring Chinook hatchery program on salmonids and non-salmonids as well as the physical environment, and potential effects of other supplementation programs, natural-origin fish, and other species on this spring Chinook hatchery program, have been evaluated in the NMFS Biological Opinion (2004) and Environmental Assessment (NMFS 2002) for a multi-year authorization for an annual take of UCR spring Chinook salmon and UCR steelhead associated with the spring Chinook supplementation program (Permit 1196). Potential effects from the program are regulated by existing policies regarding hatchery operations, maintenance protocols, fish health practices, genetic effects, ecological interactions, and fish cultural practices, as prescribed in the 1994 Integrated Hatchery Operations Team (IHOT) annual report (IHOT 1995).

3.5.1 Populations that Could Negatively Impact the Program

Juvenile hatchery spring Chinook salmon are liberated as yearling smolts through volitional releases. Because fish are released as yearling smolts, potential predation by both native and non-native predators is thought to be reduced compared to sub-yearling releases.

Fish, mammals, and birds are the primary natural predators of spring Chinook in the Upper Columbia Basin. Several fish species may consume spring Chinook. Northern pikeminnow (*Ptychocheilus oregonensis*), walleyes (*Sander vitreus vitreus*), and smallmouth bass (*Micropterus dolomieu*) have the potential to negatively affect the abundance of juvenile Chinook (Gray and Rondorf 1986; Bennett 1991; Poe et al. 1994; Burley and Poe 1994). Adult salmonids within the Upper Columbia Basin are opportunistic feeders and are therefore capable of preying on juvenile spring Chinook. Those adult salmonids likely to have some affect on the survival of juvenile salmonids include (in order of greatest likely impact), adult bull trout, rainbow trout, cutthroat trout, brook trout, and brown trout..

Predation by piscivorous birds on juvenile salmonids may also represent a large source of mortality. The NMFS (2000) identified gulls *(Larus* spp.), cormorants (*Phalacrocorax* spp.), and Caspian terns *(Sterna caspi*a) as the most important avian predators in the Columbia River Basin. In the Columbia River estuary, avian predators consumed an estimated 16.7 million smolts (range, 10-28.3 million smolts), or 18 percent (range, 11 to 30 percent), of the smolts reaching the estuary in 1998 (Collis et al. 2000). Caspian terns consumed primarily salmonids (74 percent of diet mass), followed by double-crested cormorants *(P. auritu*s) (21 percent of diet mass) and gulls (8 percent of diet mass).

Predation and delayed mortality for returning adult salmon as a result of wounding by marine mammals may negatively affect spring Chinook salmon. The incidence of wounds noted at Lower Granite Dam during 1991was 20.9 percent for adult spring migrants and 9.4 percent for summer migrant salmon (Park 1993). In 1992, the numbers were 17.4 percent and 7.6 percent, respectively. Although UCR Chinook do not pass Lower Granite Dam, the losses there may be similar to losses experienced by UCR Chinook along their migration route.

Competition and potentially predation could also occur between juvenile spring Chinook and hatchery steelhead that reside in the mainstem Columbia River and in the Methow subbasin. Although the degree of steelhead residualism is unknown, it is thought to average between 5 percent and 10 percent of the number of fish released (USFWS 1994). Competition for food and space with other hatchery released fish (e.g., coho salmon) throughout the Columbia Basin may occur as hatchery spring Chinook rear in the Methow subbasin and migrate downstream through the Columbia River. Indeed, Spaulding et al. (1989) documented a habitat shift by juvenile Chinook in side channels of the Wenatchee River in response to the introduction of juvenile coho. During the feasibility phase of the YN Mid-Columbia Coho Restoration program (YN 2008), the YN completed two predation evaluations of spring Chinook juveniles by hatchery coho juveniles in the Wenatchee subbasin. Methods for both studies were similar and are detailed in Murdoch and LaRue (2002) and Murdoch et al. (2005). The two predation evaluations, both in Nason Creek, estimated predation on spring Chinook at 0.96 percent (95 percent CI 0.12 percent to 3.5 percent) of the total spring Chinook fry population in Nason Creek in 2001 and 0.14 percent (95 percent CI 0.03 percent to 0.4 percent) of the total spring Chinook fry population in Nason Creek, in 2003, respectively. For coho juveniles scattered planted as surrogates of naturally produced coho, the predation rates on spring Chinook fry were nearly double those observed by hatchery coho (Murdoch et al. 2005). This observation could be expected considering the greater temporal overlap of the scatter-planted natural-surrogate coho with newly emerging spring Chinook fry, and the observations by others (Hawkins 2002) that naturally produced coho smolts were more effective predators of Chinook fry than hatchery coho smolts. Predation rates by naturally produced coho juveniles on spring Chinook fry in the Methow or Wenatchee sub-basins cannot be accurately measured until adequate numbers of naturally produced coho become available for study. Nevertheless, using YN estimates of future natural production of coho and available spring Chinook fry in Nason Creek in 2003, and the observed predation rate by natural-surrogate coho in 2003 from Murdoch et al. (2005), calculations of potential consumption rates of natural-origin coho on spring Chinook fry equate to 9.1 percent of estimated spring Chinook fry available in Nason Creek (Kahler 2005).

Both introduced (e.g., walleye and smallmouth bass) and native predators (e.g., northern pikeminnow) consume large numbers of juvenile salmonids as they migrate through the Columbia River system (Poe et al. 1991; Rieman et al. 1991; Tabor et al. 1993). Exacerbating this impact of predation are observations that northern pikeminnow are able to rapidly adjust their diet and foraging habits to key in on the opportunity presented by the release and seaward migration of large numbers of hatchery fish (Shively et al. 1996). Furthermore, pikeminnow predation is typically concentrated downstream of mainstem hydropower facilities where juvenile fish are less dispersed than normal, and potentially disoriented and/or stressed following navigation through the hydro facility. Ongoing programs designed to control the size of predator populations and to redesign juvenile bypass facilities to avoid the aggregation of large numbers of predators below mainstem dams are attempting to minimize the impacts of predation and increase the survival of seaward migrating juvenile salmonids.

3.5.2 Populations that Could be Negatively Impacted by the Program

The potential ecological effects of Methow Hatchery spring Chinook on natural salmonid populations is broken down into three sections: A) effects associated with juvenile releases,

B) effects associated with adult returns, and C) effects associated with both juveniles and adults. Effects to non-salmonid species are unknown at this time, but will be addressed as part of Objective 10 of the Douglas PUD M&E Plan (HCP-HC 2007).

3.5.2.1 Juvenile Releases

Hatchery-origin juvenile spring Chinook from this program can potentially interact with natural-origin spring Chinook and steelhead juveniles. These species are present year round in the UCR mainstem and tributary areas. Natural-origin spring Chinook salmon in the UCR initiate seaward migration as yearling fish between March and June (Chapman et al. 1995). Natural-origin steelhead fry emerge from the gravel in the late spring through August and disperse to downstream rearing areas in the late summer and early fall. UCR steelhead begin seaward migration as age 2+ (43.2 percent) or 3+ (46.4 percent) smolts (Peven 1990) during April and May at an average size of 136 to 188 mm (Chapman et al. 1994).

After initial incubation and rearing on well water at the Methow Hatchery, up to 550,000 (15 fish per pound [fpp]) hatchery-origin yearling juvenile spring Chinook salmon will be acclimated on and released into natal waters: the Methow River (approximately 225,000 Methow/Chewuch composite stock smolts, Rkm 82.1); the Twisp River acclimation pond (up to 100,000 Twisp River stock only, Rkm 10); and the Chewuch River acclimation pond (Rkm 12.9; approximately 225,000 Methow/Chewuch composite smolts). Fish not leaving acclimation ponds volitionally will be forced out in May; historically, it has been seldom necessary to force fish. All fish released will be either externally or internally (or both) marked according to a coordinated marking scheme to be determined by the HCP Hatchery Committees. The target release size of 15 fpp for hatchery-origin spring Chinook yearlings is specified in the Wells HCP and M&E Plan. This target for release size is intended to produce rapidly migrating juveniles that, because of their rapid migration should not compete for resources with naturally produced spring Chinook or other species.

3.5.2.2 Adult Returns

Little is known about interactions between individual stocks of spring Chinook released into the Columbia River system from this hatchery program and other salmonids between the time they leave the estuary and return as adults to spawn. Available information is inferred from CWT data taken from fish harvested from sea. Based on this available data, it is assumed that ocean harvest of upriver spring Chinook will continue to be minimal (2008 – 2017 *US v. OR* Management Agreement) and for practical purposes is assumed to be zero (FCRPS 2008). These data, however, do not give us insight into fish behavior nor inter-specific interactions among stocks in the ocean. However, given the assumed zero harvest of Methow spring Chinook in ocean fisheries, the Methow spring Chinook hatchery program is not a factor in determining ocean harvest regulations and quotas that could affect listed species.

Returning adult hatchery spring Chinook that stray to natural spawning areas may compete for spawning gravel and/or breed with native fish, potentially altering genetic fitness and influencing their ability to survive in the ecosystem. Guidance on acceptable stray rates of hatchery fish is ≤5 percent of total brood return. If one ignores the fact that, due to the chronically low abundance of NORs in the Methow Basin, hatchery-origin spawners are necessary to provide an adequate number of spawners on the spawning grounds, then one might consider that straying of hatchery spring Chinook is a significant problem in the Methow Basin. Despite this reliance in the Methow Basin on hatchery-origin spawners to achieve adequate spawner escapement, strays from out-of-basin hatchery programs are undesirable. Overall, 14.5 percent of the estimated number of hatchery fish spawning in the Methow River basin in 2007 strayed from other independent populations (Entiat, Chiwawa, and Dworshak Hatchery releases). These fish comprised 26.6 percent of the hatchery fish spawning in the Chewuch River basin, and 17.2 percent of those spawning in the upper Methow; no out-of-basin strays were recovered in the Twisp River (Snow et al. 2008). Methow Hatchery stocks have comprised less than 5 percent of the estimated spawning escapement in the Entiat River between run years 1997 to 2006 (Snow et al. 2008).

The concept of within-basin straying in the Methow Basin is controversial because hatchery spring Chinook of Methow/Chewuch-composite origin are assigned arbitrarily to release location, either directly from the Methow Hatchery or from the Chewuch acclimation pond, with the intention that greater than 5% of them will return to the spawning grounds, rather than to the hatchery. Nevertheless, any fish recovered by the hatchery M&E staff is classified as a within-basin stray if it is not within the stream in which it was released, regardless of the origin of its parents or length of acclimation at the release site. According to this practice, of the expanded CWT hatchery fish recovered on Methow Basin spawning grounds in 2007 (N = 639), 21.9 percent were classified as strays from the Methow Hatchery. Of the 2001 brood spring Chinook released in the Twisp and Chewuch rivers, greater than 5 percent of the adult returns strayed to non-target spawning areas. Stray rates of Twisp and Chewuch hatchery spring Chinook salmon were high for the 1998 and 2000 broods examined. Releases in both these watersheds were accomplished through the use of acclimation ponds, but both ponds relied on local irrigation withdrawal for their water supply. Stray rates may decrease with a longer acclimation time, but longer acclimation at the current facilities may not be possible without acquisition of ground water to prevent freezing in the ponds (Snow et al. 2008). Annual monitoring and evaluation, as required in the HCP, will be used to direct or assess future hatchery program operations to avoid exceeding the acceptable levels of strays from this hatchery program. Assuming that extended acclimation would translate into reduced straying, the addition of well water to extend the acclimation period for both the Twisp and Chewuch ponds may be necessary; the current 30-day rearing period (if not zero days due to debris or ice) is apparently not adequate to control stray rates from these sub-basins (C. Snow, WDFW, pers. comm.). However, stray rates are not known for natural-origin fish in the Methow Basin; thus, we are uncertain whether or not the rates of straying observed for fish originating from the Methow Hatchery differ from the rates within the natural population.

Potential adverse impacts to steelhead and bull trout during spring Chinook broodstock collection are negligible; WDFW has established specific procedures for handling non-target species to reduce negative effects (NMFS 2002). In addition, impacts to bull trout from the supplementation of spring Chinook are expected to be negligible (NMFS 2002).

3.5.2.3 Both Juveniles and Adults

Negative effects to other species that may result from the Methow Hatchery spring Chinook program could occur from impacts to water quantity and water quality. To limit impacts to water quantity the program complies with water-right permits established for the hatchery to prevent over appropriation of surface water. Hatchery surface water intakes are screened to current criteria. Water quality will be affected by effluent from the hatchery, but the hatchery facility is required to operate under National Pollutant Discharge Elimination System (NPDES) permits issued by Washington Department of Ecology. Hatchery effluent standards and state criteria for point-source discharge are set forth in the permit to protect aquatic life, and the habitat in the area below the discharge point. Considering that the effluent produced from the hatchery facility complies with Environmental Protection Agency standards, coupled with the low percentage of effluent to discharge (dilution factor), there is probably minimal impacts to other species.

Hatchery-raised fish may be a source of pathogen transmission to natural-origin fish in the natural environment. This impact may occur from release sites in headwater spawning and/or rearing areas and throughout the entire migration corridor (BAMP 1998; HCP-HC 2007). Pathogens responsible for diseases are present in both hatchery and natural populations, although hatchery fish are probably more susceptible to disease pathogens because of the high rearing densities and resultant stress. The HCP Hatchery Committee approved broodstock protocols that allow culling of eggs from hatchery-origin females with ELISA OD levels greater than 0.12, and the culling of eggs from natural-origin females with ELISA OD values considered by WDFW Fish Health to be a substantial risk to the program. This action alleviated the capacity constraints associated with the current WDFW BKD rearing strategy and is consistent with Objective 9 of the Hatchery M&E Plan which requires an evaluation of whether management of BKD in the hatchery program lowers the prevalence of BKD in the hatchery environment. It is also consistent with the HSRG recommendations to cull high-ELISA (high BKD) spring Chinook from broodstocks when programs are not broodstock-limited (HSRG 2009). In years where BKD titers do not exceed management thresholds (e.g., >0.12 optical density), culling of excess eggs from hatchery-origin females will be necessary to prevent exceedance of the permitted smolt-production target. Also see Section 9.1.2.

3.5.3 Populations that have a Positive Impact on the Program

Chinook, steelhead, and coho carcasses of both hatchery and natural-origin deposited within the Methow sub-basin are likely to have a positive influence on nutrient levels within the basin. Increased nutrient levels are likely to provide a more productive environment within which the natural-origin and hatchery spring Chinook can rear and migrate. Marine-derived nutrients brought to the Methow Basin by adult spring Chinook should benefit all species there (Stockner 2003).

3.5.4 Populations Positively Impacted by the Program

The Methow Basin native fish assemblage is expected to benefit from nutrients derived from carcasses of returning adult Methow Hatchery spring Chinook at dispersed locations throughout the sub-basin (Stockner 2003). This hatchery program is designed to promote natural spawning of spring Chinook salmon in a more widely dispersed manner (relative to the un-supplemented condition) consistent with available spawning habitat in the Twisp, Chewuch, and upper Methow

River sub-watersheds. The dispersed spawning will likely have a positive effect on bull trout, resident rainbow trout, and westslope cutthroat trout populations scattered throughout the Methow sub-basin because these salmonids will consume salmon eggs, fry, and parr (and flesh from carcasses).

4.0 WATER SOURCE

4.1 Provide a Quantitative and Narrative Description of the Water Source (spring, well, surface), Water Quality Profile, and Natural Limitations to Production Attributable to the Water Source

Methow Hatchery has both groundwater and surface water supplies. The facility was built with four wells capable of producing the full groundwater right of 10 cubic feet per second (cfs) (4,500 gallons per minute [gpm]). Groundwater temperatures are steady at 8.9°C year round. Maintenance on the four wells in 1995 and 1996 revealed that the total output of the wells had declined to 8.8 cfs (4,000 gpm). Thus, a fifth well was added in 1999, and a sixth well in 2007, restoring groundwater production capacity to 4,500 gpm. Methow Hatchery also has senior uninterruptible rights to 7 cfs (3,142 gpm) of surface water and 18 cfs of junior interruptible water rights, both diverted from Foghorn Irrigation Ditch. This water is used primarily for final rearing, but can be used for any rearing stage after incubation. The 7 cfs surface-water right is held by USFWS, but granted to Douglas PUD by USFWS under the terms of a Memorandum of Understanding in exchange for improvements to the intake structure of the Foghorn Ditch plus improvements to the ladder at Foghorn Dam.

Methow Hatchery also has two acclimation ponds: one each on the Twisp and Chewuch rivers. Both ponds are used for final rearing and acclimation of smolts to these drainages. The water right for each pond is 6 cfs during the period of February 1 through May 31. Water for the Twisp Pond is diverted from the Twisp Valley Power and Irrigation Company ditch, and water for the Chewuch Pond is diverted from the Chewuch Canal Company irrigation ditch. The easements from both canal companies are for delivery of water from February 1 through May 1. Neither site is suitable for late-summer rearing because (1) low flow conditions persist in both the Twisp and Chewuch rivers in late summer, and (2) existing water demands on the irrigation ditches would compete with acclimation use.

4.2 Indicate Risk Aversion Measures that will Be Applied to Minimize the Likelihood for the Take of Listed Natural Fish as a Result of Hatchery Water Withdrawal, Screening, or Effluent Discharge

Water withdrawal for use in hatcheries is monitored through the Washington State Department of Ecology and the Washington State chapter 90.03 Revised Code of Washington (RCW) water code. None of the hatchery facilities employed to carry out the proposed artificial propagation programs de-water river reaches used by listed fish for migration, spawning, or rearing. Water intakes into artificial propagation facilities shall be screened in compliance with 1995 NMFS screening criteria and as per the 1996 addendum to those criteria (NMFS 1996). As an alternative, they will comply with transitional criteria set forth by NMFS in 2000 for juvenile fish screens constructed prior to the establishment of the 1995 criteria, to minimize risks to listed salmon and steelhead. WDFW shall inspect and monitor the water intake screen structures at their hatchery facilities to determine if listed salmon and steelhead are being drawn into the facility.

All WDFW hatcheries monitor their discharge in accordance with the NPDES permit. This permit is administered in Washington by the Washington Department of Ecology under agreement with the United States Environmental Protection Agency. The permit was renewed effective June 1, 2005 and will expire June 1, 2010. Hatchery wastewater discharge is monitored monthly at each of the spring Chinook production facilities in the Upper Columbia Basin. The WDFW-operated facilities covered under this permit include Methow Hatchery. No violations of the NPDES permit limits occurred during the reporting period June 1, 2008 through May 31, 2009.

Facilities are exempted from sampling during any month that pounds of fish on hand fall below 20,000 lbs and pounds of feed used fall below 5,000 lbs, with the exception of offline settling basin discharges which are to be monitored once per month when ponds are in use and discharging to receiving waters.

Sampling at permitted facilities includes the following parameters:

FLOW	Measured in millions of gallons per day (MGD) discharge.
SS EFF	Average net settleable solids in the hatchery effluent, measured in milliliters per liter (ml/L).
TSS COMP	Average net total suspended solids, composite sample (6 times per day) of the hatchery effluent, measured in milligrams per liter (mg/L).
TSS MAX	Maximum daily net total suspended solids, composite sample (6 times per day) of the hatchery effluent, measured in mg/L.
SS PA	Maximum settleable solids discharge from the pollution abatement pond, measured in ml/L.
SS %	Removal of settleable solids within the pollution abatement pond from inlet to outlet, measured as a percent. This is no longer required under permit effective June 1, 2000.
TSS PA	Maximum total suspended solids effluent grab from the pollution abatement pond discharge, measured in mg/L.
TSS %	Removal of suspended solids within the pollution abatement pond from inlet to outlet, measured as a percent. This is no longer required under permit effective June 1, 2000.
SS DD	Settleable solids discharged during drawdown for fish release. One sample per pond drawdown, measured in ml/L.
TRC	Total residual chlorine discharge after rearing vessel disinfection and after neutralization with sodium thiosulfate. One sample per disinfection, measured in micrograms per liter (µg/L).

5.0 FACILITIES

5.1 Broodstock Collection Facilities (or methods)

The Methow Hatchery spring Chinook program uses returning spring Chinook adults collected at Wells Dam, weirs located within the Methow Basin, and volitional returns to adult capture facilities, including the Methow Hatchery outflow channel and trap (Methow River at Rkm 82.1); the WNFH volunteer ladder (Methow River at Rkm 81.1), the Twisp River weir and trap (Twisp River at Rkm 10); and the Wells Dam east and west bank fishway traps (Columbia River at Rkm 830). Broodstock may also be collected via hook-and-line angling and seining. (See Section 1.5 for hatchery facility locations and Section 7.2 for more details on broodstock collection.)

5.2 Fish Transportation Equipment (description of pen, tank truck, or container used)

IHOT guidelines for transportation are followed.

Table 5-1. Fish Transportation Equipment.

Equipment Type	Capacity (gallons)	Suppl. Oxygen (Y/N)	Temp. Control (Y/N)	Normal Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Truck with Tank	500	Y	N	30-60	MS-222 and NaCl	10 ppm and 0.8% solution
Tanker Truck	800	Y	N	45-90	MS 222 and NaCl	10 ppm and 0.8% solution

5.3 Broodstock Holding and Spawning Facilities

IHOT adult holding guidelines are followed for adult holding, density, water quality, alarm systems and predator control measures to provide the necessary security for the broodstock. Broodstock are held in covered, concrete raceways and adults are seined, sorted, killed and spawned at spawning facilities integrated into the concrete raceways (Table 5-2).

Table 5-2. Broodstock Holding and Spawning Facilities.

Ponds (No.)	Pond Type	Volume (cu. ft)	Length (ft)	Width (ft)	Depth (ft)	Available Flow (gpm)
3	Concrete Raceways	2560	80	8.0	4.0	320

5.4 Incubation Facilities

Methow Hatchery has three separate incubation rooms with 16 Heath stacks per room to accommodate the segregation of progeny from the three primary Methow Basin spawning drainages: Twisp, Chewuch, and upper Methow.

Table 5-3. Incubation Facilities.

Incubator Type	Units (number)	Flow (gpm)	Volume (cu. ft)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Iso-Buckets	300	0.5	-	3500-5000	
Heath Vertical Tray Stack Units (8 trays per stack)	48	3-4	-	-	3500-5000

5.5 Rearing Facilities

See Section 5.6 below.

5.6 Acclimation/Release Facilities.

Table 5-4. Acclimation/Release Facilities.

Ponds (No.)	Pond Type	Volume (cu. ft)	Length (ft)	Width (ft)	Depth (ft)	Flow (gpm)	Max. Flow Index	Max. Density Index
24	Intermediate Fiberglass Deep Troughs	112	15	2.5	3.0	20	0.9	0.11
12	Concrete Raceways	2560	80	8.0	4.0	320	0.9	0.11
10	Circular Start Tanks	25	--	4	2	20	0.9	0.11
1	Hypalon-Lined Pond - Methow Acclimation Satellite	28000	175	40	4.0	2700	0.9	0.11
1	Hypalon-Lined Pond - Twisp Acclimation Satellite	28000	175	40	4.0	2700	0.9	0.11
1	Hypalon-Lined Pond - Chewuch Acclimation Satellite	24000	150	40	4.0	2700	0.9	0.11

5.7 Describe Operational Difficulties or Disasters that led to Significant Fish Mortality

During high water in April 2002, a malfunction of a float alarm and/or dialer at the Twisp River acclimation pond prevented a call to the on-duty person, and 80,000 fish were lost. On March 10, 2009, the generator failed to restart a well pump, and the auto dialer failed to call out the alarm. As a result, 8,000 spring Chinook smolts were lost. The auto dialer has since been replaced, and the connection from the generator to the restart controls has been repaired. Additionally, alarm annunciators have been installed in hatchery housing to eliminate dependence on the auto-dialer and phone service.

5.8 Indicate Available Back-Up Systems, and Risk Aversion Measures that will be Applied, that Minimize the Likelihood for the Take of Listed Natural Fish that may Result from Equipment Failure, Water Loss, Flooding, Disease Transmission, or other Events that could Lead to Injury or Mortality

Fish are reared in multiple facilities or with redundant systems to reduce the risk of catastrophic loss. The Methow Hatchery and existing acclimation facilities are sited so as to minimize the risk of catastrophic fish loss from flooding. Water flow alarms monitor flow, and back-up portable pumps are available for short term usage. Staff reside on-station and the facilities are continuously staffed and monitored to assure the security of fish stocks on-site. The programs implement the "Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State" (NWIFC and Co-managers 1998) and Pacific Northwest Fish Health Protection Committee (PNFHPC 1989) guidelines to minimize the risk of fish disease amplification and transfer, and to ensure that artificially propagated fish would be released in good health.

To prevent catastrophic mortality or to reduce the preponderance of chronic disease, variance from the smolts-only release requirement may be pursued after agreement of the HCP Hatchery Committees and NMFS. Conditions such as flooding, water loss to raceways, or vandalism may warrant early release into appropriate environments after review by the HCP Committees and NMFS. Any emergency release of UCR spring Chinook salmon would be reported immediately to the NMFS Salmon Recovery Division in Portland, Oregon.

Flow reductions, flooding, and poor fish-culture practices may all cause hatchery facility failure or the catastrophic loss of listed fish under propagation. To protect endangered spring Chinook, all efforts should be made to ensure the survival of adult spring Chinook held for broodstock at the hatchery facility. WDFW, as Douglas PUD's current contract operator of the Methow Hatchery proposes a variety of measures to address risks associated with operation failures, including:

- Staffing hatchery facilities and fish weirs full time during their operation, providing for the protection of fish from vandalism and predation, and allowing for rapid response in the event of power and water loss or freezing;

- Equipping hatchery facilities with back-up generators to provide an alternative source of power to supply water to rearing fish during power outages; Methow Hatchery is equipped with an auto-start backup generator that is tested every week. It is run, under load, for one hour weekly;
- Equipping the operator housing at the Methow Hatchery with alarm annunciators to eliminate dependence on the auto-dialer and phone service during power outages;
- Rearing progeny of low-ELISA females at lower pond-loading densities to minimize the risk of loss due to disease at all facilities where spring Chinook are held; and
- Ensuring staff are adequately trained in proper fish handling, rearing, and biological sampling techniques, and that all activities will be conducted in accordance with the WDFW Fish Health Manual (WDFW 1996) and/or Pacific Northwest Fish Health Protection Committee (PNFHPC 1989) disease prevention and control standards.

6.0 BROODSTOCK ORIGIN AND IDENTITY

6.1 Describe the Origin and Identity of Broodstock Used in the Program, Its ESA-Listing Status, Annual Collection Goals, and Relationship to Natural-Origin Fish of the Same Species/Population

6.1.1 Source

The broodstock selected represents natural populations native or adapted to the watersheds in which hatchery fish will be released. Spring Chinook returning to the Methow River and its major tributaries are used in both the Twisp and Methow/Chewuch program components.

6.1.2 Supporting Information

6.1.2.1 History

Natural-origin spring Chinook broodstock collections began in the early 1990s, generally in 1992 as shown in Table 6-1. Native (natural) Methow spring Chinook were ESA-listed in 1999. In recent years the ability to collect natural-origin adults in each MaSA (Twisp, Methow, Chewuch) has been compromised, particularly by the loss of the Fulton Dam on the lower Chewuch River. The Twisp weir has had periods during which it was not functional due to flood damage; it was rebuilt in 2007-08 restoring full function in the spring of 2008. Currently the collection of natural-origin adults directly from their MaSA of origin is only possible at the Twisp weir; natural-origin fish collected as volunteers to the Methow Hatchery and WNFH outfalls are presumed to be of Methow River origin, but could include adults of Chewuch or Twisp sub-basin parentage as well.

Table 6-1. Collection sites and history for Methow River Basin spring Chinook broodstocks.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Chewuch River spring Chinook	Natural/hatchery	1992	2007[a]
Twisp River spring Chinook	Natural/hatchery	1992	Ongoing
Methow River spring Chinook (Foghorn Dam)	Natural/hatchery	1993	Ongoing
UCR spring Chinook composite (collected @ Wells Dam) (protocol varies annually as to H:W proportion taken at Wells)	Natural / Hatchery	1996	Ongoing
Methow River spring Chinook composite (Methow, Twisp, & Chewuch hatchery stocks collected @ MSFH outfall)	Natural / Hatchery	1998	Ongoing
Methow River spring Chinook composite (Methow, Twisp, & Chewuch hatchery stocks collected @ WNF Hatchery outfall – gametes given to MSFH)	Hatchery	1998	Ongoing

[a]Upkeep of the Fulton rock weir was terminated in 2007, and the weir was replaced with a "roughened channel" to facilitate fish passage at the Fulton diversion.

Besides collection at the Twisp Weir, the ladder traps at Wells Dam are used to collect broodstock to support the genetically distinct Twisp component of the program. Twisp-origin fish are differentiated from Methow/Chewuch fish using genetic analysis.

Natural-origin adults collected at the upper-basin hatchery outfalls or by other methods currently are a mixture of progeny of earlier collections that included natural-origin fish that could have been derived from either the Methow or Chewuch MaSAs. Until collection capability is established in the Chewuch and Methow rivers (e.g., at the Foghorn diversion or Chewuch Dam), the MaSA of origin for natural-origin adults collected in those rivers will be unknown, and likely a mixture of Methow and Chewuch origins.

Adipose fin clipping has not been performed on 100% of the smolts from the Methow and Winthrop Nation Fish hatcheries. Therefore, it is not yet possible to distinguish the origin of returning Methow/Chewuch hatchery adults at Wells Dam or Twisp weir.

6.1.2.2 Annual Size

Broodstock numbers have been limited by low run sizes and the requirement that natural-origin fish compose at least 30 percent of the broodstock, but no greater than 33 percent of the natural-origin run to any tributary sub-population can be taken for broodstock. Under the current 550,000 smolt program, up to 360 fish will be collected for broodstock, with up to 64 of those Twisp-origin fish for the Twisp River component. Historic broodstock collection is summarized in Table 6-2. The sex ratio of broodstock is expected to be close to 1:1.

Table 6-2. **Numbers of wild and hatchery spring Chinook collected for Methow Basin program broodstock, numbers that died before spawning, and numbers of spring Chinook spawned, 1994-2005. Unknown origin fish (i.e., undetermined by scale analysis; no elastomer, CWT, or fin clips; and no external evidence of hatchery residence) were considered naturally produced (in part from Snow et al. 2008).**

Brood year	Wild spring Chinook					Hatchery spring Chinook					Total number spawned
	Number collected[1]	Pre-spawn loss	Mortality[2]	Number spawned	Number Not Used	Number collected[1]	Pre-spawn loss	Mortality[2]	Number spawned	Number Not Used	
1994	16	0	0	16	0	2	0	0	2	0	18
1995	0	0	0	0	0	11	0	0	11	0	11
1996	117	0	0	117	0	95	4	0	86	5	203
1997	12	0	0	12	0	272	0	0	270	2	282
1998	94	0	0	94	0	88	2	0	79	7	173
1999	49	0	0	49	0	141	14	0	115	12	164
2000	6	0	0	6	0	339	23	0	306	10	312
2001	52	2	0	49	1	357	10	0	228	119	277
2002	0	0	0	0	0	438	21	0	367	50	367
2003	42	1	0	41	0	218	9	0	166	43	207
2004	50	5	0	45	0	304	4	0	299	1	344
2005	9	0	0	9	0	281	2	0	265	14	274
2006	9	1	0	8	0	342	13	0	320	9	328
2007	23	0	0	23	0	204	2	0	169	33	192
2008	56	2	0	52	2	327	4	0	308	15	360
Avg.	***36***	***1***	***0***	***35***	***0.2***	***228***	***7***	***0***	***199***	***21***	***234***

[1]The sum of broodstock collected at all sites.
[2]Mortality includes fish that died of natural causes typically near the end of spawning and were not needed for the program or were immature fish killed at spawning.

6.1.2.3 Past and Proposed Level of Natural Fish in Broodstock

Based on CWT and scale analysis on Brood Years 1994 through 2005, 15.9 percent of the 1,581 spring Chinook trapped for the Methow basin program were natural-origin, and 84.1 percent were hatchery-origin (Snow et al. 2008). Annual broodstock contribution from natural-origin fish ranged from 0 to 58 percent during this period. See Section 1.8.2.1 and 1.11.1 for proposed broodstock composition. See Table 6-2 for the historical natural and hatchery composition of past overall combined broodstock collections. For the proposed program, natural-origin fish may comprise 100% of the hatchery broodstock, provided that collection of NORs for broodstock does not exceed 33% of the NORs to the Methow Basin. Specifically for the Twisp component of the program, pNOB will be ≥ 0.5 and extraction of natural-origin broodstock will not exceed 33% of the NOSs above the Twisp weir, with production floating according to the available number of NOSs above the Twisp Weir.

6.1.2.4 Genetic or Ecological Differences

Small et al. (2007) provide a recent review of the genetic characteristics of Methow River basin spring Chinook. Fish samples from 1992 through 2006 were obtained from the Winthrop NFH, and both natural and hatchery-origin fish from the Methow, Twisp, and Chewuch Rivers. Twisp hatchery and natural-origin collections formed a discrete group distinct from a Methow-Chewuch-WNFH group. Methow River fish were very similar to the WNFH collections, and also differentiated from Chewuch River fish collected in 1992-93. The Methow and Chewuch Rivers fish became more similar after developing the broodstock that combines the Methow and Chewuch River fish. Assignment tests indicated that if natural-origin fish were collected at Wells Dam for broodstock and assigned with a moderate probability threshold (10 times more likely to have come from one collection as from another), there is low risk of incorrectly identifying a Methow-Chewuch fish as a Twisp fish, and even lower risk of incorrectly identifying a Twisp fish as a Methow-Chewuch fish.

In addition to genetic similarity, the broodstocks chosen display morphological and life history traits similar to the natural populations.

The annual adult broodstock collection protocol is keyed on target numbers at various collection sites, currently operated by WDFW, that provide broodstock for Mid-Columbia PUD mitigation program facilities. This adult broodstock collection protocol is an interim and dynamic hatchery broodstock collection plan, which may be altered following HCP Hatchery Committee discussions. As such, there may be significant in-season changes in broodstock numbers, locations, or collection times, brought about through continuing co-manager consultation and in-season monitoring of the anadromous fish runs to the Columbia River above Priest Rapids Dam. Depending on the TAC forecast for UCR spring Chinook, collection protocols will target specific populations of fish in the Methow Basin through broodstock collections in tributary locations in addition to collections at Wells Dam.

Consistent with the BAMP (1998), the draft Biological Opinion released by NMFS and the NWPPC Methow River Sub-basin Summary, broodstock will be collected in a manner that reduces the possibilities of collecting Winthrop NFH Carson-lineage fish to be consistent with the development of local tributary attributes. Recent Methow spring Chinook broodstock collections have occurred at Wells Dam, Twisp River weir, Methow Hatchery, and Winthrop NFH. Limited on-station release of smolts from the Methow Hatchery, absence of a trapping facility on the Chewuch River, and poor trapping success at Foghorn Dam on the mainstem Methow River reduce reasonable certainty of meeting adult collection requirements via tributary and Methow Hatchery outfall collections. The aforementioned limitations are the principle reasons for the inclusion of broodstock collection at Wells Dam and Winthrop NFH.

6.1.2.5 Reasons for Choosing

The goal of the program is to rebuild and recover listed UCR Spring Chinook in the Methow River basin. Multiple sub-basins have contributed to the UCR Spring Chinook genetic makeup. The sources for collection at the Twisp and Methow Rivers provide broodstock from distinguishable stocks for rebuilding and recovery of the listed UCR Spring Chinook in the Methow.

6.2 Indicate Risk Aversion Measures that will be Applied to Minimize the Likelihood for Adverse Genetic or Ecological Effects to Listed Natural Fish that may Occur as a Result of Broodstock Selection Practices

The broodstock protocols were designed to mitigate for potential genetic effects from hatchery domestication and to avoid introgression with fish from other spawning aggregates.

7.0 BROODSTOCK COLLECTION

7.1 Life-history Stage to be Collected (adults, eggs, or juveniles)

Adults are trapped at a number of locations in the Methow system; see Sections 1.8.2.1, 1.11.1, and 2.2.3 and below. Primary collection locations are Wells Dam, Methow Hatchery outfall, WNFH volunteer ladder, and the Twisp River weir.

7.2 Collection or Sampling Design

7.2.1 General Broodstock Collection Methods

Methow spring Chinook broodstock collection will generally occur at Wells Dam fishways, the Twisp River weir, and the Methow Hatchery and Winthrop NFH outfalls. Limited on-station release of smolts from the Methow Hatchery, absence of a trapping facility on the Chewuch River, and poor trapping success at Foghorn Dam on the mainstem Methow River reduce reasonable certainty of meeting adult collection requirements via tributary and Methow Hatchery outfall collections. The aforementioned limitations are the principle reasons for the inclusion of broodstock collection at Wells Dam and Winthrop NFH as a general practice.

Inclusion of natural-origin fish into the broodstock will be a priority, with natural-origin fish specifically targeted. Natural-origin fish collections will not exceed 33 percent of the Methow Basin NOR escapement to Wells Dam, and ideally should not exceed 33 percent of the NOS escapement to the either the Methow Basin or Twisp River, respectively. Recent WDFW genetic assessment of natural-origin Methow spring Chinook (Small et al. 2007) indicates that Twisp natural-origin spring Chinook can be identified with sufficient confidence that natural-origin collections can occur at Wells Dam, thereby facilitating natural-origin inclusion in the broodstock, while maintaining the ability to manage separately the Twisp origin spring Chinook spawning aggregate. Although Twisp natural-origin fish can be assigned to the Twisp population with confidence, some gene flow between the Twisp and Methow/Chewuch composite spawning aggregates are anticipated as a result of collecting natural-origin broodstock at Wells Dam.

Trapping at Wells Dam generally occurs at the east and west ladder traps beginning in early May, or at such time as the first spring Chinook are observed passing Wells Dam, and continues through about the third week of June. Access to the east ladder trap must be coordinated with staff at Wells Dam due to a rotor-rewind project continuing through approximately 2018. The trapping schedule consists of 3 days/week (Monday-Wednesday), and up to 16 hours/day. Two of the three trapping days will be concurrent with the stock-assessment sampling activities authorized through the 2010 Douglas PUD Hatchery M&E Implementation Plan (and as revised in the future by the HCP Hatchery Committee). Natural-origin spring Chinook will be retained from the run, consistent with spring Chinook run timing at Wells Dam (weekly collection quotas). Once the weekly quota target is reached, broodstock collection will cease until the beginning of the next week. If a shortfall occurs in the weekly trapping quota, the shortfall will carry forward to the collection quota for the following week. All natural-origin spring Chinook collected at Wells Dam for broodstock will be held at the Methow Hatchery.

To meet Methow Hatchery broodstock collection needs for hatchery-origin Methow/Chewuch composite and Twisp River stocks, adipose-present CWT hatchery fish (future marking schemes will also facilitate differentiation by program and release location) are generally collected at Methow Hatchery, Winthrop NFH and the Twisp River weir beginning in May, or at such time as spring Chinook arrive at those locations, and continuing through about the third week of August. Natural-origin spring Chinook are retained from the Twisp weir as necessary to bolster the Twisp program production so long as the aggregate collection at Wells Dam and Twisp River weir does not exceed 33 percent of the estimated Twisp River NORs past Wells Dam. All hatchery and natural-origin fish collected at Methow Hatchery, Twisp Weir and Winthrop NFH for broodstock will be held at the Methow Hatchery.

7.2.2 Genetic Issues

Based on the projected proportion of natural-origin broodstock (pNOB) composition for Twisp and Methow/Chewuch composite programs (31 percent and 30 percent, respectively for the 2009 brood year) and composite brood year assignment errors for natural-origin Twisp and Methow/Chewuch composite spring Chinook provided in Snow et al. (2007), the projected non-source fish contributions to the Twisp and Methow/Chewuch composite hatchery programs are 1.6 percent and 1.5 percent, respectively in 2009. In this instance, percent non-source fish contribution may be considered a gene flow estimate between the two program production elements (Twisp and Methow/Chewuch composite) and is an unavoidable consequence associated with natural-origin broodstock collection at Wells Dam. Although gene flow between the two hatchery production components is likely, it is expected to be relatively low in most years, and supports an objective of the hatchery broodstock collection program to infuse natural-origin fish into the hatchery program to maintain/improve genetic diversity and reduced domestication. For a more complete discussion regarding Methow spring Chinook genetic monitoring and evaluation, see Snow et al. (2007).

Non-lethal tissue samples (fin clips) for genetic analysis and scale samples will be obtained from adipose present, non-CWT, non-ventral clipped spring Chinook (suspected natural-origin spring Chinook) collected at Wells Dam for origin analysis. Natural-origin fish retained for broodstock will be tagged with a PIT tag (dorsal sinus) for cross-referencing with tissue sample/genetic analysis. Tissue samples will be preserved and sent to WDFW genetics lab in Olympia Washington (or other genetics lab approved by the HCP Hatchery Committee) for genetic/stock analysis. The spring Chinook sampled will be retained at Methow Hatchery and will be sorted as Twisp or non-Twisp natural-origin fish prior to spawning. The number of natural-origin Twisp and Methow/Chewuch composite (non-Twisp) spring Chinook retained will be dependent upon the number of natural-origin adults returning and the collection objective limiting extraction to no greater than 33 percent of the natural-origin spring Chinook return past Wells Dam. Based on the broodstock collection schedule (3-day/week, 16 hours/day at Wells Dam), natural-origin spring Chinook extraction is expected to be approximately 33 percent or less of the spring Chinook passing Wells Dam.

7.2.3 Run-Size Adjustment

Weekly estimates of passage of natural-origin spring Chinook past Wells Dam will be provided through stock assessment and broodstock collection activities, and will provide the opportunity to adjust, in-season, the extraction of natural-origin spring Chinook to maintain no greater than 33 percent extraction of Twisp and Methow/Chewuch composite natural-origin components, while maximizing the opportunity for the inclusion of natural-origin spring Chinook in the broodstock. In additional, in-season estimates of Twisp and Methow/Chewuch composite natural-origin escapement past Wells Dam provides the opportunity to utilize both Wells Dam and the Twisp River weir as natural-origin collection sites for the Twisp production component, thereby providing additional flexibility to account for differences between projected and actual returns of Twisp and Methow/Chewuch composite natural-origin fish. Twisp and Methow/Chewuch composite hatchery-origin spring Chinook will be captured at the Twisp weir and the Methow Hatchery outfall. Trapping at the Winthrop NFH will also provide broodstock for the Methow Hatchery program. Likewise, excess Methow Hatchery-origin returns to the Methow Hatchery will be provided to the WNFH for their use as broodstock, until their broodstock needs are met (WNFH target for Methow Hatchery fish is 20%-30% of 360 adults).

The Methow Hatchery rears spring Chinook salmon for three acclimation/release sites in the Methow River Basin, including: (1) Methow River (Methow Hatchery); (2) Twisp River (Twisp acclimation pond); and (3) Chewuch River (Chewuch acclimation pond). The total production target is up to 550,000 smolts divided as follows: 225,000 each in the Methow and Chewuch releases, and up to 100,000 in the Twisp River release. Reductions in the Twisp production resulting from insufficient NORs to the Twisp River may preclude the achievement of the 100,000-smolt production target. In such cases, there may be increases in the production numbers in the Methow and/or Chewuch rivers commensurate with the shortfall in Twisp production. The Chewuch acclimation pond and Methow Hatchery releases will typically include progeny of broodstock identified as natural non-Twisp origin, and known Methow/Chewuch composite hatchery-origin fish (WxH), but may utilize HxH crosses of Methow/Chewuch composite fish.

7.2.4 Broodstock Collection Biocriteria

<u>Methow Hatchery spring Chinook program assumptions:</u>

Production Objective:	550,000 yearling smolts, at 30g/fish
Propagation survival:	90 percent fertilization to release
Fecundity:	4,000 eggs/female
Sex ratio:	1: 1
Pre-spawn survival	95 percent
ELISA cull rate	12 percent
Maximum broodstock required	360

7.3 Identity

For hatchery-origin fish, CWTs are read prior to fertilization to determine origin and to facilitate genetic crossing at the hatchery. Non-lethal tissue samples (fin clips) for genetic analysis and scale samples will be obtained from adipose present, non-CWT, non-ventral clipped spring Chinook (suspected natural-origin spring Chinook) collected at Wells Dam for origin analysis. Natural-origin fish retained for broodstock will be tagged with a PIT tag (dorsal sinus) for cross-referencing with tissue sample/genetic analysis. Tissue samples will be preserved and sent to WDFW genetics lab in Olympia Washington for genetic/stock analysis. The spring Chinook sampled will be retained at Methow Hatchery and will be sorted as Twisp or non-Twisp natural-origin fish prior to spawning. Ongoing broodstock collections will be made at the Twisp River weir, and hook-and-line or seining collections of natural-origin adults in selected areas of the Methow and Chewuch Rivers, and natural-origin fish obtained from these efforts will be assumed to originate from those terminal locations. The 2008 Methow hatchery broodstock was comprised of 78.3% known ESA-listed, hatchery-origin, UCR spring Chinook; 7.1% unknown hatchery-origin spring Chinook; and 14.6 percent natural-origin ESA-listed UCR spring Chinook.

7.4 Proposed Number to be Collected

7.4.1 Program Goal (assuming 1:1 sex ratio for adults)

The Methow Hatchery spring Chinook program requires up to 360 adults, which includes collection of additional fish (up to 12-percent over-collection) to facilitate achievement of production targets while culling of gametes from high-ELISA hatchery-origin females for BKD control. See Section 1.8.2.1 for a more thorough discussion of over-collection for BKD management.

7.4.2 Broodstock Collection Levels for the Last Twelve Years (e.g., 1988-99), or for Most Recent Years Available

Table 7-1. Natural and hatchery-origin broodstock collected at Methow River basin traps, brood years 1992-2008.

Brood Year	Chewuch River		Methow River		Twisp River	
	Naturals	Hatchery	Naturals	Hatchery	Naturals	Hatchery
1992	25	5	0	0	20	0
1993	91	9	26	55	30	1
1994	11	1	0	1	5	0
1995	0	0	0	11	0	0
1996	21	45	74	25	22	25
1997	1	66	11	191	0	15
1998	0	0	93	77	1	11
1999	0	0	33	117	16	24
2000	0	0	0	276	6	63
2001	18	73	0	250	34	34
2002	0	126	0	297	0	15
2003	2	60	0	126	40	32
2004	1	134	0	145	49	25
2005	2	134	0	130	7	17
2006	1	125	8	189	0	28
2007	0	0	19	168	4	36
2008	0	0	44	296	12	31

7.5 Disposition of Hatchery-origin Fish Collected Surplus to Broodstock Needs

See Section 7.4, depending on annual returns. The level of fish collected has been determined by the WDFW and the HCP Hatchery Committees. Adult and jack endangered UCR spring Chinook salmon not retained for broodstock are released unharmed above the respective trapping facility for natural spawning immediately after being enumerated.

7.6 Fish Transportation and Holding Methods and Holding of Fish, Especially if Captured Unripe or as Juveniles. Include Length of Time in Transit

Table 7-2. Fish Transportation Equipment.

Equipment Type	Capacity (gallons)	Suppl. Oxygen (Y/N)	Temp. Control (Y/N)	Normal Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Truck with Tank	300	Y	N		MS-222 and NaCl	10 ppm and 0.8% solution
Tanker Truck	700	Y	N		MS 222 and NaCl	10 ppm and 0.8% solution

Table 7-3. Broodstock Holding and Spawning Facilities.

Ponds (No.)	Pond Type	Volume (cu. ft)	Length (ft)	Width (ft)	Depth (ft)	Available Flow (gpm)
3	Concrete Raceways	2560	80	8.0	4.0	320

7.7 Describe Fish Health Maintenance and Sanitation Procedures Applied

For all production programs under the Mid-Columbia Hatchery Program, standard fish-health monitoring will be conducted (monthly checks of salmon and steelhead) by fish-health specialist, with intensified efforts to monitor presence of specific pathogens that are known to occur in the donor populations. Significant fish mortality attributed to an unknown cause(s) will be sampled for histopathological study. Fish-health maintenance strategies are described in IHOT (1995). Incidence of viral pathogens in salmon and steelhead broodstock will be determined by sampling fish at spawning in accordance with the Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. Populations of particular concern may be sampled at the 100-percent level and may require segregation of eggs/progeny in early incubation or rearing, and/or culling. Specifically, incidence of *Renibacterium salmoninarum* (Rs, causative agent of BKD) in salmon broodstock will be determined by sampling fish at spawning by ELISA. Hatchery staff will segregate eggs/progeny based on levels of Rs antigen, protecting negative or low-ELISA progeny from the potential horizontal transmission of Rs bacteria from high-ELISA progeny. Progeny of any segregation study will also be tested by ELISA; at a minimum each segregation group would be sampled at release. Necropsy-based condition assessments (based on organosomatic indices) will be used to assess condition of hatchery-reared salmon smolts at release, and natural-origin salmon during outmigration. If needed, condition assessments will be performed at other key times during hatchery rearing.

7.8 Disposition of Carcasses

IHOT, PNFHPC, state or tribal guidelines are followed for broodstock fish health inspection, transfer of eggs or adults and broodstock holding and disposal of carcasses. Carcasses of the ESA-listed fish spawned in captivity may be outplanted in the Methow River watershed for nutrient enrichment if disease protocols as determined by the co-managers fish-health specialists are met, donated for educational purposes, incinerated, buried on-station after completion of spawning or disposed of at waste disposal facilities.

7.9 Indicate Risk Aversion Measures that will be Applied to Minimize the Likelihood for Adverse Genetic or Ecological Effects to Listed Natural Fish Resulting from the Broodstock Collection Program

In an effort to minimize adverse impacts to ESA-listed spring Chinook and ESA-listed UCR steelhead, WDFW trapping locations, dates and frequency are consistent with the Year 2009 UCR Salmon and Steelhead Broodstock Objectives and Site-Based Broodstock Collection Protocols (and future annual broodstock collection protocols). Adult Chinook are trapped and transferred to Methow Hatchery. Holding facilities at Methow Hatchery include covered raceways and surface water spray to minimize disturbance, provide shade, and reduce jumping by adults. Traps are checked at least once daily and no out-of-water transfers occur during transfer from trap site to holding sites. Twisp weir trapping includes on-site security to minimize potential impact to steelhead kelts, bull trout, and spring Chinook. While trapping and handling procedures for adult Chinook are implemented to minimize potential adverse affects to listed stocks, some mortality could occur.

If water temperatures at adult trapping sites exceed 69.8°F (21°C), trapping will cease pending further consultation with NMFS to determine if continued trap operations poses substantial risk to ESA-listed species.

8.0 MATING

8.1 Describe Fish Mating Procedures that will be Used, including those Applied to Meet Performance Indicators Identified Previously

8.1.1 Selection Method

All males and females collected for broodstock will be examined weekly during the spawning season to determine ripeness, and all fish will be spawned when ripe. Spawning activities for ESA-listed spring Chinook retained from the Methow basin will normally occur from mid-August to mid-September. *In-situ* stock separation of ESA-listed spring Chinook, Carson origin, and out-of basin stray fish is accomplished through scale sample and CWT analysis; only natural-origin and Methow Hatchery origin adults will be spawned. Only WxW and HxW parental crosses will be made (no HxH crosses) for the Twisp component; though not preferred, some HxH crosses may be necessary for the Methow/Chewuch component in some years with very low escapement.

8.1.2 Males

Males may be live-spawned on the first spawning day as necessary to make up for a naturally occurring low male-to-female ratio. However, inclusion of jack Chinook in the run-at-large broodstock collections helps to alleviate occasional low adult-male occurrence.

Jacks are collected in similar proportion to the run-at-large. Inclusion of about 10 percent jack Chinook in the broodstock collections helps to alleviate occasional low adult male occurrence. The hatchery broodstock remains genetically similar to, and representative of the spring Chinook populations. Back-up males are used in the spawning protocol.

8.1.3 Fertilization

Spawning protocols reflect the need to maintain genetic diversity of the separate summer Chinook populations. A 1:1 spawning ratio is employed, and each female's eggs are divided into two buckets (a and b) and each bucket is fertilized with a separate male. Thus, when two females are spawned with two males, four separate genetic crosses result: female 1a x male1; female 1b x male2; female 2a x male 1; female 2b x male2. In some cases, not enough females, males, or fish of the necessary stock/origin are available on an individual spawn day, and a standard one-male-to-one-female strategy is employed. After fertilization, the eggs are combined and incubated as individual female lots.

8.1.4 Cryopreserved gametes

Cryopreserved gametes are not used.

8.2 Indicate Risk Aversion Measures that will be Applied to Minimize the Likelihood for Adverse Genetic or Ecological Effects to Listed Natural Fish Resulting from the Mating Scheme

- A 1:1 mating scheme is employed.
- Collect jacks in similar proportion to the run-at-large. Inclusion of jack Chinook in the run-at-large broodstock collections helps to alleviate occasional low adult male occurrence. The hatchery broodstock remains genetically similar to, and representative of, the up-river spring Chinook populations.
- Fish health procedures used for disease prevention include biological sampling of spawners. Generally, kidney/spleen samples are collected from all female spawners to test for the presence of viral pathogens. The ELISA is conducted on kidney samples from all females. This assay detects the antigen for Renibacterium salmoninarium, the causative agent of BKD.

9.0 INCUBATION AND REARING

9.1 Specify any Management Goals (e.g., "egg to smolt survival") that the Hatchery is Currently Operating under for the Hatchery Stock in the Appropriate Sections Below. Provide Data on the Success of Meeting the Desired Hatchery Goals

9.1.1 Incubation

9.1.1.1 Number of Eggs Taken and Survival Rates to Eye-up and/or Ponding.

Egg-take goals will vary annually dependent upon the necessary level of over-collection for BKD management. Currently, over-collection rate is determined annually based on the average of high-titer (ELISA OD $\geq$ 0.12) females from the previous five brood years; for 2009, the over-collection rate was 12 percent. Using the 12-percent over-collection rate, egg-take goals are estimated at approximately 280,000 each for the Chewuch and Methow Rivers, and approximately 124,000 for the Twisp River.

Table 9-1. Hatchery life stage survival rate standards and level achieved (%) by stock and brood year for Met-Comp spring Chinook, brood years 1999-2008. Standards are in parentheses.

Brood Year	Unfertilized egg to eyed (92.0)	Eyed egg to ponding (98.0)	30 d after ponding (97.0)	100 d after ponding (93.0)	Ponding to release (90.0)	Transport to release (95.0)	Unfertilized egg to release (81.0)
1999	95.4	100.0	99.5	99.5	99.2	---	94.6
2000	96.5	100.0	99.6	99.4	99.0	99.9	92.7
2001	93.2	100.0	99.3	99.1	97.0	99.8	90.8
2002	96.0	100.0	98.6	98.6	96.5	98.5	92.7
2003	90.0	100.0	98.8	98.3	93.0	99.8	77.9
2004	94.8	96.2	99.2	99.2	96.6	99.8	84.6
2005	96.9	96.9	99.6	99.5	90.4	99.6	87.7
2006	93.9	95.0	89.4	89.4	76.5	96.2	68.2
2007	92.9	94.8	99.6	99.3	95.7	99.1	84.2

Table 9-2. Hatchery life stage survival rate standards and level achieved (%) by stock and brood year for Twisp River spring Chinook, brood years 1999-2008.

Brood Year	Unfertilized egg to eyed (92.0)	Eyed egg to ponding (98.0)	30 d after ponding (97.0)	100 d after ponding (93.0)	Ponding to release (90.0)	Transport to release (95.0)	Unfertilized egg to release (81.0)
1999	94.2	100.0	99.5	99.5	98.0	99.7	92.3
2000	97.1	100.0	99.6	99.5	48.0	23.9	46.6
2001	90.1	100.0	98.8	95.2	90.1	100.0	81.2
2002	97.9	100.0	99.3	99.1	98.5	99.9	96.4
2003	91.8	99.8	99.2	98.6	95.9	100.0	86.4
2004	95.4	97.8	99.1	98.8	78.7	99.5	73.3
2005	95.7	98.2	99.6	99.5	99.2	99.9	93.2
2006	95.9	99.6	99.7	99.6	94.6	99.7	90.4
2007	92.4	95.4	99.5	98.8	89.1	99.7	78.6

9.1.1.2 Cause for, and Disposition of Surplus Egg Takes

Permit conditions specify a maximum number of broodstock that can be collected as determined by expected pre-spawning survival of broodstock, fecundity, and survival-to-release of progeny. To facilitate achievement of the production target of 550,000 smolts while anticipating the need to cull progeny of high-ELISA females, annual protocols for broodstock collection include collection of up to 12-percent additional broodstock above that necessary for the production target. Given the deliberate over-collection for BKD management, culling of hatchery-origin eggs may occur as required to manage BKD and/or maintain production at no more than 550,000 yearling smolts. Under any circumstances, culling will be selective for hatchery-origin egg lots with the highest ELISA OD values. Culling of eggs from natural-origin females will not occur unless their ELISA levels are determined by WDFW Fish Health to be a substantial risk to the program.

9.1.1.3 Loading Densities Applied During Incubation

IHOT species-specific incubation recommendations will be followed for water quality, flows, temperature, substrate, and incubator capacities. Fertilized eggs from each female are incubated in individual iso-buckets to the eyed-egg stage to segregate for ELISA (BKD) values, and are then transferred to Heath stack incubators, with the progeny of one female per Heath tray (approximately 4,000 eggs/tray). Incubation conditions are based on loading densities recommended by Piper et al. (1982).

9.1.1.4 Incubation Conditions

Eggs are incubated full-term (green egg to emergence) at the Methow Hatchery.

9.1.1.5 Ponding

Spring Chinook fry are transferred from Heath trays for ponding upon button-up and swim-up. Ponding generally occurs after the accumulation of 1,650 to 1,750 temperature units. Unfed fry are transferred to the rearing ponds from early May through early June. The normal weight for fry initially ponded at the Methow Hatchery for brood years 1989-95 was 0.45 grams (1000 fish per pound). The fry fork length recorded for the same brood years was 36 to 40 mm. More recently fry have been ponded at between 1200 and 3000/lb.

9.1.1.6 Fish Health Maintenance and Monitoring

Eggs are examined daily by hatchery personnel. Prophylactic treatment of eggs for the control of fungus is prescribed by fish-health specialists, and may include treatment with formalin or other accepted fungicides. Non-viable eggs and sac-fry are removed by bulb-syringe. Adherence to WDFW, Pacific Northwest Fish Health Protection Committee, and IHOT (1995) fish disease-control policies reduces the incidence of diseases in fish produced and released from the Methow Hatchery. All lots are monitored for BKD; no eggs will be retained from hatchery-origin females with ELISA OD values ≥ 0.12. Culling of eggs from natural-origin females will not occur, unless their ELISA levels are determined by WDFW Fish Health to be a substantial risk to the program. Juveniles from natural-origin females with ELISA levels ≥ 0.12 will be differentially tagged for evaluation purposes. If the program is under the 550,000 goal some low-ELISA fish may be reared at lower densities.

9.1.1.7 Indicate Risk Aversion Measures that will be Applied to Minimize the Likelihood for Adverse Genetic and Ecological Effects to Listed Fish During Incubation

All eggs brought to the facility will be surface-disinfected with iodophor (as per disease policy). All equipment (nets tank and rain gear) is disinfected with iodophor between different fish/egg lots. Different fish/egg lots will be physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks are disinfected between the hauling of different fish lots. Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to "clean" or isolated areas of the incubation room) to prevent spread of pathogens. Formalin drips are applied to prevent fungal spread from dead eggs. Flow, D.O. and temperature units (TU) are monitored per IHOT or program guidelines.

Regarding BKD, the following will occur:

- Hatchery-origin eggs/progeny with high ELISA titers (O.D. ≥ 0.12) will be culled.
-
- Wild-origin eggs/progeny with high ELISA titers (O.D. ≥ 0.12) will be raised at lower density of 0.06.
-
- Culling very high titer progeny: All hatchery- and natural-origin eggs/progeny with very high ELISA titers (O.D. >0.19) will be culled from the program.
-
- At the first signs of infection with BKD, juvenile spring Chinook will be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

9.1.2 Rearing

9.1.2.1 Provide Survival Rate Data (average program performance) by Hatchery Life Stage (fry to fingerling; fingerling to smolt) for the Most Recent Twelve Years (1988-99), or for Years Dependable Data are Available

Tables are provided in Section 9.1.1.1.

9.1.2.2 Density and Loading Criteria (goals and actual levels)

Include density targets (lbs fish/gpm, lbs fish/ft3 rearing volume, etc).

The following table represents current density and loading criteria. The HCP Hatchery Committee may adjust criteria as deemed necessary.

Table 9-3. Density and fish loading criteria for spring Chinook.

Rearing Criteria	**Spring Chinook**	
Rearing Criteria	ELISA ≤0.119[1]	ELISA ≥0.12
Density index (lbs/cf-in)	0.12	0.06
Flow index (lbs/gpm-in)	0.75	0.60
Acclimation Criteria		
Density index (lbs/cf-in)	0.10	0.06
Flow index (lbs/gpm-in)	1.00	0.60

[1] The 0.119 threshold was developed jointly by the USFWS and WDFW. Fish with an ELISA >0.19 will be culled.

9.1.2.3 Fish Rearing Conditions

Fish are reared on a combination of well and river water. Methow River water is added beginning in late November. Rearing is on 100 percent river water by late February prior to transfer of pre-smolts to acclimation ponds. Temperature, dissolved oxygen and pond turnover rate are monitored. IHOT standards are followed for: water quality, alarm systems, predator control measures (netting) to provide the necessary security for the cultured stock, loading and density. Settleable solids, unused feed and feces are removed regularly to ensure proper cleanliness of rearing containers. All ponds are vacuumed weekly for the yearlings. Ponds are pressure washed between broods. Temperature and dissolved oxygen are monitored and recorded daily during fish rearing. Temperatures during the rearing cycle range from a high of 55°F to a low of 33°F.

9.1.2.4 Indicate Biweekly or Monthly Fish Growth Information (average program performance), including Length, Weight, and Condition Factor Data Collected During Rearing, if Available

These data are not collected monthly at the Methow Hatchery.

9.1.2.5 Indicate Monthly Fish Growth Rate and Energy Reserve Data (average program performance), if Available

These data are unavailable at the Methow Hatchery.

9.1.2.6 Indicate Food Type Used, Daily Application Schedule, Feeding Rate Range (e.g., % B.W./Day and Lbs/Gpm Inflow), and Estimates of Total Food Conversion Efficiency During Rearing (average program performance)

Table 9-4. Food Type Information.

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
December-January	BioDiet Starter	3-4	1.0-3.0	0.025	0.8
February-March	BioDiet Starter	2-3	1.0-2.0	0.02	1.0
April-May	BioVita	2	1.0-2.0	0.02	1.0
June-September	BioVita	1-2	1.0-1.5	0.02	1.0
October-April	BioVita	1	1.0	0.02	1.0

9.1.2.7 Fish Health Monitoring, Disease Treatment, and Sanitation Procedures

Standard fish-health monitoring will be conducted by a fish-health specialist at frequencies appropriate to the life stage and susceptibility to disease. Significant fish mortality attributable to unknown cause(s) will be sampled appropriately for study (i.e., viral assay, bacterial culture, and histopathology). Fish health maintenance strategies are described in IHOT (1995). Incidence of viral pathogens in spring Chinook broodstock will be determined by sampling fish at spawning in accordance with the Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. Populations of particular concern may be sampled at the 100 percent level and may require segregation of eggs/progeny in early incubation or rearing.

Fish are monitored daily by staff during rearing for signs of disease, through observations of feeding behavior and monitoring of daily mortality trends. A fish-health specialist will monitor fish health often as determined necessary. More frequent care will be provided as needed if disease is noted. Hatchery Specialists under the direction of the Fish Health Specialist will provide treatment for disease. Sanitation will consist of raceway cleaning as necessary by brushing, and disinfecting equipment. Fish-health examinations are performed on all spring Chinook production lots throughout the rearing period and pre-release.

All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots. Tank trucks are disinfected between the hauling of adult and juvenile fish. Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

The general policy is to bury dead juvenile fish and eggs to minimize the risk of disease transmission to natural fish. Adult spring Chinook carcasses will be buried or disposed of in an approved landfill if individuals have been treated with antibiotics and died within the withdrawal period identified by the FDA. All adults injected with maturation accelerating hormones (such as sGnRHa implants) will be disposed of in an approved landfill, consistent with INAD requirements.

9.1.2.8 Smolt Development Indices (e.g., gill ATPase activity), if Applicable

Degree of smoltification is monitored through monthly collection of data indicating average condition factor (Kfl) of the populations. Gill ATPase levels have been monitored in the past to attempt to indicate degree of smoltification. However, this index has not been found to be a useful tool for determining when to begin releases, due to the delay in obtaining results from sampling, and the finding that ATPase levels do not actually increase until the smolts are actively migrating in the Columbia River (Petersen et al. 1999b). Organosomatic Index analysis of Methow Composite fish in 2004 provided a normality index of 97.5 percent.

9.1.2.9 Indicate the Use of "Natural" Rearing Methods as Applied in the Program

Currently, natural rearing methods are approached through the transfer of most Chinook smolts to acclimation ponds at release locations. The trapezoidal, Hypalon-lined acclimation ponds provide lower density rearing vessels for the fish on their natal water prior to release. Any changes to current rearing approaches must be approved by the HCP Hatchery Committee. Additionally, dispersed acclimation of a portion of the spring Chinook from the Methow Hatchery may occur at the discretion of the Hatchery Committee following the development of natural rearing sites in the Methow Basin by others (e.g., the Yakama Nation, Methow Salmon Recovery Foundation, etc.), provided that Douglas PUD relinquishes responsibility for and receives credit for the production of spring Chinook acclimated in those locations at the time they are released from the custody of Douglas PUD.

9.1.2.10 Indicate Risk Aversion Measures that will be Applied to Minimize the Likelihood for Adverse Genetic and Ecological Effects to Listed Fish Under Propagation

- Marked fish from outside of the Mid-Columbia Region will be excluded from the Methow broodstock. Progeny from adults captured at Wells Dam that are from the Entiat or Wenatchee programs will be returned to their hatchery of origin, if this action is consistent with fish-health protocols. This will require reading of CWTs during spawning.
- Adults may be PIT tagged (or individually marked by some means) to identify them by time of arrival. If too many adults are collected because the actual run size differs substantially from the prediction, adults may be selected for return to the river for natural spawning or, alternatively, removed for control of pHOS. This will be performed in a manner that allows an adequate representation of the gene pool, and is consistent with ongoing disease prophylaxis treatments. Origins of late arriving adults will be investigated through in-situ scale pattern analysis and maturation timing to help ensure that ocean-type Chinook salmon are not inadvertently included in the broodstock.
- In-situ stock separation of Methow/Chewuch composite, Twisp, Carson-based Winthrop stock and stray fish via scale analysis, PIT-tag identification, and reading of CWTs during spawning operations will continue.

10.0 RELEASE

10.1 Describe Fish Release Levels, and Release Practices Applied Through the Hatchery Program

10.1.1 Proposed Fish Release Levels

Table 10-1. Approximate size and number targets for production of spring Chinook smolts from the Methow Hatchery spring Chinook program. Targets are subject to change at the discretion of the HCP Hatchery Committees, and may fluctuate dependent upon availability of NORs at the Twisp Weir and PUD obligations as determined through survival studies (as described in the pertinent HCPs and Grant PUD's Settlement Agreement).

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs	None	NA	NA	NA
Unfed Fry	None	NA	NA	NA
Fry	None	NA	NA	NA
Fingerling	None	NA	NA	NA
Yearling	225,000	15	April – May	Chewuch River
Yearling	225,000	15	April – May	Methow River
Yearling	100,000	15	April - May	Twisp River

Up to 550,000 smolts will be produced per Douglas, Chelan, and Grant PUD obligations. The numbers planted to each system will depend on the availability of composite stock and identification of fish from Chewuch or Twisp populations. Currently, Douglas PUD's obligation is for 61,071 yearling UCR spring Chinook, Chelan PUD's obligation is for 288,000 yearling UCR spring Chinook, and 201,000 yearling UCR spring Chinook are produced for Grant PUD. These production proportions will remain until modified by the HCP Hatchery Committees (Douglas and Chelan PUDs) and/or the Priest Rapids Coordinating Committee Hatchery Subcommittee (PRCC HSC; Grant PUD).

10.1.2 Specific Location(S) of Proposed Release(S)

Stream, river, or watercourse:
Release point:
Major watershed:
Basin or Region:

Fish are released on station from the Methow Hatchery to the Methow River at RKm 82.1.
Fish are released from an acclimation pond on the Twisp River at RKm 10.
Fish are released from an acclimation pond on the Chewuch River at RKm 12.9.

All sites are in the (Upper) Columbia River watershed, and the Methow River sub-basin (WRIA 48). Future acclimation facilities within the Methow Basin may be developed by others and may receive releases of spring Chinook from the Methow Hatchery spring Chinook program at the discretion of the HCP Hatchery Committees (and the PRCC HSC, when applicable).

10.1.3 Actual Numbers and Sizes of Fish Released by Age Class through the Program

Table 10-2. Methow River Basin yearling spring Chinook smolt releases, 1994-2005.

Release Year	Methow River			Chewuch River			Twisp River		
	No.	Date (MM/DD)	Avg Size (fpp)	No.	Date (MM/DD)	Avg Size (fpp)	No.	Date (MM/DD)	Avg Size (fpp)
1994	-	-	-	40,881	4/18	15.1	35,853	4/15	15.1
1995	210,849	4/15	15.9	284,165	4/17	16.4	116,749	4/17	15.2
1996	4,477	4/22	14.5	11,854	4/21	12.7	19,835	4/21	14.4
1997	28,878	4/15	14.1	-	-	-	-	-	-
1998	202,947	4/15	18.1	91,672	4/15	20	76,687	4/15	14.8
1999	332,484	4/15	18.3	132,759	4/19	16.2	26,714	4/15	16.1
2000	218,499	4/17	16	217,171	4/17	18.4	15,470	4/17	15.0
2001	180,775	4/17	11.0	-	-	-	67,408	4/17	9.5
2002	66,454	4/16	16.9	199,938	4/16	16.9	75,704	4/15-23	16.7
2003	130,787	4/21	16.0	261,284	4/21-23	15.0	57,471	4/21	21.0
2004	181,235	4/2-14	15.8	254,238	4/14	12.9	58,074	4/13	15.0
2005	48,831	4/18	16.0	127,614	4/18	16.4	136,998	4/18-25	16.1

Data source: Snow et al. (2008), and WDFW unpublished data.

10.1.4 Actual Dates of Release and Description of Release Protocols

See Section 10.3 (Table 10-2) for recent release dates. Releases from the acclimation ponds at the beginning of the release period in April are volitional for approximately 20 days with the remaining fish forced out by mid-May.

10.1.5 Fish Transportation Procedures, if Applicable

Pre-smolts are transported from the hatchery to the Chewuch and Twisp acclimation ponds in March by tanker truck (Table 10-3). Current fish-transport procedures include crowding and loading into distribution tucks via a fish pump. Distribution trucks are reliable and safe and water is tempered as appropriate. Fish are tempered to within 3°C of the receiving water prior to release into the ponds. Loading densities are from 0.3 to 0.5 pounds of fish per gallon of water. Fish are volitionally released directly from the ponds to the river and do not require additional transportation.

Table 10-3. Fish Transportation Equipment.

Equipment Type	Capacity (gallons)	Suppl. Oxygen (Y/N)	Temp. Control (Y/N)	Normal Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Truck with Tank	300	Y	N	30 minutes	MS-222 and NaCl	10 ppm and 0.8% solution
Tanker Truck	700	Y	N	30 minutes	MS 222 and NaCl	10 ppm and 0.8% solution

10.1.6 Acclimation Procedures (methods applied and length of time)

On or about March 15th, pre-smolts are transferred from Methow Hatchery to Twisp and Chewuch acclimation ponds where fish are acclimated for approximately 30 days. Fish are provided a volitional release, and typically migrate quickly from the acclimation facilities.

10.1.7 Marks Applied, and Proportions of the Total Hatchery Population Marked, to Identify Hatchery Adults

All juveniles in the current program (through 2009) are 100 percent CWT marked but not adipose fin clipped, and are segregated into rearing vessels based on ELISA (BKD) values and stock (Twisp and Methow/Chewuch composite). Segregation by stock and ELISA category will continue, and all smolts will be marked to distinguish specific hatchery crosses and to facilitate removal of hatchery-origin fish in selective fisheries. The HCP Hatchery Committee will determine the marking scheme that will be coordinated among all releases of spring Chinook above Wells Dam.

10.1.8 Disposition Plans for Fish Identified at the Time of Release as Surplus to Programmed or Approved Levels

Broodstock and egg collections are designed to minimize the potential for egg surpluses. Egg surpluses, if any, will be culled (see Section 9.1.2). Thus, surplus smolts are not expected.

10.1.9 Fish Health Certification Procedures Applied Pre-Release

Fish health and disease condition are continuously monitored in compliance with the requirements of the "Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State" (Co-managers 1998), requirements of the Section 10 ESA permit issued and guidelines of IHOT (1995). Spring Chinook are monitored daily by staff during rearing for signs of disease, through observations of feeding behavior, and monitoring of daily mortality trends. A fish health specialist monitors fish health as least monthly; these inspections must adhere to the disease prevention and control guidelines established by the Pacific Northwest Fish Health Protection Committee. More frequent care will be provided as needed if disease is noted. Prior to release, the population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release, and up to 6 weeks on systems with pathogen free water and little or no history of disease.

10.1.10 Emergency Release Procedures in Response to Flooding or Water System Failure

Emergency releases shall be allowed in the event of flooding, water loss to raceways, or vandalism that necessitates early release of ESA-listed spring Chinook to prevent catastrophic mortality. Any emergency releases made by the hatchery operators will be reported immediately to the NMFS Salmon Recovery Division in Portland, OR.

In the event of a water-system failure, screens will be pulled to allow fish to exit the ponds, or in some cases they will be transferred into other rearing vessels to prevent an emergency release. Upon permission, fish would be force-released into the Methow River by pulling the screens/outlets of rearing units. Outlet screens/stop logs of the ponds would be pulled, and fish would be forced out, or allowed to volitionally move into the Methow. This would only occur if the program were in jeopardy. WDFW also has emergency response procedures for providing back-up pumps, transport trucks, etc. in cases of emergency. In cases of severe flooding the screens will not be pulled because flood waters rise to the point where they breach the ponds. Every effort will be made to avoid pre-programmed releases including transfer to alternate facilities. Emergency releases, if necessary and authorized, would be managed by removal of outlet screens and pull sumps of the rearing units. If possible, staff would set up portable pumps to use river water to flush the fish.

10.1.11 Indicate Risk Aversion Measures that will be Applied to Minimize the Likelihood for Adverse Genetic and Ecological Effects to Listed Fish Resulting from Fish Releases

The risk of ecological hazards to listed species resulting from liberations of hatchery-origin spring Chinook will be minimized through the following measures:

- Hatchery spring Chinook will be reared to sufficient size such that smoltification occurs within nearly the entire population, reducing residence time in the streams after release and promoting rapid seaward migration.
- Spring Chinook smolt releases will be timed with releases from Columbia River dams to further accelerate seaward migration, to improve survival at mainstem dams, and to reduce the duration of interactions with wild fish.
- Acclimation in natal stream water will contribute to smoltification, reducing the residence time in the rivers and mainstem corridors.
- Hatchery spring Chinook smolts will be released when environmental conditions exist that promote rapid emigration.
- Total number of smolts released with expected adult contribution to natural spawning will be managed with consideration of both the HCP obligations and the tributary carrying capacity.
- All artificially propagated UCR spring juveniles shall be externally or internally marked prior to release, according to the coordinated marking scheme under development by the HCP Hatchery Committee.

Variance from this smolts-only release requirement shall only be allowed in the event of an emergency, such as flooding, water loss to raceways, or vandalism that necessitates early release of ESA-listed spring Chinook to prevent catastrophic mortality. Any emergency spring Chinook releases made by the action agencies will be reported immediately to the NMFS Salmon Recovery Division in Portland, OR.

11.0 MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1 Monitoring and Evaluation of "Performance Indicators" Presented in Section 1.10

The HCP Hatchery Committee has developed a rigorous monitoring plan (M&E Plan) for the Methow Hatchery spring Chinook program (HCP HC 2007), attached as Appendix A. Douglas PUD funds an M&E program based upon that M&E Plan and a companion document, the "Analytical Framework" (Hays et al. 2007), attached as Appendix B, which describes the necessary data and analytical rules by which to assess the performance of the program relative to the specific objectives in the M&E Plan. Implementation of the M&E Plan is guided by an annual M&E Implementation Plan (Murdoch and Snow 2009; attached as Appendix C) prepared by Douglas PUD's M&E contractor (currently WDFW) and approved by the HCP Hatchery Committee. The M&E program is subject to review by the HCP Hatchery Committee at least every five years (or as needed), and it is within the purview of the HCP Hatchery Committee to modify the M&E Plan and Analytical Framework (and thus, the M&E program) at any time (adaptive management).

The M&E program monitors survival and growth within the hatchery and the effects of hatchery fish on population productivity, genetic diversity, run and spawn timing, spawning distribution, and age and size at maturity. This information is collected directly from, or is derived from spawning ground surveys, broodstock sampling, stock composition sampling (stock assessment), hatchery juvenile sampling, smolt trapping, PIT tagging, elastomer tagging, adipose clipping, genetic sampling, disease sampling, and snorkeling. The monitoring and evaluation program is consistent with the draft monitoring and evaluation plan prepared by NMFS for the Recovery Plan (see Appendix P to the Recovery Plan; UCSRB 2007) and the Ad Hoc Supplementation Monitoring and Evaluation Workgroup recommendations (Galbreath et al. 2008).

11.1.1 Describe Plans and Methods Proposed to Collect Data Necessary to Respond to Each "Performance Indicator" Identified for the Program

The M&E Plan and Analytical Framework were developed by the Hatchery Evaluation Technical Team (HETT; *ad hoc* technical subcommittee to the HCP Hatchery Committees and PRCC Hatchery Subcommittee). The objectives within the M&E Plan and Analytical Framework were developed to assess progress toward achieving the hatchery program goals defined by the JFP in the M&E Plan. The Wells HCP Hatchery Committee approved the initial 2005 M&E Plan at the July 2005 HCP Hatchery Committee meeting and approved the updated version in September of 2007. The Wells HCP Hatchery Committee may modify the M&E Plan as necessary to ensure that the program goals are being appropriately monitored.

The M&E Plan for the Methow Hatchery spring Chinook program intends to use control populations (sometimes called "reference streams") for comparative analysis (i.e., to tease out hatchery effects). Availability, feasibility, and viability of using control population are currently being evaluated by the HETT. Because of the difficulty in finding suitable control populations (spring Chinook systems similar to the Methow, but with no hatchery influence) and the ability to detect impacts, the HCP Hatchery Committee has tentatively accepted this approach while the HETT conducts the necessary analyses to identify control populations and validate the approach.

The M&E Plan and Analytical Framework (Appendices A and B) thoroughly describe the program objectives, their respective hypotheses, measured variables, derived metrics, and analyses.

11.1.2 Indicate Whether Funding, Staffing, and other Support Logistics are Available or Committed to Allow Implementation of the Monitoring and Evaluation Program

Douglas PUD funds and Chelan and Grant PUDs co-fund the M&E activities for this program. WDFW, as a contractor to Douglas PUD and co-holder of the permit, currently provides the personnel and equipment for conducting these activities. Copies of the Annual Report on M&E activities are routinely and regularly provided to NMFS through its representative on the Wells HCP Hatchery Committee.

11.2 Indicate Risk Aversion Measures that will be Applied to Minimize the Likelihood for Adverse Genetic and Ecological Effects to Listed Fish Resulting from Monitoring and Evaluation Activities

11.2.1 Juvenile Monitoring

Injury to steelhead, spring Chinook salmon, and bull trout may occur through trapping, handling, and marking procedures. Primary injury and mortality events are associated with debris accumulation in the trap live-box, reaction to anesthesia, handling stress, over-crowding in the live-box, predation in the live-box, and increased predation post release. Injury and mortality will be minimized through diligent trap attendance. Traps will be checked a minimum of once a day in the morning or more often as needed (as determined by capture rate, debris loading, discharge, temperature, etc.). Injury and mortality associated with handling stress and post-release predation will be addressed by applying MS-222 (or other anesthetic approved by WDFW and/or NMFS) to all fish handled, and allowing full recovery of fish before release. Other risk aversion measures include:

- No more than 20 percent of the natural or hatchery emigrants may be captured.
- Lethal take may not exceed 2 percent of the natural or hatchery fish captured.
- Tissue sampling shall be minimized to the extent possible.

- Fish must be kept in water to the maximum extent possible. Adequate water circulation and replenishment of water in holding units is required.
- Fish must be moved using equipment that holds water during transfer.
- Fish must not be handled if water temperatures exceed 69.8°F (21°C) at the capture site.
- The incidence of capture, holding, and handling effects shall be minimized and monitored.
- Visual observation protocols must be used instead of intrusive sampling methods whenever possible.

The Section 10 Permits No. 1196 describes the risk aversion measures required of the current M&E activities for spring Chinook.

11.2.2 Adult Monitoring

No injury or mortalities are expected during spring Chinook spawning ground surveys. Field staff will minimize disturbance to any spawning spring Chinook by identifying spawning sites and using a land route around their location. In addition, wading is restricted to the extent practical to minimize disturbance, and extreme caution is used to avoid adults and redds when wading is required.

During sampling at Twisp Weir, Methow Hatchery, WNF Hatchery, and Wells Dam (and other collection/sampling locations and methods as approved by the HCP Hatchery Committee), injury to spring Chinook may occur through trapping, handling, and sampling procedures. Primary injury and mortality events are associated with reaction to anesthesia, handling stress, and over-crowding in collection areas. Injury and mortality will be minimized through diligent trap attendance. Traps will be checked a minimum of once a day in the morning or more often as needed. Injury and mortality associated with handling stress, anesthetizing, and sampling will be addressed by applying MS-222 (or other anesthetic approved by WDFW and/or NMFS) to all fish handled, and allowing full recovery of fish before release. Procedures and trapping equipment have been rigorously tested and refined over the last five years. Potential sources of injury have been identified and corrected by Douglas PUD and WDFW staff.

Additionally, WDFW (as Douglas PUD's current contractor) submits annual reports as conditioned by Section 10 Permit No. 1196 covering the period from January 1 – December 31 each year per permit Reporting and Annual Authorization Requirements. Specifically, the annual reports include detailed activities as per requirements including monitoring of performance indicators identified for the program. A summary documenting the M&E activities associated with the endangered UCR spring Chinook hatchery program is included in annual progress reports submitted to NMFS. Monitoring activities have already been approved by the permit. Any additional harm to listed fish beyond the permit allowances are communicated immediately to NMFS by the WDFW ESA response lead in the area for review or needed changes.

12.0 RESEARCH

Other than what data collection and analysis is encompassed within the M&E activities described in Section 11 and Appendices A, B, and C, no specific research projects are ongoing or proposed in association with the Methow Hatchery spring Chinook program. Any unanticipated, future research that may be associated with this program must be approved by the HCP Hatchery Committees.

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14.0 CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Name: Wm C Dobbins	Name: Heather Bartlett
Title: General Manager	Title: Hatcheries Division Mgr.
Date: March 9, 2010	Date: March 15, 2010

Appendix A

Conceptual Approach to Monitoring and Evaluation for Hatchery Programs

Conceptual Approach to Monitoring and Evaluation for Hatchery Programs

funded by Douglas County Public Utility District

Prepared for:
Douglas PUD Habitat Conservation Plan Hatchery Committee

Committee members:

Brian Cates (US Fish and Wildlife Service)
Rick Klinge (Douglas PUD)
Jerry Marco (Colville Tribes)
Kristine Petersen (NOAA Fisheries)
Tom Scribner (Yakama Nation)
Kirk Truscott (Washington Department of Fish and Wildlife)

Last modified: September 2007

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Abstract

Public Utility District No. 1 of Douglas County (Douglas PUD) implements hatchery programs as part of the Habitat Conservation Plan (HCP) agreement relating to the operation of the Wells Hydroelectric Project. The HCP defines the goal of achieving no net impact (NNI) to anadromous fish species affected by operation of Wells Dam. The HCP identifies general program objectives as "contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest. The HCP further establishes a Hatchery Committee charged with defining specific hatchery program objectives and developing a monitoring and evaluation (M & E) program to determine if the hatchery objectives are being met. The HCP specifies that this plan will be reevaluated and adjusted, if need be, every five years. The purpose of this plan is to provide the conceptual framework to monitor and evaluate the success of the hatchery programs. This will in turn provide information to the HCP Hatchery Committee to manage these programs.

Introduction

In April 2002, negotiations on the Wells Habitat Conservation Plan (HCP) were concluded (DPUD 2002). The HCP is a long-term agreement between Douglas PUD, National Marine Fisheries Service (NOAA Fisheries), the Washington Department of Fish and Wildlife (WDFW), the U. S. Fish and Wildlife Service (USFWS), the Confederated Tribes of the Colville Reservation (Colville Tribes) and the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation) [12]. The HCP objective is to achieve No Net Impact (NNI) for each plan species (spring Chinook salmon, summer/fall Chinook salmon, sockeye salmon, steelhead, and coho salmon of upper Columbia River (UCR) Basin) affected by the hydroelectric project. NNI consists of two components: (1) 91% combined adult and juvenile project survival achieved by project passage improvements implemented within the geographic area of the Project, (2) up to 9% compensation for unavoidable project mortality provided through hatchery and tributary programs, with a maximum 7% compensation provided through hatchery programs and 2% compensation provided through tributary programs. The signatory parties intend these actions to contribute to the rebuilding of tributary habitat production capacity and basic productivity and numerical abundance of plan species. Previous artificial propagation commitments to compensate for habitat inundation are carried forth in the HCP[13].

The Joint Fisheries Parties (JFP) include fishery resource managing agencies that are signatories to the HCP agreements and responsible for developing species-specific hatchery program goals. At this time, the WDFW, the USFWS, the Colville Tribes, the Yakama Nation and NOAA Fisheries constitute the JFP in regards to the HCP agreements. The JFP has agreed that hatchery programs for anadromous salmonid tributary populations (Methow and Okanogan) will attempt to follow the concepts and

[12] The Yakama Nation signed the HCP on March 24, 2005.
[13] For further information on the HCPs, and the creation and role of the Hatchery Committees, please see the HCP (DPUD 2002).

strategies of supplementation as defined and outlined in RASP (1992) and Cuenco et al. (1993). While hatchery programs for those salmonid population(s) that are released directly into the Columbia River will follow conventional hatchery practices associated with harvest augmentation. The Entiat River has been selected as a potential reference stream (population) for hatchery evaluations purposes, and as such, no new HCP hatchery supplementation programs will be initiated in that watershed. Conversely, conventional hatchery practices will continue to be utilized for plan species released into the mainstem Columbia River. The primary goal of these hatchery programs continues to be both inundation compensation and harvest augmentation.

The HCP Hatchery Committee (HCP HC) is responsible for developing a monitoring and evaluation (M&E) plan to assess overall performance of Douglas PUD's hatchery programs in achieving the general program objective of *"contributing to the rebuilding and recovery of naturally reproducing populations in their native habitats, while maintaining genetic and ecologic integrity, and supporting harvest as well as defining and monitoring specific hatchery program objectives".* The HCP HC has developed and adopted goals for specific hatchery programs. The various goals of those programs are outlined below:

1. Support the recovery of ESA listed species[14] by increasing the abundance of the natural adult population, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity.

   Hatchery Programs: Methow spring Chinook; Methow steelhead; and Okanogan steelhead

2. Increase the abundance of the natural adult population of unlisted plan species, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity. In addition, provide harvest opportunities in years when **spawning escapement** is sufficient to support harvest.

   Hatchery Programs: Methow summer/fall Chinook; Okanogan sockeye[15]

3. Provide salmon for harvest and increase harvest opportunities, while segregating returning adults from natural spawning populations.

   Hatchery Programs: Wells summer/fall Chinook

As previously mentioned, Douglas PUD's hatchery program encompasses two different hatchery strategies that address different goals due in part to the purpose in which the program was created. The main focus and an important goal of the hatchery program is

[14] While the HCP is not a recovery plan into itself, the hatchery component of it must be consistent with hatchery goals and objectives through the ESA, and as such should aid in the recovery of listed fish.
[15] Evaluation of the Douglas PUD Okanogan Sockeye obligation is conducted through the implementation of the Fish-Water Management Tool Program.

to increase the natural production of fish in the tributaries that will aid in the achievement of no net impact (NNI) and in the recovery of ESA listed stocks. This is accomplished through the strategy of supplementation. Simple put, supplementation uses broodstock for the hatchery program from a target stream or area, the offspring of which are reared in a hatchery and released back to the target stream or area. Fish will be reared and released in a manner that ensures appropriate spatial distribution and genetic integrity of the populations being supplemented. Subsequently, these juvenile hatchery fish will return as adults to supplement the natural spawning population with the intent of increasing the natural production of the population.
The fundamental assumption behind the theory of supplementation is that hatchery fish returning to the spawning grounds are "reproductively similar" to naturally produced fish. There is some information that suggests that this may not be true. Therefore, one of the questions that will be answered through this M&E plan is how effective are hatchery-origin salmon and steelhead at reproducing in the natural environment.

One of the important aspects of this Plan is to compare changes in productivity of a supplemented population to a non-supplemented population. Potential reference streams (e.g., Entiat) should have similar biotic and abiotic components as experimental streams. Preliminary determinations regarding the suitability of potential reference streams or areas within streams will be made based on the following criteria (these criteria are not considered all inclusive at this time):

- No recent (within last 5-10 years; two generations) hatchery releases directed at target species
- Similar information of hatchery contribution on the spawning grounds
- Similar fluvial-geomorphologic characteristics
- Similar out of subbasin effects
- Similar historic records of productivity
- Appropriate scale for comparison
- Similar in-basin biological components, based on analysis of empirical information

The question of how effective hatchery-origin salmon and steelhead are at reproducing in the natural environment will be answered in separate studies (i.e., DNA pedigree) that will eventually be added to this plan. Results from ongoing reproductive success studies (Wenatchee spring Chinook) as well as future studies (Upper Columbia steelhead) will be incorporated into the Plan on a continual basis. This plan recognizes that it is important to manage the numbers of hatchery fish spawning in the wild and the proportion of naturally produced fish in the broodstock. The further development of goals to achieve these mutual management actions will be developed by the HCP HC in the future and will be incorporated within the M&E plan at that time.

The second strategy is intended to increase harvest opportunities. This is accomplished primarily with releases of hatchery fish into the mainstem of the Columbia River or other terminal areas with the intent that the returning adults be harvested.

Additionally non harvest fish should remain segregated, from the naturally spawning populations.

Conceptual Framework of the Monitoring and Evaluation Plan

It is important that the M&E Plan has obtainable goals, and that the objectives and strategies are clearly linked to those goals. Figure 1 depicts the generalized conceptual model that this M&E Plan will follow. The hypotheses that will be tested under the objectives will be based on previous monitoring and evaluation information (i.e., key findings), and from the Biological Assessment and Management Plan (BAMP, 1998). Strategies, and the subsequent research, monitoring and evaluation, will clearly link to and provide feedback for the objectives.

The HCP specifies that the M&E Plan will be reevaluated, and revised if necessary every five years. It is important that information is collected through the evaluation plan that will enable the committee to make changes if needed. One of the challenges presented in developing the M&E Plan is to develop quantifiable metrics that support the goals of the hatchery programs. As such, it will be necessary to develop a conceptual framework for not only the M&E Plan, but for each objective to determine what types of information is required. A hierarchal approach to accomplishing the objectives would optimize data collection, analysis, and resources required to implement the Plan. Some of the data collection tasks will not need to be performed unless a data gap appears from other monitoring efforts.

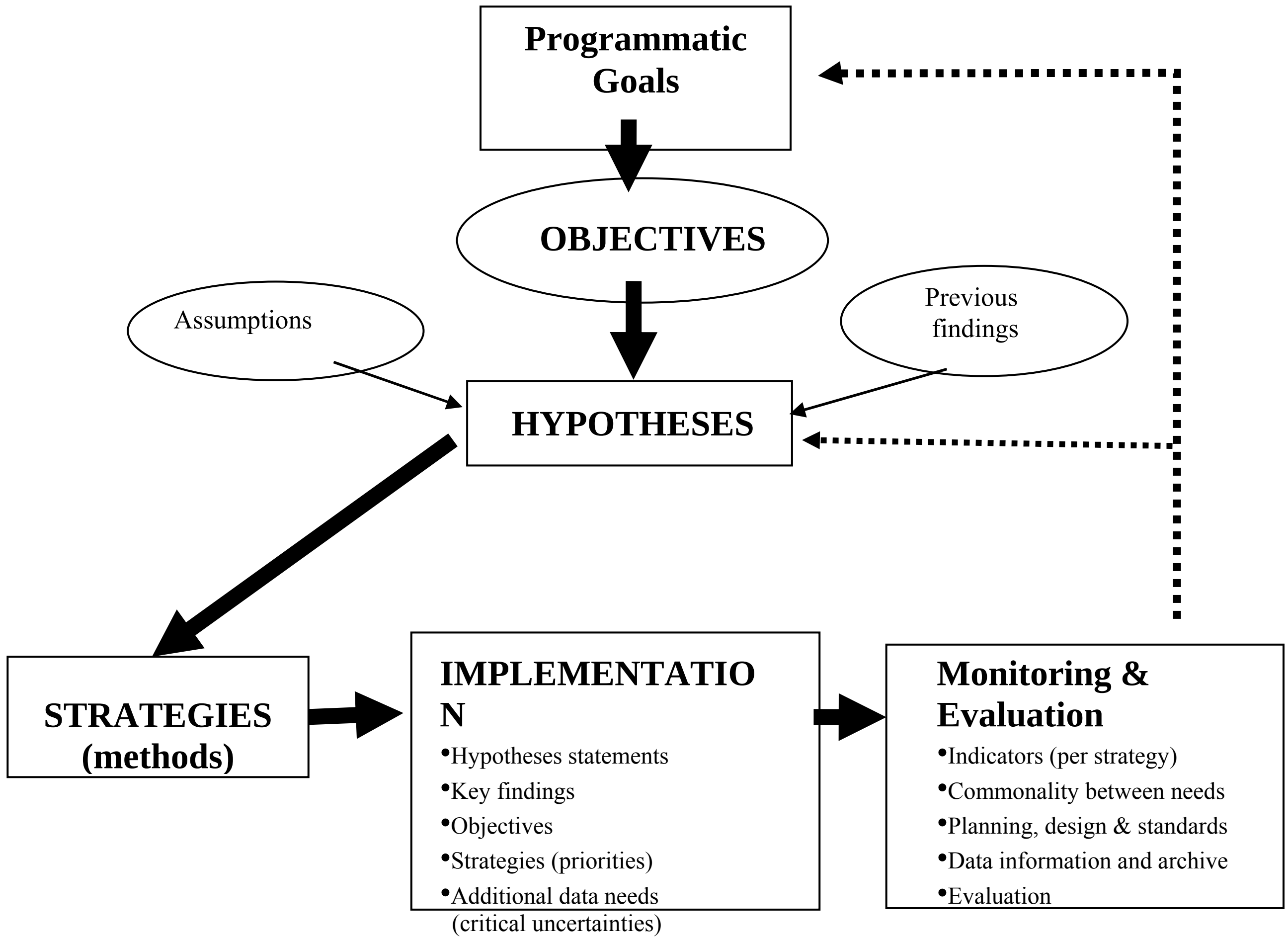

Figure 1. Conceptual model of how goals, objectives, strategies, and monitoring and research interrelate.

Monitoring and Evaluation Plan Objectives

The objectives (and subsequent hypotheses) of the Plan are generated in part from existing evaluations plans, the BAMP, and support the Hatchery Program Goals as defined by the HCP HC.

Objective 1: Determine if supplementation programs have increased the number of naturally spawning and naturally produced adults of the target population relative to a non-supplemented population (i.e., reference stream) and the changes in the natural replacement rate (NRR) of the supplemented population is similar to that of the non-supplemented population.

Hypotheses:

- Ho: Δ Total spawners $_{\text{Supplemented population}}$ > Δ Total spawners $_{\text{Non-supplemented population}}$

- Ho: Δ NOR[16] $_{\text{Supplemented population}} \geq \Delta$ NOR $_{\text{Non-supplemented population}}$

- Ho: Δ NRR $_{\text{Supplemented population}} \geq \Delta$ NRR $_{\text{Non-supplemented population}}$

Objective 2: Determine if the run timing, spawn timing, and spawning distribution of both the natural and hatchery components of the target population are similar.

Hypotheses:

- Ho: Migration timing $_{\text{Hatchery}}$ = Migration timing $_{\text{Naturally produced}}$

- Ho: Spawn timing $_{\text{Hatchery}}$ = Spawn timing $_{\text{Naturally produced}}$

- Ho: Redd distribution $_{\text{Hatchery}}$ = Redd distribution $_{\text{Naturally produced}}$

Objective 3: Determine if genetic diversity, population structure, and effective population size have changed in natural spawning populations as a result of the hatchery program. Additionally, determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.

Hypotheses:

- Ho: Allele frequency $_{\text{Donor}}$ = Allele frequency $_{\text{Naturally produced}}$ = Allele frequency $_{\text{Hatchery}}$

- Ho: Genetic distance between subpopulations $_{\text{Year x}}$ = Genetic distance between subpopulations Structure $_{\text{Year y}}$

- Ho: Δ Spawning Population = Δ Effective Spawning Population

- Ho: Ho: Age at Maturity $_{\text{Hatchery}}$ = Age at Maturity $_{\text{Naturally produced}}$

- Ho: Size at Maturity $_{\text{Hatchery}}$ = Size at Maturity $_{\text{Naturally produced}}$

Objective 4: Determine if the hatchery adult-to-adult survival (i.e., hatchery replacement rate, HRR)[17] is greater than the natural adult-to-adult survival (i.e., natural replacement rate, NRR) and equal to or greater than the program specific HRR expected value (BAMP1998).

[16] Natural Origin Recruits.
[17] See Table 1 for HRR.

Hypotheses:

- Ho: $HRR_{Year\ x} \geq NRR_{Year\ x}$
- Ho: HRR $\geq$ Expected value per assumptions in BAMP

Objective 5: Determine if the stray rate of hatchery fish is below the acceptable levels to maintain genetic variation between stocks.

Hypotheses:

- Ho: Stray rate $_{Hatchery\ fish}$ < 5% total brood return
- Ho: Stray hatchery fish < 5% of spawning escapement of other independent populations [18]
- Ho: Stray rate $_{Hatchery\ fish}$ < 10% total within independent populations [19]

Objective 6: Determine if hatchery fish were released at the programmed size and number.

Hypotheses:

- Ho: Hatchery fish $_{Size}$ = Programmed $_{Size}$
- Ho: Hatchery fish $_{Number}$ = Programmed $_{Number}$

Objective 7: Determine if the proportion of hatchery fish on the spawning grounds affects the freshwater productivity (i.e., number of smolts per redd) of supplemented streams when compared to non-supplemented streams.

Hypotheses:

- Ho: Δ smolts/redd $_{Supplemented\ population}$ > Δ smolts/redd $_{Non\text{-}supplemented\ population}$

[18] This stray rate is suggested based on a literature review and recommendations by the ICTRT. It can be re-evaluated as more information on naturally-produced Upper Columbia salmonids becomes available. This will be evaluated on a species and program specific basis and decisions made by the HCP HC. It is important to understand the actual spawner composition of the population to determine the potential effect of straying.

[19] This stray rate is suggested based upon a literature review. It can be re-evaluated as more information on naturally produced Upper Columbia salmonids becomes available. The selected values will be evaluated on a species and program specific basis and decision.

Objective 8: Determine if harvest opportunities have been provided using hatchery returning adults where appropriate.

Hypotheses:

- Ho: Harvest rate ≤ Maximum level to meet program goals

Regional Objectives

Two additional objectives will be included within the total framework of this plan because they are related to the goals of the programs funded by Douglas PUD and other hatchery programs throughout the region. These regional objectives will be implemented at various levels into all M&E plans in the upper Columbia Basin region (Douglas PUD, Chelan PUD, Grant PUD, USFWS, and CCT). These objectives may be more suitable for a specific hatchery or subbasin, the results of which could be transferred to other locations. As such, the HCP HC should ensure that these efforts are coordinated throughout the region so resources are used efficiently. Other objectives that are deemed more regional in nature, per HCP HC, could also be included in the section.

Objective 9: Determine whether BKD management actions lower the prevalence of disease in hatchery fish and subsequently in the naturally spawning population. In addition, when feasible, assess the transfer of Rs infection at various life stages from hatchery fish to naturally produced fish.

Monitoring Questions:

Q1: What is the effect of BKD disease management on BKD disease prevalence?

Q2: Are study fish exposed to hatchery effluent infected to a greater extent than control fish?

Q3: Is Rs infection transferred at various life stages from hatchery fish to naturally produced fish or appropriate surrogates?[20]

Hypotheses Q1:

- Ho_1: Rearing density has no effect on survival rates of hatchery fish.
- Ha_1: Rearing density has an effect on survival rates of hatchery fish.

- Ho_2: Antigen level has no effect on survival rates of hatchery fish.
- Ha_2: Antigen level has an effect on survival rates of hatchery fish.

[20] Hypothesis statements for these monitoring questions will be developed.

- Ho_3: Interaction between antigen level and rearing density has no effect on survival rates of hatchery fish.
- Ha_3: Interaction between antigen level and rearing density has an effect on survival rates of hatchery fish.

Hypothesis Q2:
- o Ho_1: Rs infection is not transferred from hatchery effluent to study fish.
- o Ha_1: Rs infection is transferred from hatchery effluent to study fish.

Objective 10: Determine if the release of hatchery fish impact non-target taxa of concern (NTTOC) within acceptable limits.

Hypotheses:

- Ho: NTTOC abundance $_{\text{Year x}}$ = NTTOC abundance $_{\text{Year y}}$
- Ho: NTTOC distribution $_{\text{Year x}}$ = NTTOC distribution $_{\text{Year y}}$
- Ho: NTTOC size $_{\text{Year x}}$ = NTTOC size $_{\text{Year y}}$

Detailed Objectives

Below, we detail the objectives, generate hypotheses, and describe the importance of each objective in accomplishing goals of the plan.

Objective 1: Determine if supplementation programs have increased the number of naturally spawning adults of the target population relative to a non-supplemented population

At the core of a supplementation program is the objective of increasing the number of spawning adults (both naturally produced and hatchery fish) in order to affect a subsequent increase in the number of returning naturally produced fish or natural origin recruits (NOR). This is measured as the Natural Replacement Rate (NRR). All other objectives of the M&E Plan either directly support this objective or minimize impacts of the supplementation program to non-supplemented population. Specific hypotheses tested under this objective are:

Ho: Δ Total spawners $_{\text{Supplemented population}}$ > Δ Total spawners $_{\text{Non-supplemented population}}$

Ho: Δ NOR $_{\text{Supplemented population}} \geq \Delta$ NOR $_{\text{Non-supplemented population}}$

Ho: Δ NRR $_{\text{Supplemented population}}$ > Δ NRR $_{\text{Non-supplemented population}}$

The supplementation program should in all cases increase the number of spawning adults (i.e., hatchery origin). If the supplementation program does not increase the number of spawners, the subsequent increase in natural produced fish cannot occur. Under this scenario, poor survival or high stray rates of the hatchery fish will prevent the objectives and goals of the hatchery program from being met.

When an increase in the spawning population has been observed, the subsequent increase in naturally produced retuning adults is determined by comparing the natural replacement rate of the treatment population to a reference population (i.e., non-supplementation fish). If supplementation fish do have a similar reproductive success as naturally produced fish, then the trend of the NRR of both populations should not differ over time. Should divergence of the NRRs occur and the treatment population NRR does decline over time, the level or strategy of supplementation will be reevaluated by the HCP HC and appropriate adjustments to the program would be recommended.

If reference streams are not available for all hatchery programs or are not suitable due to 1) effects of other hatchery programs or 2) biotic or abiotic conditions are different from the treatment stream, an alternate experimental design needs to be considered to examine this important aspect of the Plan. Relative productivity of hatchery and naturally produced fish can be empirically measured using DNA pedigree approach study design. This approach may not be logistically feasible for all programs (i.e., too many fish to sample or poor trap efficiency). Alternatively, a temporal rather than a spatial reference stream can be used. This approach would involve not releasing hatchery fish in a specific stream for at least one generation and determine if a change in the NNR is observed without hatchery fish present on the spawning grounds. Regardless of the approach or experimental design used, this component of the Plan is crucial and must be examined in order to determine if supplementation will result in an increased number of naturally produced adults.

Another important comparison, with or without reference streams, can be made by looking at different parental crosses (treatments) and what affects these crosses may have on NRR and HRR.

<u>Objective 2</u>: Determine if the run timing, spawn timing, and spawning distribution of both the natural and hatchery components of the target population are similar.

Supplementation is an integrated hatchery program. Hatchery and naturally produced fish are intended to spawn together and in similar locations. Run timing, spawn timing, and spawning distribution may be affected through the hatchery environment (i.e., domestication). If supplemented fish are not fully integrated into the naturally produced spawning population, the goals of supplementation may not be achieved. Hatchery adults that migrate at different times than naturally produced fish may be subject to differential survival. Hatchery adults that spawn at different times or locations than naturally produced fish would not be integrated into the naturally produced spawning population (i.e., segregated stock). Specific hypotheses tested under this objective are:

Ho: Migration timing $_{\text{Hatchery}}$ = Migration timing $_{\text{Naturally produced}}$

Ho: Spawn timing $_{\text{Hatchery}}$ = Spawn timing $_{\text{Naturally produced}}$

Ho: Redd distribution $_{\text{Hatchery}}$ = Redd distribution $_{\text{Naturally produced}}$

Broodstock collection and spawning protocols should ensure appropriate run timing and spawn timing of the supplemented fish, respectively. Observed differences in these indicators would suggest that protocols be reevaluated. Differences in redd distributions will be evaluated based upon the location that carcasses were recovered during spawning ground surveys. However, freshets or fall floods may limit the utility of these data. If the accuracy of carcass recovery location is questionable (i.e., floods), a more precise, although more labor intensive, indicator for redd distribution would involve determining the origin of actively spawning fish.

<u>Objective 3</u>: Determine if genetic diversity, population structure, and effective population size have changed in natural spawning populations as a result of the hatchery program. Additionally, determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.

The genetic component of the Plan specifically addresses the long-term fitness of supplemented populations. Fitness, or the ability of individuals to survive and pass on their genes to the next generation in a given environment, includes genetic, physiological, and behavioral components. Maintaining the long-term fitness of supplemented populations, per the HCP Hatchery Program goals, requires a comprehensive evaluation of genetic and phenotypic characteristics. Evaluation of some phenotypic traits (i.e., run timing, spawn timing, spawning location and stray rates) is already addressed under other objectives.

Theoretically, a supplementation program should maintain genetic variation present in the original donor population, and as a program proceeds, genetic variability in hatchery- and naturally-produced fish in the supplemented population should be similar. Loss of within-population variation is a genetic risk of artificial production programs, and genetic divergence between hatchery and natural components of a supplemented population may lead to a loss of long-term fitness.

Differences in genetic variation among neighboring populations maintain the genetic population structure of drainages, basins, and regions. Mixing of populations in the hatchery (e.g., improper broodstock collection) or in the natural environment (e.g., excessive straying of hatchery fish) may lead to outbreeding depression and a loss of long-term fitness. Loss of between-population variation is also a genetic risk of artificial production programs, and can lead to long-term fitness loss at a scale larger than the population targeted for supplementation. Specific hypotheses tested under this objective for these issues are:

H_o: Allele frequency $_{\text{Hatchery}}$ = Allele frequency $_{\text{Natural}}$ = Allele frequency $_{\text{Donor}}$

H_o: Genetic distance between subpopulations $_{\text{Year x}}$ = Genetic distance between subpopulations $_{\text{Year y}}$

Supplementation should increase spawning population abundance as a result of high juvenile survival in the hatchery. Associated with an increase in returning spawner abundance should be an increase in effective population size (i.e., the number of actual breeders that produce successful offspring; N_e). The relative proportion of hatchery-origin spawners that participate in natural spawning is an important factor in realizing improvements in N_e. A disproportionate number of hatchery spawners may cause inbreeding depression if their level of relatedness is relatively high due to expected high juvenile survival. A decrease in reproductive success and thus lowered N_e is an expected result of inbreeding. Lowered genetic variability is also expected. Achieving a larger N_e in a supplemented population should improve long-term fitness. The specific hypothesis tested under this objective for this issue is:

H_o: Spawning Population Size Change = Effective Population Size Change

Results of domestication selection may be expressed through changes in life history patterns. Changes in phenotypic traits can result from inadvertent selection during artificial propagation and rearing. Persistence of selection effects will be influenced by the genetic basis of a trait. Age and size at maturity are two important phenotypic traits that have not been already addressed in the Plan. Should domestication selection be found, changes in broodstock collection protocols and hatchery operations would be required. Specific hypotheses tested under this objective for this issue are:

H_o: Age at Maturity $_{\text{Hatchery}}$ = Age at Maturity $_{\text{Naturally produced}}$

H_o: Size at Maturity $_{\text{Hatchery}}$ = Size at Maturity $_{\text{Naturally produced}}$

<u>Objective 4:</u> Determine if the hatchery adult-to-adult survival (i.e., hatchery replacement rate) is greater than the natural adult-to-adult survival (i.e., natural replacement rate) and equal to or greater than the program specific expected value (BAMP 1998).

The survival advantage from the hatchery (i.e., egg-to-smolt) must be sufficient to overcome the survival disadvantage after release (i.e., smolt-to-adult) in order to produce a greater number of returning adults than if broodstock were left to spawn naturally. If a hatchery program cannot produce a greater number of adults than naturally spawning fish the program should be modified or discontinued. Production levels were initially developed using historical run sizes and smolt-to-adult survival rates (BAMP 1998). Using the stock specific NRR and the values listed in the BAMP, comparisons to actual survival rates will be made to ensure the expected level of survival has been achieved. Specific hypotheses for this objective are:

Ho: $HRR_{\text{year x}} \geq NRR_{\text{year x}}$

Ho: HRR $\geq$ Expected value per assumptions in BAMP

Using five-year mean and determining trends in survival of specific programs would address interannual variability in survival. Although annual differences among programs would still be analyzed to detect within year differences, which could explain some the variability among programs. Specific recommendations to increase survival would be provided for programs in which the HRR do not exceed the NRR or the expected values.

Table 1. The expected smolt to adult (SAR) and hatchery replacement rates (HRR) for Wells Complex programs based on assumptions provided in BAMP (1998).

Program	SAR	HRR
Methow spring Chinook	0.0030	4.5
Chewuch spring Chinook	0.0030	4.5
Twisp spring Chinook	0.0030	4.5
Wells summer Chinook (yearlings)	0.0030	4.9
Wells summer Chinook (subyearlings)	0.0012	3.0
Wells steelhead	0.0100	19.5

<u>Objective 5:</u> Determine if the stray rate of hatchery fish is below the acceptable levels to maintain genetic variation between stocks

Maintaining locally adapted traits of fish populations requires that returning hatchery fish have a high rate of site fidelity to the target stream. Hatchery practices (e.g., acclimation, release methodology and location) are the main variables that affect stray rates. Regardless of the adult returns, if adult hatchery fish do not contribute to the donor population the program will not meet the basic condition of a supplementation program. Fish that do stray to other independent populations should not comprise greater than 5% of the spawning population. Likewise, fish that stray within an independent population should not comprise greater that 10% of the spawning population. Specific hypothesis for this objective is:

Ho: Stray rate $_{\text{Hatchery fish}}$ < 5% total brood.

Ho: Stray rate $_{\text{Hatchery fish}}$ < 10% within independent populations

Stray rates should be calculated using the estimated number of hatchery fish that spawned in a stream and CWTs were recovered. Recovery of CWT from hatchery traps or broodstock may include “wandering fish” and may not include actual fish that spawned. Special consideration will be given to fish recovered from non-target streams in which the sample rate was very low (i.e., sample rate < 10%). Expansion of strays from spawning ground surveys with low sample rates may overestimate the number of strays (i.e., random encounter).

The rate and trend in strays from hatchery programs will be used to provide recommendations that would lead to a reduction in strays. Depending on the severity, hatchery programs with fish straying out of basin will be given high priority, followed by strays among independent populations, and finally strays within an independent population.

<u>Objective 6</u>: Determine if hatchery fish were released at the programmed size and number.

The HCP outlines the number and size of fish that are to be released to meet NNI compensation levels. Although many factors can influence both the size and number of fish released, past experience with these stocks should assist in minimizing impacts to the program. Specific hypotheses for this objective are:

Ho: Hatchery fish $_{\text{Size}}$ = Programmed $_{\text{Size}}$

Ho: Hatchery fish $_{\text{Number}}$ = Programmed $_{\text{Number}}$

Understanding causes of not meeting programmed release size or goal is important for the continued success of the program. Systematic problems must be identified and managed properly to achieve the objective(s) and goal of the program. Annual and some stock specific issues may be addressed via changes in hatchery operations.

A review of broodstock collection protocols every five years should occur concurrently with an evaluation of the number of fish released from each hatchery. In addition, the assumptions under pinning the HCP size at release goals should be evaluated and if necessary should be adjusted based upon the best scientifically based conclusions. In the absence of such studies, the HCP size at release goal should be the target for each hatchery program.

<u>Objective 7:</u> Determine if the proportion of hatchery fish on the spawning grounds affect the freshwater productivity (i.e., number of smolts per redd) of supplemented streams when compared to non-supplemented streams.

Out of basin effects (e.g., smolt passage and ocean productivity) have a strong influence on survival of smolts after they migrate from the tributaries. These effects introduce substantial variability into the adult-to-adult survival rates (NRR and HRR), which may mask in-basin effects (e.g., habitat quality, density related mortality, and differential reproductive success of hatchery and naturally produced fish). The objective of smolt monitoring programs in the Upper Columbia ESU is to determine the egg-to-smolt survival of target stocks. Smolt production models generated from the information obtained through these programs will provide a level of predictability with greater sensitivity to in-basin effects than spawner-recruitment models that take into account all effects.

A critical uncertainty with the theory of supplementation is the reproductive success of hatchery fish. Given the dependence of hatchery fish to assist in achieving program and recovery goals, monitoring smolt production with respect to the proportion of hatchery fish on the spawning grounds is critical in understanding subsequent adult-to-adult survival. While some factors that affect freshwater production require years or decades to detect change in productivity (e.g., habitat quality and quantity), other factors (e.g., spawner density and number of hatchery fish) can be adjusted annually in most tributaries.

The number of smolts per redd (i.e., smolt production estimate divided by total number of redds) will be used as an index of freshwater productivity. While compensatory mortality in salmonid populations cause survival rates to decrease as the population size increases, inferences regarding the reproductive success of hatchery fish may be possible by carefully examining and understanding this relationship. Inherent differences in productivity are expected among tributaries (spatial), changes in relative differences among years (temporal) would suggest differences in spawner productivity. Negative effects could then be minimized through actions take by the management agencies. Specific hypothesis for this objective is:

Ho: Δ smolts/redd $_{\text{Supplemented pop.}}$ > Δ smolts/redd $_{\text{Non-supplemented pop.}}$

Robust smolt production models derived from basin specific data are critical to this objective. In addition, accurate estimates of the proportion of hatchery fish on the spawning grounds will be needed. Inferences regarding the freshwater productivity cannot be made until both of these requirements are satisfied. Alternatively, DNA pedigree studies can be used to assess the relative freshwater production of hatchery and naturally produced fish within a tributary.

<u>Objective 8:</u> Determine if harvest opportunities have been provided using hatchery returning adults where appropriate.

In years when the expected returns of hatchery adults are above the level required to meet program goals (i.e., supplementation of spawning populations and/or broodstock requirements), surplus fish are available for harvest (i.e., target population). Harvest or removal of surplus hatchery fish from the spawning grounds would also assist in reducing genetic impacts to naturally produced populations (loss of genetic variation within and between populations). Specific hypotheses for this objective are:

Ho: Harvest rate $\leq$ Maximum level to meet program goals

A robust creel program on any fishery would provide the precision needed to ensure program goals are met. In addition, creel surveys would be used to assess impacts to non-target stocks.

Regional Objectives

<u>Objective 9:</u> Determine whether BKD management actions lower the prevalence of disease in hatchery fish and subsequently in the naturally spawning population. In addition, when feasible, assess the transfer of Rs infection at various life stages from hatchery fish to naturally produced fish.

The hatchery environment has the potential to amplify diseases that are typically found at low levels in the natural environment. Amplification could occur within the hatchery population (i.e., vertical and horizontal transmission) or indirectly from the hatchery effluent or commingling between infected and non-infected fish (i.e., horizontal transmission). Potential impacts to natural populations have not been extensively studied, but should be considered for programs in which the hatchery fish are expected to commingle with natural fish. This is particularly important for supplementation type programs. Specifically, the causative agent of bacterial kidney disease (BKD), *Renibacterium salmoninarum* (Rs), could be monitored at selected acclimation ponds, both in the water and fish, in which the risk and potential for transmission from the hatchery is highest. Although it is technologically possible to measure the amount of Rs in water or Rs DNA in smolts and adults non-lethally sampled, the biological meaning of these data are uncertain. Currently, the only metric available for M & E purposes is measuring the antigen level from kidney/spleen samples (i.e., ELISA). When available, non-lethal sampling may replace or be used in concert with lethal sampling.

Implementation of this objective will be conducted in a coordinated approach within the hatchery and natural environment. BKD management within the hatchery population (e.g., broodstock or juveniles) has the potential to reduce the prevalence of disease through various actions (e.g., culling or reduced rearing densities). BKD management must also take into account and support other relevant objectives of the M & E program (e.g., Hatchery Return Rate [HRR], number of smolts released). Hence, the goal of BKD management is to decrease the prevalence of disease and maintain hatchery production objectives (i.e., number and HRR).

As previously discussed, disease transmission from hatchery to naturally produced fish may occur at various life stages and locations. Of these, horizontal transmission from hatchery effluent, vertical transmission on the spawning grounds, and horizontal transmission in the migration corridor have been identified as disease interactions that could be examined under this objective, although others may also be relevant. Experimental designs addressing this objective may require technology not yet available, although in some instances samples may be collected, but not analyzed until a link can be established between bacteria levels in samples and disease prevalence.

Developing a complete set of questions and hypotheses statements for this objective may not be practical at this time, because there is currently no BKD Management Plan. However, while developing experimental designs for this objective, it may be feasible to incorporate both hatchery and natural environment monitoring under a single study design. Integration of the different aspects of the objective would likely result in a more robust approach into understanding the effectiveness of disease management strategies.

Monitoring Questions:

Q1: What is the effect of BKD disease management on BKD disease prevalence?

Q2: Are study fish exposed to hatchery effluent infected to a greater extent than control fish?

Q3: Is Rs infection transferred at various life stages from hatchery fish to naturally produced fish or appropriate surrogates?[21]

Target Species/Populations:

- Q1 and Q2 both apply to spring Chinook (primary focus) and summer Chinook programs.

Hypotheses Q1:

- Ho_1: Rearing density has no effect on survival rates of hatchery fish.
- Ha_1: Rearing density has an effect on survival rates of hatchery fish.

[21] Hypothesis statements for these monitoring questions will be developed.

- Ho_2: Antigen level has no effect on survival rates of hatchery fish.
- Ha_2: Antigen level has an effect on survival rates of hatchery fish.

- Ho_3: Interaction between antigen level and rearing density has no effect on survival rates of hatchery fish.
- $Ha_{3:}$ Interaction between antigen level and rearing density has an effect on survival rates of hatchery fish.

Hypothesis Q2:
- o Ho_1: Rs infection is not transferred from hatchery effluent to study fish.
- o Ha_1: Rs infection is transferred from hatchery effluent to study fish.

Measured Variables:
- Hypotheses Q1:
  - o Numbers of fish (at different life stages)

- Hypothesis Q2:
  - o Numbers of Rs+ fish

Derived Variables:
- Survival rates
- SARs
- HRRs

Spatial/Temporal Scale:
- o Hypotheses Q1:
  - o Analyze annually based on brood year.
- o Hypothesis Q2:
  - o Analyze annually.

Statistical Analysis:
- Hypotheses Q1: either 2-way ANOVA or response-surface design.
- Hypothesis Q2: ANOVA.

Analytical Rules:
- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

<u>Objective 10:</u> Determine if the release of hatchery fish impact non-target taxa of concern (NTTOC) within acceptable limits.

Supplementation of any stock or species will increase demand for resources and the potential of species interactions. The benefits gained from supplementation must be balanced with the ecological costs of the releasing hatchery fish into the ecosystem. Resource managers must be aware of and monitor potential impacts of supplementation related activities to non-target taxa. This is more important when supplementation activities involving more than one taxon are occurring simultaneously. For example, within the Methow Basin supplementation programs (i.e., spring Chinook, summer/fall Chinook, and steelhead), a spring Chinook harvest augmentation program and a coho reintroduction program release fish annually. At full program, the number of hatchery fish released into the Methow Basin would be approximately 2.4 million. Theoretical or realized benefits from supplementation activities may be at a cost to other taxa that are too great for the program to be deemed successful. In extreme cases, the costs of such activities may negate benefits of similar activities within the same subbasin. For example, predation by residualized hatchery steelhead may reduce the abundance of naturally produced spring Chinook fry that may subsequently result in a lower number of naturally produced adult spring Chinook.

In the Upper Columbia River ESU, a target species in one program is likely a non-target species in another program. The extent of spatial overlap is a decisive factor in determining the potential for ecological interactions and the associated risk. Consideration must be given to those fish that pose the greatest risk to NTT. Busack et al. (1997) categorized NTT into two classes. Strong interactor taxa (SIT) are those species that potentially could influence the success of the program through predation, competition, disease transmission or mutualistic relationships. Other NTT are classified as stewardship or utilization taxa (SUT), which are important ecologically or have high societal value.

Monitoring and evaluation plans concentrate efforts on the target species with little effort pertaining to the direct or indirect impacts to non-target species. In the Upper Columbia River ESU, a target species in one program is likely a non-target species in another program. There are also some stocks and species in which no artificial propagation programs have been initiated and as a result are non-target for all existing hatchery programs. While impacts to non-target taxa are often preconceived to be negative (e.g., competition, predation, behavioral, and pathogenic), positive impacts may also occur (e.g., nutrient enhancement and prey). Monitoring efforts will be concentrated on those interactions that pose the highest risk of limiting the success of the programs and deemed important for ecological reasons. Specific hypotheses for this objective are:

Ho: NTTOC abundance $_{\text{Year x}}$ = NTTOC abundance $_{\text{Year y}}$

Ho: NTTOC distribution $_{\text{Year x}}$ = NTTOC distribution $_{\text{Year y}}$

Ho: NTTOC size $_{\text{Year x}}$ = NTTOC size $_{\text{Year y}}$

If changes in abundance, distribution, and size of NTTOC occur, other information will need to be considered before attributing the changes to the hatchery program.

Strategies

The hypotheses and strategies that have been created in this plan were developed from the objectives of the hatchery program (Figure 1). As such, it is important to consider the goals and how they relate to the overall vision of the hatchery program, which is to meet NNI. The strategies outlined in this plan form the basis for how information will be collected and analyzed.

Commonalities among certain strategies and hypotheses will provide efficiencies in data collection and analysis. A detailed explanation of each strategy employed in the Plan is provided in the appendices to ensure repeatability in protocols, data collection, and analysis.

Other strategies and potentially hypotheses may be developed after information is collected and analyzed through the five-year review as specified in the HCP.

Indicators

An important function of the Plan is to define the indicators and methods used to measure the effect of hatchery fish on naturally spawning populations, guide hatchery operations and subsequent M&E activities. The indicators in the M&E Plan describe the biological data of interest. The protocols describe the strategy or methodologies used to measure or calculate the indicator. These are found in the appendices. The M&E Plan will also enable the hatchery committee to assess the progress toward meeting the goals and objectives of the hatchery program. The plan will be used to assure that the proper information is collected, and can be used to reevaluate hatchery production levels in 2013. In order to do this, each objective must have a:

- **Indicator**: A description of the biological data of interest. Each indicator must have a standardized methodology or protocol to ensure accuracy and precision are consistent spatially and temporally.

- **Baseline condition**: Each indicator must have a measurement or range of measurements (spatially and temporally) against which future conditions will be compared.

- **Target**: A scientifically defendable value that when obtained would lead to meeting the objective(s).

- **Performance Gap**: The difference in the baseline condition of an indicator and the target.

In order to refine the monitoring and evaluation plan with an appropriate detail, indicators are distributed into three categories: 1) the primary indicators that will be used initially to quantitatively assess if the objectives of the programs are being achieved (i.e., was the target reached or exceeded); 2) secondary indicators that will be used to collect information annually and may be used to calculate the primary indicator or assess whether the objectives are being reached in conjunction with the primary indicators; and 3) tertiary indicators that will be used when secondary indicators fail to explain some critical uncertainties in reaching the target. Primary indicators may reflect performance on a longer (temporal) or larger (spatial) scale where secondary and tertiary indicators are often used to drive smaller scale adjustments and refinements in operations to improve the likelihood of meeting the target.

To the extent possible, the objectives of this Plan must be quantifiable. The HC specified the capability to assess if the goals are being achieved. To assess this, indicators were developed that have targets associated with them that enable the HC to determine if the hatchery program is meeting objectives (see Tables 3 and 4).

Due to the variability in survival, monitoring and reporting will be conducted annually but evaluation of most objectives will be conducted over a five-year period. Measurements will center on the established indicators and whether the targets are being met. Trends in the primary indicators rather than simply the five-year mean will be important in determining if objectives are being achieved. Primary and secondary indicators will be calculated when needed (as dictated by the information obtained). However, in the event that these indicators fall below the agreed to target values, tertiary indicators may be required to explain the differences observed (uncertainty) and also a possible course of action.

Realistic targets for the indicators need to be identified. Targets set too low may lead to a perceived short-term success, but may ultimately result in the long-term failure of the hatchery program. Conversely, targets that are too high may lead to an unnecessary use of resources and a low cost-benefit ratio. The proposed initial targets for indicators appear in Table 3.

Supplementation is a strategy used in most of the hatchery programs (except Wells summer/fall Chinook) and will be the focus of discussion. As mentioned earlier, supplementation by definition implies that naturally spawning hatchery fish possess a similar reproductive potential as naturally produced fish. This critical uncertainty associated with the theory of supplementation is a primary focus of the M&E Plan and logically a majority of the primary indicators in this plan are related to testing this uncertainty. Thus, the targets of many of the indicators are based on measurements taken from naturally produced populations, both temporally and spatially (i.e., Before-After-Control-Impact Design or BACI). Under this statistical design, inferences can be made regarding the effectiveness of supplementation in achieving the goals of the hatchery program. Without the use of a control or reference population, changes in the indicators over time could not be attributed to the supplementation fish. Due to potential multiple treatment effects, a direct comparison of the indicators may be invalid. Instead, a comparison in the change of the indicators over time may be more appropriate. For example, if indicator A showed a 15% increase in the reference population in the first five years, a similar 15% increase in the treatment population would also be expected Thus, any decrease in the change of the treatment population relative to the reference population could be attributed to the presence or abundance supplementation fish.

All primary and a proportion of the secondary indicators have a target. Those indicators that are influenced by out of basin causes (e.g., ocean productivity) or density dependent factors (e.g., egg-to-smolt survival) do not have a target identified in this Plan because the ability to change these indicators fall outside the control of the HC. All primary and secondary indicators will be calculated on an annual basis. Tertiary indicators would only be measured or calculated when required. Most primary indicators will be analyzed at the five-year scale. All secondary and tertiary indicators would be analyzed on an annual basis. The relationship between indicators and the methods used to calculate them is listed in Table 4. A list of appendices with detailed methodologies for each strategy is listed in Table 5.

Table 2. Relationship of hypotheses and strategies (methods) used in monitoring and evaluation plan.

Methods	*Relative increase in spawners of supplemented stream is greater than non-supplemented stream*	*NRR of supplemented stream is equal to that of non-supplemented stream*	*Run timing, spawn timing, and redd distribution of supplemented fish is equal to that of naturally produced fish*	*No loss of within or between genetic variability* *Size and age at maturity of hatchery fish is equal to that of naturally produced fish*	*Effective population size of supplemented stream increases in relation to spawning population*	*HHR is greater than NRR* *HRR is equal or greater than expected value*
Spawning ground survey	X	X	X	X	X	X
Creel surveys	X	X	X	X	X	X
Broodstock sampling	X	X	X	X	X	X
Hatchery juvenile sampling				X	X	X
Smolt trapping				X	X	X
Residual sampling				X	X	X
Precocity sampling				X	X	X
PIT tagging	X		X	X	X	X
CWT tagging	X	X	X	X	X	X
Radio tagging	X	X	X			
Genetic sampling	X			X	X	
Disease sampling						
Snorkel surveys		X	X			
Redd capping		X				

	Stray rates of hatchery fish are less than 5%	*Hatchery fish are released at programmed number and size*	*Hatchery fish have not increased the prevalence of disease in the supplemented stream or hatchery and naturally produced populations*	*Impacts to NTTOC (size, abundance, and distribution) are within acceptable levels*	*Supplemented streams have equal ratio of smolts/redd than non-supplemented streams*	*Harvest of hatchery fish is at or below the desired level to meet program goals*
Spawning ground surveys	X		X		X	X
Creel surveys	X					X
Broodstock sampling	X	X	X			X
Hatchery juvenile sampling		X	X			
Smolt trapping		X	X	X	X	
Residual sampling		X	X	X	X	
Precocity sampling		X	X	X	X	
PIT tagging		X		X	X	
CWT tagging	X	X	X			
Radio tagging	X					
Genetic sampling						
Disease sampling			X	X	X	
Snorkel surveys				X	X	

Redd capping				X	X	

Table 3. A list of primary indicators and targets used in the M&E Plan (S=supplementation; H=harvest augmentation). Data will be collected annually and analyzed when required (minimum every 5 years). The HC will reevaluate objectives and results and make recommendations. See Glossary for definition of indicators.
[1] Derived from plug numbers in BAMP

Objective #	Program	Indicator	Target	Preliminary results
1	S	Natural replacement rate	≥ Non-supplemented pop.	> 10 yrs
2/3	S	Run timing	= Naturally produced run timing	5 yrs
2/3	S	Spawn timing	= Naturally produced spawn timing	5 yrs
2/3	S	Redd distribution	= Naturally produced spawning distribution	5 yrs
3	S	Genetic variation	= Donor population	5 yrs
3	S	Genetic structure	= Baseline condition	5 yrs
3	S	Effective population size	Δ Spawning population size	5 yrs
3	S	Size and age at maturity	= Naturally produced fish	5 yrs
4	S/H	Hatchery replacement rate	≥ Expected value[1]	5 yrs
5	S/H	Stray rate	< 5% of adult returns	5 yrs
6	S/H	Number and size of fish	± 10% of production level	5 yrs
7	S	Smolts/redd	≥ Non-supplemented pop.	> 10 yrs
8	H	Harvest	≤ Maximum level	5 yrs
9	S/H	Disease	< Baseline values	> 5 yrs
10	S/H	NTTOC	Various (0-40%)	> 5 yrs

Table 4. Indicators that will be used in the monitoring and evaluation plan, indicator level (primary, secondary, and tertiary), and the strategies used to calculate the indicator.

Specific Indicators	Level	Strategies														
		Spawning ground surveys	*Creel surveys*	*Broodstock collection*	*Hatchery spawning*	*Hatchery juvenile sampling*	*Smolt trapping*	*Residual sampling*	*Precocity sampling*	*PIT tagging*	*CWT tagging*	*Radio tagging*	*Genetic sampling*	*Disease sampling*	*Snorkel surveys*	*Redd capping*
Natural replacement rate	1	X	X	X	X					X	X					
Spawning escapement	2	X						X	X	X	X	X	X	X	X	X
Spawning composition	2	X		X	X											
Sex ratio	2	X	X	X	X											
Recruits	2	X	X	X	X					X	X					
Number of redds	2	X														
Run timing	1			X						X		X				
Spawn Timing	1	X														
Redd Distribution	1	X														
Genetics variation/structure	1	X		X	X	X	X						X			
Effective pop. Size	1	X		X	X								X			
Broodstock composition	2			X	X											
Age at maturity	1	X	X	X	X											
Size at maturity	1	X	X	X	X											
Hatchery replacement rate	1	X	X	X	X	X		X	X	X	X			X		

Table 4. Continued.

Specific indicators	LLevel	*Strategies* *Spawning ground surveys*	*Creel surveys*	*Broodstock collection*	*Hatchery spawning*	*Hatchery juvenile sampling*	*Smolt trapping*	*Residual sampling*	*Precocity sampling*	*PIT tagging*	*CWT tagging*	*Radio tagging*	*Genetic sampling*	*Disease sampling*	*Snorkel surveys*	*Redd capping*
Smolt-to-adult	2	X	X	X	X	X	X	X	X	X	X			X		
Number of broodstock	2			X	X											
Precocity rates	2					X	X		X							
Residualism rates	2						X	X	X	X	X					
Stray rate	1	X	X	X	X					X		X	X			
Days of acclimation	2					X				X	X					
Number juveniles released	1			X	X	X				X				X	X	
Fecundity	2			X	X											
Broodstock survival	2			X	X											
In-hatchery survival	2					X				X	X			X		
Size of juveniles released	1			X	X	X		X	X	X	X			X	X	
Growth rates	2				X	X										
Incubation timing	3				X	X										
Disease	1					X								X		
Density index	2					X										
Flow index	2					X										

Table 4. Continued.

Specific Indicators	LLevel	*Strategies*														
		Spawning ground surveys	*Creel surveys*	*Broodstock collection*	*Hatchery spawning*	*Hatchery juvenile sampling*	*Smolt trapping*	*Residual sampling*	*Precocity sampling*	*PIT tagging*	*CWT tagging*	*Radio tagging*	*Genetic sampling*	*Disease sampling*	*Snorkel surveys*	*Redd capping*
Pathogen values	2					X								X		
Hatchery effluent	2					X								X		
Smolts per redd	1	X					X								X	X
Egg-to-smolt	2	X					X								X	X
Egg-to-parr	3	X					X								X	X
Parr-to-smolt	3	X					X								X	X
Smolt-to-smolt	3	X					X			X						
Egg-to-fry	3	X														X
NTTOC (A,S,D)	1						X	X	X	X					X	
Harvest rate	1	X	X	X	X						X					

Table 5. List of appendices outlining the methodologies for calculating indicators used in the M & E plan.

Appendix	Strategy	Indicator(s)	
		Primary	Secondary and/or tertiary
A	Broodstock protocols	Not applicable	Broodstock number
B	Broodstock collection	Run timing	Broodstock number, male to female ratio, run composition, run timing, trap efficiency, extraction rate
C	Hatchery evaluations	Number and size of fish released	Age at maturity, length at maturity, spawn timing, fecundity, broodstock survival, juvenile hatchery survival, rearing density index, incidence of disease
D	Post-release survival and harvest	HHR Exploitation rate	SAR, harvest rates
E	Smolt trapping	Smolts per redd	Smolt production, egg-to-smolt survival, overwinter survival, size at emigration
F	Spawning ground surveys	NRR Spawn timing Redd Distribution	Spawning escapement, redd count, spawning composition, age structure, size at maturity, stray rates,
G	Relative abundance	NRR	Recruits
H	Genetics	Genetic variation Stock structure Effective pop. size	Broodstock composition, spawning composition, stray rates
I	NTTOC	NTTOC	Size, abundance, and distribution
J	Disease sampling	Naturally produced fish incidence of disease Hatchery fish incidence of disease	Flow index, hatchery effluent

Implementation

A statement of work based on this document will be developed annually that outlines and prioritizes proposed M&E activities for the upcoming field season. This document will be reviewed by the HCP HC for approval before being finalized prior to the field season. The draft statement of work should be completed no later than July 1 and approved by the HCP HC no latter than September 1, unless otherwise agreed to by the HCP HC.

The annual plan will serve two purposes; allow the HCP HC to determine whether the monitoring efforts are prioritized correctly and to determine costs of the program for budgeting.

Reporting

A yearly comprehensive report, in the form of a technical memorandum, will be completed for HC review. A draft of the report will be ready for distribution by March 1 of the year following the monitoring efforts. A final report will be completed by the middle of May of the same year.

Within the annual report, all indicators that were measured for that particular year will be displayed. This will include topics such as smolt trapping information, run timing, spawn timing, redd distribution, stray rates, and all other information that is generated by additional analyses, like smolt-to-adult survival, NRR, HRR, etc. Tables 3 and 4 should be used as guidance on what indicators are reported, as well as the yearly statement of work that is agreed upon by the HC.

It will also be important to maintain cumulative information that is updated yearly as appendices to the technical memorandum.

Glossary

The following is a definition of terms used throughout the M&E Plan:

<u>Age at maturity</u>: the age of fish at the time of spawning (hatchery or naturally)

<u>Augmentation</u>: a hatchery strategy where fish are released for the sole purpose of providing harvest opportunities.

<u>Adult-to-Adult survival (Ratio)</u>: the number of parent broodstock relative to the number of returning adults.

<u>Broodstock</u>: adult salmon and steelhead collected for hatchery fish egg harvest and fertilization.

<u>Donor population</u>: the source population for supplementation programs before hatchery fish spawned naturally.

Effective population size (N*e*): the number of reproducing individuals in an ideal population (i.e., N*e* = N) that would lose genetic variation due to genetic drift or inbreeding at the same rate as the number of reproducing adults in the real population under consideration (Hallerman 2003).

ESA: Endangered Species Act passed in 1973. The ESA-listed species refers to fish species added to the ESA list of endangered or threatened species and are covered by the ESA.

Expected value: a number of smolts or adults derived from survival rates agreed to in the Biological Assessment and Management Plan (BAMP 1998).

Extraction rate: the proportion of the spawning population collected for broodstock.

Genetic Diversity: all the genetic variation within a species of interest, including both within and between population components (Hallerman 2003).

Genetic variation: all the variation due to different alleles and genes in an individual, population, or species (Hallerman 2003).

Genetic stock structure: a type of assortative mating, in which the gene pool of a species is composed of a group of subpopulations, or stocks, that mate panmictically within themselves (Hallerman 2003).

HCP: Habitat Conservation Plan is a plan that enables an individual or organization to obtain a Section 10 Permit which outlines what will be done to "minimize and mitigate" the impact of the permitted take on a listed species.

HCP-HC Habitat Conservation Plan Hatchery Committee is the committee that directs actions under the hatchery program section of the HCP's for Chelan and Douglas PUDs.

HRR: Hatchery Replacement Rate is the ratio of the number of returning hatchery adults relative to the number of adults taken as broodstock, both hatchery and naturally produced fish (i.e., adult-to-adult replacement rate).

Long-term fitness: Long-term fitness is the ability of a population to self-perpetuate over successive generation.

Naturally produced: progeny of fish that spawned in the natural environment, regardless of the origin of the parents.

NRR: Natural replacement rate is the ratio of the number of returning naturally produced adults relative to the number of adults that naturally spawned, both hatchery and naturally produced.

(NTTOC) Non-target taxa of concern: species, stocks, or components of a stock with high value (e.g., stewardship or utilization) that may suffer negative impacts as a result of a hatchery program.

Productivity: the capacity in which juvenile fish or adults can be produced.

Reference population: a population in which no directed artificial propagation is currently directed, although may have occurred in the past. Reference populations are used to monitor the natural variability in survival rates and out of basin impacts on survival.

Segregated: a type of hatchery program in which returning adults are spatially or temporally isolated from other populations.

(SAR) Smolt-to-adult survival rate: smolt-to-adult survival rate is a measure of the number of adults that return from a given smolt population.

Size-at-maturity: the length or weight of a fish at a point in time during the year in which spawning will occur.

Smolts per redd: the total number of smolts produced from a stream divided by the total number of redds from which they were produced.

Spawning Escapement: the number of adult fish that survive to spawn.

Stray rate: the rate at which fish spawn outside of natal rivers or the stream in which they were released.

Supplementation: a hatchery strategy where the main purpose is to increase the relative abundance of natural spawning fish without reducing the long-term fitness of the population.

Target population: a specific population in which management actions are directed (e.g., artificial propagation, harvest, or conservation).

Literature

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Appendices

APPENDIX A

Broodstock Collection Protocols

The Broodstock Collection Protocol is intended to be implemented over a five-year period, consistent with the M & E plan. This protocol will be updated annually base don the yearly run size estimates by the HCP-HC. This appendix provides the methodology to determine where and when the actual broodstock would be collected and allows for in-season escapement estimates. Appendix B (broodstock collection) provides the broodstock composition and numbers and will be used annually to adjust the broodstock collection composition.

This protocol was developed for hatchery programs associated with the Wells Habitat Conservation Plan. Hatchery programs or facilities operated by other agencies or tribes are not addressed in the document. Trapping facilities associated with these programs have been operated in a similar manner without modifications for an adequate period of time to allow baseline data collection. Using the actual trap extraction efficiencies broodstock collection protocols could be developed under a large range of run escapement scenarios. This adult broodstock collection protocol is intended for implementation over a five-year period, consistent with the M & E plan. After which, the Hatchery Committee could modify the protocol where appropriate to ensure collection goals are met while maintaining consistency with the overall program goals. As trap modifications are completed in the Methow Basin (Twisp trap in 2005, Chewuch trap in 2006), trap efficiencies and extraction rates for the new facilities would be calculated.

The general approach in developing this protocol involved analyzing the last five years of run timing and trapping data. Using the trapping period outlined in the 2004 protocol, stock specific daily and cumulative passage dates (i.e. 25%, 50%, 75%) were calculated (Table 1). Weekly collection goals were calculated based on the proportion of the broodstock goal expected to migrate upstream of the collection location (Table 2). Weekly collection values would differ if the broodstock goal was not expected to be obtained for a given stock. Using pre-season escapement estimates and the five-year trap extraction efficiencies (Table 3), the probability of achieving the broodstock collection goal can be estimated assuming the following general guidelines:

- **Very high probability** - If the required trap extraction efficiency (broodstock goal/estimated escapement) is below the observed five-year minimum trap extraction efficiency.

- **High probability** - If the required trap extraction efficiency (broodstock goal/estimated escapement) is below the observed five-year average trap extraction efficiency.

- **Moderate probability** - If the required trap extraction efficiency (broodstock goal/estimated escapement) is below the observed five-year maximum trap extraction efficiency.

- **Low probability** - If the required trap extraction efficiency (broodstock goal/estimated escapement) is above the observed five-year maximum trap extraction efficiency.

As previously mentioned, in-season escapement estimates will also be used to estimate the probability of achieving broodstock collection goals. When the probability of achieving the broodstock goal is estimated to be moderate or low, modifications to the collection protocol, broodstock composition, or production level would occur on a stock specific basis (See flow charts).

Table 1. Cumulative passage dates of salmon and steelhead stocks based on the trapping period.

Stock	Cumulative passage dates during trapping period[1]			
	25%	50%	75%	100%
MEOK summer	12 Jul	22 Jul	08 Aug	14 Sept
MEOK steelhead	29 Aug	15 Sep	28 Sep	31 Oct
Met comp. spring	10 May	21 May	2 Jun	28 Jun
Twisp spring[1]	10 May	21 May	2 Jun	28 Jun

[1] To be determined at Twisp Weir following operation of new weir.

Table 2. Weekly collection quotas for spring Chinook, summer Chinook and steelhead.

Week	MetComp[1]	Twisp spring		Wells Summer		MEOK Steelhead	
		H	NP	H	NP	H	NP
07 May	24		12				
14 May	32		16				
21 May	42		21				
28 May	44		22				
04 Jun	24		12				
11 Jun	20		10				
18 Jun	16		8				
25 Jun	14		7				
02 Jul	10		5				
09 Jul	8		4				
16 Jul	4		2	232	26		
23 Jul	2		1	195	22		
30 Jul	1		1	195	22		
06 Aug				195	22	15	6
13 Aug				154	17	20	8
20 Aug				69	8	32	11
27 Aug				37	4	32	11
03 Sep						32	11
10 Sep						32	11
17 Sep						51	21
24 Sep						36	12
01 Oct						28	11
08 Oct						25	10
15 Oct						15	6
22 Oct						5	4
29 Oct						3	1
31 Oct							
07 Nov							
Total	242	0	121	1077	121	326	123

[1] A combination of hatchery and wild fish collected at Methow FH, Foghorn and Chewuch weir.

Table 3. Historical trap extraction rates and required escapement levels to achieve broodstock goal under average extraction rates.

Stock	Broodstock goal		Required escapement		Observed extraction rate[1]		
	W	H	W	H	Mean	Min	Max
Wells summer	121	1077					
MEOK steelhead	123	326					
Twisp spring	121	0					
Met comp	121	121					

Methow River Basin Spring Chinook

The spring Chinook collection protocols will target specific populations of fish in the Methow Basin through broodstock collections in tributary locations and the remainder collected at Methow Hatchery. Fish will be collected from tributaries in an attempt to increase the number of natural origin fish incorporated into the broodstock and to improve local tributary survival attributes.

Consistent with the BAMP (1998), Biological Opinion for ESA Section 10 Permit 1196; Permit 1196; and the Biological Opinion for Section 7 Consultation on the Interim Operations for the Priest Rapids Hydroelectric Project (FERC N0. 2114), WDFW proposes to collect broodstock consistent with the production level of 550,000 smolts, development of local tributary attributes and in a manner that reduces the Carson lineage within the supplementation production.

The collection protocol outlines trapping at the Methow FH outfall and tributary trapping on the Methow, Chewuch, and Twisp rivers. Site specific broodstock collection numbers and origin may vary due to unknown tributary trap efficiency, origin composition and extent of the return; however, the maximum number of broodstock spawned will not exceed 363 fish (assuming a 50:50 sex ratio). If sex ratios are skewed toward the male component, additional females may be targeted for broodstock collection. Accurate sex determination is difficult early in the collection period; therefore, any shortfall in the number of females required for full production will likely be known toward the latter stages of broodstock collection. Additional collection at this time will require release of excess males in an effort to maintain a total spawning population no greater than 363 fish. All fish released will be retuned to the tributary of collection. Three hundred and sixty-three fish (182 females) accounts for a 15% reduction expected due to ELISA culling, 5% pre-spawn mortality and maximum facility production of 550,000 smolts. The number of natural origin fish available for broodstocking purposes will be revised “in-season” and will be proportional, based on the initial forecast provided in Table 2 of the 2005 upper Columbia River Salmon and Steelhead Escapement and Broodstock Forecast.

Current estimates have 4,573 Chinook destine above Wells Dam, 33% or 1,528 are expected to be natural origin (TAC forecast have no effect on this estimate, since the estimate was derived from hatchery releases, hatchery SARs, and natural production (R/S estimates) and not based on the TAC estimate). “In-season” estimates of natural origin Chinook to individual tributaries will be estimated based on proportion natural origin returns to Twisp, Chewuch and upper Methow (Table 2 of the 2004 upper Columbia River Salmon and Steelhead Escapement and Broodstock Forecast) and 33% proportion of natural origin fish in the total return past Wells Dam. Natural origin fish inclusion into the broodstock will be a priority, with natural origin fish specifically being targeted; however, natural origin fish collections will not exceed 33% of the projected or in-season estimated return to any tributary spawning population.

Methow FH Spring Chinook

Biological Assumptions

Production level	550,000 yearling smolts
Propagation survival	90% fertilization to release
Maximum broodstock require	363
Natural origin/hatchery broodstock composition	90% / 10%
Pre-spawn survival	95%
Female to male ratio	1 to 1
Fecundity	4,200 eggs/female
ELISA cull rate	15%

Winthrop NFH spring Chinook program (BAMP):

Production Objective	600,000 yearling smolts
Broodstock required	352 (BAMP)

Trapping Locations

<u>Methow River</u>

Foghorn Dam 1 May – 30 July

Trap 7-days/week- Operated by WDFW personnel. Adipose present Chinook will be retained at this site. All fish collected at this site will be held at the Methow FH. Up to 121 fish (9.9% of the 1,228 fish projected to return to the mainstem Methow River) may be retained for broodstock purposes. One hundred percent (121 fish) may be natural origin (29.5% of the 410 natural origin fish projected to return to the mainstem Methow River). If other trap locations at the Methow FH, and Fulton Dam experience collection shortfalls, additional fish may be collected over and above the 121 fish to effectively minimize the shortfall.

In-season estimates of natural origin fish returning to the upper Methow River will be provided through initial estimates provided in Table 2 of the 2005 escapement and broodstock forecast and observed passage at Wells Dam. Overall broodstock collection and number of natural origin fish retained will be modified, in-season, as necessary to maintain a collection protocol that removes no more than 33% of the return. Fish collected at from the Methow River will be held at the Methow FH.

Chewuch River

Fulton Dam Trap 1 May – 30 July

Trap 7-days/week- Operated by WDFW personnel. The WDFW will also attempt to seine broodstock once a week at locations determined to be effective and where fish can be safely transported to Methow Hatchery. Angling will be used as a last resort if all other methods do not provide adequate broodstock.

Adipose present spring Chinook will be retained from the Chewuch River. Up to 121 fish (7.9% of the 1,524 fish projected to return to the Chewuch River) may be retained for broodstock purposes, of which, up to 121 natural origin fish (17% of the 680 natural origin fish projected to return to the Chewuch River) may be retained for broodstock purposes. If other trap locations at the Methow FH and Foghorn Dam experience collection shortfalls, additional fish may be collected over and above the 121 fish to effectively minimize the shortfall.

In-season estimates of run size and origin of spring Chinook to the Chewuch River will be made, similar to that described for the Methow River. The collection protocols will be modified as necessary to maintain an extraction of no more than 33% of the projected return. Fish collected at the Chewuch trap will be held at the Methow FH.

The trapping efficiency of the Fulton facility averaged 30% between 1992 and 1994, ranging from a low of 9.2 in 1992 to a high of 58.2% in 1993. Significant river flows in 1996 and 1997 disrupted the configuration of the dam, likely reducing the potential trapping efficiencies from those observed between 1992 and 1994. Maintenance work completed in the spring of 2001 was expected to return trapping efficiencies to approximately 60%. Unfortunately, the 2001 trapping efficiencies were approximately 3.5%, significantly less than anticipated. During the late winter/early spring of 2002, minor construction was again performed at the Fulton Dam site, seeking improvements to trapping efficiencies. Trapping efficiencies during the 2002 broodstock collection fell to just 0.3%, a clear indication that the modifications completed in 2001 and 2002 failed to return the trap to pre-1994 trapping efficiencies.

Current snow-pack in the Methow River Basin is low and reminiscent of conditions in 2001. Based on current snow-pack conditions, WDFW expects flow in the Chewuch basin to be similar to 2001 and therefore, expects trap extraction rates to be similar to 2001 (approximately 3.5%). WDFW anticipates the Fulton Dam trap to provide approximately 24 natural origin and 29 hatchery origin fish. Based on the anticipated collection at Fulton Dam, collections at the Methow FH will be required to address the shortfall in adult collections at Fulton Dam.

Twisp River

Twisp Weir 1 May – 30 July

Trap 7-days/week- Operated by WDFW personnel. A floating weir on the Twisp River provides for collection of Twisp stock spring Chinook. Historically, trap efficiency at this facility has been low, averaging 16% (range 10.4% – 23.7%) between 1992 and 1994. During the 2001 trapping season, the trap efficiency was just 6% and fell to just 0.2% in 2002. A modified V-trap installed along the weir sill, adjacent to the trap entrance, increased the trap efficiency in 2003 to 42%; however the 2004 trap efficiency was estimated at 19.2%. The installation of the permanent V-trap will allow trapping over a greater range of stream flows and should provide greater extraction potential than observed in 2004. To guard against extracting more than 33% of the natural origin return, WDFW assumes the weir to have 100% extraction potential. Based on an assumed 100% extraction potential, one of three natural origin fish captured will be retained for broodstock, effectively limiting the extraction to 33%.

Based on an escapement estimate of 1,167 fish, including 445 natural origin and 722 hatchery origin fish (2005 escapement and broodstock forecast), up to 121 fish (10.4% of the projected return to the Twisp River.) may be retained for broodstock purposes, of which a collection goal of 121 fish (27% of the projected natural origin return to the Twisp River) may be natural origin. In-season estimates of run size and origin of spring Chinook to the Twisp River will be made, similar to that described for the Methow River. The collection protocols will be modified as necessary to maintain an extraction of no more than 33% of the projected return. Twisp origin spring Chinook trapped at this site will be held at the Methow FH.

The Twisp weir poses several operating constraints, including stranding of steelhead and spring Chinook on the weir pickets during upstream and downstream movement. The new weir design is capable of submerging the pickets to allow stranded fish to swim off the pickets. The weir will be manned 24-hours/day to facilitate operation to minimize impact to steelhead kelts and spring Chinook fallback. If the new weir design and operation cannot adequately address kelt migration or spring Chinook fallback, trapping will cease and the weir removed (pending appropriate flow conditions).

Methow FH

Methow FH Outfall Trap 01 May – 30 July

Collection at the Methow Fish Hatchery outfall will be variable and dependent upon success of tributary collections. Outfall trapping will be used in conjunction with tributary traps, seining and angling to achieve a production level of 550,000 ESA-listed upper Columbia River spring Chinook smolts.

<u>Winthrop NFH</u>

Trapping is expected to occur at the Winthrop NFH and will be consistent with collection protocols provided by the USFWS. Additional adult collection at Winthrop NHF may occur, if required to meet broodstock collection shortfalls at the Methow FH, Foghorn Dam and Fulton Dam.

<u>Wells Dam</u>

No spring Chinook trapping at Wells Dam will occur unless the total annual adult return to Wells Dam is predicted to be 668 or less as identified in Section 10 Permit 1196.

Columbia River Mainstem below Wells Dam

Wells Hatchery Summer Chinook

Biological Assumptions

Wells program	320,000 yearling smolts (182 adults)
	484,000 subyearlings (266 adults)
Lake Chelan program	100,000 green eggs (44 adults)
Rocky Reach program	200,000 yearling smolts (114 adults)
	628,000 subyearlings (345 adults)
	450,000 accel. subyearling (247 adults)
Broodstock required	1,198
Broodstock composition	10% natural origin from west ladder
Pre-spawn survival	90%
Female to male ratio	1 to 1
Fecundity	5,000 eggs per female
Propagation survival	81% unfertilized egg to 0+ release
	78% unfertilized egg to 1+ release

Trapping Assumptions

Trapping period	14 July – 28 August (hatchery origin)
	01 July – 14 September (natural origin)
# Days/week	3
# Hours/day	16 (Monday-Wednesday)
Broodstock composition	10% natural origin from west ladder
Broodstock number	Not to exceed 33% of the population

The goal of the Wells/Turtle Rock summer Chinook program is to provide harvest augmentation. Those fish that are not harvested have the potential and have been documented to spawn in tributaries where supplementation is currently ongoing. Until a terminal fishery is developed or methods to reduce the number of Wells/Turtle Rock fish that spawn in tributaries are found, infusing natural origin genes into the broodstock will minimize the risk of inbreeding depression, genetic drift, and domestication selection. This is consistent with the objectives of the Harvest and Genetic Reserve program as outlined by NOAA Fisheries (Rob Jones, NOAA Fisheries, personal communication).

Collect 1,198 run-at-large summer Chinook from the volunteer ladder trap at Wells Fish Hatchery outfall (1,077 hatchery fish) and west ladder (121 natural origin fish). The 3-year old component will be limited to 10% of the broodstock collection to minimize the potential of reduced production as a result of a strong 3-year-old age class, as was the case in 2001. In the event excess fish are collected, they will be returned to the Columbia River below Wells Dam.

Methow / Okanogan River Basins

Wells Hatchery Steelhead

Biological Assumptions

Wells HCP (Methow/Okanogan)	349,000 yearling smolts (178 adults)
Grant PUD BiOp (Methow/Okanogan)	100,000 yearling smolts (52 adults)
WNFH transfer (Methow River)	100,000 smolts (55 adults)
Ringold transfer (Columbia River)	180,000 smolts (88 adults)
Grant PUD Survival Studies	150,000 yearling smolts (76 adults)
Broodstock required	449 Adults
Natural origin/hatchery broodstock composition	
Wells Production [1/]	33% / 67%
Survival Studies	0% / 100%
Pre-spawn survival	97%
Female to male ratio	1 to 1
Fecundity	5,400 eggs per female
Propagation survival	87% fertilization to eyed egg
	86% eyed egg to yearling release
	75% fertilization to yearling release

[1/]- Includes Wells HCP, Grant PUD BiOp, Winthrop NFH and Ringold production.

Trapping Assumptions

Trapping period	01 July – 29 October
# Days/week	3
# Hours/day	16

Broodstock number/composition	
Wells Production	373 - (33% natural / 67% hatchery)
Survival Studies	76 - (0% natural / 100% hatchery)
Total Broodstock	449 – (27% natural / 735 hatchery)

Trapping efforts will selectively retain 449- steelhead at Wells Dam (East and West ladder collection), to attain a 33% natural origin component within the "Wells production" broodstock (123 natural origin steelhead) and 100% hatchery origin within the survival study production components. Overall collection will not exceed 33% of the expected return (hatchery or natural origin). Increasing the natural origin component within the broodstock to near 33% will provide opportunities to increase the HxW and WxW parental cross proportion from what has occurred previously under random run-at-large collections. Increasing the number of HxW and WxW parental crosses within the Wells Program is consistent with management objectives described in WDFW's ESA Section 10 Permit 1395 Application and consistent with other upper Columbia River summer steelhead supplementation efforts. Collection within the "Wells Production" component will also be selective for adipose present hatchery origin steelhead (HxW parental crosses), consistent with production objectives. The east and west ladder traps at Wells Dam will be operated concurrently, three days per week, up to 16 hours per day. Trapping on the east ladder will be commensurate with summer Chinook brood stocking efforts through 14 September and will continue through 29 October, concurrent with west ladder collections. All steelhead excluded from the broodstock will be directly passed upstream at the trapping site or captured, examined and released upstream from the trap site.

Adult return composition including number, origin, age structure, and sex ratio will be assessed in-season at Priest Rapids and Wells dams. Broodstock collection adjustments will be made consistent with the estimated return of natural origin steelhead to Wells Dam and production objectives

APPENDIX B

Broodstock Collection

Task 1: Collect the required number of broodstock that represent the demographics of the donor population with minimal injuries and stress to target and non-target fish. (*Broodstock number, male to female ratio, run composition, run timing, trap efficiency, extraction rate*)

Task 1-1. Develop broodstock trapping protocol based on program goal, estimated escapement, number and age classes of returning wild fish, minimum proportion of wild fish required in the broodstock, and demographics of the donor population to achieve production levels (Table 1).

a. Ensure broodstock collection protocols are consistent with Section 10 Permits.

b. Reexamine and modify assumptions of the broodstock protocol to reflect recent data (e.g., male to female ratio, fecundity, prespawn survival, egg to smolt survival).

Table 1. Annual broodstock collection worksheet for Wells Complex programs.

Stock	Estimated escapement		Broodstock goal		Required extraction rate		Observed extraction rate			Estimated broodstock	
	W	H	W	H	W	H	Avg	Min	Max	W	H
Wells summer			121	1,077							
Wells steelhead			76	153							
Met comp. spring			242	0							
Twisp spring			121	0							

Task 1-2. Monitor operation of adult traps in the Twisp River, Chewuch River, Fulton Dam, Methow Hatchery, Wells Hatchery and Wells Dam. Ensure compliance with established broodstock collection protocols and Section 10 permits for each station.

a. Record date, start time, and stop time of trapping operations.

Task 1-3. Conduct in-season run forecasts and modify broodstock protocols accordingly (Table 2).

a. Monitor run timing at Columbia River dams and make comparisons using previous years data.

b. Determine run timing and size using PIT tag detections at Columbia River Dams.

c. Make recommendations to broodstock collection protocols to increase probability of collecting broodstock goal.

Table 2. In-season Chinook and steelhead escapement worksheet.

Stock	Pre-season run estimate	Cumulative passage dates during trapping period[1]				In-season run estimate
		25%	50%	75%	100%	
MEOK summer		12 Jul	22 Jul	08 Aug	14 Sept	
MEOK steelhead		29 Aug	15 Sep	28 Sep	31 Oct	
Met comp. springer		10 May	21 May	2 Jun	28 Jun	
Twisp spring[1]		10 May	21 May	2 Jun	28 Jun	

[1] To be determined at Twisp Weir following operation of new weir.

Task 1-4. Monitor timing, duration, composition, and magnitude of the salmon and steelhead runs at adult collection sites.

a. Maintain daily records of trap operation and maintenance, number and condition of fish trapped, and river stage.

b. Record species, origin, and sex of all fish collected for broodstock.

c. Record species, origin, and sex of all fish not collected for broodstock (i.e., passed upstream).

d. Collect biological information on trap-related moralities. Determine the cause of mortality if possible.

Task 1-5. Evaluate the efficacy of the broodstock protocol in achieving collection goals.

a. Summarize results and review assumptions, escapement estimates, extraction rates, and broodstock goals.

b. Calculate trapping efficiency (TE).

TE = Number of fish trapped/Estimated spawning escapement

c. Calculate extraction rate (ER).

ER = Number of fish collected/Estimated spawning escapement

d. Ensure broodstock collections follow weekly collections quotas.

e. Calculate trap operation effectiveness (TOE).

$$TOE = \frac{\text{Number of hours trap operated}}{\text{Maximum number of hours trap could operate per protocol}}$$

f. Calculate estimated maximum trap efficiency (i.e., TOE = 1).

$$\text{Estimated Max. TE} = \frac{\text{Number of fish trapped/TOE}}{\text{Estimated spawning escapement}}$$

g. Provide recommendations on means to improve adult trapping and refinements to broodstock collection protocols for each stock.

APPENDIX C

Hatchery Evaluation

Task 2: Conduct spawning operations and collect biological data from broodstock (*Age at maturity, length at maturity, spawn timing, fecundity)*

Task 2-1. Collect biological data from all broodstock during spawning including mortality (i.e., date, origin, scales, fork length and POH, DNA, CWT, and PIT tags).

a. All females are sampled for disease (i.e., kidney, spleen, ovarian fluid).

Task 2-2. Ensure proper mating schemes are followed that is consistent with the program objectives and per broodstock protocol.

a. One female per incubation tray unless physically separated within tray.

b. All egg lots will be run through an egg counter to determine fecundity

Task 3: Monitor growth and health during rearing and determine life stage survival rates for each stock at each of the Wells Hatchery Complex facilities. (*Broodstock survival*, j*uvenile hatchery survival, rearing density index, size at release, incidence of disease*)

Task 3-1. Monitor growth of juvenile fish during rearing and prior to release.

a. Collect end of month length and weight data.

   1. Whenever possible, crowd fish and dip net into 500-1000 fish into a net pen.

   2. Measure and record fork length on 100 fish to the nearest millimeter.

   3. Dip net approximately 200 fish into a bucket and record weight. Calculate grams/fish by dividing total weight by number.

   4. Repeat weight sample three times and calculate average weight of fish.

b. Collect length and weight data prior to release.

1. Whenever possible, crowd fish and dip net into 500-1000 fish into a net pen.

2. Measure and record fork length (nearest millimeter) and weight (nearest 0.1 g) on 200 fish.

c. Analyze data to ensure fish were released at the proper fork length, condition factor, and size distribution (i.e., CV of fork length).

Task 3-2. Calculate end of month density indices for juvenile fish.

a. Use end of month length and weight data and the total rearing volume to calculate rearing density index (DI).

$$DI = \frac{(\text{Population size* mean weight (lbs))/total rearing volume (ft}^3)}{\text{Mean fork length (inches)}}$$

Task 3-3. Monitor fish health, specifically as related to cultural practices that can be adapted to prevent fish health problems.

a. Standard hatchery fish health monitoring will be conducted monthly by fish health specialist, with intensified efforts to monitor presence of specific pathogens that are known to occur in the donor populations. Significant fish mortality of unknown cause(s) will be sampled for histopathological study.

b. Collect biological information on all adult broodstock moralities. Determine the cause of mortality whenever possible.

c. The incidence of viral pathogens in salmon and steelhead broodstock will be determined by sampling fish at spawning in accordance with the Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State. Stocks of particular concern may be sampled at the 100% level and may require segregation of eggs/progeny in early incubation or rearing.

d. Determine antigen levels of *Renibacterium salmoninarum* (Rs, causative agent of bacterial kidney disease) in Chinook salmon broodstock by sampling fish at spawning using the enzyme-linked immunosorbent assay (ELISA).

e. If required, provide recommendations to hatchery staff on means to segregate eggs/progeny based on levels of Rs antigen, protecting “low/negative” progeny from the potential horizontal transmission of Rs bacteria from “high” progeny.

f. Autopsy-based condition assessments (OSI) or other physiological assessments deemed valuable would be used to assess hatchery-reared salmon smolts at release. If needed, perform assessments at other key times during hatchery rearing.

g. Provide recommendations on fish cultural practices at Wells Complex hatcheries and satellite stations on monthly basis. Summarize results for presentation in annual report or technical memorandum if applicable.

Task 3-4. Calculate various life stage survival rates for broodstock and juvenile fish (Table 3).

a. Use the stock inventory at time of tagging to recalculate population sizes and life stage survival rates.

Task 3-5. Summarize broodstock collection, spawning, rearing survival, and release information in an annual technical memorandum.

a. Where applicable, provide recommendations to increase survival rates of life stages that were lower than the survival standard or recommend studies to investigate causes of poor survival.

Task 4: Determine if broodstock collections and hatchery survival was adequate to achieve smolts releases at the programmed production levels (*Number of fish released, size at release*).

Task 4-1. Calculate the number of fish released from Wells FH Complex facilities.

a. If release numbers are within ± 10% of the production levels no further action required (Table 4).

b. If release numbers are not within ± 10% of the production levels determine what factors contributed to the shortage/overage.

Task 4-2. Calculate the size of fish released from Wells FH Complex facilities.

a. If size at release numbers is within ± 10% of the target no further action required (Table 5).

b. If size at release is not within ± 10% of the target determine what factors contributed to the shortage/overage.

Table 3. Hatchery life stage survival rate standards, 5 year mean (SD), and survival achieved for current brood year.

Life stage	Survival standard	Wells steelhead		Wells summer Chinook		Methow spring Chinook		Chewuch spring Chinook		Twisp spring Chinook	
		Mean (95%)	Survival achieved	Mean (95%)	Survival achieved	Mean (95%)	Survival achieved	Mean (95%)	Survival achieved	Mean (95%)	Survival achieved
Collection-to-spawning	*90.0 Female*										
Collection-to-spawning	*85.0 Male*										
Unfertilized egg-to-eyed	92.0										
Eyed egg-to-ponding	98.0										
30 d after ponding	97.0										
100 d after ponding	93.0										
Ponding-to-release	*90.0*										
Transport-to-release	95.0										
Unfertilized egg-to-release	*81.0*										

Italics are revised survival standards

Table 4. Summary of the number of fish released from Wells FH Complex.

Stock	Target	5-year min.	5-year max.	5-year mean	Number released
Wells yearling summer Chinook	320,000	185,200	45,770	321,060	
Wells subyearling summer Chinook	484,000	370,617	498,500	416,369	
Methow spring Chinook	183,024	66,454	218,499	155,570	
Chewuch spring Chinook	183,023	0	261,284	143,092	
Twisp spring Chinook	183,024	15,470	75,704	53,668	
Wells steelhead	348,858	390,965	694,765	539,768	

Table 5. Size at release targets for fish released from Wells FH Complex.

Stock	Target		Actual	
	Fork length (CV)	Weight	Fork length (CV)	Weight
Wells yearling summer	176 (9.0)	45.4		
Wells subyearling summer	140 (9.0)	22.7		
Methow spring Chinook	154 (9.0)	30.2		
Chewuch spring Chinook	154 (9.0)	30.2		
Twisp spring Chinook	154 (9.0)	30.2		
Wells steelhead	198 (9.0)	75.6		

APPENDIX D

Post-release Survival and Harvest

Task 5: Determine whether the survival from release-to-adult of fish from the Wells Hatchery Complex is sufficient to achieve the program goal. (*Smolt to adult survival, hatchery replacement rate, exploitation rate, harvest rate*)

Task 5-1. Mark (i.e., adipose fin clip) and tag (i.e., coded-wire tag or elastomer) each stock subjected to ocean fisheries or mainstem Columbia River commercial, sport, or tribal fisheries with sufficient coded-wire tags (CWT) to estimate harvest contribution.

a. Provide summary of marked and unmarked smolt releases from the Wells Hatchery Complex.

b. Determine the statistical requirements to provide reliable estimates of escapement and harvest contribution. Determine the number of coded-wire tags and other marks needed in relation to the number of recoveries expected.

Task 5-2. Summarize information at time of release that may influence post-release survival and performance.

a. Calculate mean fork length (FL) at release, FL coefficient of variation (CV), and condition factor (K) for all stocks released from Wells Complex.

b. Summarize fish health information (e.g., reports, OSI, precocity rates).

c. Calculate the number of days rearing on well and river water. Calculate the number of days reared at acclimation sites.

Task 5-3. When applicable, estimate travel time and smolt-to-smolt survival rates of hatchery and wild fish using PIT tag recaptures.

a. Compare smolt-to-smolt survival, emigration rate, and duration with rearing water source, duration of acclimation, and size at emigration.

Task 5-4. Estimate the harvest contribution for each stock released from the Wells Hatchery Complex.

a. Compile CWT recovery data from Wells Hatchery releases for inclusion in reports.

b. Recover heads from marked (adipose fin clipped) returns to Wells Fish Hatchery Facilities during routine spawning operations. Transfer heads to WDFW tag recovery lab in Olympia, Washington.

c. Conduct statistically valid creel surveys during sport fisheries in the mid-Columbia River to estimate harvest and adult returns of hatchery stocks from Wells Complex releases.

d. For each brood year and run year, calculate exploitation rate and harvest rates in commercial, tribal, and sport fisheries.

Task 5-5. Estimate the contribution to spawning escapement for each stock released from the Wells Hatchery Complex.

a. Provide a summary of the number of fish contributing to spawning escapement, broodstock, commercial, sport, and tribal fisheries.

b. Calculate stray rates for all stocks released form Wells FH Complex facilities and compare with rearing water source and duration.

Task 5-6. Determine the smolt to adult survival rates (SAR) for each stock.

a. Determine the total estimated the number of hatchery adults recovered in all fisheries, hatcheries, and spawning ground surveys using CWT data.

b. To calculate SAR for salmon, use the estimated number of smolts released divided by the estimated number of hatchery adults.

c. To calculate SAR for steelhead, use the estimated number of smolts released divided by the estimated number of adults migrating pass Priest Rapids Dam

d. Examine the influence of size, fish health, rearing location, and acclimation on survival and straying.

e. Compare SARs using CWT recoveries and PIT tag recaptures of adults, when applicable.

Task 5-7. Determine the expected and actual hatchery replacement rate for each brood year (Table 6).

a. Calculate HRR by dividing the number of broodstock collected by the estimated number of returning adults.

b. For stocks that fail to meet or exceed the expected hatchery replacement rate determine the life history stage that limited survival.

Table 6. The expected and actual smolt to adult (SAR) and hatchery replacement rates (HRR) or adult to adult survival rates for Wells FH Complex programs.

Program	Number of broodstock	Smolts released	SAR	Adult equivalents	# smolts/ adult	HRR
Wells yearling summer Chinook						
Expected	182	320,000	0.003	960	333	5.3
Actual						
Wells subyearling summer Chinook						
Expected	266	484,000	0.0012	581	833	2.2
Actual						
Twisp spring Chinook						
Expected	121	183,024	0.003	549	333	4.5
Actual						
Methow spring Chinook						
Expected	121	183,024	0.003	549	333	4.5
Actual						
Chewuch spring Chinook						
Expected	121	183,023	0.003	549	333	4.5
Actual						
Wells steelhead						
Expected	229	348,858	0.010	3,489	100	15.2
Actual						

Appendix E

Smolt Production

Task 6: Calculate freshwater production estimates of anadromous salmonids from selected river systems (*Egg-to-smolt survival, smolts per redd, emigration timing, size at emigration*)

Task 6-1. Install and operate a rotary smolt trap(s) in a location downstream from the majority of the spawning areas and that allows operation throughout the emigration period.

Task 6-1-1. Identify potential trap positions based on variation in flows. Large variations in discharge may require alternate trap locations.

Task 6-1-2. Operate trap continuously throughout the emigration period.

a. During the first year of operation at a new location determine the extent of emigration during daylight hours. Significant emigration during the daylight hours will require trap efficiency trails to be conducted during both the day and night.

b. Trap should be checked at a minimum every morning of operation. Remove fish from the live box and place in an anesthetic solution of MS-222. Identify fish to species and enumerate.

c. Determine sample size requirements of target and nontarget species for biological sampling.

d. All fish should be allowed to fully recover in fresh water prior to being released in an area of calm water downstream from the smolt trap.

e. Pressure wash trap and clean debris from cone and live box prior to leaving.

Task 6-2. Collect daily environmental and biological data.

a. Record the time the trap was checked, water temperature, river discharge, and trap position, if applicable.

b. Identify species and enumerate all fish captured to include life stage for non-anadromous species (e.g., fry, juvenile, and adult) or degree of smoltification for anadromous species (i.e., parr, transitional, or smolt). Parr have distinct parr marks, transitional fish have parr marks that are fading and not distinct, and smolts do not have parr marks and exhibit a silvery appearance, often with a black band on the posterior edge of the caudal fin.

c. Examine all fish for external marks as a result of trap efficiency trails and record them as recaptures.

d. Record fork length and weight measurements for all fish, or per designated sample size. All fish to be used in mark/recapture efficiency trials will be measured and weighed, and again as subsequent recaptures. Fork length is measured to the nearest millimeter and weight to the nearest 0.1 g.

e. Scales samples should be randomly collected throughout the emigration period from species with multiple year class smolts (i.e., steelhead and sockeye).

Task 6-3. Conduct mark-recapture trials for target species to develop a discharge-trap efficiency linear regression model to estimate daily trap efficiency.

Task 6-3-1. Conduct mark/recapture efficiency trials throughout the trapping season at the largest range of discharge possible.

a. No less than 100 fish should be used for each trial.

b. Parr and smolts can be marked by clipping the tip of either the upper or lower lobe of the caudal fin. Alternate fin clip location for each trial. Fry should be marked with dye.

c. All marked fish should be allowed to recover in a live pen for at least 8 h before being transported to a release site at least 1 km upstream of the trap. Release marked fish across the width of the river, when possible, or equally along each bank in pools or calm pockets of water.

d. Nighttime efficiency trials should be conducted after sunset. Daytime efficiency trials should be conducted after sunrise.

e. The following assumptions should be valid for all mark-recapture trials:

    1. All marked fish passed the trap or were recaptured during time period *i*.

    2. The probability of capturing a marked or unmarked fish is equal.

    3. All marked fish recaptured were identified.

    4. Marks were not lost between the time of release and recapture.

f. Calculate trap efficiency using the following formula.

    Trap efficiency = $E_i = R_i / M_i$

Where E_i is the trap efficiency during time period i; M_i is the number of marked fish released during time period i; and R_i is the number of marked fish recaptured during time period i.

Task 6-3-2. Perform linear regression analysis using discharge (independent variable) and trap efficiency (dependent variable) data from the mark-recapture trails to develop a model to estimate trap efficiency on days when no mark-recapture trials were conducted. Separate models should be developed for each trap position and target species.

Task 6-4. Estimate daily migration population by dividing the number of fish captured by the estimated daily trap efficiency using the following formula:

Estimated daily migration = $\hat{N}_i = C_i / \hat{e}_i$

where N_i is the estimated number of fish passing the trap during time period i; C_i is the number of unmarked fish captured during time period i; and e_i is the estimated trap efficiency for time period i based on the regression equation.

Task 6-5. Calculate the variance for the total daily number of fish migrating past the trap using the following formulas:

Variance of daily migration estimate = $$\mathrm{var}\left[\hat{N}_i\right] = \hat{N}_i^2 \frac{\mathrm{MSE}\left(1 + \frac{1}{n} + \frac{\cdots}{(n-1)s_X^2}\right)}{\hat{e}_i^2}$$

where X_i is the discharge for time period i, and n is the sample size. If a relationship between discharge and trap efficiency was not present (i.e., $P < 0.05$; $r^2 \lesssim 0.5$), a pooled trap efficiency was used to estimate daily emigration:

Pooled trap efficiency = $E_p = \sum R / \sum M$

The daily emigration estimate was calculated using the formula:

Daily emigration estimate = $\hat{N}_i = C_i / E_p$

The variance for daily emigration estimates using the pooled trap efficiency was calculated using the formula:

Variance for daily emigration estimate = $$\mathrm{var}\left[\hat{N}_i\right] = \hat{N}_i^2 \frac{E_p(1 - E_p) / \sum M}{E_p^2}$$

Task 6-6. Estimate the total emigration population and confidence interval using the following formulas:

Total emigration estimate = $\sum N_i$

95% confidence interval = $1.96 \times \sqrt{\sum \mathrm{var}\lfloor N_i \rfloor}$

Task 7: Calculate survival rates at various life stage for target species.

Task 7-1. Calculate the total estimated egg deposition for the selected river.

a. When possible, estimated egg deposition should be based on the average fecundity of the spawning population. Hatchery broodstock randomly collected from the run should provide a representative sample of the spawning population.

b. Multiply the average fecundity by the total number of redds upstream of the trap location to estimate the total egg deposition.

Task 7-2. Calculate the egg-to-emigrant or egg-to-smolt survival of the target species, dependent on the trap location in the watershed and life history of the target species.

a. Egg-to-emigrant survival rates are calculated by dividing the total estimated number of subyearling and yearling fish of the same brood year by the total estimated number of eggs deposited.

b. Egg-to-smolt survival rates are calculated by dividing the total estimated number of smolts of the same brood year by the total estimated number of eggs deposited. For species with multiple year class smolts, the egg-to-smolt survival may require several years of trapping data.

Task 7-3. Calculate egg-to-parr and parr-to-smolt (i.e., overwinter) survival for target species.

a. Egg-to-parr survival rates are calculated by dividing the total estimated number of parr the total estimated number of eggs deposited. Parr estimated are derived independently using snorkel methodologies described in Hillman and Miller (2002).

b. Parr-to-smolt survival rates are calculated by dividing the overwinter population by the total estimated number of smolts that emigrated that following spring. The overwinter population is calculated by subtracting the estimated number of parr that emigrated following the completion of the summer parr estimate.

c. To estimate the parr-to-smolt survival rate of those parr that emigrated, representative samples of subyearling and yearling emigrants should be PIT tagged (*N* = 5,000/group). Subsequent PIT tag survival analysis would provide the relative survival of the two groups. The estimated number of parr could be converted to smolts based on the reduced survival. Subsequently, an egg-to-smolt survival estimate (versus and egg-to-emigrant) could be calculated.

Appendix F

Spawner Escapement and Distribution

Task 7: Determine the stock demographics, spawn timing, redd distribution, redd abundance, and estimate the spawning escapement of selected streams (*spawner escapement, proportion of hatchery fish, fish per redd, number of precocial fish, sex ratio, redd distribution, spawn timing, stray rate*).

Task 7-1. Delineate survey reaches of all available spawning habitat. Whenever possible, use historical reaches for comparisons across years.

a. Reaches should not take longer than one day to survey.

b. Historical reaches can be subdivided if required.

c. Beginning and end points of reaches should be fixed locations (e.g., confluence with a stream or bridge).

Task 7-2: Conduct comprehensive spawning ground surveys of all available spawning habitat and count all redds within a selected stream (i.e., total redd count).

a. Conduct weekly surveys of all reaches by foot or raft. The survey period should begin at the earliest known date of spawning and continue until no new redds have been observed within a reach.

   1. One person can conduct surveys on small stream were both stream margins are easily observed. Two people should conduct surveys whenever both stream margins cannot be easily observed from a location.

   2. When a raft is used to conduct surveys, two observers should be in a elevated position at the front of the raft while one person navigates the raft.

b. Individually number all completed redds.

   1. In areas with low spawner density, flagging can be placed on the nearest vegetation. Data on flag should include unique redd number, distance from flag to redd, and date. Data recorded in field notes should include date, water temperature, reach, and redd number. If applicable, the number and origin of the fish on the redd should be recorded.

   2. In areas with medium and high spawner density, mapping of redds is required. Site specific (e.g., a single riffle), area specific (e.g., section of stream between two power lines), or aerial photographs can be used to

annotate redds. Redds should be uniquely number on the map(s). Different symbols should be used complete, incomplete, and test redds.

3. All completed redds should have the correct redd morphology (i.e., well developed tailspill and pit or the appropriate size for the target species). Incomplete redds have fish actively constructing a redd, but no completed. Test digs are disturbed areas of substrate that do not have the correct morphological characteristics for the target species.

Task 7-3: Conduct index spawning ground counts and estimate the total number of redds in a selected stream.

Task 7-3-1: Identify index reaches in selected tributaries.

a. Index reaches should overlap historical reaches whenever possible.

b. Index reaches should be identified in streams with known or suspected spawning populations.

c. Index reaches should be located in the core spawning locations of the stream.

d. Multiple index areas should be identified for streams when any of the following apply:

    1. Potential spawning habitat of target species cannot be surveyed in one day for any reason.

    2. Large tributaries enter the stream that may affect visibility.

    3. Significant gradient changes that may affect visibility.

Task 7-3-2: Conduct comprehensive spawning ground surveys and count all redds within an index area (See Task 5-2).

Task 7-3-3: Conduct a final survey of the entire reach(s) at the end of spawning or after peak spawning if poor water conditions are expected (n_{total}).

a. Count all redds in each reach. Marking redds is not required.

b. A different surveyor should survey within the index area. Count only redds that are visible.

c. Calculate an index expansion factor (*IF*) by dividing the number of visible redds in the index by the total number of redds in the index area.

$$IF = n_{visible} / n_{total}$$

d. Expand the non-index area redd counts by the proportion of visible redds in the index to estimate the total number of redds in the entire reach (*RT*).

$$RT = n_{non-index} / IF$$

e. Estimate the total number of redds (*TR*) by summing the reach totals.

$$TR = \sum RT$$

Task 7-4: Conduct comprehensive modified-peak spawning ground surveys and estimate the total number of redds in a selected stream.

Task 7-4-1: Establish index areas per Task 5-3-1.

Task 7-4-2: Conduct comprehensive spawning ground surveys and count all redds within an index area (See Task 5-2).

Task 7-4-3: Conduct comprehensive peak spawning ground surveys within non-index and index areas.

a. Different survey crew must perform the index area total counts and the index area peak counts.
b. Count all visible redds within the non-index area, but do not individually mark the redds.

Task 7-4-4: Calculate an index peak expansion factor (*IP*) by dividing the peak number of redds in the index by the total number of redds in the index area.

$$IP = n_{peak} / n_{total}$$

Task 7-4-5: Expand the non-index area peak redd counts by the *IP* to estimate the total number of redds in the entire reach (*RT*).

$$RT = n_{peak} / IP$$

Task 7-4-6: Estimate the total number of redds (*TR*) by summing the reach totals.

$$TR = \sum RT$$

Task 7-5: Conduct carcass surveys on selected streams and collect biological data from a representative sample (i.e., 20%) of the spawners.

a. Determine the sampling protocol based on escapement and effort. A sampling rate of 100% of all carcasses encountered is normally required, the exception is for sockeye.

b. Collect biological data from all carcasses sampled, including:

1. Sex.
2. Fork and post orbital-to-hypural length (cm).
3. Scales.
4. Remove snout including the eyes for CWT analysis is adipose fin-clipped or if origin is undetermined.
5. Number of eggs in body cavity, if body cavity is intact.
6. DNA tissue (5 hole punches from opercle) if applicable.

c. All biological information should be recorded on the scale card to include:

1. Date.
2. Stream.
3. Reach.
4. Stream survey tag number if snout was collected.
5. DNA sample number if tissue was collected.

d. All sampled carcasses must have the tail removed (posterior of the adipose fin) and placed back into the stream after data have been recorded.

Task 7-6: Conduct snorkel surveys on redd to determine the incidence of precocial fish spawning in the wild.

a. Determine sampling protocol based on escapement and personnel.

b. Survey crews should consist of two snorkelers.

c. Snorkel surveys should be conducted only on active redds (i.e., presence of spawning female).

d. Snorkel surveys should be conducted in an upstream direction.

e. Record the number of males by size (e.g., adult, jack, or precocial) and origin (e.g., wild or hatchery).

Task 7-7: Determine the spawning distribution of wild and hatchery fish in a selected stream.

a. Assume the carcass recovery location (i.e., reach) is also the spawning location.

b. Calculated the proportion of the spawning population that spawned in each reach and compare with historical values (i.e., before supplementation).

c. Compare the proportion of each component (i.e., wild and hatchery) that spawned in each reach.

Task 7-8: Calculate a sex ratio and fish per redd ratio (i.e., redd expansion factor) for a selected stream.

a. Sex ratios for spawning populations should be calculated for the hatchery broodstock if the broodstock was randomly collected from the run-at-large.

b. If broodstock stock was not collected randomly from the run-at-large, trapping records can be used in conjunction with the broodstock to develop a random sample provided sex was recorded for those fish trapped and released.

c. Once a sex ratio has been determined for a stock (e.g., 1 female: 1.5 males) a redd expansion factor can be calculated by summing the ratio (e.g., 1 female: 1.5 males = 2.5 fish per redd).

    1. Assumptions associated with this methodology include: a female constructs only one redd and male fish only spawn with one female.

d. This redd expansion factor can be applied to stocks without a hatchery broodstock, but have similar age compositions.

e. An alternative method (Meekin 1967) involves using previously calculated adults per redd values (i.e., 2.2 adults/redd for spring Chinook and 3.1 adults/redd for summer Chinook) and adjusting for the proportion of jacks in the run (e.g., jack spring Chinook comprise 10% of the run. The redd expansion factor = 2.2 x 1.1 = 2.4 fish/redd).

Task 7-9: Calculate the proportion of hatchery fish (target and non-target or strays) on the spawning grounds.

a. The proportion of hatchery on the spawning grounds is determined via scale analysis from carcasses randomly collected over the spawning period and all available habitat.

b. Stray rates are calculated from CWT recoveries divided by tag rate and sample rate.

Task 7-10: Summarize length-at-age and age-at-maturity data for the spawning population.

Appendix G

Relative Spawner Abundance Monitoring

Task 8: Determine if the relative abundance of supplemented populations is greater than non-supplemented populations and the influence the relative proportion of hatchery origin spawners may have on the abundance (*NRR, recruits*).

Task 8-1. Calculate the adult-to-adult survival rates or natural replacement rate (NRR) for selected stocks using the formula

$$NRR = r_{i+1} + r_{i+2} + r_{i+3} + \cdots / S_i$$

a. Estimate the number of spawners (*S*) from redd counts during year *i* by expanding the total redd count by a redd expansion value. When comparing across years, the number of spawners should be calculated using the same methodologies.

   1. When available, use the sex ratio of broodstock randomly collected from the run as the redd expansion factor.

   2. The alternate method would be the modified Meekin method that is calculated using a 2.2 adults/redd values expanded for the proportion of jacks within the run.

b. Estimate the number of recruits (*r*). When applicable, use the age composition derived from broodstock randomly collected from the run in stock reconstruction. Age composition data derived from spawning round surveys may bias towards larger and older fish.

   1. Exploitation rate of hatchery fish (indicator stock) may be used for naturally produced fish provided the stock was not subjected to selected fisheries. In which case, a hooking mortality should be applied and recruits adjusted accordingly.

   2. Stocks without a hatchery component (i.e., reference streams) may use exploitation rate of supplemented stock provide there is no difference in run timing or probability of harvest.

c. Conduct spawner-recruit analysis to explain density dependent effects within each of the supplemented and reference stream and correlate with the proportion of hatchery spawners for each brood year.

Task 8-2. Compare NNR of supplemented stream and reference stream to detect differences due to supplementation program.

a. When possible, establish baseline conditions (i.e., before supplementation) for supplemented and reference streams. Ensure spawning data is comparable across years and calculated using similar methodologies for each stream, preferably both streams.

b. High variability in SAR may preclude use of NRR.

Task 8-3. Compare the relationships of the number of smolts per redd (independent variable) and NRR (dependent variable) of the supplemented and reference streams.

a. Conduct regression analysis using number of smolts per redd and NRR of both the supplemented stream and reference stream. Adjust the number of smolts per redd variable for differences in the number of Columbia River hydro projects between the supplemented and reference streams.

b. Perform statistical analysis to determine if the slope of the two regression equations is similar.

Task 8-4. Conduct statistical analysis to determine what influence hatchery fish may have on relative abundance.

a. Examine the relationship between the proportion of hatchery fish on the spawning grounds and NRR.

b. Examine the relationship between the proportion of hatchery fish on the spawning grounds and egg-to-emigrant survival.

c. Examine the relationship between the proportion of hatchery fish on the spawning grounds and the number of smolts per redd.

d. Examine the relationship between the proportion of hatchery fish on the spawning grounds and smolt-to-adult survival.

Appendix H

Genetics

Task 9: Determine if genetic variation of hatchery-origin fish is similar to that of donor population and naturally produced fish in supplemented populations (*Genetic variation, proportionate natural influence*).

Task 9-1. Establish a genetic sampling and analysis schedule for programs in the Wells FH Complex.

a. Prioritize programs for evaluation relative to recovery monitoring needs. An example scheme is shown in Table 7.

b. Determine if adequate genetic samples (N= 50 to 100 per year for at least 2 years) of donor population per program have been collected.

c. If necessary, design a sampling plan to collect additional donor population samples.

d. Determine whether suitable DNA markers are available or need to be developed for target species.

e. Determine the number of genetic samples from current wild population(s) and hatchery-origin adults that need to be collected each year of an evaluation period (period length depends on species).

f. Develop annual schedule of laboratory analysis and reporting with agency genetics staff.

g. Conduct analyses and evaluate results.

h. Determine the frequency of analysis necessary for long-term monitoring of genetic variation in naturally produced and hatchery-origin populations.

Table 7. Example of prioritized genetic sampling and analysis scheme for evaluation of Wells FH programs (D=Donor population pre-hatchery program, H=hatchery, NP=naturally produced).

Stock	Origin	Last samples collected			Priority	Start year
		Year(s)	*N*	Stage		
Twisp spring Chinook	D				1	2006
	H				1	2006
	NP				1	2006
MetComp spring Chinook	D				2	2007
	H				2	2007
	NP				2	2007
Wells Steelhead	D				3	2008
	H				3	2008
	NP				3	2008
Wells summer Chinook	D				4	2009
	H				4	2009
	NP				4	2009

Task 9-2. In conjunction with genetic sampling schedule, conduct evaluation of phenotypic traits that serve as indicators of potential domestication impacts of hatchery programs

a. Determine availability and applicability of historical phenotypic data from donor populations. If data are not adequate, develop plan to acquire appropriate contemporary data.

b. Determine availability and extent of phenotypic data from current hatchery and natural populations and whether sample sizes from annual samples are adequate. Phenotypic data sets should extend over a series of years to account for effects of environmental variability. Plan data collection schedule if necessary for current populations.

c. Conduct data analysis using appropriate statistical methods.

d. Where available spawning ground survey data are suitable, calculate recent and historical proportionate natural influence (PNI; formula shown below) for target stocks. Develop survey protocol where data are unavailable, and collect spawning ground data for target stocks throughout evaluation period in order to calculate PNI.

$$PNI = \frac{\text{proportion of natural produced fish in the broodstock (pNOB)}}{\text{pNOB + proportion of hatchery fish on the spawning grounds (pHOS)}}$$

Task 10: Determine if genetic stock structure of within-basin natural populations has changed due to effects of hatchery programs.

Task 10-1. Establish a sampling and analysis schedule for potentially affected populations in the Upper Columbia Basin.

a. Based on program prioritization established in Task 9-1, determine if adequate historical genetic samples (N= 50 to 100 per year for at least 2 years) of potentially affected populations are available.

b. If necessary, design and conduct a sampling plan to collect appropriate within-basin population samples. An example scheme is shown in Table 8 relative to the Chiwawa spring Chinook program.

c. Depending on baseline data available (historical and/or recent), develop data analysis plan to assess temporal variability of with-in basin genetic population structure over meaningful time frames.

d. Develop schedule of laboratory analysis and reporting with agency genetics staff.

e. Conduct analyses and use results to determine subsequent evaluation needs.

Task 10-2. Establish a field sampling and data analysis program to verify and monitor impacts from hatchery programs on affected within-basin populations.

a. Based on genetic results from Task 10-1, design a sampling plan to enumerate hatchery-origin strays within non-target, affected populations and to collect genetic samples of naturally produced fish of pertinent brood years from these populations.

b. Conduct genetic laboratory and statistical analyses and evaluate results.

c. Determine the frequency of analysis necessary for long-term monitoring of genetic effects of hatchery supplementation fish on non-target natural populations.

Table 8. Example of genetic sampling and analysis scheme for evaluation of effect of Methow spring Chinook supplementation program on within-basin population structure (NP=naturally produced).

Stock	Origin	Last samples collected			Priority	Year
		Year	*N*	Stage		
Twisp spring Chinook	NP				1	2006
Methow spring Chinook	NP				1	2006
Chewuch spring Chinook	NP				1	2006
Entiat R. spring Chinook	NP				1	2006

Task 11: Determine if effective population size (N_e) of target natural spawning populations increases at rate expected given an increase in hatchery-origin fish on the spawning grounds.

a. In order to estimate current or baseline N_e, assess whether temporal samples of naturally spawning populations planned in Task 9-1(e) provided the necessary genetic data from natural-origin adults of same brood year from at least three brood years. (Indirect estimates of N_e are made from temporal variation of gene frequencies or genetic linkage disequilibrium in cohorts).

b. If adult (by brood year) sample sizes are adequate, estimate N_e for the base period using genetic methods.

c. If adult (by brood year) sample sizes are not adequate, design and conduct genetic sampling of same brood year naturally produced juveniles for at least a three year period.

d. Conduct laboratory analyses to collect genetic data from juvenile samples and estimate $N_{e.}$

e. Compare N_e results to spawning ground survey estimates of annual spawner population census sizes, and proportions of naturally spawning hatchery- and wild-origin fish.

f. At least one generation later, assuming supplementation program is providing large proportions of hatchery-origin fish and their natural adult progeny on spawning grounds, ensure that sampling for other evaluation and monitoring purposes includes adequate temporal genetic samples of same-brood year natural adults.

g. Conduct laboratory analyses to collect genetic data from adult samples *if* these data are not being collected to accomplish another evaluation task.

h. Estimate N_e for the later period using genetic methods and compare results to survey data on census size and hatchery/wild proportions.

Appendix I

Monitoring non-target taxa of concern

Task 12: Monitor non-target taxa of concern (NTTOC) to determine if impacts are within acceptable levels.

Task 12-1. Identify NTTOC for each target stock and define acceptable level of impact associated with hatchery program (Table 9).

Task 12-2. Identified the most probable interactions (Table 10) that would impact NTTOC as described by Pearsons et al. (19XX).

Task 12-3. Conduct risk assessment to prioritize monitoring effort (Table 11).

Task 12-4. Monitor size, distribution, and abundance of NTTOC as it relates to target stock and determine impact levels.

a. Monitor size and abundance of NTTOC using smolt traps.

b. Monitor distribution of NTTOC using snorkel surveys.

c. If impact levels exceed acceptable levels determine if changes in NTTOC are correlated to changes in production levels, size of fish released from hatchery, or location hatchery fish are released.

    1. Determine if changes in abundance are a result from predation, disease, or competition.

    2. Determine if changes in size are a result of competition.

    3. Determine if changes in distribution are a result of predation, disease, or competition.

Task 12-5. Develop and implement specific research studies to determine causation of impacts to NTTOC.

Table 9. NTTOC containment objectives for hatchery programs in the Upper Columbia River ESU. Impacts are defined as the decline in one or more variables (size, abundance, and distribution) that can be attributed to hatchery fish.

Target Species/Stock	NTTOC	Containment Objective
Common to all programs	Bull trout	No impact (0%)
	Pacific lamprey	No impact (0%)
	Mountain sucker	Very low impact (≤ 5%)
	Leopard dace	Very low impact (≤ 5%)
	Westslope cutthroat	Low impact (≤ 10%)
	Resident *O. mykiss*	Low impact (≤ 10%)
	Mountain whitefish	Moderate impact (≤ 40%)
	Other native species[1]	High impact (≤ Maximum)
Twisp spring Chinook	Methow steelhead	No impact (0%)
	Twisp spring Chinook	No impact (0%)
	Methow summer Chinook	Low impact (≤ 10%)
Metcomp spring Chinook	Methow spring Chinook	No impact (0%)
	Chewuch spring Chinook	No impact (0%)
	Methow steelhead	No impact (0%)
	Methow summer Chinook	Low impact (≤ 10%)
Methow steelhead	Methow spring Chinook	No impact (0%)
	Chewuch spring Chinook	No impact (0%)
	Twisp spring Chinook	No impact (0%)
	Methow steelhead	No impact (0%)
	Methow summer Chinook	Low impact (≤ 10%)
Methow summer Chinook	Methow spring Chinook	No impact (0%)
	Methow steelhead	No impact (0%)
	Methow summer Chinook	Low impact (≤ 10%)
Okanogan summer Chinook	Okanogan steelhead	No impact (0%)
	Okanogan summer Chinook	Low impact (≤ 10%)
Wells summer Chinook	Methow spring Chinook	No impact (0%)
	Methow steelhead	No impact (0%)
	Okanogan steelhead	No impact (0%)
	Methow summer Chinook	Low impact (≤ 10%)
	Okanogan summer Chinook	Low impact (≤ 10%)

1/ Native species refers to all other species endemic to the subbasin. Impacts to should not exceed a level required to maintain a sustainable population.

Table 10. Species interactions between hatchery programs and NTTOC (C=competition, F=Prey for predators, P=Predation, D=disease).

Hatchery program	NTTOC	Interaction			
		Type	Risk	Potential	Uncertainty
Methow/Twisp spring Chinook	Steelhead	C, F, D	Low	Low	Mod.
	Spring Chinook	C, F, D	High	Mod	High
	Bull trout	C, F, D	Low	Low	Low
	WCT	C, F, D	Low	Low	Low
	Resident *O. mykiss*	C, F, D	Mod	Mod	Mod
	Mountain sucker	C, F, D	Low	Low	Low
Wells steelhead	Spring Chinook	C, P, D	Mod	Mod	Low
	Summer Chinook	C, P, D	Mod	Mod	Low
	Sockeye	C, P, D	Low	Low	Low
	Bull trout	C, P, D	Low	Low	Low
	WCT	C, P, D	Mod	Mod	Low
	Resident *O. mykiss*	C, P, D	Mod	High	Mod
	Mountain sucker	C, P, D	Low	Low	Low
	Pacific lamprey	C, P, D	Low	Low	Low
	Leopard dace	C, P, D	Low	Low	Low
Wells summer Chinook	Spring Chinook	C, F, D	High	Mod	Mod
	Steelhead	C, F, D	Low	Low	Low
	Bull trout	C, F, D	Low	Low	Low
	WCT	C, F, D	Low	Low	Low
	Resident *O. mykiss*	C, F, D	Low	Low	Low
	Mountain sucker	C, F, D	Low	Low	Low
	Pacific lamprey	C, F, D	Low	Low	Low
	Leopard dace	C, F, D	Low	Low	Low

Table 11. Risk assessment of target and nontarget taxa for hatchery programs.

Target species	Interactors	Life stage	Interaction	Risk Assessment
Spring Chinook	Steelhead	Fry, parr	F, C	Low
	Spring Chinook	Fry, parr, smolt	C, D	Low
	Bull trout	Fry, parr	F, C	Low
Steelhead	Spring Chinook	Fry, parr, smolt	P, C, D	High
	Summer Chinook	Fry, parr, smolt	P, C, D	High
	Steelhead	Fry, parr, smolt	P, C, D	Mod
Summer Chinook	Spring Chinook	Smolt	C, D	Low
	Steelhead	Fry, parr, smolt	P, C, D	Mod

Appendix J

Disease monitoring of hatchery programs

Task 13: Determine if hatchery programs have influenced incidence or magnitude of disease in hatchery and naturally produced fish.

Task 13-1. Monitor disease in broodstock and juvenile fish.

a. Sample all female broodstock for disease per WDFW Fish Health protocols.

    1. Monitor density and flow index in adult holding pond.

    2. Examine relationship between holding conditions and disease.

b. Sample juvenile fish monthly and prior to release to develop disease profile (*N*=30).

    1. Monitor density and flow index during rearing.

    2. Examine relationship between holding conditions and disease.

c. Sample naturally produced fish monthly, both upstream and downstream of acclimation ponds or release sites (*N*=30).

d. Sample naturally produced fish monthly from a population without hatchery program (*N*=30).

Task 13-2. Examine the influence between the incidence of disease in the broodstock and progeny.

Task 13-3. Monitor incidence of disease in hatchery effluent and natural environment.

a. Collect monthly water samples from hatchery effluent and upstream and downstream of acclimation ponds.

b. Determine if acclimation ponds increase disease load in river.

Appendix B

Analytical Framework for Monitoring and Evaluating PUD Hatchery Programs

ANALYTICAL FRAMEWORK FOR MONITORING AND EVALUATING PUD HATCHERY PROGRAMS

Final

September 20, 2007

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Analytical Framework for Monitoring and Evaluating PUD Hatchery Programs

This document is a supplement to the Monitoring and Evaluation Programs for the Mid-Columbia PUDs Hatchery Programs (e.g., Murdoch and Peven 2005; Cates et al. 2005). The analyses and data used to support the information contained in this document are subject to change as new information becomes available. Any changes to these programs are subject to the approval of the HCP Hatchery Committees or PRCC Hatchery Subcommittee as appropriate.

There are currently 10 objectives associated with monitoring the effectiveness of hatchery programs funded by the mid-Columbia PUDs (Murdoch and Peven 2005; Cates et al. 2005). For each objective specific data are needed to assess the risks to the resource and to determine if the hatchery programs are meeting their goals. Effectiveness monitoring requires analytical rules that guide statistical analyses and management decisions. In many cases these rules come directly from agreements between the agencies and the PUDs. Other rules are made outside the directives of the agreements, but nonetheless are necessary in managing hatchery programs and guiding effectiveness monitoring. Identified below are descriptions of analytical rules that need to be made in developing a hatchery monitoring program.

Effect Size—Effect size refers to the size of change in a variable that constitutes the level of acceptable change. More formally, it is the amount of departure of the data from the null hypothesis (i.e., that the treatment or management action has resulted in no important change in the variable) that is needed before accepting the alternative hypothesis (i.e., that the treatment or management action has resulted in an important or unacceptable change in the variable). Effect size should be identified before conducting effectiveness monitoring and is usually identified in binding agreements (e.g., number and size of hatchery smolts produced) or is a policy decision associated with the risk or scientific uncertainty in the parameter of interest.

Minimum Detectable Difference (a.k.a. Minimum Detectable Effect Size)—The size of change in the variable of interest (e.g., the difference between the treatment and reference condition) that can be detected statistically at the specified significance level, power, and sample size. The minimum detectable difference could be greater than the effect size identified by management.

Type I Error—A Type I Error occurs when one concludes that there is a difference between treatment and reference condition when in fact there is no difference. This error may be costly to funding entities, because one may conclude that the hatchery program is not successful when in fact it is. Committing a Type I Error may result in additional studies or management actions that are not necessary. This error is under the control of the investigator and is set before conducting effectiveness monitoring. In this plan, we follow the generally accepted standard of $P < 0.05$ (i.e., a 5% chance of committing a Type I error).[22]

Type II Error—A Type II Error occurs when one concludes that there is no difference when in fact there is a real difference. This error may be harmful to the resource, because one may conclude that the hatchery program is successful when in fact it is not. This error can be reduced by selecting the appropriate sample size needed to detect a biological or practical effect size (see below).

Power—Power is the probability that a statistical test will result in a significant difference (reject the hypothesis of no difference when there is truly a difference—a correct decision). More technically, it is the probability of detecting a specified treatment effect when it is present. This is the intent of all monitoring programs. Power is calculated as 1 – Type II Error.

Sample Size—Sample size indicates the number of replicates (in space or time) that is needed to avoid making a Type II error (failing to reject the hypothesis of no difference). Typically, a larger sample size is needed to increase power (or reduce the probability of a Type II error).

The monitoring program is set up so that the null hypothesis is stated as "no difference." Therefore, in some but not all cases, the null hypothesis will be stated such that the supplementation program has no harmful effect on the natural population (or that hatchery goals have been met). The alternative hypothesis is that supplementation has harmed the natural population. In this case, failure to reject the null hypothesis leads to the conclusion that there is no real evidence that supplementation has harmed the natural population. In other words, the data have to provide "evidence" that the supplementation program is harmful. The supplementation program is "innocent" until proven "guilty."[23]

A primary goal of supplementation is to contribute to the rebuilding and recovery of naturally reproducing populations within their native habitat. In this plan, natural replacement rates (NRR), recruitment of naturally produced fish (NOR), and juvenile productivity (juveniles/redd) are important indicators for assessing the success of supplementation. However, these indicators are difficult to measure precisely and are

[22] In this plan we do not attempt to make an experiment-wide error-rate adjustment. Our analyses are predicated on the idea that all of the null hypotheses are true. Making an adjustment effectively penalizes us for conducting multiple tests, because the standard for rejection of the null hypothesis increases as more tests are conducted. Yet it is the pattern of which particular tests are rejected that is important in this program. Adjusting the error-rate may cause us to throw out this important information (see Gotelli and Ellison (2004) for a discussion on error-rate adjustments). We do, however, avoid excessive statistical tests that are not independent of one another.

[23] The alternative is to state the null hypothesis so that the supplemented population and reference population are not equivalent (the concept of bioequivalence). In this case the data have to provide evidence that the null hypothesis is not true before the populations are declared to be equivalent (i.e., supplementation has no harmful effects). Thus, an adverse effect is assumed unless the data suggest otherwise.

quite variable in space and time (i.e., these measures can carry high uncertainty).[24] Therefore, this plan identifies several other indicators that will be measured to help explain some of the uncertainty associated with productivity indicators. These monitoring indicators, which are either directly or indirectly affected by the hatchery programs, can be evaluated to determine if changes (or no changes) in productivity were related to the hatchery programs or other unexplained factors. These indicators include stray rates, hatchery replacement rates, genetics, run timing, spawn timing, spawning distribution, age-at-maturity, and size-at-maturity.

The relationship between supplementation hatchery programs and indicators can be viewed in a chain-of-causation (Figure 1). That is, management actions within hatchery programs affect the status of monitoring indicators, which influence productivity indicators. Non-supplementation programs, such as harvest-oriented programs, include many of the same factors.

Figure 1. The relationship of indicators to the assessment of supplementation programs viewed in a chain-of-causation. In the chain-of-causation, the hatchery program affects monitoring indicators, which influence productivity indicators. Data may be available in the future that identify monitoring indicators having greater influence on productivity.

Both monitoring and productivity indicators will be used to evaluate the success of hatchery programs. In the event that productivity indicators cannot be measured with enough precision (e.g., 95% certain that the point estimates fall within some specified range of the true value) to make sound decisions, some of the monitoring indicators may be used instead.

Identified below are the types of indicators (monitoring or productivity) associated with each objective described in Murdoch and Peven (2005). For each indicator we identified monitoring questions, specific populations and species associated with each indicator, hypotheses, measured variables, derived variables, spatial and temporal scales of

[24] Natural replacement rates are affected by many factors that are independent of the hatchery programs. For example, natural replacement rates are affected by climatic conditions; mainstem, estuary, and ocean conditions; predators and competitors; different fisheries; and habitat. These factors add variability (uncertainty) to estimates of productivity.

analysis, and statistical analyses. Lastly, we identified draft analytical rules for each indicator. We included effect sizes and statistical rules for each indicator.

Objective 1: Determine if supplementation programs have increased the number of naturally spawning and naturally produced adults of the target population relative to a non-supplemented population (i.e., reference stream) and if the change in the natural replacement rate (NRR) of the supplemented population is similar to that of the non-supplemented population.

At the core of a supplementation program is the objective of increasing the number of spawning adults (i.e., the combined number of naturally produced and hatchery fish) in order to affect a subsequent increase in the number of returning naturally produced fish or natural origin recruits (NOR). This is measured as the Natural Replacement Rate (NRR) or the ratio of NOR to the parent spawning population. The proportion of the hatchery origin spawners that will increase natural production without creating adverse effects to the genetic diversity or reproductive success rate of the natural population is not known. All other objectives of the M&E Plan either directly support this objective or seek to minimize impacts of the supplementation program to non-target stocks of concern.

Differences in carrying capacities of supplemented and non-supplemented streams can confound the effects of supplementation on total number of spawners returning to the streams. For example, if the supplemented population is at carrying capacity and the non-supplemented population is not, the total number of spawners returning to the non-supplemented population may show an increasing trend over time, while the supplemented population would show no increasing trend. To avoid concluding that the supplementation program has no effect or perhaps a negative effect on total spawners, the capacity of the habitats must be estimated and removed from the analyses. The Supplementary Hypotheses offered under each “regular” hypothesis are designed to remove the confounding effects of different carrying capacities from the analyses.

1.1 Adult Return Rates of Hatchery Fish (*Monitoring Indicator*)

Monitoring Questions:
Q1: Is the annual number of hatchery fish that spawn naturally greater than the number of naturally and hatchery produced fish taken for broodstock?

Target Species/Populations:
- Q1 applies to all supplemented species and populations.

Hypothesis:
- Ho_1: The annual number of hatchery produced fish that spawn naturally is less than or equal to the number of naturally and hatchery produced fish taken for broodstock.
- Ha_1: The annual number of hatchery produced fish that spawn naturally is greater than the number of naturally and hatchery produced fish taken for broodstock.

Measured Variables:
- Number of hatchery produced fish on spawning grounds annually
- Number of naturally and hatchery produced fish removed for broodstock annually

Derived Variables:
- No derived variables needed for the analysis

Spatial/Temporal Scale:
- Analyzed annually based on return year.
- On a five-year period analyze return years for patterns that correlate with extraneous factors such as ocean conditions.

Statistical Analysis:
- No statistical test is needed for hypothesis 1.
- Additional analysis over time may include correlating (regressions analysis) escapements with other extraneous variables (e.g., ocean conditions, climatic effects, etc.).
  - o Analysis may include the use of reference areas.

Analytical Rules:
- This indicator is simply used to document whether or not the annual number of hatchery fish that return and spawn is greater than the number of naturally and hatchery produced fish taken for broodstock.
- No statistical analysis is needed.

1.2 Hatchery Contribution to Recruitment of Naturally Produced Fish (*Productivity Indicator*)

Monitoring Questions:
Q1: Is the annual change in the number of natural origin recruits (NORs) produced from the supplemented population greater than or equal to the annual change in NORs in a non-supplemented population?

Target Species/Populations:

- Q1 applies to all supplemented species and populations assuming reference populations are available.

Hypothesis:

- Ho_1: ΔNOR/Max Recruitment $_{\text{Supplemented population}}$ ≥ ΔNOR/Max Recruitment $_{\text{Non-supplemented population}}$
- Ha_1: ΔNOR/Max Recruitment $_{\text{Supplemented population}}$ < ΔNOR/Max Recruitment $_{\text{Non-supplemented population}}$
    - o These hypotheses incorporate carrying capacity.[25]

Measured Variables:

- Number of hatchery and naturally produced fish on spawning grounds
- Number of naturally produced fish harvested

Derived Variables:

- Number of naturally produced recruits by brood year for both naturally produced parents and hatchery parents (≥age-3).
- May include ratio or difference scores of NORs (requires reference area).
- Spawner-recruit ratios (in part rely on data from Objective 7).

Spatial/Temporal Scale:

- Analyzed annually based on brood year.
- Analyze as a time series (initially as a 5-year period; i.e., 5-year mean of annual change).
- Ho_1 will be used for both temporal scales.

Statistical Analysis:

- Two-sample t-test (other tests may include RIA, ARIMA, or other tests) to evaluate difference scores or ratios over time (initial 5-year period).
- On a five-year period analyze brood years for patterns that correlate with extraneous factors such as ocean conditions.
    - o Analysis may include the use of reference areas.

[25] At this time, estimates of carrying capacity (maximum recruits) is unknown at this time for all populations within the Upper Columbia.

Analytical Rules:

- This is a productivity indicator that will be used to assess the success of the supplementation program.
- Type I Error of 0.05.
- Interim analytical rules will be based on effect sizes reported in Table 1.

1.3 Natural Replacement Rates of Supplemented Populations (*Productivity Indicator*)

Monitoring Questions:

Q1: Is the change in natural replacement rates (NRRs) within the supplemented population greater than or equal to the change in natural replacement rates in a non-supplemented population?

Target Species/Populations:

- Q1 applies to all supplemented species and populations.

Hypothesis 1.3:

- Ho_1: Δ NRR $_{\text{Supplemented population}} \geq \Delta$ NRR $_{\text{Non-supplemented population}}$
- Ha_1: Δ NRR $_{\text{Supplemented population}} < \Delta$ NRR $_{\text{Non-supplemented population}}$

Measured Variables:

- Number of hatchery and naturally produced fish on spawning grounds.
- Number of hatchery and naturally produced fish taken for broodstock.
- Number of hatchery and naturally produced fish taken in harvest (if recruitment is to the Columbia).

Derived Variables:

- NORs (number of naturally produced recruits (total recruits) by brood year for both naturally produced parents and hatchery parents (≥age-3)).
- NRRs (calculated as NORs/spawner).
- May include ratio or difference scores of NRRs (requires reference area).

Spatial/Temporal Scale:

- Analyzed annually based on brood year.
- Analyze as a time series (initially as a 5-year period and to the extent possible use pre-2006 data; i.e., 5-year mean of annual change).
- Ho_1 will be used for both temporal scales.

Statistical Analysis:

- Two-sample t-test (other tests may include RIA, ARIMA, or other tests) to evaluate difference scores or ratios over time (initial 5-year period).
- On a five-year period analyze brood years for patterns that correlate with extraneous factors such as ocean conditions.

- o The testing is appropriate if populations are below carrying capacity and density-dependent factors are not regulating the populations at high spawner abundances.

Analytical Rules:

- This is a productivity indicator that will be used to assess the success of the supplementation program.
- Type I Error of 0.05.
- Interim analytical rules will be based on effect sizes reported in Table 1.

Objective 2: Determine if the run timing, spawn timing, and spawning distribution of both the natural and hatchery components of the target population are similar.

Inherent in the supplementation strategy is that hatchery and naturally produced fish are intended to spawn together and in similar locations. Run timing, spawn timing, and spawning distribution may be affected through the hatchery environment (i.e., domestication). If supplemented fish are not fully integrated into the naturally produced spawning population, the goals of supplementation may not be achieved. Hatchery adults that migrate at different times than naturally produced fish may be subject to differential survival. Hatchery adults that spawn at different times or locations than naturally produced fish would not be integrated into the naturally produced spawning population (i.e., segregated stock).

2.1 Migration Timing (*Monitoring Indicator*)

Monitoring Questions:

Q1: Is the migration timing of hatchery and naturally produced fish from the same age class similar?

Target Species/Populations:

- Q1 applies to all supplemented species and populations.

Hypothesis 2.1:

- Ho: Migration timing $_{\text{Hatchery Age X}}$ = Migration timing $_{\text{Naturally produced Age X}}$
- Ha: Migration timing $_{\text{Hatchery Age X}} \neq$ Migration timing $_{\text{Naturally produced Age X}}$

Measured Variables:

- Ages of hatchery and naturally produced fish sampled via pit tags or stock assessment monitoring.
- Time (Julian date) of arrival at Bonneville, Priest Rapids, Wells, and within tributaries (e.g., Tumwater, Dryden, weirs).

Derived Variables:

- Mean Julian date for a given age class.

Spatial/Temporal Scale:

- Analyzed annually based on return year and age class.
- Analyze as a time series (initially as a 5-year period and to the extent possible use pre-2006 data).

Statistical Analysis:

- ANOVA by age and origin

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

2.2 Timing of Spawning (*Monitoring Indicator*)

Monitoring Questions:

Q1: Is the timing of spawning (measured as the time female salmon carcasses are observed) similar for hatchery and naturally produced fish? (Timing of spawning of hatchery and naturally produced steelhead may be evaluated if marking or tagging efforts provide reasonable results)

Target Species/Populations:

- Q1 applies to all supplemented species and populations.

Hypothesis 2.2:

- Ho: Spawn timing $_{\text{Hatchery}}$ = Spawn timing $_{\text{Naturally produced}}$
- Ha: Spawn timing $_{\text{Hatchery}}$ ≠ Spawn timing $_{\text{Naturally produced}}$

Measured Variables:

- Time (Julian date) of hatchery and naturally produced salmon carcasses observed on spawning grounds within defined reaches.
- Time (Julian date) of ripeness of steelhead captured for broodstock.

Derived Variables:

- Mean Julian date.
- Elevations (covariate)

Spatial/Temporal Scale:

- Analyzed annually based on return year.
- Analyze as a time series (initially as a 5-year period and to the extent possible use pre-2006 data).

Statistical Analysis:

- ANOVA by sex and location

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

2.3 Distribution of Redds (*Monitoring Indicator*)

Monitoring Questions:

Q1: Is the distribution of redds similar for hatchery and naturally produced fish?

Target Species/Populations:

- Q1 applies to all supplemented species and populations.

Hypothesis 2.3:

- Ho: Redd distribution $_{\text{Hatchery}}$ = Redd distribution $_{\text{Naturally produced}}$
- Ha: Redd distribution $_{\text{Hatchery}}$ ≠ Redd distribution $_{\text{Naturally produced}}$

Measured Variables:

- Location (GPS coordinate) of female salmon carcasses observed on spawning grounds. (The distribution of hatchery and naturally produced steelhead redds may be evaluated if marking or tagging efforts provide reasonable results)

Derived Variables:

- Location of female salmon carcass in RKm (0.01).
- Calculate percent overlap in distribution across available spawning habitat.

Spatial/Temporal Scale:

- Analyzed annually based on return year (ANOVA).
- Analyze as a time series (initially as a 5-year period and to the extent possible use pre-2006 data).

Statistical Analysis:

- ANOVA by origin and sex

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

Objective 3: Determine if genetic diversity, population structure, and effective population size have changed in natural spawning populations as a result of the hatchery program. Additionally, determine if hatchery programs have caused changes in phenotypic characteristics of natural populations.

The genetic component of the M&E Plan specifically addresses the long-term fitness of supplemented populations. Fitness, or the ability of individuals to survive and pass on their genes to the next generation in a given environment, includes genetic, physiological, and behavioral components.[26] Maintaining the long-term fitness of supplemented populations requires a comprehensive evaluation of genetic and phenotypic characteristics. Evaluation of some phenotypic traits (i.e., run timing, spawn timing, spawning location, and stray rates) is addressed under other objectives.

Assessing the genetic component of the hatchery program does not require annual sampling. Meeting stray-rate targets (hypotheses tested under Objective 5) should prevent significant changes in population genetics. Therefore, testing statistical hypotheses associated with genetic components (Hypotheses 3.1, 3.2, and 3.3) should be conducted every three to five years, depending on the type of hatchery program. More frequent genetic sampling may be necessary if actual stray rates exceed targets.

3.1 Allele Frequency (*Monitoring Indicator*)

Monitoring Questions:
Q1: Is the allele frequency of hatchery fish similar to the allele frequency of naturally produced and donor fish?

Target Species/Populations:

- Q1 applies to all supplemented species and populations.

Hypothesis 3.1:

- Ho: Allele frequency $_{\text{Hatchery}}$ = Allele frequency $_{\text{Naturally produced}}$ = Allele frequency $_{\text{Donor pop.}}$
- Ha: Allele frequency $_{\text{Hatchery}}$ ≠ Allele frequency $_{\text{Naturally produced}}$ = Allele frequency $_{\text{Donor pop.}}$ or

[26] These metrics are difficult to measure, and phenotypic expression of these traits may be all we can measure and evaluate.

- Ha: Allele frequency $_{\text{Hatchery}}$ = Allele frequency $_{\text{Naturally produced}}$ ≠ Allele frequency $_{\text{Donor pop.}}$ or
- Ha: Allele frequency $_{\text{Hatchery}}$ ≠ Allele frequency $_{\text{Naturally produced}}$ ≠ Allele frequency $_{\text{Donor pop.}}$

Measured Variables:
- Microsatellite genotypes

Derived Variables:
- Allele frequency

Spatial/Temporal Scale:
- Analyze as a time series, initially comparing pre- and post-hatchery samples and thereafter every 3-5 years.
- Compare samples within drainages.

Statistical Analysis:
- Population differentiation tests, analysis of molecular variance (AMOVA), and relative genetic distances.

Analytical Rules:
- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

3.2 Genetic Distances Between Populations (*Monitoring Indicator*)

Monitoring Questions:
Q1: Does the genetic distance among subpopulations within a supplemented population remain the same over time?

Target Species/Populations:
- Q1 applies to all supplemented species and populations.

Hypothesis 3.2:
- Ho: Genetic distance between subpopulations $_{\text{Year x}}$ = Genetic distance between subpopulations $_{\text{Year y}}$
- Ha: Genetic distance between subpopulations $_{\text{Year x}}$ ≠ Genetic distance between subpopulations $_{\text{Year y}}$

Measured Variables:
- Microsatellite genotypes

Derived Variables:

- Allele frequencies

Spatial/Temporal Scale:

- Analyze as a time series, initially comparing pre- and post-hatchery samples and thereafter every 3-5 years.
- Compare samples among drainages.

Statistical Analysis:

- Population differentiation tests, AMOVA, and relative genetic distances.

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

3.3 Effective Spawning Population (*Monitoring Indicator*)

Monitoring Questions:

Q1: Is the ratio of effective population size (N_e) to spawning population size (N) constant over time?

Target Species/Populations:

- Q1 applies to all supplemented species and populations.

Hypothesis 3.3:

- Ho: $(N_e/N)_{t0} = (N_e/N)_{t1}$ for each population
- Ha: $(N_e/N)_{t0} \neq (N_e/N)_{t1}$ for each population

Measured Variables:

- Microsatellite genotypes

Derived Variables:

- Allele frequencies

Spatial/Temporal Scale:

- Analyze as a time series, initially comparing pre- and post-hatchery samples and thereafter every 3-5 years.
- Compare samples among drainages.

Statistical Analysis:

- Population differentiation tests, relative genetic distances, statistics to calculate effective population size (e.g., harmonic means).

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

3.4 Age at Maturity (*Monitoring Indicator*)

Monitoring Questions:
Q1: Is the age at maturity of hatchery and naturally produced fish similar?

Target Species/Populations:

- Q1 applies to all supplemented species and populations.

Hypothesis 3.4:

- Ho: Age at Maturity $_{\text{Hatchery}}$ = Age at Maturity $_{\text{Naturally produced}}$
- Ha: Age at Maturity $_{\text{Hatchery}}$ ≠ Age at Maturity $_{\text{Naturally produced}}$

Measured Variables:

- Age of hatchery and naturally produced salmon carcasses collected on spawning grounds.
- Age of broodstock.
- Age of fish at stock assessment locations (e.g., Dryden, Tumwater, Wells, Priest Rapids).

Derived Variables:

- Saltwater ages

Spatial/Temporal Scale:

- Analyzed annually based on brood year.
- Analyze as a time series (initially as a 5-year period and to the extent possible use pre-2006 data).

Statistical Analysis:

- Chi-square or ANOVA by origin and gender.
    - Whenever possible age at maturity will be measured at weirs or dams near the spawning stream to avoid the size-related carcass recovery bias on spawning grounds (carcass sampling).

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

3.5 Size at Maturity (*Monitoring Indicator*)

Monitoring Questions:
Q1: Is the size (length) at maturity of a given age and sex of hatchery fish similar to the size at maturity of a given age and sex of naturally produced fish?

Target Species/Populations:
- Q1 applies to all species and populations.

Hypothesis 3.5:
- Ho: Size (length) at Maturity $_{\text{Hatchery Age X and Gender Y}}$ = Size (length) at Maturity $_{\text{Naturally produced Age X and Gender Y}}$
- Ha: Size (length) at Maturity by age and gender $_{\text{Hatchery}}$ ≠ Size (length) at Maturity by age and gender $_{\text{Naturally produced}}$

Measured Variables:
- Size (length), age, and gender of hatchery and naturally produced salmon carcasses collected on spawning grounds.
- Size (length), age, and gender of broodstock.
- Size (length), age, and gender of fish at stock assessment locations (e.g., Dryden, Tumwater, Wells, Priest Rapids).

Derived Variables:
- Calculate total age and saltwater age

Spatial/Temporal Scale:
- Analyzed annually based on brood year.
- Analyze as a time series (initially as a 5-year period and to the extent possible use pre-2006 data).

Statistical Analysis:
- ANOVA by origin, gender, and age

Analytical Rules:
- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

<u>Objective 4</u>: Determine if the hatchery adult-to-adult survival (i.e., hatchery replacement rate) is greater than the natural adult-to-adult survival (i.e., natural replacement rate) and equal to or greater than the program specific HRR expected value based on survival rates listed in the BAMP (1998).

The survival advantage from the hatchery (i.e., egg-to-smolt) must be sufficient to overcome the survival disadvantage after release (i.e., smolt-to-adult) in order to produce a greater number of returning adults than if broodstock were left to spawn naturally. If a hatchery program cannot produce a greater number of adults than naturally spawning fish the program should be modified or discontinued. Production levels were initially developed using historical run sizes and smolt-to-adult survival rates (BAMP 1998). Using the stock specific NRR and the values listed in the BAMP, comparisons to actual survival rates will be made to ensure the expected level of survival has been achieved.

4.1 Hatchery Replacement Rates (HRRs) (*Monitoring Indicator*)

Monitoring Questions:
Q1: Is the adult-to-adult survival rate of hatchery fish (HRR) greater than or equal to the adult-to-adult survival rate (NRR) of naturally produced fish?
Q2: Is the adult-to-adult survival rate of hatchery fish (HRR) greater than or equal to the value in BAMP (Table 6 in Appendix D; includes sum of adults harvested, taken for broodstock, and adults on spawning grounds)?

Target Species/Populations:
- Q1 applies to all species and populations.
- Q2 applies to all species and populations.

Hypothesis 4.1:
- Ho_1: $HRR_{\text{Year x}} \geq NRR_{\text{Year x}}$
- Ha_1: $HRR_{\text{Year x}} < NRR_{\text{Year x}}$
- Ho_2: HRR ≥ BAMP value (preferred)
- Ha_2: HRR < BAMP value

Measured Variables:
- Number of hatchery and naturally produced fish on spawning grounds
- Number of hatchery and naturally produced fish harvested
- Number of hatchery and naturally produced fish collected for broodstock.
- Number of broodstock used by brood year (hatchery and naturally produced fish).

Derived Variables:
- Number of hatchery and naturally produced adults by brood year (≥age-3).
- HRR (number of returning adults per brood year/broodstock)
- NRR (from above)

Spatial/Temporal Scale:
- Analyzed annually based on brood year.
- Analyze as a time series (initially as a 5-year period but include pre-2006 data to the extent possible).

Statistical Analysis:

- For Q1 a two-sample t-test to compare HRR to NRR
- For Q2 a one-sample t-test to evaluate HRR.
- On a five-year period analyze brood years for patterns that correlate with extraneous factors such as ocean conditions.

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

<u>Objective 5</u>: Determine if the stray rate of hatchery fish is below the acceptable levels to maintain genetic variation between stocks.

Maintaining locally adapted traits of fish populations requires that returning hatchery fish have a high rate of site fidelity to the target stream. Hatchery practices (e.g., rearing and acclimation water source, release methodology, and location) are the main variables thought to affect stray rates. Regardless of the adult returns, if adult hatchery fish do not contribute to the donor population the program will not meet the basic condition of a supplementation program. Fish that do stray to other independent populations should not comprise greater than 5% of the spawning population. Likewise, fish that stray within an independent population should not comprise greater than 10% of the spawning population.

5.1 Stray Rates among Populations for Brood Return (*Monitoring Indicator*)

Monitoring Questions:
Q1: Is the stray rate of hatchery fish less than 5% for the total brood return?

Target Species/Populations:

- Q1 applies to all species and populations.

Hypothesis 5.1:

- Ho: Stray rate $_{\text{Hatchery fish}} \geq 5\%$ of total brood return
- Ha: Stray rate $_{\text{Hatchery fish}} < 5\%$ of total brood return

Measured Variables:

- Number of hatchery carcasses found in non-target and target spawning areas.
- Number of hatchery fish collected for broodstock.
- Number of hatchery fish taken in fishery.

Derived Variables:

- Hatchery carcasses and take in fishery estimated from expansion analysis.
- Locations of live and dead strays (used to tease out overshoot).

Spatial/Temporal Scale:

- Analyzed annually based on brood year.
- Analyze as a time series (initially as a 5-year period and to the extent possible use pre-2006 data).

Statistical Analysis:

- A simple statistical approach is to use a one-sample t-test to compare the actual stray rate with the target (5%) stray rate.

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

5.2 Stray Rates among Populations for Return Year (*Monitoring Indicator*)

Monitoring Questions:

Q1: Is the stray rate of hatchery fish less than 5% of the spawning escapement within other independent populations?

Target Species/Populations:

- Q1 applies to all species and populations.

Hypothesis 5.2:

- Ho: Stray hatchery fish ≥ 5% of spawning escapement (based on run year) within other independent populations
- Ha: Stray hatchery fish < 5% of spawning escapement (based on run year) within other independent populations [27]

[27] This stray rate is suggested based on a literature review and recommendations by the ICTRT. It can be re-evaluated as more information on naturally-produced Upper Columbia salmonids becomes available. This will be evaluated on a species and program specific basis and decisions made by the HCP HC. It is important to understand the actual spawner composition of the population to determine the potential effect of straying.

Measured Variables:

- Number of hatchery carcasses (PIT tagged steelhead) found in non-target and target spawning areas.

Derived Variables:

- Hatchery salmon carcasses (PIT tagged steelhead) estimated from expansion analysis.

Spatial/Temporal Scale:

- Analyzed annually based on return year.
- Analyze as a time series (initially as a 5-year period and to the extent possible use pre-2006 data).

Statistical Analysis:

- A simple statistical approach is to use a one-sample t-test to compare the actual proportion of strays with the target of 5% strays

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

5.3 Stray Rates within the Population (*Monitoring Indicator*)

Monitoring Questions:

Q1: Is the stray rate of hatchery fish less than 10%[28] of the spawning escapement within other spawning aggregations within the target independent population?

Target Species/Populations:

- Q1 applies to all species and populations.

Hypothesis 5.3:

- Ho: Stray hatchery fish ≥ 10% of spawning escapement (based on run year) of any non-target streams within independent population
- Ha: Stray hatchery fish < 10% of spawning escapement (based on run year) of any non-target streams within independent population

Measured Variables:

- Number of hatchery carcasses (possibly PIT tagged steelhead) found in non-target and target spawning aggregates.

[28] This value should be reviewed annually by the Hatchery Committee. See footnote 5 for additional information.

Derived Variables:

- Hatchery salmon carcasses (possibly PIT tagged steelhead) estimated from expansion analysis.

Spatial/Temporal Scale:

- Analyzed annually based on return year.
- Analyze as a time series (initially as a 5-year period and to the extent possible use pre-2006 data).

Statistical Analysis:

- A simple statistical approach is to use a one-sample t-test to compare the actual proportion of strays with the target of 10% strays.

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

<u>Objective 6</u>: Determine if hatchery fish were released at the programmed size and number.

The HCP outlines the number and size of fish that are to be released to meet NNI compensation levels. Although many factors can influence both the size and number of fish released, past hatchery cultural experience with these stocks should assist in meeting program production levels.

6.1 Size of Hatchery Fish (*Monitoring Indicator*)

Monitoring Questions:
Q1: Is the size of hatchery fish released equal to the program goal?

Target Species/Populations:

- Q1 applies to all species and populations.

Hypothesis 6.1:

- Ho: Hatchery fish $_{\text{Size at release}}$ = Programmed $_{\text{Size}}$
- Ha: Hatchery fish $_{\text{Size at release}}$ ≠ Programmed $_{\text{Size}}$

Measured Variables:

- Length and weights of random samples of hatchery smolts.

Derived Variables:

- CVs.

Spatial/Temporal Scale:

- Analyzed annually.
- Analyze as a time series (initially as a 5-year period and to the extent possible use pre-2006 data).

Statistical Analysis:

- A simple statistical approach is to use a one-sample t-test to compare the actual size of hatchery fish at time of release with the program goal.

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

6.2 Number of Hatchery Fish (*Monitoring Indicator*)

Monitoring Questions:
Q1: Is the number of hatchery fish released equal to the program goal?

Target Species/Populations:

- Q1 applies to all species and populations.

Hypothesis 6.2:

- Ho: Hatchery fish $_{\text{Number}}$ = Programmed $_{\text{Number}}$
- Ha: Hatchery fish $_{\text{Number}}$ ≠ Programmed $_{\text{Number}}$

Measured Variables:

- Numbers of smolts released from the hatchery.

Derived Variables:

- NA

Spatial/Temporal Scale:

- Review annually.

Statistical Analysis:

- No statistical analysis needed.

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- No statistical analysis is necessary.

Objective 7: Determine if the proportion of hatchery fish on the spawning grounds affects the freshwater productivity (i.e., number of smolts per redd) of supplemented streams when compared to non-supplemented streams.

Out-of-basin effects (e.g., smolt passage through the hydro system and ocean productivity) have a strong influence on survival of smolts after they migrate from the tributaries. These effects introduce substantial variability into the adult-to-adult survival rates (NRR and HRR), which may mask in-basin effects (e.g., habitat quality, density related mortality, and differential reproductive success of hatchery and naturally produced fish). The objective of long-term smolt monitoring programs in the Upper Columbia ESU is to determine the egg-to-smolt or egg-to-juvenile survival of target stocks. Smolt production models generated from the information obtained through these programs will provide a level of predictability with greater sensitivity to in-basin effects than spawner-recruitment models that take into account all effects.

Differences in carrying capacities of supplemented and non-supplemented streams can confound the effects of supplementation on numbers of juveniles per redd. For example, if the supplemented population is at or above carrying capacity and the non-supplemented population is not, numbers of juveniles per redd in the non-supplemented population may be significantly greater than the number of juveniles per redd in the supplemented population. To avoid concluding that the supplementation program has no effect or perhaps a negative effect on juveniles per redd, the capacity of the habitats must be included in the analyses. The Supplementary Hypotheses are designed to address the confounding effects of different densities on the analyses.

7.1 Juvenile Productivity (*Productivity Indicator*)

Monitoring Questions:
Q1: Is the change in numbers of juveniles (smolts, parr, or emigrants) per redd in the supplemented population greater than or equal to that in the non-supplemented population?
Q2: Does the number of juveniles per redd decrease as the proportion of hatchery spawners increases?[29]

Target Species/Populations:
- Q1 applies to all supplemented species and populations (depending on reference areas).
- Q2 applies to all supplemented species and populations.

[29] Information is needed to estimate the effects of density dependence on these questions.

Hypothesis 7.1:

- Ho_1: Slope of Ln(juveniles/redd) vs redds $_{\text{Supplemented population}}$ = Slope of Ln(juveniles/redd) vs redds $_{\text{Non-supplemented population}}$
- Ha_1: Slope of Ln(juveniles/redd) vs redds $_{\text{Supplemented population}}$ ≠ Slope of Ln(juveniles/redd) vs redds $_{\text{Non-supplemented population}}$
- Ho_2: The relationship between proportion of hatchery spawners and juveniles/redd is ≥ 1.
- Ha_2: The relationship between proportion of hatchery spawners and juveniles/redd is < 1.

Measured Variables:

- Number of hatchery and naturally produced fish on spawning grounds.
- Numbers of redds.
- Number of juveniles (smolts, parr [not appropriate for all populations], and emigrants).

Derived Variables:

- Number of juveniles per redd.

Spatial/Temporal Scale:

- Analyzed annually based on brood year.
- Analyze as a time series (initially as a 5-year period and to the extent possible use pre-2006 data).

Statistical Analysis:

- Two-sample t-test to evaluate differences between treatment and reference slopes (initial 5-year period).
- Regression analysis to examine relationships between hatchery adult composition and juveniles/redd.

Analytical Rules:

- This is a productivity indicator that will be used to assess the success of the supplementation program.
- Type I Error of 0.05.
- Interim decisions will be based on effect sizes reported in Table 1.

<u>Objective 8</u>: Determine if harvest opportunities have been provided using hatchery returning adults where appropriate (e.g., Turtle Rock program).

In years when the expected returns of hatchery adults are above the level required to meet program goals (i.e., supplementation of spawning populations and/or brood stock requirements), surplus fish may be available for harvest (i.e., target population). The M&E Plan specifically addresses harvest and harvest opportunities upstream from Priest Rapids Dam. Harvest or removal of surplus hatchery fish from the spawning grounds would also assist in reducing potential adverse genetic impacts to naturally produced populations (loss of genetic variation within and between populations).

8.1 Harvest Rates (*Monitoring Indicator*)

Monitoring Questions:
Q1: Is the harvest on hatchery fish produced from harvest-augmentation programs high enough to manage natural spawning but low enough to sustain the hatchery program?
Q2: Is the escapement of fish from supplementation programs in excess of broodstock and natural production[30] needs to provide opportunities for terminal harvest?

Target Species/Populations:
- Q1 applies to summer Chinook reared at Turtle Rock.
- Q2 applies to all supplemented stocks.

Hypothesis 8.1:
- Ho_1: Harvest rate ≤ Maximum level to meet program goals
- Ha_1: Harvest rate > Maximum level to meet program goals
- Ho_2: Escapement ≤ Maximum level to meet supplementation goals
- Ha_2: Escapement > Maximum level to meet supplementation goals

Measured Variables:
- Numbers of hatchery fish taken in harvest.

Derived Variables:
- Total harvest by fishery estimated from expansion analysis.

Spatial/Temporal Scale:
- Reviewed annually.

Statistical Analysis:
- A one-sample t-test can be used to compare harvest rates with the level needed for program goals.

Analytical Rules:
- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

[30] At this time, the escapement of adults needed to fully seed habitat in the Upper Columbia is unknown.

Regional Objectives

Hatchery programs have the potential to increase diseases that typically occur at low levels in the natural environment (Objective 9). In addition, hatchery fish can reduce the abundance, size, or distribution of non-target taxa through ecological interactions (Objective 10). These are important objectives that will be monitored at a later time. Analytical rules will be established for these objectives before monitoring activities begin.

Objective 9: Determine whether BKD management actions lower the prevalence of disease in hatchery fish and subsequently in the naturally spawning population. In addition, when feasible, assess the transfer of Rs infection at various life stages from hatchery fish to naturally produced fish.

The hatchery environment has the potential to amplify diseases that are typically found at low levels in the natural environment. Amplification could occur within the hatchery population (i.e., vertical and horizontal transmission) or indirectly from the hatchery effluent or commingling between infected and non-infected fish (i.e., horizontal transmission). Potential impacts to natural populations have not been extensively studied, but should be considered for programs in which the hatchery fish are expected to commingle with natural fish. This is particularly important for supplementation type programs. Specifically, the causative agent of bacterial kidney disease (BKD), *Renibacterium salmoninarum* (Rs), could be monitored at selected acclimation ponds, both in the water and fish, in which the risk and potential for transmission from the hatchery is highest. Although it is technologically possible to measure the amount of Rs in water or Rs DNA in smolts and adults non-lethally sampled, the biological meaning of these data are uncertain. Currently, the only metric available for M & E purposes is measuring the antigen level from kidney/spleen samples (i.e., ELISA). When available, non-lethal sampling may replace or be used in concert with lethal sampling.

Implementation of this objective will be conducted in a coordinated approach within the hatchery and natural environment. BKD management within the hatchery population (e.g., broodstock or juveniles) has the potential to reduce the prevalence of disease through various actions (e.g., culling or reduced rearing densities). BKD management must also take into account and support other relevant objectives of the M & E program (e.g., Hatchery Return Rate [HRR], number of smolts released). Hence, the goal of BKD management is to decrease the prevalence of disease and maintain hatchery production objectives (i.e., number and HRR).

As previously discussed, disease transmission from hatchery to naturally produced fish may occur at various life stages and locations. Of these, horizontal transmission from hatchery effluent, vertical transmission on the spawning grounds, and horizontal transmission in the migration corridor have been identified as disease interactions that could be examined under this objective, although others may also be relevant. Experimental designs addressing this objective may require technology not yet available, although in some instances samples may be collected, but not analyzed until a link can be established between bacteria levels in samples and disease prevalence.

Developing a complete set of questions and hypotheses statements for this objective may not be practical at this time, because there is currently no BKD Management Plan. However, while developing experimental designs for this objective, it may be feasible to incorporate both hatchery and natural environment monitoring under a single study design. Integration of the different aspects of the objective would likely result in a more robust approach into understanding the effectiveness of disease management strategies.

Monitoring Questions:
Q1: What is the effect of BKD disease management on BKD disease prevalence?
Q2: Are study fish exposed to hatchery effluent infected to a greater extent than control fish?
Q3: *Is Rs infection transferred at various life stages from hatchery fish to naturally produced fish or appropriate surrogates?*[31]

Target Species/Populations:

- Q1 and Q2 both apply to spring Chinook (primary focus) and summer Chinook programs.

Hypotheses Q1:

- Ho_1: Rearing density has no effect on survival rates of hatchery fish.
- Ha_1: Rearing density has an effect on survival rates of hatchery fish.

- Ho_2: Antigen level has no effect on survival rates of hatchery fish.
- Ha_2: Antigen level has an effect on survival rates of hatchery fish.

- Ho_3: Interaction between antigen level and rearing density has no effect on survival rates of hatchery fish.
- $Ha_{3:}$ Interaction between antigen level and rearing density has an effect on survival rates of hatchery fish.

Hypothesis Q2:

- o Ho_1: Rs infection is not transferred from hatchery effluent to study fish.
- o Ha_1: Rs infection is transferred from hatchery effluent to study fish.

Measured Variables:

- Hypotheses Q1:
  - o Numbers of fish (at different life stages)

- Hypothesis Q2:
  - o Numbers of Rs+ fish

[31] Hypothesis statements for these monitoring questions will be developed.

Derived Variables:

- Survival rates
- SARs
- HRRs

Spatial/Temporal Scale:

- o Hypotheses Q1:
  - o Analyze annually based on brood year.
- o Hypothesis Q2:
  - o Analyze annually.

Statistical Analysis:

- Hypotheses Q1: either 2-way ANOVA or response-surface design.
- Hypothesis Q2: ANOVA.

Analytical Rules:

- This is a monitoring indicator that will be used to support management decisions.
- Type I Error of 0.05.
- Effect sizes will be reported annually.

Adaptively Managing Monitoring Results

Because of naturally large variation in productivity indicators, several years of data may be required before statistical inferences can be made regarding the effects of hatchery fish on productivity of naturally produced fish. Furthermore, given the large natural variation of productivity indicators, productivity could decrease as a result of the hatchery programs before a difference is detected statistically. In the interim, risk associated with supplementation programs and the productivity of naturally produced fish can be quantified based on observed natural variation in the indicator of interest (Table 1). If large differences in rates of change between supplemented and reference populations are observed, management actions may be required earlier than anticipated (every five years).

Assuming hatchery programs do not negatively affect the productivity of naturally produced fish, the observed difference in rates of change between the supplemented and reference populations should decrease over time as more of the natural variation within and between populations is incorporated into these data. More simply, as the number of years increases, the acceptable observed difference in the indicator(s) decreases. The value of the difference at any point in time would determine if management actions are warranted.

Table 1. Average differences between supplemented and reference conditions that represent different levels of management concerns. Large differences (red) indicate the need for relatively quick management changes, moderate differences (yellow) indicate that indicators need to be reviewed carefully before making management changes, and small differences (green) indicate that management changes are not currently necessary. Average differences corresponding to each level of concern are scaled to reflect the increasing risk associated with multiple brood years that show differences between supplemented and reference conditions. These differences are currently based on the temporal variability associated with each productivity indicator and will change as more information becomes available (i.e., information on the variability in difference scores between treatment and reference conditions).

Indicator	Number of Brood Years	No Concern	Warning	Concern
NRR	1	0-50%	51-100%	>100%
	2	0-40%	41-80%	>80%
	3	0-30%	31-60%	>60%
	4	0-20%	21-40%	>40%
	5	0-10%	11-20%	>20%
NOR	1	0-50%	51-100%	>100%
	2	0-40%	41-80%	>80%
	3	0-30%	31-60%	>60%
	4	0-20%	21-40%	>40%
	5	0-10%	11-20%	>20%
Juv/Redd	1	0-100%	101-200%	>200%
	2	0-80%	81-160%	>160%
	3	0-70%	71-140%	>140%
	4	0-60%	61-120%	>120%
	5	0-50%	51-100%	>100%

Appendix C

Implementation of Comprehensive Monitoring and Evaluation of Hatchery Programs

IMPLEMENTATION OF COMPREHENSIVE MONITORING AND EVALUATION OF HATCHERY PROGRAMS FUNDED BY DOUGLAS COUNTY PUD

Submitted to

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October 2009

Introduction

The Douglas County PUD Monitoring and Evaluation Plan (M&E Plan; Wells HCP Hatchery Committee 2007) describes eight objectives specific to the hatchery programs funded by Douglas County PUD and two regional objectives that are related to artificial propagation. These same objectives have been identified in the M&E Plan for Chelan County PUD (Murdoch and Peven 2005) and are designed to address key questions regarding the use of supplementation as mitigation for mortality associated with the operation of Wells Hydroelectric Project. All objectives have specified indicators (i.e., primary) that will be measured and compared against target values established in the M&E Plan. Specific tasks and methodologies to be used in accomplishing the objectives are provided in the M&E Plan.

The primary focus of this proposal is the first eight objectives outlined in the M&E Plan, but additional regional objectives are included where warranted. Both disease (Objective 9) and non-target taxa (Objective 10) monitoring have been identified as important components of the M&E Plan. These regional objectives will be implemented once experimental designs have been developed and approved by the Wells HCP Hatchery Committee.

Successful implementation of the M&E Plan requires a continuation and potential expansion of existing relationships between the WDFW and other entities conducting similar field work in the Upper Columbia River Basin. Certain objectives require data to be collected from both target and reference populations. Field activities (i.e., data collection) not conducted by the WDFW, that are also required to implement the M&E Plan (i.e., reference populations) are not included in this proposal.

Addressing all the objectives within the M&E Plan will require multiple years of data collection. Several objectives may be adequately addressed after one year or five years (Table 1), and may require only periodic monitoring (e.g., every five or ten years). This proposal and budget encompasses one year of work in which WDFW will furnish all supervision, labor, services, materials, tools, and equipment necessary to implement the Monitoring and Evaluation Plan of hatchery programs funded by Douglas County PUD. All statistical analyses will be conducted consistent with the Analytical Framework for Monitoring and Evaluating PUD Hatchery Programs (Hays et al. 2007).

Table 1. A potential long-term implementation schedule of objectives outlined in the Douglas County PUD M&E Plan.

Objective	Year of implementation									
	1-4	5	6-9	10	11-14	15	16-19	20	21-24	25
1	X	X	X	X	X	X	X	X	X	X
2	X	X		X		X		X		X
3	X				X				X	
4	X	X	X	X	X	X	X	X	X	X
5	X	X	X	X	X	X	X	X	X	X
6	X	X	X	X	X	X	X	X	X	X
7	X	X	X	X	X	X	X	X	X	X
8	X	X		X		X		X		X
9	Experimental design not complete									
10	Experimental design not complete									

Reference Streams

Reference streams or populations are a critical component of the M&E Plan (Goodman 2004; ISRP & ISAB 2005). Data collected from reference populations will be included in the analysis for objectives 1 and 7. Depending on the reference population, data collected may also be included in the analysis for objectives 3, 4, 5, and 8. Suitability of a population as a reference or control for target populations for ongoing hatchery programs funded by Douglas County Public Utility District (DCPUD) has not yet been determined. The Hatchery Evaluation Technical Team (HETT) is currently evaluating potential spatial reference streams for all supplemented populations in the Methow and Okanogan Rivers. The HETT will recommend to the Wells HCP HC, reference populations that should be incorporated into the M&E Plan. Historical data may or may not exist for some proposed reference populations. If data has been collected, an assessment of the methodology used must also be conducted to determine if the historical data is suitable for inclusion in the analysis. As part of the M&E Plan, future data collection activities in the reference populations should use similar methodologies and metrics as those used in treatment populations.

WORK PLAN BY OBJECTIVE

Objective 1: Determine if a) supplementation programs have increased the number of naturally spawning and naturally produced adults of the target population relative to a non-supplemented population (i.e., reference stream) and b) the changes in the natural replacement rate (NRR) of the supplemented population are similar to that of the non-supplemented population.

Hypotheses:

- Ho_1: Number of hatchery fish that spawn naturally > number of naturally and hatchery produced fish taken for broodstock.
- Ha_1: Number of hatchery fish that spawn naturally ≤ number of naturally and hatchery produced fish taken for broodstock.
- Ho_2: ΔNOR/Max recruitment $_{\text{Supplemented population}}$ ≥ ΔNOR/Max recruitment $_{\text{Non-supplemented population}}$
- Ha_2: ΔNOR/Max recruitment $_{\text{Supplemented population}}$ < ΔNOR/Max recruitment $_{\text{Non-supplemented population}}$
- Ho_3: Δ NRR $_{\text{Supplemented population}} \geq \Delta$ NRR $_{\text{Non-supplemented population}}$
- Ha_3: Δ NRR $_{\text{Supplemented population}} < \Delta$ NRR $_{\text{Non-supplemented population}}$

General Approach

Spawning ground, broodstock, and harvest data (e.g., selective fisheries) will be the source of all abundance, composition, and productivity information required for this objective. Identification of suitable non-supplemented populations will be problematic in the Upper Columbia Basin because some species/races do not have populations that have not been either supplemented or influenced by hatchery fish (e.g., summer Chinook). For those supplemented populations without a suitable spatial reference population, temporal references may be used (i.e., prior to hatchery intervention). Temporal reference populations may also be initiated if deemed necessary, by discontinuing hatchery releases in a target population for a predetermined period of time (i.e., at least one generation minimum).

Methodology

Standard spawning ground survey methodology outlined in Appendix F of the M&E Plan (Spawning ground surveys) and data analysis outlined Appendix G of the M&E Plan (Relative Abundance) will be used under this objective. WDFW will coordinate with other Agencies (i.e., USFWS, USFS, Tribes) that conduct spawning ground surveys to ensure methodologies and sample rates are consistent with methodologies used in this objective (Table 2). Spawning/carcass surveys will be conducted for Methow Basin spring Chinook (WDFW); Methow Basin steelhead (WDFW); and Okanogan steelhead (CCT). The use of a composite spring Chinook broodstock in the Methow and Chewuch Rivers suggests that the Methow and Chewuch spawning aggregates be treated as a single group. The combined group (i.e., MetChew) is supported by genetic data, which concluded that both spawning aggregates are very closely related (Snow et al. 2007). However, differences in spawner abundance and carrying capacity of the two subbasins may require that each subbasin be treated independently for data analysis purposes.

Table 2. Methodologies used to determine biological information used in Objective 1.

Population	Spawning ground methodology	Spawner composition	Age composition
Methow steelhead	Expanded index	Wells Dam	Wells Dam
Twisp steelhead	Expanded index/Total ground	Twisp weir	Twisp weir
Okanogan steelhead [a]	Total ground	Wells Dam	Wells Dam
Methow sp. Chinook	Total ground	Carcasses	Wells Dam
Chewuch sp. Chinook	Total ground	Carcasses	Wells Dam
Twisp sp. Chinook	Total ground	Carcasses	Wells Dam

[a] Conducted by CCT.

Schedule of Activities

Table 3. Schedule for conducting spawning ground surveys and data analysis (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow/Okanogan steelhead	A	A	D	D	D	D	A	A	A	A	A	A
Methow Basin spring Chinook	A	A	A	A	D	D	D	D	D	A	A	A

Objective 2: Determine if the run timing, spawn timing, and spawning distribution of both the natural and hatchery components of the target population are similar.

Hypotheses:

- Ho_4: Migration timing $_{\text{Hatchery Age X}}$ = Migration timing $_{\text{Naturally produced Age X}}$
- Ha_4: Migration timing $_{\text{Hatchery Age X}}$ ≠ Migration timing $_{\text{Naturally produced Age X}}$
- Ho_5: Spawn timing $_{\text{Hatchery}}$ = Spawn timing $_{\text{Naturally produced}}$
- Ha_5: Spawn timing $_{\text{Hatchery}}$ ≠ Spawn timing $_{\text{Naturally produced}}$
- Ho_6: Redd distribution $_{\text{Hatchery}}$ = Redd distribution $_{\text{Naturally produced}}$
- Ha_6: Redd distribution $_{\text{Hatchery}}$ ≠ Redd distribution $_{\text{Naturally produced}}$

General Approach

A properly integrated hatchery program produces fish that have similar life history traits as naturally produced fish. Differences in any of these behavioral life history traits may affect progeny survival. Migration timing in the Columbia River of both juvenile and adult fish will be assessed using PIT tags when available. Migration timing into spawning tributaries will be assessed at broodstock collection locations, or using in-stream PIT antenna arrays. In 2009, in-stream antenna arrays were installed in the lower Methow and Twisp rivers to assess the distribution and migration timing of adult hatchery and wild steelhead. These antennas, in conjunction with arrays installed by other researchers (i.e., USGS) will be used to assess steelhead and spring Chinook run timing and distribution throughout the Methow Basin.

Spawn timing and redd distribution data for spring Chinook will be collected during spawning ground surveys. We propose selecting index reaches to evaluate spawn timing in reaches where similar proportions of hatchery and naturally produced fish are expected to spawn (based on carcass recovery data). The use of index reaches will eliminate any potential bias in spawn timing due to differences in spawning locations. For fish that are not adipose fin clipped, the female carcass recovery date will allow for a comparison of the relative spawn timing. Carcass recovery locations will be used as a surrogate for spawning location.

In 2010, WDFW will conduct an evaluation of steelhead spawn timing throughout the Methow Basin. Because visual observation of spawning fish will be required to evaluate spawn timing and location, adult female steelhead sampled in 2009 at Wells Dam, Priest Rapids Dam, and at the Twisp River weir in 2010 will be externally floy tagged based on stock and origin, and surveyors will conduct intensive surveys to quantify redd distribution and collect observational data from floy-tagged females.

Methodology

Migration Timing

As previously stated, when available, PIT tags will be used to evaluate differences in migration timing in the Columbia River. During broodstock collection activities at mainstem dams, tributary traps, and the Twisp River weir, PIT tags will be inserted in all fish captured and released in excess of broodstock requirements so that data on migration timing to spawning tributaries can be collected (Table 4). Migration timing into spawning tributaries will be assessed using PIT antenna arrays deployed in the lower Methow and Twisp rivers, and utilizing antennas installed by other researchers within the Methow and Okanogan Basins.

Table 4. Methods and locations used for evaluating differences in migration timing between hatchery and naturally produced salmon and steelhead.

Target population	Migration timing	
	Columbia River*	Spawning tributary
Methow spring Chinook	Wells Dam, PIT tags, CWTs	Chewuch/Twisp weirs
Methow steelhead	Wells Dam, PIT tags, VIE	Twisp weir
Okanogan steelhead	Wells Dam, PIT tags, Ad clip	Omak Cr. Weir/Zosel Dam

* PIT tags will be used when available (i.e., in conjunction with other objectives).

Spawn Timing

All spawn timing information necessary for evaluating differences between hatchery and naturally produced salmon and steelhead will be collected during spawning ground surveys (M&E Plan Appendix F). Specific spawn timing information will only be collected within index spawning areas. Index areas identified are likely to have a similar proportion of hatchery and naturally produced fish spawning based on carcass recoveries between 2003 and 2006 (Table 5). Carcass recovery date of female spring Chinook salmon will be used to examine relative differences in spawn timing.

Determining the relative spawn timing of steelhead in the natural environment is problematic because not all hatchery fish are adipose fin clipped. In 2010, an evaluation of steelhead spawn timing in the Methow Basin will be conducted utilizing female steelhead floy-tagged in 2009 at mainstem Columbia River dams (i.e., Priest Rapids and Wells) or fish captured in 2010 at the Twisp River weir. Approximately 85% of the steelhead in the Twisp River spawn upstream of the Twisp River weir (mean 2003-2005). Steelhead will be captured and tagged at the Twisp River weir between 1 March and 1 June. All fish captured will be examined to determine origin (VIE, PIT, CWT, or eroded fins), age, and tagged with colored anchor tags depending on stock and origin. Because the number and spawning location of wild steelhead throughout the Methow Basin is unknown, surveys will target sections within each subbasin which have high spawning activity. Surveyors will record the tag color and date of all female steelhead observed during surveys and record GPS locations of all redds. Because of inherent differences in spawn timing due to changes in elevation, comparisons of spawn timing may be limited to those reaches within the Methow Basin with the highest number of wild steelhead.

Table 5. Potential tributary index areas identified for each respective target population used for evaluating differences in spawn timing between hatchery and naturally produced salmon and steelhead.

Target population	Historical reach(s)
Twisp spring Chinook	Twisp River (T5 - T6)
Chewuch spring Chinook	Chewuch River (C4 - C6)
Methow spring Chinook	Methow River (M9 - M11)
Twisp steelhead	Twisp River (T4 - T10)
Methow steelhead	Methow River (M10 – M11)
Chewuch steelhead	Chewuch River (C4)

Spawning Distribution

Redd distribution data will also be collected during spawning ground surveys (M&E Plan Appendix F). The origin of spawners will be identified from carcasses (i.e., scales or CWT), and carcass recovery location (i.e., rkm) of female spring Chinook will be used to determine redd distribution. Overall steelhead redd distribution will be determined from GPS location information for each redd observed. Distribution by origin of spawning adult steelhead cannot be determined without application of an additional mark (e.g., floy tag) because not all hatchery steelhead were adipose fin-clipped. Steelhead spawning distribution by origin of spawning adults will be assessed at the Twisp River weir in 2010. Surveys will be conducted weekly in all sections upstream of the weir to assess distribution of floy-tagged females as previously described. Additionally, all female steelhead without existing PIT tags will be PIT tagged in the body cavity to determine spawning distribution by scanning redds for expelled PIT tags. Resident rainbow, residual hatchery steelhead, and cutthroat trout females will also be PIT tagged in the body cavity to determine if these species or resident stages contribute to steelhead redd count estimates.

Schedule of Activities

Table 6. Schedule for conducting migration timing, spawn timing, and spawning distribution field activities and data analysis (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow steelhead	A	A	D	D	D	D	D	D	D	D	A	A
Methow spring Chinook	A	A	A	A	D	D	D	D	D			

Objective 3: Determine if genetic diversity, population structure, and effective population size have changed in natural spawning populations as a result of the hatchery program. Additionally, determine if hatchery programs have caused changes in the phenotypic characteristics of natural populations.

Hypotheses:

- Ho_7: Allele frequency $_{Hatchery}$ = Allele frequency $_{Naturally\ produced}$ = Allele frequency $_{Donor}$
- Ha_{7a}: Allele frequency $_{Hatchery}$ ≠ Allele frequency $_{Naturally\ produced}$ = Allele frequency $_{Donor}$
- Ha_{7b}: Allele frequency $_{Hatchery}$ = Allele frequency $_{Naturally\ produced}$ ≠ Allele frequency $_{Donor}$
- Ha_{7c}: Allele frequency $_{Hatchery}$ ≠ Allele frequency $_{Naturally\ produced}$ ≠ Allele frequency $_{Donor}$
- Ho_8: Genetic distance between subpopulations $_{Year\ x}$ = Genetic distance between subpopulations $_{Year\ y}$
- Ha_8: Genetic distance between subpopulations $_{Year\ x}$ ≠ Genetic distance between subpopulations $_{Year\ y}$
- Ho_9: $(N_e/N)_{t0} = (N_e/N)_{t1}$ for each population
- Ha_9: $(N_e/N)_{t0} \neq (N_e/N)_{t1}$ for each population
- Ho_{10}: Age at Maturity $_{Hatchery}$ = Age at Maturity $_{Naturally\ produced}$
- Ha_{10}: Age at Maturity $_{Hatchery}$ ≠ Age at Maturity $_{Naturally\ produced}$
- Ho_{11}: Size (length) at Maturity $_{Hatchery\ Age\ X\ and\ Gender\ Y}$ = Size (length) at Maturity $_{Naturally\ produced\ Age\ X\ and\ Gender\ Y}$
- Ha_{11}: Size (length) at Maturity by age and gender $_{Hatchery}$ ≠ Size (length) at Maturity by age and gender $_{Naturally\ produced}$

General Approach

Genotypes of hatchery and naturally produced populations will be sampled and monitored based upon the schedule outlined in Appendix H of the Douglas PUD M&E Plan. Priority of analysis was based upon recovery needs or relative risk a hatchery program may have on the naturally produced population. Differences in phenotypic characteristics that may arise as a result of hatchery programs (i.e., domestication) will be measured using historical (i.e., prior to current hatchery programs) and recent data collected from wild fish and broodstock or carcasses recovered on the spawning grounds. Data related to additional important phenotypic characteristics will be collected and analyzed as part of Objective 2 (e.g., run timing, spawn timing, and spawning location), Objective 4 (e.g., fecundity), and Objective 7 (e.g., size and age at smolt migration).

Methodology

Specific methodologies related to DNA extraction and genetic analysis are available from the WDFW Genetics Lab and were not included in the M&E Plan (Appendix H). Historical donor population samples (i.e., DNA collected from tissue or scale samples collected before hatchery programs) will be used to establish a genetic baseline for comparing against samples collected from current hatchery and naturally produced fish.

In 2010, summer Chinook DNA collected at Wells Hatchery will be incorporated into the analysis scheduled for summer Chinook stocks within the Chelan PUD M&E Plan.

Data for monitoring phenotypic characteristics (i.e., age at maturity and size at maturity) will be collected annually as part of the broodstock collection protocol (M&E Plan Appendix B). Broodstock for all programs are not collected randomly from the run at large with respect to sex, origin, or age. Trapping activities do provide an opportunity to collect data from a random sample from the run at large (i.e., those fish collected during broodstock trapping and released upstream). Historically, information related to the spawning population was derived from broodstock, carcasses, or a combination of both. Recent data suggests that these methods are biased and additional sampling at broodstock collection sites is required (Zhou 2002; Murdoch et al. 2005). Broodstock collection sites are located near or below a majority of the spawning locations (Table 7). All fish trapped, or a random sample depending on the stock, will be sampled to determine origin, age, and size. Additionally, PIT tags may be inserted into adult fish released upstream of Wells Dam to address other M&E Plan objectives (i.e., migration timing, Objective 2; stray rates, Objective 5).

Table 7. Broodstock collection locations for stock assessment and phenotypic characterization of hatchery and naturally produced fish.

Stock	Primary location	Secondary location
Methow Basin spring Chinook	Wells Dam	Twisp weir
Methow/Okanogan steelhead	Wells Dam	Twisp weir / Priest Rapids Dam

Schedule of Activities

Table 8. Schedule for conducting genetic analysis and size and age at maturity comparisons (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow/Okanogan steelhead	D	D	D	D	A	A	D	D	D	D	D	D
Methow spring Chinook	A	A	A	A	D	D	D	D	D			

Objective 4: Determine if the hatchery adult-to-adult survival (i.e., hatchery replacement rate) is greater than the natural adult-to-adult survival (i.e., natural replacement rate) and equal to or greater than the program specific expected value (BAMP 1998).

Hypotheses:

- Ho_{12}: $HRR_{Year\ x} \geq NRR_{Year\ x}$
- Ha_{12}: $HRR_{Year\ x} < NRR_{Year\ x}$
- Ho_{13}: HRR ≥ BAMP value (preferred)
- Ha_{13}: HRR < BAMP value

General Approach

The survival advantage from the hatchery (i.e., egg-to-smolt) must be sufficient to overcome lower post-release survival (i.e., smolt-to-adult) in order to produce a greater number of returning adults than if broodstock were left to spawn naturally. If a hatchery program cannot produce a biologically significant greater number of adults than naturally spawning fish, the program should be modified or discontinued. More simply, the hatchery replacement rate should always be greater than the natural replacement rate.

Hatchery programs in the Upper Columbia River were initially designed based on observed mean survival rates for each stock (BAMP 1998). Performance of the hatchery programs will be assessed using those expected survival rates and the number of broodstock collected on a brood year basis. Harvest augmentation hatchery programs will only be compared to the expected HRR value because a corresponding NRR is not available or applicable (e.g., Wells summer Chinook).

Methodology

Smolt to adult (SAR) and HRR values will be calculated for each stock. SAR values are currently calculated using CWT recoveries from all locations (harvest, hatcheries, and spawning grounds), except for steelhead, which is calculated based on sampling that occurs at Priest Rapids Dam or Wells Dam. HRR values that fall below the expected values or NRR (M&E Plan Appendix G) will be evaluated to determine whether in-hatchery (M&E Plan Appendix C) or out of hatchery (M&E Plan Appendix D) factors contributed to the reduced survival.

An unknown number of Wells summer Chinook spawn immediately downstream of Wells Dam, and possibly in areas on Bridgeport Bar (G. Wiest, WDFW, personal communication). Surveys will be conducted by boat or helicopter to determine redd abundance and to recover carcasses in these areas per protocols outlined in the M&E Plan.

Schedule of Activities

Table 9. Schedule of activities for hatchery evaluation activities (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow/Okanogan steelhead	A/D	A/D	D	D	D	D	D	D	D	D	D	D
Wells summer Chinook	A/D	A/D	D	D	D	D	D	D	D	D	D	D
Methow Basin spring Chinook	A/D	A/D	D	D	D	D	D	D	D	D	D	D

Objective 5: Determine if the stray rate of hatchery fish is below the acceptable levels to maintain genetic variation.

Hypotheses:

- Ho_{14}: Stray rate $_{\text{Hatchery fish}}$ < 5% of total brood return
- Ha_{14}: Stray rate $_{\text{Hatchery fish}}$ ≥ 5% of total brood return
- Ho_{15}: Stray hatchery fish < 5% of spawning escapement (based on run year) within other independent populations
- Ha_{15}: Stray hatchery fish ≥ 5% of spawning escapement (based on run year) within other independent populations
- Ho_{16}: Stray hatchery fish < 10% of spawning escapement (based on run year) of any non-target streams within independent populations
- Ha_{16}: Stray hatchery fish ≥ 10% of spawning escapement (based on run year) of any non-target streams within independent populations

General Approach

Excessive strays from hatchery programs pose significant genetic risk (loss of genetic variation between populations) and must be monitored in order to determine the magnitude of the problem and develop reasonable and appropriate recommendations. Stray rates will be monitored using CWT recoveries from Chinook spawning ground surveys. The Regional Mark Information System (RMIS) database will provide all necessary CWT information needed when calculating stray rates for each brood year or within and outside basin stray rates based on spawning escapement estimates.

Brood year stray rates will require multiple year CWT recoveries (i.e., all age classes) from broodstock and carcass recoveries on the spawning grounds. The estimated number of strays for the entire brood year will be calculated by dividing the number of strays by the total number of hatchery fish that returned. Stray rates within, and between independent populations will be calculated in a similar manner as brood year stray rates, except on an annual basis and based on the estimated spawning escapement.

Collecting stray rate information for steelhead poses the greatest challenge because carcasses are not available for examination. When available, radio tag information and/or adult PIT tag monitoring may provide adequate information for evaluating stray rates. Some data needed for evaluating stray rates for the Methow/Okanogan steelhead will be collected during broodstock trapping activities at Wells Dam (M&E Plan Appendix B), and through operation of the Twisp River weir when assessing spawn timing (see Objective 2). Stray rates in other tributaries may need to be calculated by other types of sampling (i.e., PIT tags, radiotags, hook and line) if warranted. Antenna arrays installed by WDFW and other researchers should provide tributary stray rate information, provided that adequate numbers of juvenile fish are PIT tagged prior to release (hatchery fish) or within natal streams (wild fish).

Methodology

Stray rates will be calculated using procedures outlined in the spawning ground survey methodology (M&E Plan Appendix F). As stated previously, information needed to evaluate steelhead stray rates will occur during broodstock collection activities at Wells Dam, operation of the Twisp weir and antenna array, and through other proposals. However, direct observations on the spawning grounds by other Agencies (e.g., USFWS, CCT, or USGS) or via PIT tags may be required in non-target streams (Table 10).

Table 10. Proposed methodologies used to evaluate stray rates for target and non-target streams.

Hatchery program	Target stream	Method
Methow steelhead	Methow, Twisp, Chewuch	PIT/Observation/creel*
Okanogan steelhead	Okanogan, Similkameen	PIT/Observation/creel*
Methow Basin spring Chinook	Methow, Twisp, Chewuch	CWT
Wells summer Chinook	Wells Hatchery	CWT

***** The number of strays will also be estimated during broodstock collection activities or PIT tag detections at Columbia River or tributary dams/detectors where applicable.

Schedule of Activities

Table 11. Schedule for data analysis to determine stray rates of hatchery fish (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow steelhead	A	A	D	D	D	D						
Okanogan steelhead	A	A	D	D	D	D						
Methow Basin spring Chinook	A	A						D	D			
Wells summer Chinook	A	A								D	D	

Objective 6. Determine if hatchery fish were released at the programmed size and number.

Hypotheses:

- Ho_{17}: Hatchery fish $_{\text{Size at release}}$ = Programmed $_{\text{Size at release}}$
- Ha_{17}: Hatchery fish $_{\text{Size at release}}$ ≠ Programmed $_{\text{Size at release}}$
- Ho_{18}: Hatchery fish $_{\text{Number released}}$ = Programmed $_{\text{Number released}}$
- Ha_{18}: Hatchery fish $_{\text{Number released}}$ ≠ Programmed $_{\text{Number released}}$

General Approach

The HCP outlines the number and size at which fish of each program are to be released. The programmed size and number of fish for each program will be compared to actual values at release each year. The number of broodstock collected and the assumptions (i.e., sex ratio, fecundity, and survival) in the broodstock collection protocol are important components that need to be considered. A program's failure to meet the HCP standards (e.g., over or under program goals) will be evaluated taking into account the number of broodstock and assumptions. The size of fish will be compared using a representative sample collected immediately prior to release.

Methodology

The number and size of fish released will be calculated according to methodologies outlined in the M&E Plan (Appendix C). An annual review of size and number of fish from each program will be compared to those values defined in the HCP. If release targets were achieved within acceptable levels (i.e., 10% +/- of HCP defined values) then no change would be recommended. If release targets are not achieved then causation will be determined and recommendations will be made based upon the results of the evaluation. A review of the broodstock protocols will occur every five years (or more frequently if necessary) concurrently with an evaluation of the number of fish released from each program.

Schedule of Activities

Table 12. Schedule of activities to determine the number and size of fish released (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Wells steelhead	D	D	D	D	D	A	D	D	D	D	D	D
Wells summer Chinook	D	D	D	D	D	D	D	A	D	D	D	D
Methow spring Chinook	D	D	D	D	D	A	D	D	D	D	D	D

Objective 7: Determine if the proportion of hatchery fish on the spawning grounds affects the freshwater productivity (i.e., number of smolts per redd) of supplemented streams when compared to non-supplemented streams.

Hypotheses:

- Ho_{19}: Slope of Ln(juveniles/redd) vs redds $_{\text{Supplemented population}}$ = Slope of Ln(juveniles/redd) vs redds $_{\text{Non-supplemented population}}$
- Ha_{19}: Slope of Ln(juveniles/redd) vs redds $_{\text{Supplemented population}}$ ≠ Slope of Ln(juveniles/redd) vs redds $_{\text{Non-supplemented population}}$
- Ho_{20}: The relationship between proportion of hatchery spawners and juveniles/redd is ≥ 1.
- Ha_{20}: The relationship between proportion of hatchery spawners and juveniles/redd is < 1.

General Approach

Supplementation should result in an increase in the natural production of the target stock. Given variability in abundance of adult salmonid populations in the Upper Columbia River Basin, monitoring juvenile production (e.g., smolts/redd) should provide a direct assessment of the efficacy of hatchery fish in rebuilding natural populations. Monitoring the freshwater production of both supplemented and non-supplemented populations may provide an early indication of the reproductive success of hatchery fish on the spawning grounds (i.e., no out of basin effects on survival). Conversely, without a smolt monitoring program, changes in smolt production may be masked by out of basin effects. Thus, subsequent recommendations concerning hatchery program modifications may be misdirected.

Smolt monitoring programs are currently ongoing for most treatment streams (Table 13). Coordination with the Agencies operating the various traps is ongoing to ensure similar levels of effort and methodologies are used.

Table 13. Population and location of smolt traps that may be used in examining the influence of hatchery fish on freshwater productivity.

Population	Smolt trap	Size	Agency
Methow Basin spring Chinook	Methow	1 - 8 ft trap; 1 - 5 ft trap	WDFW
Twisp spring Chinook	Twisp	1 - 5 ft trap	WDFW
Methow Basin steelhead	Methow	1 - 8 ft trap; 1 - 5 ft trap	WDFW
Twisp steelhead	Twisp	1 - 5 ft trap	WDFW
Okanogan steelhead	Okanogan	1 - 8 ft trap; 1 – 5 ft trap	CCT

Comparisons between supplemented and unsupplemented populations require extensive data sets, with potentially high annual variability that may require years before the efficacy of the program can be determined. Furthermore, the Wells steelhead program began decades before the HCP was signed and pretreatment data may not be available.

Methodology

Procedures for this objective are outlined in Appendix E of the M&E Plan. Juvenile monitoring requires an extensive trapping period (Table 15) over many successive generations due to the diverse life history of spring Chinook (subyearling and yearling emigrants) and summer steelhead (multiple age class smolts). Random scale samples must be collected for all stocks with multiple age class smolts in order to calculate the number of smolts produced from each brood year. Additionally, whenever possible direct measurements of the proportion of hatchery fish on the spawning grounds should be conducted (i.e., Twisp weir).

Current estimates of egg to smolt survival for Methow spring Chinook are much lower than expected. Based on scale analysis of returning Chinook adults, we assumed that at the Methow smolt trap all yearling emigrants were spring Chinook and subyearling emigrants were summer Chinook. Results of DNA sampling at the Methow River trap during the fall of 2006 and 2007 indicated that the majority of subyearling Chinook captured were spring Chinook. Because of this, fall trapping and DNA sampling will be conducted at the Methow smolt trap. Provided no unmarked subyearling hatchery fish are released prior to trapping, we propose to conduct DNA sampling during the spring period to determine the extent of subyearling spring Chinook spring emigration at the Methow smolt trap.

The low abundance of steelhead and yearling Chinook captured at smolt traps in the Methow Basin limits the sample size to conduct migration timing comparisons and life stage survival estimates (e.g., PIT tag recaptures). The installation of PIT tag antenna arrays in the lower Twisp and Methow rivers will provide additional opportunities to assess migration behavior and survival, provided an adequate number of fish are PIT tagged. We propose to conduct additional PIT tagging of juvenile steelhead and Chinook that are encountered during ongoing sampling activities. These fish would be captured via hook-and-line angling, seine netting, or rescued from de-watering areas via traps or nets. Tagging methodology would be consistent with ongoing activities in the Wenatchee and Entiat basins following protocols developed under the ISEMP (Table 14).

For life-stage survival comparisons and to monitor stray rates, migration patterns, rate, and speed within the basin, we propose that comparison groups of hatchery steelhead be tagged at Wells Hatchery prior to release (Table 14). Comparison groups of hatchery spring Chinook and steelhead were historically tagged at each smolt trap, but tag rates were likely too low to provide meaningful comparisons. Further, PIT tagging at the Methow trap likely incorporated fish from hatchery programs not covered under the M&E Plan (i.e., WNFH) because release time and hatchery mark are often the same for steelhead and spring Chinook released from WDFW and USFWS hatcheries in the Methow Basin. Since releases of similar fish from these hatcheries have exhibited different survival rates (Townsend and Skalski 2004), tagging should occur at the hatchery of origin to ensure that evaluations are conducted with target stocks.

Table 14. PIT tagging goals for remote sampling (wild fish) and in-hatchery tagging (hatchery fish) in the Methow Basin.

Target population	Wild fish		Hatchery fish	
	Steelhead	Subyearling Chinook	Target population	Steelhead
Methow	500	500	Methow (ad-clipped)	10,000
Twisp	500	500	Methow (non-clipped)	10,000
Chewuch	500	500	Okanogan (ad-clipped)	10,000
Misc. tribs	500			
Total	2,000	1,500		30,000

Schedule of Activities

Table 15. Schedule of activities for smolt monitoring programs in the Methow Basin (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D
Methow Basin steelhead	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A
Twisp steelhead	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A
Methow Basin spring Chinook	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A
Twisp spring Chinook	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A
Methow summer Chinook	A	D/A	D/A	D	D	D	D	D	D	D	D	D/A

Objective 8: Determine if harvest opportunities have been provided using hatchery returning adults where appropriate (e.g., Wells Chinook salmon).

Hypotheses:

- Ho_{21}: Harvest rate ≤ Maximum level to meet program goals
- Ha_{21}: Harvest rate > Maximum level to meet program goals
- Ho_{22}: Escapement ≥ Maximum level to meet supplementation goals
- Ha_{22}: Escapement < Maximum level to meet supplementation goals

General Approach

In years when the expected returns of hatchery adults are above the levels required to meet program goals (i.e., broodstock, natural escapement), surplus fish may be available for harvest. Harvest of returning adults is the goal of some programs (e.g., Wells summer Chinook) and an ancillary benefit of other programs (e.g., Methow/Okanogan steelhead). Contribution to fisheries, whether incidental or directed, will be monitored using CWT recoveries on a brood year basis. Target harvest rates have not been outlined in the M&E Plan. Hence, a qualitative assessment of the contribution rates of hatchery fish to fisheries versus broodstock or spawning grounds is required to determine if the objective has been met.

One approach, based on the goal of the hatchery program, is to compare CWT recoveries by recovery location (i.e., broodstock, fisheries, or spawning grounds). For example, a majority of the CWT recoveries for harvest augmentation programs should occur in fisheries. Conversely, supplementation programs should have a majority of the CWT recoveries occur on the spawning grounds.

Methodology

Robust statistically valid creel programs will be conducted for all sport fisheries in the Upper Columbia River to estimate harvest of hatchery fish from Douglas County PUD funded hatchery programs (M&E Plan Appendix D). Creel survey programs will be designed and implemented by WDFW Fish Management staff. Creel surveys in the Upper Columbia River are also an important component in calculating the HRR (Objective 4) because most CWT recoveries occur within the Upper Columbia River, the exception being summer Chinook. Significant time lags in reporting CWT recovery data to the Regional Mark Information System (RMIS) database requires a continual requerying of recovery data until the number of estimated fish does not change. The number of fish and proportion by brood year for CWT recoveries will be summarized in several categories (Table 16).

Table 16. Categories for CWT recoveries of hatchery fish released from Douglas County PUD funded programs.

Category	Estimated number of fish (%)		
Broodstock	Total	Target stream	Nontarget streams
Spawning ground	Total	Target stream	Nontarget streams
Fisheries	Total	Commercial	Sport
Commercial	Ocean	Columbia River Treaty	Columbia River non-Treaty
Sport	Ocean	Columbia River	Terminal

Schedule of Activities

Table 17. Schedule of activities to determine harvest rates of hatchery fish (D = data collection; A = data analysis).

Target population	J	F	M	A	M	J	J	A	S	O	N	D

Methow/Okanogan steelhead	D	D	D	A	A	A		D	D	D	D	D
Wells summer Chinook	A	A					D	D	D	D		
Methow basin spring Chinook	A	A										

DELIVERABLES

Annual Reports: A draft annual report will be provided to the District by 1 April. A final report will be provided to the HCP HC within 30 days of receiving comments on the draft report. The annual report will summarize all field activities conducted during the contract period. The format of the report will be similar to the 2007 and 2008 annual reports that have been provided to the District, with each task reported in a separate chapter. Primary indicators and the data used in calculations during each task will also be presented in each chapter. Secondary and tertiary indicators will be reported if needed to calculate the primary indicator.

Chapter 1. Hatchery Brood Report

a. Broodstock
    Number collected
    Age composition
    Size at maturity
b. Juvenile
    Number released
    Size at release
c. Hatchery replacement rates

Chapter 2. Harvest

a. Hatchery fish
    Number
    Location
    Stray rates
b. Wild fish
    Number
    Location

Chapter 3. Smolt Monitoring

a. Smolt production
    Number of smolts (captured and total estimate)
    Smolts/redd
    Size at emigration
    Age at emigration
b. Survival
    Egg to emigrant survival
    Number of fish PIT tagged
    Smolt to smolt survival

c. Remote PIT tagging
   Number tagged

Chapter 4. Steelhead Spawning Ground Surveys

a. Migration timing
b. Spawn timing
c. Redd distribution
   Number of redds
   Spawning escapement
   Spawner composition
   Number of NOR
   NRR
   Stray rates

Chapter 5. Chinook Spawning Ground Surveys

a. Migration timing
b. Spawn timing
c. Redd distribution
   Number of redds
   Spawning escapement
   Spawner composition
   Number of NOR
   NRR
   Stray rates

Chapter 6. Genetic Analysis

a. Genetic distances
b. Allele frequencies
c. Effective population sizes

Five-Year Summary Report: In addition to the annual report, a draft five-year summary report will be developed and provided to the District no later than 1 April 2011. A final report will be provided to the HCP HC within 30 days of receiving comments on the draft report. The format of the five-year summary report will be similar to the M&E Plan and results will be presented by objective, not by task as in the annual reports. Statistical analysis of data will be based on the statistical design that is currently under development. All raw data used in the statistical analysis will also be presented in the report.

Recommendations: Recommendations to modify the M&E Plan or reporting will occur on an annual basis and again at the five-year summary. Initially, changes to protocols or methodologies may be necessary to ensure the data required in the M&E Plan is collected. Changes to the M&E Plans' implementation or hypotheses will be included in the five-year summary report. Recommendations will be consistent with the hatchery program goals and will be included in a separate section of the summary report.

Presentations: A formal presentation (i.e., power point format) of the M&E Plan results will be provided to Douglas PUD or the HCP HC at their convenience. Presentations will include the status of all hatchery programs in meeting their objectives, potential problems and recommendations. Similar presentations of annual results from field activities can be requested and provided if warranted.

COORDINATION BETWEEN DOUGLAS PUD AND HATCHERY STAFF

The WDFW Supplementation Research Team (a.k.a. Methow Field Office) has been directly involved in the evaluation, development, and implementation of the hatchery programs since 1992. Currently, the WDFW is contracted by Douglas PUD not only to operate its hatcheries, but also to implement the Evaluation Plan developed when the Methow Hatchery program came online.

Coordination with hatchery staff has been a continual process. Hatchery staff conducts routine sampling at the hatcheries and data is provided to us for inclusion in monthly reports. However, special meetings with the hatchery staff are typically conducted prior to significant events (i.e., broodstock collection, spawning, release of juveniles) to ensure proper methodologies are used and critical data is collected. Evaluation staff is present at all significant events and collect data needed for evaluation purposes.

Additional coordination between evaluation staff, hatchery staff, and the WDFW ESA Permitting biologist is often required to ensure that conditions of ESA Section 10 permits are not violated. The ESA permitting biologist is co-located with evaluation staff, which allows for efficient and effective communication on a daily basis in order to ensure compliance with existing permits. Currently, all ESA reporting related to the hatchery programs is the responsibility of the WDFW Permitting Biologist (0.5 FTE). Given the limited resources dedicated to ESA Permit reporting and the extensive workload required to meet reporting requirements, this relationship is critical to ensuring hatchery programs operate within the conditions of the permit.

Monthly reports have served as a primary mode of coordination and are used to keep Douglas PUD as well as HCP Committee members and co-managers informed on all hatchery and evaluation related activities. Unless otherwise requested by Douglas PUD, the role of monthly reports will remain the same. Upon request, additional information can be included in the monthly reports.

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Appendix D

2009 UCR Salmon and Steelhead Broodstock Objectives and Site-Based Broodstock Collection Protocols

Appendix D

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
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April 15, 2009

To: Kristine Petersen, Salmon Recovery Division, NMFS

From: Kirk Truscott, WDFW

Subject: **Final DRAFT 2009 UPPER COLUMBIA RIVER SALMON AND STEELHEAD BROODSTOCK OBJECTIVES AND SITE-BASED BROODSTOCK COLLECTION PROTOCOLS**

The attached protocol was developed in coordination with the mid-Columbia Habitat Conservation Plans (HCPs) for hatchery programs rearing spring Chinook salmon, sockeye salmon, summer Chinook salmon and summer steelhead associated with the mid-Columbia HCPs, spring Chinook salmon and steelhead programs associated with the 2008 Biological Opinion for the Priest Rapids Hydroelectric Project (FERC No. 2114) and fall Chinook consistent with Grant County Public Utility District and Federal mitigation obligations associated with Priest Rapids and John Day dams, respectively. These programs are funded by Chelan, Douglas, and Grant County Public Utility Districts (PUDs) and are operated by the Washington Department of Fish and Wildlife (WDFW). Additionally, the Yakama Nation's (YN) Coho Reintroduction Program broodstock collection protocol, when provided by the YN, will be included in this protocol because of the overlap in trapping dates and locations.

This protocol is intended to be a guide for 2009 collection of salmon and steelhead broodstocks in the Methow, Wenatchee, and Columbia River basins. It is consistent with previously defined program objectives such as program operational intent (i.e., conservation and/or harvest augmentation), mitigation production levels (HCPs, Priest Rapids Dam 2008 Biological Opinion and to comply with ESA permit provisions.

Notable in this year's protocols are: (1) Wenatchee spring Chinook broodstock collection strategies targeting Chiwawa hatchery origin Chinook at Tumwater Dam, intended to provide improved hatchery origin broodstock collection and to reduce the number of Leavenworth NFH strays into other Wenatchee basin UCR spring Chinook spawning aggregates; (2) Natural origin Chiwawa spring Chinook collection at the Chiwawa Weir, consistent with ESA Section 10 Permit 1196; (3) Methow spring Chinook broodstock protocol targeting natural origin spring Chinook at Wells Dam and at the Twisp River weir; (4) utilization of genetic sampling/assessment to differentiate Twisp River and non Twisp River natural origin adults collected at Wells Dam and CWT interrogation during spawning of hatchery spring Chinook collected at the Twisp Weir, Methow FH and Winthrop NFH to differentiate Twisp and Methow Composite hatchery fish for discrete management of Twisp and Methow Composite production components; (5) the collection of hatchery origin spring Chinook for the Methow River Basin program in excess of production requirements for BKD management, (6) the use of ultra-sound technology to determine sex of Wenatchee summer Chinook during collection to aid in achieving the appropriate female equivalents for programmed production, and (7) the potential collection of Wells summer Chinook to support the Yakama Nation (YN) summer Chinook re-introduction program in the Yakima River Basin (requires agreement of the HCP Hatchery Committee). These protocols may be adjusted in-season, based on actual run monitoring at mainstem dams and other sampling locations.

Above Wells Dam

Spring Chinook
Natural origin fish inclusion into the broodstock will be a priority, with natural origin fish specifically being targeted. Natural origin fish collections will not exceed 33 percent of the MetComp and Twisp natural origin run escapement at Wells Dam.

To facilitate BKD management, to comply with ESA Section 10 permit take provisions and to meet programmed production, hatchery origin spring Chinook will be collected in numbers excess to program production requirements. Based on historical Methow FH spring Chinook ELISA levels above 0.12, the hatchery origin spring Chinook broodstock collection will include hatchery origin spring Chinook in excess to broodstock requirements by approximately 18 percent. The parties to the HCP have acknowledged that targeting broodstock collection objectives at levels that provide for culling of eggs from higher ELISA level hatchery origin females and prioritizing natural origin fish for rearing to yearling smolt stage is a viable approach to balance the promotion of fish health while limiting indirect reductions in genetic diversity and reduced program production, particularly for ESA listed supplementation programs. For purposes of BKD management and to comply with maximum production levels and other take provisions specified in ESA Section 10 permit 1196, culling will include the destruction of eggs from hatchery origin females with ELISA levels greater than 0.12 and or that number of hatchery origin eggs required to maintain production at 550,000 yearling smolts. Culling of eggs from natural origin females will not occur, unless their ELISA levels are determined by WDFW Fish Health to be a substantial risk to the program. Juveniles from natural origin females with ELISA levels greater than 0.12 will be differentially tagged for evaluation purposes. To monitor the efficacy of culling in reducing the prevalence of BKD in Methow Basin spring Chinook, annual monitoring and evaluation of the prevalence and level of BKD in returning hatchery and natural origin spring Chinook will continue and will be reported in the annual monitoring and evaluation report for this program.

The 2009 Methow spring Chinook broodstock collection will occur at Wells Dam, Twisp River Weir, Methow FH and Winthrop NFH. Limited on-station release of smolts from the Methow FH, absence of a trapping facility on the Chewuch River and poor trapping success at Foghorn Dam on the mainstem Methow River preclude reasonable certainty of meeting adult collection requirements via tributary and Methow FH outfall collections. The aforementioned limitations are the principle reasons for the inclusion of broodstock collection at Wells Dam and Winthrop NFH during 2009.

Recent WDFW genetic assessment of natural origin Methow spring Chinook (Small et al. 2007) suggest that Twisp natural-origin spring Chinook can be identified with sufficient confidence that natural origin collections can occur at Wells Dam, thereby facilitating natural origin inclusion in the broodstock, while maintaining the ability to manage separately the Twisp origin spring Chinook spawning aggregate. Although Twisp natural origin fish can be assigned to the Twisp population with confidence, some gene flow between the Twisp and Methow Composite spawning aggregates are anticipated as a result of collecting natural origin broodstock at Wells Dam. Based on projected Proportion Natural Origin (pNOB) broodstock composition for Twisp and Methow Composite programs (31% and 30%, respectively) and composite brood year assignment errors for wild Twisp and MetComp spring Chinook provided in Snow et al. (2007), the projected non-source fish contributions to the Twisp and MetComp hatchery programs for 2009 are 1.6% and 1.5%, respectively. In this instance, percent non-source fish contribution may be considered a gene flow estimate between the two program production elements (Twisp and Methow Composite) and is an unavoidable consequence associated with natural origin broodstock collection at Wells Dam during 2009. Although gene flow between the two hatchery production components is likely, it is expected to be relatively low in 2009 and supports a hatchery broodstock collection program objective to infuse natural origin fish into the hatchery program to maintain/improve genetic diversity and reduced domestication. For complete discussion regarding Methow Spring Chinook genetic monitoring and evaluation see Snow et al. (2007).

Non-lethal tissue samples (fin clips) for genetic analysis and scale samples will be obtained from adipose present, non-CWT, non-ventral clipped spring Chinook (suspected natural origin spring Chinook) collected at Wells Dam for origin analysis. Natural origin fish retained for broodstock will be tagged with a PIT tag (dorsal sinus) for tissue sample/genetic analysis cross-reference. Tissue samples will be preserved and sent to WDFW genetics lab in Olympia Washington for genetic/stock analysis. The spring Chinook sampled will be retained at Methow FH and will be sorted as Twisp or non-Twisp natural origin fish prior to spawning. The number of natural origin Twisp and Methow Composite (non-Twisp) spring Chinook retained will be dependent upon the number of natural origin adults returning and the collection objective limiting extraction to no greater than 33% of the natural origin spring Chinook return past Wells Dam. Based on the broodstock collection schedule (3-day/week, 16 hours/day), natural origin spring Chinook extraction is expected to be approximately 33% or less.

Weekly estimates of natural-origin spring Chinook passage past Wells Dam will be provided through stock assessment and broodstock collection activities and will provide the opportunity to adjust, in-season, the extraction of natural origin spring Chinook to maintain no greater that 33% extraction of Twisp and Methow Composite natural origin components while maximizing the opportunity for the inclusion of natural origin spring Chinook in the broodstock. Additionally, in-season estimates of Twisp and Methow Composite natural origin escapement past Wells Dam provides the opportunity to utilize both Wells Dam and the Twisp Weir as natural origin collection sites for the Twisp production component, thereby providing additional flexibility to account for differences between projected and actual returns of Twisp and Methow Composite natural origin fish. Twisp and Methow Composite hatchery origin spring Chinook will be captured at the Twisp Weir, Methow FH outfall. Trapping at the Winthrop NFH will be included if needed to address broodstock shortfalls.

The Methow FH rears spring Chinook salmon for three acclimation/release sites in the Methow River Basin, including: (1) Methow River (Methow FH); (2) Twisp River (Twisp Acclimation Pond) and (3) Chewuch River (Chewuch Acclimation Pond). The total production level target is 550,000 smolts divided equally among the three release sites (approximately 183,000 smolts per site).

Pre-season run-escapement of Methow origin spring Chinook past Wells Dam during 2009 are estimated at 2,237 spring Chinook, including 1,943 hatchery and 294 natural origin Chinook (Table 1 and Table 2). In-season estimates of natural origin spring Chinook will be adjusted proportional to the estimated returns to Wells Dam at weekly intervals and may result in adjustments to the broodstock collection targets presented in this document.

Based on current juvenile rearing capacity at Methow FH, programmed production levels (550,000 smolts), BKD management strategies, projected return for BY 2009 Methow Basin spring Chinook at Wells Dam (Table 1 and Table 2), and assumptions listed in Table 3, the following broodstock collection protocol was developed.

The 2009 Methow spring Chinook broodstock collection will target 359 adult spring Chinook. Based on the pre-season run forecast, Twisp fish are expected to represent 3% of the adipose present, CWT tagged hatchery adults and 12% of the natural origin spring Chinook passing above Wells Dam (Tables 1 and 2). Based on this proportional contribution, and a collection objective to limit extraction to no greater than 33%, the 2009 Twisp origin broodstock collection will be predominantly hatchery origin and total 33 fish (11 wild and 22 Hatchery), representing 30% of the broodstock necessary to meet Twisp program production of 183,000 smolts. Methow Composite fish are expected to represent 97% of the adipose present CWT tagged hatchery adults and 88% of the natural origin spring Chinook passing above Wells Dam (Tables 1 and 2). Based on this proportional contribution and a collection objective to limit extraction to no greater than 33%, the 2009 Methow Composite (combined Methow and Chewuch river spawning aggregates) broodstock collection will be predominantly hatchery origin and total 326 spring

Chinook (86 wild and 240 Hatchery). The broodstock collected for the Methow Composite production represents 100% of the broodstock necessary to meet Methow Composite program production of 367,000 smolts (combined Methow and Chewuch production), and sufficient to backfill the expected shortfall of 129,000 Twisp River spring Chinook. The Twisp River releases will be limited to releasing progeny of broodstock identified as wild Twisp and or known Twisp hatchery origin fish, per ESA Permit 1196. The Chewuch Pond and Methow FH releases will include progeny of broodstock identified as wild non-Twisp origin and known Methow Composite hatchery origin fish.

Table 1. Brood Year 2004-2006 age-class return projection for wild spring Chinook Dam above Wells during 2009.

	Smolt Estimate		Age-at-Return								
	Twisp [1/]	Methow Basin [2/]	Twisp				Methow Basin				
BY			**Age-3**	**Age-4**	**Age-5**	**Total**	**Age-3**	**Age-4**	**Age-5**	**Total**	**SAR** [3/]
2004	5,873	22,941	2	21	**10**	33	6	83	**38**	128	0.005581
2005	5,372	55,381	1	**19**	9	30	15	**201**	93	309	0.005581
2006	18,580	198,400	**5**	67	31	104	**55**	720	332	1107	0.005581
2009 Return Year			**5**	**19**	**10**	**34**	**55**	**201**	**38**	**294**	

[1/]- Smolt estimate based on sub-yearling and yearling emigration (Snow et al. 2008)

[2/]- Estimated Methow Basin smolt emigration, based on Twisp Basin smolt emigration, proportional redd deposition in the Twisp River and Twisp Basin smolt production estimate.

[3/]- Mean 1998-2003 Chiwawa River wild SAR as a surrogate wild SAR for Methow spring Chinook

BY 2004-2006 age-class and origin run-escapement projection for UCR spring Chinook at Wells Dam, 2009

	Projected Escapement											
	Origin								Total			
	Hatchery				Wild				Methow Basin			
Stock	**Age-3**	**Age-4**	**Age-5**	**Total**	**Age-3**	**Age-4**	**Age-5**	**Total**	**Age-3**	**Age-4**	**Age-5**	**Total**
MetComp	164	947	42	1,153	50	182	28	260	214	1,129	70	1,413
% Total				59%				88%				63%
Twisp	14	47	6	67	5	19	10	34	19	66	16	101
% Total				3%				12%				5%

Winthrop (MetComp)	723 37%					723
Total	1,943 87%	55	201	38	294 13%	2,237 100%

Table 3. Assumptions and calculations to determine number of broodstock needed for BY 2009 production of 550,00 smolts

Smolt release		**550,000**	**Smolts**
Fertilization-to-release survival	90%		
Egg-take (Production)		611,000	Eggs
18% cull allowance [2/]		73,000	
Total Egg Take		**684,000**	**Eggs**
Fecundity	4,000 [1/]	171	Females spawned
Female to male ratio	1 to 1	341	Total spawned
Pre-spawn survival	**95%**	**359**	**Broodstock collection target**

[1/]- Based on historical program age-4 fecundities and expected 2009 return age structure (Table 1).

[2/]- Hatchery origin MetComp. component only, and is based on projected natural origin collection and assumption that all Twisp (hatchery and wild) and wild MetComp. will be retained for production.

Trapping at Wells Dam will occur at the East and West ladder traps beginning on 04 May, or at such time as the first spring Chinook are observed passing Wells Dam and continue through 24 June 2009. Access to the east ladder trap will be coordinated with staff at Wells Dam due to rotor rewind project. Trapping schedule will consists of 3-day/week (Monday-Wednesday), up to 16-hours/day. Two of the three trapping days will be concurrent with the stock assessment sampling activities authorized through the 2009 Douglas PUD Hatchery M&E Implementation Plan. Natural origin spring Chinook will be retained from the run, consistent with spring Chinook run timing at Wells Dam (weekly collection quotas). Once the weekly quota target is reached, broodstock collection will cease until the beginning of the next week. If a shortfall occurs in the weekly trapping quota, the shortfall will carry forward to the following weeks collection quota. All natural origin spring Chinook collected at Wells Dam for broodstock will be held at the Methow FH.

To meet Methow FH broodstock collection for hatchery origin Methow Composite and Twisp River stocks, adipose-present coded-wire tagged hatchery fish will be collected at Methow FH, Winthrop NFH and the Twisp Weir beginning 01May or at such time as spring Chinook are observed passing Wells Dam and continuing through 21 August 2009. Natural origin spring Chinook will be retained at the Twisp weir as necessary to bolster the Twisp program production so long as the aggregate collection at Wells Dam and Twisp River weir does not exceed 33% of the estimated Twisp River natural origin return past Wells Dam. All hatchery and natural origin fish collected at Methow FH, Twisp Weir and Winthrop NFH for broodstock will be held at the Methow FH.

__Steelhead__

Steelhead mitigation programs above Wells Dam (including the USFWS steelhead program at Winthrop NFH) utilize adult broodstock collections at Wells Dam and incubation/rearing at Wells Fish Hatchery (FH). The Wells

Steelhead Program also provides eggs for UCR steelhead reared at Ringold FH, not as a mitigation requirement, but rather an opportunity to reduce the prevalence of early spawn hatchery steelhead in the mitigation component above Wells Dam. Typically, Wells hatchery origin steelhead held at Wells FH spawn earlier than natural origin steelhead. Early maturation of hatchery fish in the hatchery may indicate a propensity for these fish to spawn early in the natural environment as well and may have a negative effect on hatchery spawner success. In efforts to minimize impacts from early maturation, the Wells Hatchery program has transferred eggs from the earliest spawn hatchery steelhead to Ringold FH. Preliminary evaluations indicate that the mean spawn timing of HxH steelhead at Wells FH has been delayed and may be a function of these actions (Figure 1). Based on these preliminary evaluations, WDFW proposes to continue the transfer eggs from early spawn hatchery origin steelhead to Ringold FH.

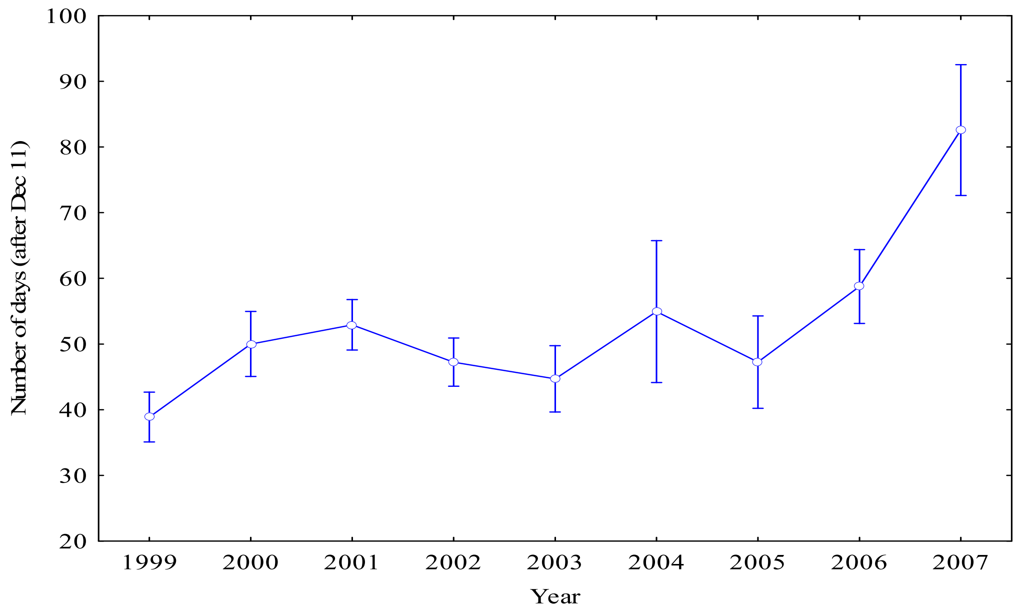

Figure 1. Mean spawn timing of HxH steelhead at Wells FH, BY 1999-2007 (WDFW unpublished Data).

Based on mitigation program production objectives (Table 4) and program assumptions (Table 5), the following broodstock collection protocol was developed.

Trapping at Wells Dam will selectively retain 366 steelhead (east and west ladder collection). Access to the east ladder trap will be coordinated with staff at Wells Dam due to rotor rewind project. Hatchery and natural origin collections will be consistent with run-timing of hatchery and natural origin steelhead at Wells Dam. The collection will retain no greater than 33% natural origin broodstock for the mitigation programs and 100% hatchery origin within the Ringold FH production component. Overall collection will be limited to no more than 33% of the entire run or 33% of the natural origin return. The east and west ladder trapping at Wells Dam will begin on 01 August and terminate by 31 October and will be operated concurrently, three days per week, up to 16 hours per day, if required to meet broodstock objectives. Trapping on the east ladder will be concurrent with summer Chinook broodstocking efforts through 14 September and will continue through 31 October, concurrent with west ladder steelhead collections. Adult return composition including number, origin, age structure, and sex ratio will be assessed in-season at Priest Rapids and Wells dams. Broodstock collection adjustments may be made based on in-season monitoring and evaluation.

Table 4. Adult steelhead collection objectives for programs supported through adult steelhead broodstock collection at Wells Dam.							
Program	**# Smolts**	**# eyed eggs**	**% Wild**	**# Wild**	**# Hatchery**	**Total Adults**	
DCPUD [1/]	349,000	401,149	33%	59	119	178	
GCPUD [1/]	80,000	91,954	33%	14	27	41	
USFWS [1/]	80,000	91,954	33%	14	27	41	3/
Sub-Total	**509,000**	**585,057**	**33%**	**87**	**174**	**260**	
Ringold	180,000	240,000	0%	0	106	106	3/
Sub-Total	**180,000**	**240,000**	**0%**	**0**	**106**	**106**	
Grand Total [2/]	**689,000**	**825,057**	**24%**	**87**	**289**	**366**	

[1/]- Above Wells Dam releases. Target HxW parental adults as the hatchery component

[2/]- Based on steelhead production consistent with Mid Columbia HCP's, GCPUD BiOp and Section 10 Permit 1395.

[3/]- Based on adults required for eyed egg allotment

Table 5. Program assumptions used to determine adult collection required to meet steelhead production objectives for programs above Wells Dam and at Ringold Springs Fish Hatchery.	
Program assumption	**Standard**
Pre-spawn survival	97%
Female to male ratio	1.0 : 1.0
Fecundity	5,400
Propagation survival	
87% fertilization to eyed egg	87%
86% eyed egg to yearling release	86% [1/]
75% fertilization to yearling release	75% [1/]

[1/]- Not applicable to Ringold Springs Fish Hatchery

Summer/fall Chinook

Summer/fall Chinook mitigation programs above Wells Dam utilize adult broodstock collections at Wells Dam and incubation/rearing at Eastbank Fish Hatchery. The total production level target is 976,000 summer/fall Chinook smolts for two acclimation/release sites on the Methow and Similkameen rivers (Carlton Pond and Similkameen Pond, respectively).

The TAC 2009 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2005, 2006 and 2007 spawn escapement to tributaries above Wells Dam indicate sufficient summer Chinook will return past Wells Dam to achieve full broodstock collection for supplementation programs above Wells Dam. Based on initial run expectations of summer Chinook to the Columbia River, program objectives and program assumptions (Table 6); the following broodstock collection protocol was developed.

WDFW will retain 556 natural-origin summer/fall Chinook at Wells Dam east and west ladder, including 278 females. Collection will be proportional to return timing between 01 July and 13 September. Access to the east ladder trap will be coordinated with staff at Wells Dam due to rotor rewind project. Trapping will occur 3-days/week, 16 hours/day. The 3-year old component will be limited to 10 percent of the broodstock collection. If the probability of achieving the broodstock goal is reduced based on actual natural-origin escapement levels, broodstock origin composition will be adjusted to meet the broodstock collection objective.

Table 6. Assumptions and calculations to determine number of broodstock needed for summer/fall Chinook production at Carlton and Similkameen ponds.

Program Assumption		Carlton Pond	Similkameen Pond	Total
Smolt release		**400,000**	**576,000**	**976,000**
Fertilization-to-release survival	90%			
Eggtake Target		**512,821**	**738,462**	**1,251,282**
Fecundity	5,000			
Female target		**103**	**148**	**250**
Female to male ratio	1 to 1			
Broodstock target		**205**	**295**	**501**
Pre-spawn survival	95%			
Total collection target		**228**	**328**	**556**

Columbia River Mainstem below Wells Dam

Summer/fall Chinook

Summer/fall Chinook mitigation programs that release juveniles directly into the Columbia River between Wells and Rocky Reach dams are supported through adult broodstock collections at Wells Dam. The total production level supported by this collection is 520,000 yearling and 1,562,000 sub-yearling Chinook. Upon agreement in the HCP, the 2009, summer Chinook broodstock collections at Wells FH may also include 250,000 green eggs to support the Yakama Nation (YN) reintroduction of summer Chinook to the Yakima River Basin. If approved by the HCP Hatchery Committee, the YN eggs will be the last eggs taken and will be the responsibility of staff associated with the YN program.

Adults returning from this program are to support harvest opportunities and are not intended to increase natural production and have been termed segregated harvest programs. These programs have contributed to harvest opportunities; however, adults

from these programs have been documented contributing to the adult spawning escapement in tributaries upstream and downstream from their release locations. Because adults from these programs contribute to the natural spawn escapement, the broodstock collection will incorporate 10 percent natural-origin fish into the broodstock to reduce the potential genetic risk to the naturalized summer/fall Chinook stocks in the upper Columbia River region. Based on mitigation objectives and program assumptions (Table 7), the following broodstock collection protocol was developed.

WDFW will collect 1,476 run-at-large summer Chinook including 1,339 hatchery fish from the volunteer ladder trap at Wells Fish Hatchery outfall and 137 natural-origin fish from the Wells Hatchery outfall, and/or Wells Dam east and west ladders. Access to the east ladder trap will be coordinated with staff at Wells Dam due to rotor rewind project. Overall extraction of natural-origin fish passing Wells Dam (Wells program and above Wells Dam summer/fall Chinook programs) will not exceed 33 percent. West ladder collections will begin 01 July and completed by 14 September and will be consistent with run timing past Wells Dam. Due to fish health concerns associated with the volunteer collection site (warming Columbia River water during late August), the volunteer collection will begin 10 July and terminate by 31 August. The 3-year old component will be limited to 10 percent of the broodstock collection.

Table 7. Assumptions and calculations to determine number of broodstock needed for summer/fall Chinook production at Wells and Turtle Rock Island hatcheries.

	Standard		Wells FH		Turtle Rock FH		YN [1/]	
Program Assumption	**Sub-yearling**	**Yearling**	**Sub-yearling**	**Yearling**	**Sub-yearling**	**Yearling**	**green-egg**	**Total**
Smolt release			484,000	320,000	1,078,000	200,000	250,000	NA
Fertilization-to-release survival	73% [2/]	78%					NA	NA
Eggtake Target			663,014	410,256	1,476,712	256,410	250,000	3,056,392
Fecundity	4,600	4,600						
Female target			144	89	321	56	54	664
Female to male ratio	1 to 1	1 to 1						
Broodstock target			288	178	642	111	109	1,328
Pre-spawn survival	90%	90%						
Total collection target			**320**	**198**	**713**	**124**	**121**	**1,476**

1/ – Green eggs for YN reintroduction program in the Yakima River Basin.

2/ – Based on increased monitoring of the green egg-to-marking loss for BY 07 and 08 that indicates a un-fertilized- to- marking loss of 27%.

Coho

Yakama Nation will provide broodstock collection objectives for the coho reintroduction program in the Methow River basin. WDFW will work collaboratively with the Yakama Nation to facilitate coho collections at Wells Dam. Access to the east ladder trap will be coordinating with staff at Wells Dam due to the rotor rewind project.

Wenatchee River Basin

Spring Chinook

The Eastbank Fish Hatchery (FH) rears spring Chinook salmon for the Chiwawa River acclimation pond located on the Chiwawa River. The program production level target is 672,000 smolts, requiring a total broodstock collection of 379 spring Chinook (Table 8).

Table 8. Assumptions and calculations to determine number of broodstock needed for Chiwawa program release of 672,000 smolts.

Program Assumption	Standard	Chiwawa program
Smolt release		**672,000**
Fertilization-to-release survival	83%	
Eggtake Target		**809,639**
Fecundity	4,400	
Female target		**184**
Female to male ratio	1 to 1	
broodstock target		**368**
Pre-spawn survival	97%	
Total broodstock collection		**379**

Natural origin fish inclusion into the broodstock will continue to be a priority, with natural origin fish specifically being targeted. Consistent with ESA Section 10 Permit 1196, natural origin fish collections will not exceed 33 percent of the return to the Chiwawa River and will provide, at a minimum, 33 percent of the total broodstock retained.

In addition to production levels and ESA permit provisions, the 2009 broodstock collection, will again, as in 2008, target hatchery origin Chiwawa spring Chinook at Tumwater Dam. Also in 2009, an interim measure will include extraction of adipose clipped non-coded wire tag adult spring Chinook, as a strategy to reduce straying of Leavenworth NFH spring Chinook to the upper Basin habitat.

Pre-season estimates project 5,114 spring Chinook destine for the Chiwawa River, of which 703 (13.7%) and 4,411 fish (86.3%) are expected to be natural and hatchery origin spring Chinook, respectively (Table 9 and 10). Based on the projected 2009 Chiwawa River run-size and origin composition, and provisions in ESA Section 10 Permit 1196, WDFW will retain 379 spring Chinook for broodstock purposes, representing 100% of the program broodstock objective. Two hundred and thirty-two (232) natural origin spring Chinook will be retained at the Chiwawa Weir and 147 adipose-clipped, CWT hatchery origin spring Chinook will be collected at Tumwater Dam. In-season assessment of the magnitude and origin composition of the spring Chinook return above Tumwater Dam will be used to provide in-season adjustments to broodstock collection, consistent ESA Section 10 Permit 1196.

Table 9. BY 2004-2006 age-class return projection for wild spring Chinook above Tumwater Dam during 2009

	Smolt Estimate		Chiwawa				Wen. Basin above Tumwater Dam				
Brood Year	Chiwawa [1/]	Wen. Basin [2/]	Age-3 [3/]	Age-4 [3/]	Age-5 [3/]	Total	Age-3 [3/]	Age-4 [3/]	Age-5 [3/]	Total	SAR [4/]
2004	101,172	197,944	28	367	**169**	565	55	718	**331**	1,105	0.005581
2005	140,737	338,079	39	**510**	236	785	94	**1,226**	566	1,887	0.005581
2006	86,579	153,918	**24**	314	145	483	**43**	558	258	859	0.005581
Total 2008 Return			**24**	**510**	**169**	**703**	**43**	**1,226**	**331**	**1,600**	

1/- Smolt production estimate.

2/- smolt production estimate based on proportional redd disposition in the Wenatchee Basin above Tumwater Dam and Chiwawa smolt production estimate.

3/- Based on average age-at-return for natural-origin spring Chinook above Tumwater Dam (WDFW unpublished data).

4/- Mean Chiwawa spring Chinook SAR to the Wenatchee Basin (BY 1998-2003)(WDFW unpublished data).

Table 10. BY 2004-2006 age-class return projection for Chiwawa Hatchery spring Chinook above Tumwater Dam during 2009

	Smolt Estimate	Adult Return				
Brood Year	Chiwawa [1/]	Age-3 [2/]	Age-4 [2/]	Age-5 [2/]	Total	SAR [3/]
2004	494,517	883	2,564	**757**	4,203	0.0085
2005	494,012	882	**2,561**	756	4,199	0.0085
2006	612,482	**1,093**	3,176	937	5,206	0.0085
Total 2008 Return		**1,093**	**2,561**	**757**	**4,411**	

1/- Chiwawa smolt release (Hillman et al. 2007)

2/- Based on average age-at-return for natural-origin spring Chinook above Tumwater Dam (Hilllman et al. 2007) . and total estimated BY return.

3/- Mean Chiwawa hatchery spring Chinook SAR to the Wenatchee Basin (BY 1996-2001)

Trapping at Tumwater Dam will begin 01 May and will be concurrent with trapping for the Spring Chinook Reproductive Success Study. Collection at both Tumwater Dam and Chiwawa Weir will be based on weekly quotas, consistent with average run timing at Tumwater Dam. If the weekly quota is attained prior to the end of the week, retention of spring Chinook for broodstock will cease. If the weekly quota is not attained, the shortfall will carry forward to the next week. The number of hatchery origin fish retained at Tumwater Dam will be adjusted in-season, based on estimated Chiwawa River natural-origin returns provided through extrapolation of returns past Tumwater Dam. If hatchery origin Chinook are retained in excess to that required to maintain a minimum 33 percent natural origin composition in the broodstock, excess fish will be returned to the Chiwawa River beginning the third week of July.

Throughout broodstock collection at Tumwater Dam, adipose absent, non-CWT spring Chinook will be extracted and provided to USFWS as a measure to reduce the prevalence of non-endemic spring Chinook above Tumwater Dam. All adults that are found at Tumwater Dam with a missing adipose fin and lacking a coded wire tag will be putatively classified as LNFH strays. However, it is likely that some proportion of the adipose clipped non-CWT fish are ESA-listed hatchery adults that have shed their tags. Based on the BY 2004, 2005, and 2006 tag rate for Chiwawa spring Chinook and the projected 2009 Chiwawa hatchery return to Tumwater Dam, the extraction of adipose clipped non-CWT spring Chinook may include 61 Chiwawa spring Chinook, representing just 1.4% of the projected 4,411 returning Chiwawa hatchery origin spring Chinook. Based on the USFWS estimates of projected LNFH strays arriving at Tumwater Dam in 2009 (USFWS 2009), the extraction action is expected to remove an estimated 89 LNFH stays, representing 54% of the total stray estimate. With reduced rates of CWT marking at LNFH (in upcoming return years) the USFWS forecasts that the rate of extraction of LNFH strays at Tumwater will increase to 68% in 2010, 75% in 2011, and 80% in 2011. As long as CWT marking rates remain at the current USFWS goal of 17%, the extraction rate of LNFH strays at Tumwater Dam will remain greater than 80% for 2012 and beyond. Logistics for 2009 extraction activities will be coordinated between USFWS, WDFW and CPUD.

Broodstock collection at the Chiwawa Weir will begin 01 June and terminate no later than 10 September. Spring Chinook trapping at the Chiwawa Weir will follow a 4-days up and 3-days down schedule, consistent with weekly broodstock collection quotas that approximate the historical run timing and a maximum 33 percent retention of the projected natural-origin escapement to the Chiwawa River. If the weekly quota is attained prior to the end of the 4-day trapping period, trapping will cease. If the weekly quota is not attained within the 4- day trapping period, the shortfall will carry forward to the next week.

All bull trout and spring Chinook in excess of broodstock needs trapped at the Chiwawa weir will be transported by tank truck and released into a resting/recovery pool at least 1.0 km upstream from the Chiwawa River Weir.

Steelhead
The steelhead mitigation program in the Wenatchee Basin use broodstock collections at Dryden and Tumwater dams located on the Wenatchee River. Per ESA section 10 Permit 1395 provisions, broodstock collection will target 50% natural origin fish and 50% hatchery origin fish, not to exceed 33% of the natural origin steelhead return to the Wenatchee Basin. Based on these limitations and the assumptions listed below (Table 11), the following broodstock collection protocol was developed.

WDFW will retain 208 mixed origin steelhead at Dryden and Tumwater dams, including 104 natural origin and 104 hatchery origin steelhead. Collection will be proportional to return timing between 01 July and 12 November. Collection may also occur between 13 November and 3 December at both traps, concurrent with the Yakama Nation coho broodstock collection activities. Hatchery x hatchery parental cross and unknown hatchery parental cross adults will be excluded from the broodstock collection. Hatchery steelhead parental origins will be determined through evaluation of VIE tags and PIT tag interrogation during collection. Adult return composition including number, origin, age structure, and sex ratio will be assessed in-season at Priest Rapids and at Dryden Dam. Broodstock collection adjustments may be made based on these in-season monitoring and evaluation.

In the event that steelhead collections fall substantially behind schedule, WDFW may initiate/coordinated adult steelhead collection in the mainstem Wenatchee River by hook and line. In addition to trapping and hook and line collection efforts, Tumwater and Dryden dams may be operated between February and early April to supplement broodstock numbers if the fall trapping effort provides fewer than 208 adults.

Table 11. Assumptions and calculations to determine number and origin of adult steelhead needed for Wenatchee Basin Steelhead program release of 400,000 smolts.		
Program Assumption	**Standard**	**Wenatchee program**
Smolt release		**400,000**
Fertilization-to-release survival	75%	
Eggtake Target		**533,333**
Fecundity	5,400	
Female target		**99**
Female to male ratio	1 to 1	
broodstock target		**198**
Pre-spawn survival	95%	
Total broodstock collection		**208**
Natural : hatchery ratio	1 to 1	
Natural origin collection total		**104**
Hatchery origin collection total		**104**

Summer/fall Chinook

Summer/fall Chinook mitigation programs in the Wenatchee River Basin utilize adult broodstock collections at Dryden and Tumwater dams, incubation/rearing at Eastbank Fish Hatchery (FH) and acclimation/release from the Dryden Acclimation Pond. The total production level target is 864,000 smolts.

The TAC 2009 Columbia River UCR summer Chinook return projection to the Columbia River (Appendix A) and BY 2005, 2006 and 2007 spawn escapement to the Wenatchee River indicate sufficient summer Chinook will return to the Wenatchee River to achieve full broodstock collection for the Wenatchee River summer Chinook supplementation program. Review of recent summer/fall Chinook run-timing past Dryden and Tumwater dam indicates that previous broodstock collection activities have omitted the early returning summer/fall Chinook, primarily due to limitations imposed by ESA Section 10 Permit 1347 to minimize impacts to listed spring Chinook. In an effort to incorporate broodstock that better represent the summer/fall Chinook run timing in the Wenatchee Basin, the broodstock collection will front-load the collection to account for the disproportionate collection timing. Approximately 43 percent of the summer/fall Chinook passage to the upper Basin occurs prior to the end of the first week of July; therefore, the collection will provide 43 percent of the objective by the end of the first week of July. Weekly collection after the first week of July will be consistent with run timing of summer/fall Chinook during the remainder of the trapping period. Collections will be limited to a 33 percent extraction of the estimated natural-origin escapement to the Wenatchee Basin. Based on these limitations and the assumptions listed below (Table 12), the following broodstock collection protocol was developed.

WDFW will retain 492 natural-origin, summer Chinook at Dryden and Tumwater dams, including 246 females. To better assure achieving the appropriate females equivalents for programmed production, the collection will utilize ultra-sound equipment to determine the sex of each fish retained for broodstock. Trapping at Dryden Dam will begin 01 July and terminate no later than 14 September and operate up to 7-days/week, 24-hours/day. Trapping at Tumwater Dam may begin 15 July and terminate no later than 14 September and operate 3-days/week, 8-hours/day.

If the probability of achieving the broodstock goal is reduced, based on the estimated escapement levels, broodstock composition will be adjusted to meet the broodstock collection objective of 492 summer Chinook.

Table 9. Assumptions and calculations to determine number of summer Chinook broodstock needed for Wenatchee Basin program release of 864,000 smolts.

Program Assumption	Standard	Wenatchee program
Smolt release		**864,000**
Fertilization-to-release survival	78%	
Eggtake Target		**1,107,692**
Fecundity	5,000	
Female target		**222**
Female to male ratio	1 to 1	
broodstock target		**443**
Pre-spawn survival	90%	
Total broodstock collection		**492**

Sockeye

Sockeye Salmon mitigation in the Wenatchee River Basin utilizes adult broodstock collections at Tumwater Dam, incubation/rearing at Eastbank Fish Hatchery (FH) and rearing/pre-smolt releases from the net pens in Lake Wenatchee. The total production level for the 2009 BY is 200,000 pre-smolts. 1/

The TAC 2009 UCR sockeye return projection to Columbia River (Appendix A) indicates sufficient Lake Wenatchee sockeye will be available to meet broodstock collection objectives. Based on TAC projected return, 100% natural-origin broodstock composition and assumptions listed below (Table 13), the following broodstock collection protocol was developed.

WDFW will retain 260 natural origin sockeye, proportional to run timing at Tumwater Dam. Due to the unequal sex ratio in previous years, attempts will be made to collect an equal number of males and females. Trapping may begin on 15 July and terminate by 15 August. Trapping will occur no more than 3-days/week, 8- hours/day.

1/- Chelan HCP Hatchery Committee has agreed to future production level of 280,000 fish, pending appropriate infrastructure improvements.

Table 13. Assumptions and calculations to determine number of sockeye salmon broodstock needed for Wenatchee Basin program release of 200,000 pre-smolts.		
Program Assumption	**Standard**	**Wenatchee program**
Smolt release		**200,000**
Fertilization-to-release survival	78%	
Eggtake Target		**256,410**
Fecundity	2,615	
Female target		**99**
Female to male ratio	1 to 1	
broodstock target		**198**
Pre-spawn survival	76%	
Total broodstock collection		**260**

Coho
Yakama Nation will provide broodstock collection objectives and program assumptions for the coho reintroduction program in the Wenatchee River basin. WDFW will work collaboratively with the Yakama Nation to facilitate coho broodstock collections at Dryden and Tumwater Dam.

White River Spring Chinook Captive Brood

Smolt production associated with the White River Captive Broodstock Program (150,000 smolts) will be separate from the smolt production objective associated with the Chiwawa River adult supplementation program. Spawning, incubation, rearing acclimation and release will be consistent with provisions of ESA Permit 1592.

Broodstock collection efforts for brood year 2009 will be addressed in a document separate from this 2009 broodstock collection/protocol document and developed through the Priest Rapids Coordinating Committee Hatchery Committee (PRCC HC).

Priest Rapids Fall Chinook
Collection of fall Chinook broodstock at Priest Rapids Hatchery will generally begin in early September and continue through mid November. Smolt release objectives specific to Grant PUD (5,000,000 sub-yearlings) and Federal (1,700,000 sub-yearlings) mitigation commitments and biological assumptions are detailed in Table 14.

Agreements are in place and/or being negotiated that would allow Priest Rapids to take up to 3.7M eyed eggs for the Ringold Springs Rearing Facility. Us V Oregon parties recently agreed that the brood stock used for the program at Ringold should be Priest Rapids stock. This was also a key recommendation by HSRG. This program is partial mitigation for the John Day Dam and will be funded by the ACOE if implemented. Upon negotiated agreement among the effected parties for the additional egg collection for Ringold Springs Rearing Facility, the broodstock collection total will be adjusted accordingly.

Table 14. Assumptions and calculations to determine the number of fall Chinook broodstock needed for the Priest Rapids program release of 6,700,000 sub-yearling fall Chinook

Biological Assumptions	Standard	Program Objective
Smolt Production level:		
Grant PUD Mitigation-PUD Funded		**5,000,000**
John Day Mitigation- Federally Funded		**1,700,000**
Fert.-to-release survival	87%	
Eggtake Target		**7,700,000**
Fecundity	*4,500*	
Female requirement		**1,711**
Sex ratio	*1:1*	
Pre-Spawn Survival	*88%*	
Broodstock Required		**3,888**

Reference

Snow et al. 2007. Snow, C., c. Frady, A. Fowler, A. Murdoch, M. Small, K. Warheit, and C. Dean. Monitoring and evaluation of the Wells and Methow programs in 2006. Prepared for Douglas County Public Utility District and Wells Habitat Conservation Plan Hatchery Committee. Washington Dept. of Fish and Wildlife, Supplementation Research Office, Twisp, WA., and Washington Dept. Fish and Wildlife, Conservation Unit, Genetics Lab, Olympia, WA.

USFWS 2009. Hatchery and Genetics Management Plan (HGMP), Leavenworth National Fish Hatchery. U.S. Fish and Wildlife Service, Leavenworth, WA.

Appendix E-10

Comprehensive List of the Plant Species Occurring in the Wells Project

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Appendix E-10
Comprehensive List of the Plant Species Occurring in the Wells Project

Common Name	Scientific Name
Alfalfa	*Medicago sativa*
Alfalfa	*Medicago sp.*
Alkali bluegrass	*Poa juncifolia*
Alkali buttercup	*Ranunculus cymbalaria*
American speedwell	*Veronica americana*
American vetch	*Vicia americana*
American water horehound	*Lycopus americanus*
Annual agoseris	*Agoseris heterophylla*
Annual fescue	*Vulpia myuro*
Annual hairgrass	*Deschampsia danthonioides*
Antelope bitterbrush	*Purshia tridentata*
Arrowleaf balsamroot	*Balsamorhiza sagittata*
Arrowleaf buckwheat	*Eriogonum cf. compositum*
Atkinson's tickseed	*Coreopsis atkinsoniana*
Babysbreath gypsophila	*Gypsophila paniculata*
Balkan catchfly	*Silene cserei*
Ballhead sandwort	*Arenaria congest ssp. prolifera*
Baltic rush	*Juncus balticus var. balticus*
Barestem biscuitroot	*Lomatium nudicaule*
Basin cryptantha	*Cryptantha ambigua*
Basin wildrye	*Elymus cinereus*
Basin wildrye	*Leymus cinereus*
Bastard toadflax	*Comandra umbellata*
Bay forget-me-not	*Myosotis laxa*
Bearded flatsedge	*Cyperus aristatus*
Bearded hawksbeard	*Crepis atrabarba*
Bebb willow	*Salix bebbiana*
Bebb's sedge	*Carex bebbii*
Bedstraw	*Galium sp.*
Big sagebrush	*Artemisia tridentata*
Bigbract verbena	*Verbena bracteata*
Bigleaf sedge	*Carex cf. amplifolia*
Bigseed biscuitroot	*Lomatium macrocarpum*
Birdfoot deervetch	*Lotus corniculatus*
Black cottonwood	*Populus balsamifera ssp. trichocarpa*
Black hawthorn	*Crataegus columbiana*
Black hawthorn	*Crataegus douglasii*
Black locust	*Robinia pseudo-acacia*
Blackfoot River evening-primrose	*Camissonia andina*
Blister sedge	*Carex vesicaria*
Blue elderberry	*Sambucus caerulea*
Blue lettuce	*Lactuca pulchella*
Blue mountain buckwheat	*Eriogonum strictum*
Blue wildrye	*Elymus glaucus*
Bluebunch wheatgrass	*Pseudoroegneria spicata*
Bluntleaf yellowcress	*Rorippa obtusa*
Bottlebrush sedge	*Carex hystericina*
Bouncingbet	*Saponaria officinalis*
Boxelder	*Acer negundo*
Bristly fiddleneck	*Amsinckia tessellata*
Brittle pricklypear	*Opuntia fragilis*
Narrowleaf cattail	*Typha angustifolia*
Broadleaved pepperweed	*Lepidium latifolium*
Bulbous bluegrass	*Poa bulbosa*
Bull thistle	*Cirsium vulgare*
Bush penstemon	*Penstemon fruticosis*
Buttecandle	*Cryptantha celosioides*
Califonia false hellborn	*Verathrum californicum*
California brome	*Bromus carinatus*
Canada bluegrass	*Poa compressa*
Canada goldenrod	*Solidago canadensis*
Canada thistle	*Cirsium arvense*
Canada wildrye	*Elymus canadensis*
Canadian horseweed	*Conyza canadensis*
Canadian waterweed	*Elodea canadensis*
Catnip	*Nepeta cataria*
Chaffweed	*Centunculus minimus*
Chairmaker's bulrush	*Scirpus americanus*
Cheatgrass	*Bromus tectorum*
Chelan penstemon	*Penstemon pruinosus*
Chokecherry	*Prunus virginiana*
Clammy hedgehyssop	*Gratiola neglecta*
Clasping pepperweed	*Lepidium perfoliatum*
Climbing nightshade	*Solanum dulcamara*
Clustered broomrape	*Orobanche fasciculata*
Clustered field sedge	*Carex praegracilis*
Colonial bentgrass	*Agrostis tenuis*
Common dandelion	*Taraxacum officinale*
Common gaillardia	*Gaillardia aristida*
Common horsetail	*Equisetum hymale*
Common ladyfern	*Athyrium filix-femina*
Common mullein	*Verbascum thapsus*
Common pepperweed	*Lepidium densiflorum*
Common plantain	*Plantago major*
Common rush	*Juncus effusus*
Common Selfheal	*Prunella vulgaris*
Common sheep sorrel	*Rumex acetosella*
Common sneezeweed	*Helenium autumnale*
Common snowberry	*Symphoricarpos albus*
Common spikerush	*Eleocharis palustris*
Common St. Johnswort	*Hypericum perforatum*
Common sunflower	*Helianthus annuus*
Common tansy	*Tanacetum vulgare*
Common wooly sunflower	*Eriophyllum lanatum*
Common yarrow	*Achillea millefolium*
Coon's tail	*Ceratophyllum demersum*
Corn gromwell	*Lithospermum arvense*
Cosmopolitan bulrush	*Scirpus maritimus*
Cotton's stickseed	*Hackelia diffusa v. cottonii*
Creeping buttercup	*Ranunculus repens*
Crested wheatgrass	*Agropyron cristatum spp. pectinatum*
Crossflower	*Chorispora tenella*
Cupped stickseed	*Lappula redowskii*
Curly dock	*Rumex crispus*
Curly pondweed	*Potamogeton crispus*
Cushion cryptantha	*Cryptantha circumcissa*
Cusick's bluegrass	*Poa cusickii*
Cusick's shootingstar	*Dodecatheon cusickii*
Cusock's rockcress	*Arabis cusickii*
Cutleaf beardtongue	*Penstemon richardsonii*
Cutleaf nightshade	*Solanum triflorum*
Cut-leaf waterhorehound	*Lycopus uniflorus*

Common Name	Scientific Name
Cutleaf waterparsnip	*Berula erecta*
Dalmatian toadflax	*Linaria dalmatica*
Desert yellow fleabane	*Erigeron linearis*
Diffuse collomia	*Collamia tenella*
Diffuse knapweed	*Centaurea diffusa*
Douglas' dustymaiden	*Chaenactis douglasii*
Douglas fir	*Pseudotsuga menziesii*
Douglas' knotweed	*Polygonum douglasii*
Douglas maple/Rocky Mountain maple	*Acer glabrum*
Douglas' sagewort	*Artemisia douglasiana*
Douglas' sedge	*Carex douglasii*
Eastern cottonwood	*Populus deltoides*
European centaury	*Centaurium cf. umbellatum*
Feathery false lilly of the valley	*Maianthemum racemosum*
Fendler threeawn	*Aristida longiseta*
Fernleaf biscuitroot	*Lomatium dissectum*
Fescue	*Vulpia sp.*
Field bindweed	*Convolvulus arvensis*
Field horsetail	*Equisetum arvense*
Field pennycress	*Thlaspi arvense*
Field sagewort	*Artemisia campestris var. scouleriana*
Fireweed	*Epilobium angustifolium*
Flatspine burr ragweed	*Ambrosia acanthicarpa*
Fowl mannagrass	*Glyceria elata*
Fowl mannagrass	*Glyceria striata*
Fox sedge	*Carex vulpinoidea*
Foxtail barley	*Hordeum jubatum*
Fringed loosestrife	*Lysimachia ciliata*
Fringed orchid	*Platanthera sp.*
Fringed willowherb	*Epilobium ciliatum*
Fuzzytongue penstemon	*penstemon eriantherus var. eriantherus*
Gairdner's penstemon	*Penstemon gairdneri*
Garden asparagus	*Asparagus officinalis*
Gardner's yampah	*Perideridia gairdneri*
Geyer's biscuitroot	*Lomatium geyeri*
Giant red Indian paintbrush	*Castilleja miniata*
Goldenrod	*Solidago "young"*
Golden sedge	*Carex aurea*
Grand collomia	*Collomia grandiflora*
Granite prickly phlox	*Leptodactylon pungens*
Gray alder	*Alnus incana*
Gray rabbitbrush	*Ericameria nauseosa*
Gray's biscuitroot	*Lomatium grayi*
Green rabbitbrush	*Chrysothamnus viscidiflorus*
Hairy brome	*Bromus ramosus*
Hairy false goldenaster	*Chrysopsis villosa var. villosa*
Hairy false goldenaster	*Heterotheca villosa*
Hairy purslane speedwell	*Veronica peregrina var. xalapense*
Hairy whitetop	*Cardaria pubescens*
Hardstem bulrush	*Scirpus acutus*
herb sophia	*Descurainia sophia*
Himalayan blackberry	*Rubus discolor*
Hoary tansyaster	*Machaeranthera canescens*
Holboell's rockcress	*Arabis holboellii*
Hollyleaved barberry	*Berberis aquifolium*
Honeysuckle	*Lonicera (common shrub)*
Idaho fescue	*Festuca idahoensis*

Common Name	Scientific Name
Indian ricegrass	*Oryzopsis hymenoides*
Indianhemp	*Apocynum cannabinum*
Inland sedge	*Carex interior*
Japanese brome	*Bromus japonicus*
Japanese knotweed	*Polygonum cuspidatum*
Jessica stickweed	*Hackelia micrantha*
Jointleaf rush	*Juncus articulatus*
Kentucky bluegrass	*Poa pratensis*
Knotsheath sedge	*Carex retrorsa*
Knotted rush	*Juncus nodosus*
Lakeshore sedge	*Carex lenticularis*
Largeflower triteleia	*Brodiaea douglasii*
Largeleaf avens	*Geum macrophyllum*
Leafy spurge	*Euphorbia esula*
Lenspod whitetop	*Cardaria chalapensis*
Lewis' mock orange	*Philadelphus lewisii*
Limestone hawksbeard	*Crepis intermedia*
Little bluestem	*Schizachyrium scoparium*
Little green sedge	*Carex oederi*
Little western bittercress	*Cardamine oligosperma*
Longleaf fleabane	*Erigeron corymbosus*
Longleaf phlox	*Phlox longifolia*
Longspur lupine	*Lupinus arbustus*
Long-styled rush	*Juncus longistylis*
Low phacelia	*Phacelia humilis*
Low pussytoes	*Antennaria dimorpha*
Lupine spp.	*Lupinus spp.*
Lyall's angelica	*Angelica arguta*
Lyall's mariposa lily	*Calochortus lyallii*
Maiden blue eyed Mary	*Collinsia parviflora*
Marsh skullcap	*Scutellaria galericulata*
Marsh spikerush	*Eleocharis palustris*
Meadow deathcamas	*Zigadenus venenosus*
Meadow ryegrass	*Festuca pratensis*
Menzies' campion	*Silene menziesii*
Mexican-fireweed	*Kochia scoparia*
Miner's lettuce	*Claytonia perfoliata*
Mountain monardella	*Monardella odoratissima*
Multiflora rose	*Rosa multiflora*
Narrow mock goldenweed	*Nestotus stenophyllus*
Narrowflower flaxflower	*Leptodactylon liniforus*
Narrowleaf goosefoot	*Chenopodium leptophyllums*
Narrowleaf plantain	*Plantago lanceolata*
Narrowleaf skullcap	*Scutellaria angustifolia*
Narrowleaf willow	*Salix exigua*
Narrowleaf wirelettuce	*Stephanomeria tenuifolia*
Nebraska sedge	*Carex nebrascensis*
Needle and thread	*Stipa comata*
Needle spikerush	*Eleocharis acicularis*
Nightflowering silene	*Silene noctiflora*
Nineleaf biscuitroot	*Lomatium triternatum*
Nodding begartick	*Bidens cernua*
Nootka rose	*Rosa nutkana*
Northern bog violet	*Viola nephrophylla*
Northern green orchid	*Platanthera hyperborea*
Northern wormwood	*Artemisia campestris var. scouleriana*
Northern sweetgrass	*Hierochloe odorata*
Norway maple	*Acer platanoides*
Oceanspray	*Holodiscus discolor*
Okanogan stickseed	*Hackelia ciliata*
Old man's whiskers	*Geum triflorum*
Oneflower helianthella	*Helianthella uniflora*

Common Name	Scientific Name
Onespike danthonia	*Danthonia unispicata*
Orchardgrass	*Dactylis glomerata*
Oregon ash	*Fraxinus latifolia*
Oregon cliff fern	*Woodsia oregana*
Ovate spikerush	*Eleocharis ovata*
Owyhee mudwort	*Limosella acaulis*
Oxeye daisy	*Chrysanthemum leucanthemum*
Pacific popcornflower	*Plagiobothrys tenellus*
Pacific willow	*Salix lucida ssp. lasiandra*
Pale agoseris	*Agoseris glauca*
Pale evening-primrose	*Oenothera pallida*
Panicled bulrush	*Scirpus microcarpus*
Parsnipflower buckwheat	*Eriogonum heracleoides*
Perennial pepperweed	*Lepidium latifolium*
Philadelphia fleabane	*Erigeron philadelphicus*
Poison ivy	*Rhus radicans*
Ponderosa pine	*Pinus ponderosa*
Popcornflower spp.	*Plagiobothrys spp.*
Poverty rush	*Juncus tenuis*
Prairie junegrass	*Koeleria cristata*
Prickly lettuce	*Lactuca serriola*
Prickly Russian thistle	*Solsola tragus*
Prostrate knotweed	*Polygonum aviculare*
Purple Loosestrife	*Lythrum salicaria*
Purple Sage	*Salvia dorrii*
Quackgrass	*Elymus repens*
Quaking aspen	*Populus tremuloides*
Red clover	*Trifolium pratense*
Red fescue	*Festuca rubra*
Red sandspurry	*Spergularia rubra*
Red-osier dogwood	*Cornus sericea*
Redtop	*Agrostis alba*
Reed canarygrass	*Phalaris arundinacea*
Rice cutgrass	*Leersia oryzoides*
Rocky Mountain iris	*Iris missouriensis*
Rocky Mountain juniper	*Juniperus scopulorum*
Rosy gilia	*Gilia sinuata*
Rosy pussytoes	*antennaria microphylla*
Rough bugleweed	*Lycopus asper*
Rough cockleburr	*Xanthium strumarium*
Roundleaf alumroot	*Heuchera cylindrica*
Royal penstemon	*Penstemon speciosus*
Rubber rabbitbrush	*Chrysothamnus nauseosus*
Ruch skeletonweed	*Lygodesmia juncea*
Rush spp.	*Juncus spp.*
Russian knapweed	*Centaurea repens*
Russian olive	*Elaeagnus angustifolia*
Russian thistle	*Salsola kali*
Sagebrush buttercup	*Ranunculus glaberrimus*
Sagebrush false dandelion	*Nothocalais troximoides*
Sagebrush mariposa lily	*Calochortus macrocarpus*
Sagebrush stickseed	*Hackelia arida*
Sagebrush violet	*Viola vallicola*
Sand dropseed	*Sporobolus cryptandrus*
Sandberg bluegrass	*Poa juncifolia*
Sandberg bluegrass	*Poa secunda*
Sanddune wallflower	*Erysimum asperum*
Saskatoon serviceberry	*Amelanchier alnifolia*
Scabland penstemon	*Penstemon deustus var. d.*
Scarlet gilia	*Gilia aggregata*
Scarlet gilia	*Ipomopsis aggregata*
Scouler's popcornflower	*Plagiobothrys scouleri*

Common Name	Scientific Name
Scouringrush horsetail	*Equisetum hyemale*
Scratchgrass	*Muhlenbergia asperifolia*
Scribner's rosette grass	*Panicum scribnerianum*
Seabluff catchfly	*Silene douglasii var. d.*
Sedge spp.	*Carex spp.*
Seep monkeyflower	*Mimulus guttatus*
Shaggy fleabane	*Erigeron pumilus*
Shortbeak sedge	*Carex brevior*
Showy milkweed	*Asclepias speciosa*
Showy phlox	*Phlox speciosa*
Siberian elm	*Ulmus pumila*
Silky lupine	*Lupinus sericeus var. serieus*
Silver maple	*Acer saccharinum*
Silverleaf phacelia	*Phacelia hastata*
Silverweed cinquefoil	*Potentilla anserina*
Sitka alder	*Alnus sinuata*
Slender cinquefoil	*Potentilla gracilis*
Slender flatsedge	*Cyperus bipartitus*
Slender hawksbeard	*Crepis barbigera*
Slender mountain sandwort	*Arenaria capillaris*
Slender phlox	*Microsteris gracilis*
Slenderbeak sedge	*Carex athrostachya*
Small bluebells	*Lithospermum longiflora*
Small enchanter's nightshade	*Circaea alpine*
Small fescue	*Vulpia microstachys*
Smallflower woodland-star	*Lithophragma parviflora*
Smallwing sedge	*Carex microptera*
Smooth brome	*Bromus inermis var. inermis*
Smooth sumac	*Rhus glabra*
Smoothstem blazingstar	*Mentzelia laevicaulis*
Snow buckwheat	*Eriogonum niveum*
Soft brome	*Bromus hordeaceus*
Soft lupine	*Lupinus sulphureus var. subsaccatus*
Softstem bulrush	*Schoenoplectus*
Spearleaf stonecrop	*Sedum lanceolatum*
Spearmint	*Mentha spicata*
Spike watermilfoil	*Myriophyllum spicatum*
Spiny sowthistle	*Sonchus asper*
spotted knapweed	*Centaurea stoebe*
Spreading dogbane	*Apocynum androsaemifolium*
Spreading fleabane	*Erigeron divergens*
Spreading phlox	*Phlox diffusa*
Spring draba	*Draba verna*
Spurless touch-me-not	*Impatiens ecalcarata*
Squirreltail	*Elymus elymoides*
Starry false lily of the valley	*Maianthemum stellatum*
Sticky cinquefoil	*Potentilla glandulosa*
Sticky purple geranium	*Geranoum viscosissimum*
Stickystem penstemon	*Penstemon glandulosus v. chelanensis*
Stickywilly	*Galium aparine*
Stiff sagebrush	*Artemisia rigida*
Stinging nettle	*Urtica dioica*
Stonecrop spp.	*Sedum spp.*
Stream orchid	*Epipactis gigantea*
Streambank wheatgrass	*Agropyron dasystachyum*
Suckling clover	*Trifolium dubium*
Sulphur lupine	*Lupinus sulphureus var. sylfhureus*
Swamp verbena	*Verbena hastata*
Sweetcicely	*Osmorhiza berteroi*
Tall annual willowherb	*Epilobium brachycarpum*

Common Name	Scientific Name
Tall fescue	*Festuca arundinacea*
Tall tumblemustard	*Sisymbrium altissimum*
Tall Western groundsel	*Senecio integerrimus*
Tall wheatgrass	*Thinopyrum ponticum*
Tall woolly buckwheat	*Eriogonum elatum*
Tansy ragwort	*Senecio jacobaea*
Tapertip onion	*Allium acuminatum*
Tarragon	*Artemisia dracunculus*
Tarweed fiddleneck	*Amsinckia lycopsoides*
Thimbleberry	*Rubus parviflorus*
Thompson's clover	*Trifolium thompsonii*
Thompson's cryptantha	*Cryptantha thompsonii*
Thompson's Indian paintbrush	*Castilleja thompsonii*
Threadleaf fleabane	*Erigeron filifolius*
Threadleaf phacelia	*Phacelia linearis*
Threepetal bedstraw	*Gilium trifidum*
Threetip sagebrush	*Artemisia tripartita*
Thurber's needlegrass	*Stipa thurberiana*
Thymeleaf buckwheat	*Eriogonum thymoides*
Thymeleaf sandwort	*Arenaria serpyllifolia*
Timothy	*Phleum pratense*
Tiny trumpet	*Collomia linearis*
Toad rush	*Juncus bufonius*
Torrey's rush	*Juncus torreyi*
Tree of heaven	*Ailanthus altissima*
Trident maple	*Acer tridentata*
Tufted loosestrife	*Lysimachia thyrsiflora*
Turpentine wavewing	*Cymopteris terebinthinus*
Twolobe larkspur	*Delphinium nuttallianum*
Vanilla grass	*Hierochloe odorata*
Veiny dock	*Rumex venosus*
Velvet lupine	*Lupinus leucophyllus*
Virginia creeper	*Parthenocissus quinquefolia*
Water birch	*Betula occidentalis var. o.*
Water knotweed	*Polygonum amphibium*
Water mint	*Mentha piperita*
Water mudwort	*Limosella aquatica*
Water pygmyweed	*Crassula aquatica*

Common Name	Scientific Name
Wavyleaf thistle	*Cirsium undulatum*
Wax currant	*Ribes cereum*
Weeping willow	*Salix babylonica*
Weevil prairie-dandelion	*Microseris troximoides*
Western blue virginsbower	*Clematis occidentalis*
Western goldenrod	*Solidago occidentalis*
Western meadow-rue	*Thalictrum occidentale*
Western needlegrass	*Stipa occidentalis*
Western panicgrass	*Panicum occidentale*
Western pearly everlasting	*Anaphalis margaritacea*
Western tansymustard	*Descurainia pinnata*
Western water hemlock	*Cicuta douglasii*
Western white clematis	*Clematis ligusticifolia*
Wheat sedge	*Carex atherodes*
White clover	*Trifolium repens*
White cottonwood	*Populus fremontii*
White mulberry	*Morus alba*
White poplar	*Populus alba*
White sagebrush	*Artemisia ludoviciana*
White sweetclover	*Melilotus alba*
Whitebark raspberry	*Rubus leucodermis*
Whitestem blazingstar	*Mentzelia albicaulis*
White-stemmed frasera	*Frasera albicaulis*
Wholeleaf saxifrage	*Saxifraga integrifolia*
Wild chives	*Allium schoenoprasum*
Wild mint	*Mentha arvensis*
Willow spp.	*Salix spp.*
Wine grape	*Vitis vinifera*
Wingnut cryptantha	*Cryptantha pterocarya*
Winter vetch	*Vicia villosa*
Woods' rose	*Rosa woodsii*
Wooly sedge	*Carex lanuginosa*
Woolypod milkvetch	*Astragalus purshii*
Wyeth biscuitroot	*Lomatium ambiguum*
Yellow flag	*Iris pseudacorus*
Yellow fritillary	*Fritillaria pudica*
Yellow owl's-clover	*Orthocarpus luteus*
Yellow salsify	*Tragopogon dubius*

Appendix E-11

WDFW Off-License Settlement

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OFF-LICENSE SETTLEMENT AGREEMENT

Resident Fish Stocking and Wells Wildlife Area Funding

An Agreement Between the Washington State Department of Fish and Wildlife and the Public Utility District No. 1 of Douglas County

Wells Hydroelectric Project
FERC Project No. 2149

December 10, 2007

WDFW signed 12/11/07

OFF-LICENSE SETTLEMENT AGREEMENT
Resident Fish Stocking and Wells Wildlife Area Funding

This AGREEMENT is entered into between the Public Utility District No. 1 of Douglas County, Washington (Douglas), a municipal corporation, and the State of Washington, Department of Fish and Wildlife (WDFW). Douglas and WDFW may be referred to herein collectively as the "Parties" and individually as "Party."

RECITALS

1. Douglas is the initial licensee and current operator of the Wells Hydroelectric Project (FERC Project No. 2149). The original FERC license for the Wells Project expires on May 31, 2012. Douglas has commenced the process to apply for a new FERC license.

2. WDFW (at the time Washington Department of Game and Washington Department of Fisheries) participated in the initial licensing proceeding for the Wells Project. WDFW was involved in the assessment of project impacts to recreational fisheries and to wildlife habitat.

3. On July 15, 1974, WDFW and Douglas entered into a wildlife mitigation agreement (1974 Agreement) as a result of a FERC hearing involving wildlife mitigation for the Wells Hydroelectric Project. The 1974 Agreement required Douglas to transfer, in fee title, 5,715.8 acres of land to WDFW and to provide a lump sum payment of $1,250,000 to establish the Wells Wildlife Area. The money was deposited by WDFW into a Special Wildlife Fund. The fund has paid for the operation of Wells Wildlife Area since that time. On July 19, 1994, WDFW determined that the fund did not contain adequate monies to ensure the continued operation of the Wells Wildlife Area through the term of the Wells Project license. To ensure continued operation of the Wells Wildlife Area, Douglas and WDFW entered into a Memorandum of Agreement in which Douglas provided "Supplemental" funding to WDFW to augment the income from the Special Wildlife Fund.

4. The Wells Wildlife Area is located in Douglas and Okanogan counties of Washington State and consists of six units -- three shoreline/riparian units and three upland units. Bridgeport Bar (502 acres), Okanogan (100 acres) and Washburn Island (261 acres) are located along the shoreline of the Wells Reservoir and a portion of each unit lies within the Project Boundary. West Foster Creek (1,025 acres), Central Ferry (1,602 acres) and Indian Dan Canyon (4,716 acres) are upland units and are entirely outside the Wells Project Boundary. WDFW leases 1,550 acres of land from the Washington Department of Natural Resources. Management of the DNR land and 180 acres of Bureau of Land Management land located within the Indian Dan Unit boundary will be funded through this Agreement.

5. The Cassimer Bar Wildlife Area is owned by Douglas but jointly managed by the Confederated Tribes of the Colville Reservation and Douglas for the benefit of wildlife at the confluence of the Okanogan and Columbia rivers and is excluded from this agreement.

6. The original management goal for the Wells Wildlife Area was to enhance and manage upland game habitat and release upland birds for public hunting. The goal of the program was broadened, after the pheasant release program ended, to include the development of winter and migratory waterfowl food plots and to further enhance upland bird habitat. The goal of the program was also expanded to include the enhancement of native riparian, wetland and shrub steppe habitat to support native wildlife species diversity on Wells Wildlife Area lands both within and adjacent to the Wells Project. WDFW and Douglas agree that the habitat enhancement on the Wells Wildlife Area has successfully achieved the mitigation goals of the 1974 Agreement.

7. Douglas has provided WDFW the opportunity to raise 20,000 pounds of rainbow trout and up to 75,000 summer/fall Chinook fry at the Wells Hatchery. The rainbow trout have been planted in lakes in Douglas and Okanogan counties to provide recreational fishing opportunities in the Project area. The Chinook fry have been planted in a tributary to Lake Chelan to also provide recreational fishing opportunities.

8. In 2006, FERC issued a Policy Statement on Hydropower Relicensing Settlements that limits the ability of licensees to include certain ongoing measures outside of their respective project boundaries as conditions of a new operating license enforceable by FERC. The rainbow trout program, Chinook fry stocking and Wells Wildlife Area all have components of their respective programs that support activities that occur outside of the Wells Project Boundary. WDFW contends that the rainbow trout program and Wells Wildlife Area Funding programs are necessary to mitigate for ongoing impacts of the Wells Project during the term of the new operating license. Douglas contends that there are no ongoing impacts on Resident Fish, Wildlife Resources and their associated habitats related to the Project. Although Douglas and WDFW disagree regarding ongoing impacts to Resident Fish and Wildlife Resources and their associated habitats related to the Project, Douglas and WDFW would like to continue these programs during the term of the New Operating License. To ensure the continuation of these two programs, Douglas and WDFW have entered into this Agreement for the Wells Project outside of the FERC relicensing process. WDFW and Douglas will not seek FERC approval to continue these two programs. References to these programs will be included in the Final License Application that Douglas intends to file with FERC. FERC may or may not include these programs as conditions of the New Operating License. Douglas and WDFW intend that these programs be implemented pursuant to this Agreement to settle WDFW's contention with respect to ongoing impacts to Resident Fish,

Wildlife Resources and their associated habitats and to provide enhancements to Wildlife Resources, Resident Fish resources and their associated habitats through mutually agreed upon measures.

9. Although one of the purposes of this Agreement is to resolve any and all claims or assertions by WDFW relating to ongoing Project impacts on Wildlife Resources, Resident Fish and their associated habitats, by agreeing to fund the activities outlined in this Agreement, Douglas is not admitting that there are any ongoing impacts associated with the Wells Project.

10. At the time of execution of this Agreement, Douglas and WDFW recognize and appreciate the quality of wildlife habitat on Wells Wildlife Area lands as managed under the ongoing Wells Wildlife Area Funding Program. It is the intent of both Parties to continue to manage Wells Wildlife Area lands during the term of the New Operating License to maintain a comparable level of habitat function and quality on these lands. Therefore, both Parties agree it is their intent to continue to maintain a working relationship based on reliability and reasonableness in the pursuit of maintaining the level of habitat function and condition currently achieved on Wells Wildlife Area lands.

Now therefore, for and in consideration of the mutual covenants and agreements herein contained, it is agreed by and between the Parties hereto as follows:

1.0 DEFINITIONS

1.1 "CWA" refers to the Clean Water Act.

1.2 "FPA" refers to the Federal Power Act.

1.3 "HCP Plan Species" refers to those anadromous fish species covered by the HCP, including spring, summer/fall Chinook, steelhead, sockeye and coho.

1.4 "HCP" refers to the Wells Anadromous Fish Agreement and Habitat Conservation Plan.

1.5 "New Operating License" means the first long-term operating licenses for Project No. 2149 to be issued by the FERC to Douglas and any subsequent annual licenses that take effect after the expiration of the New Operating License.

1.6 "Original Operating License" means the original fifty (50) year operating license, as amended, for Project No. 2149 issued by the FERC with an expiration date of May 31, 2012 and any subsequent annual licenses that take effect after the expiration of the Original Operating License.

1.7 "RTE" means rare, threatened and endangered species, including aquatic, terrestrial or botanical species, listed as endangered, threatened and candidate species by the federal Endangered Species Act. RTE also includes species listed as endangered, threatened and sensitive by the Washington State Department of Fish and Wildlife and further includes threatened or endangered botanical species as defined by the Washington State Natural Heritage Program.

1.8 "Resident Fish" means all fish species residing within the Wells Reservoir except for those fish species covered by the Aquatic Settlement Management Plans (including the Bull Trout, Sturgeon and Pacific Lamprey plans), and the five species of anadromous salmonids covered by the HCP.

1.9 "Wildlife Resources" means all wildlife, wildlife habitat and botanical resources found within or affected by the Wells Project.

2.0 DURATION OF AGREEMENT

This Agreement shall become effective upon execution by both Parties, provided that Douglas's obligations in Section 5.1 shall commence June 1, 2012. This Agreement shall expire upon the expiration of the New Operating License.

This Agreement shall terminate (1) in the event that FERC does not issue a New Operating License to Douglas for the Wells Project or (2) on the expiration date of any New Operating License or (3) in the event that FERC issues a New Operating License to Douglas that is not accepted by Douglas or (4) in the event that the New Operating License is revoked or (5) in the event that WDFW and/or Douglas does not adhere to the provisions described in Section 5 (Obligations) following application of the Dispute Resolution process described in Section 6 (Dispute Resolution).

3.0 MODIFICATION OF AGREEMENT

This Agreement may be amended or modified only by written consent of both Parties.

4.0 SCOPE OF PROGRAMS

4.1 Trout Program

The goal of the Trout Program is to address WDFW's contentions with respect to ongoing Project impacts on Resident Fish, Resident Fish habitat and lost Resident Fish harvest during the term of the New Operating License (not including HCP Plan Species, white sturgeon, bull trout and Pacific lamprey), by enhancing Resident Fish resources within Okanogan and Douglas counties. The program will provide 20,000 pounds of rainbow trout equivalents to be stocked annually in Okanogan and Douglas Counties for the enhancement of recreational fishing harvest opportunities. The fish for this program will be raised at the Wells Fish Hatchery, provided sufficient hatchery capacity exists after HCP Plan Species hatchery needs are met, unless otherwise agreed. If the fish are raised somewhere other than at the Wells Fish Hatchery, both Parties must agree that fish quality and fish health status are equal to or better than fish raised at the Wells Fish Hatchery.

The Trout Program, to be implemented through this Agreement, shall be composed of similar numbers of fish at the various life-stages as the Rainbow Trout Program approved for implementation in 2007.

In 2007, the Wells Fish Hatchery was authorized to raise and release 125,000 fingerlings at 75 fpp (1,667 pounds), 35,000 catchable trout at 2 fpp (17,500 pounds) and 500 trout at 0.6 fpp (833 pounds). Modifications to the Trout Program, described above, can only be made following the annual coordination meetings between the Parties and only following mutual consent of both Parties to this Agreement.

Various life stages of trout can be raised and released provided that the aggregate weight does not exceed 20,000 pounds of rainbow trout equivalents and does not negatively impact production of HCP Plan Species. The following tasks will be implemented toward the fulfillment of the goals of the Trout Program:

4.1.1 Acquire sufficient eyed trout eggs from either a state, federal or private hatchery program (e.g., Ford Fish Hatchery, Columbia Basin Hatchery, Omak Hatchery, Trout Lodge, Columbia Fish Farms) to be reared toward fulfillment of the goals of this program;

4.1.2 The transportation and planting of these fish will be conducted by Wells Fish Hatchery staff including the use of planting trucks assigned to the Wells Hatchery and other adjacent hatcheries, when needed;

4.1.3 Notice of joint cooperation by WDFW and Douglas shall be posted at the lakes enhanced by this program. Douglas shall provide the materials and labor associated with posting this information.

4.2 Additional WDFW Trout

WDFW has requested access to the Wells Fish Hatchery to raise fish for the agency's own purposes beyond those required under this Agreement. These "Additional Fish" are not part of this Agreement and the funding and facilities required to raise these fish are not Douglas's responsibility. However, through this Agreement, Douglas agrees to consider WDFW's future request(s) to raise Additional Fish at the Wells Fish Hatchery during the annual Trout Program coordination meeting, on a year to year basis, provided that the following conditions are met prior to the initiation of each year's program:

4.2.1 Douglas has secured sufficient water rights for the Wells Fish Hatchery and for rearing WDFW's Additional Fish;

4.2.2 WDFW's Additional Fish will not change or in any way negatively affect the rearing of fish to meet Douglas's obligations at the Wells Fish Hatchery;

4.2.3 Douglas retains full ownership over any new permanent infrastructure sited, developed or installed within the boundary of the Wells Project, including the Wells Fish Hatchery;

4.2.4 WDFW's Additional Fish program will not impede Douglas from implementing various hatchery sharing and species trade agreements with other agencies;

4.2.5 WDFW has secured the applicable permits for the proposed program;

4.2.6 WDFW reimburses Douglas for all costs required to produce and transport WDFW's Additional Fish; and

4.2.7 WDFW will not hold Douglas responsible for any unforeseen circumstances that may result in the death of WDFW's Additional Fish prior to their release into state waters.

4.3 Wells Wildlife Area Program

The Wells Wildlife Area Program addresses WDFW's contentions regarding ongoing project impacts to Wildlife Resources by providing mitigation lands and funding to create, protect, maintain and enhance Wildlife Resources. The goal of the program is to create, protect and maintain wildlife habitat on the Wells Wildlife Area including habitat that WDFW and Douglas PUD developed during the implementation of the 1974 Agreement. For the duration of this Agreement, unless changes are approved in advance by both Parties, WDFW will implement the Wells Wildlife Area Program, including the following tasks:

4.3.1 Grow annual food crops on Bridgeport Bar and Washburn Island Units to benefit waterfowl and other wildlife;

4.3.2 Grow annual food crops and maintain feeders and water catchments on all units for upland game birds and other wildlife species;

4.3.3 Protect and maintain the riparian vegetation on all units to benefit riparian obligate species and maintain nesting habitat and cover for upland game birds, raptors and passerines;

4.3.4 Protect and maintain the ponds and wetland habitats on all units as habitat for amphibians and other wetland obligate species;

4.3.5 Protect and maintain riparian habitat on Indian Dan Canyon Unit used by Bald eagles (*Haliaeetus leucocephalus*) as a night roost to benefit wintering bald eagles;

4.3.6 Protect and maintain shrub steppe habitat on all units for upland game species, shrub steppe obligate species including sharp-tailed grouse (*Tympanuchus phasianellus*), greater sage grouse (*Centrocercus urophasianus*) and mule deer (*Odocoileus hemionus*);

4.3.7 Provide wildlife related recreation opportunities including hunting and wildlife observation on the wildlife area;

4.3.8 Control invasive weeds to protect and maintain habitat;

4.3.9 Maintain all boundary fencing to prevent livestock trespass. Build and replace boundary fences as needed;

4.3.10 WDFW will not lease any unit for livestock grazing or allow camping outside of parking areas on the wildlife area, in order to protect wildlife habitat;

4.3.11 Promote native vegetation where it is consistent with the goals of the program.

The Parties will annually review the program, and by mutual agreement may modify and expand any of the above tasks.

5.0 OBLIGATIONS

5.1 Douglas's Responsibilities

5.1.1 Trout Program

Douglas will provide funds necessary to produce and transport the fish described in Section 4.1 (Trout Program). Douglas will meet with WDFW in April of each year to establish the annual rearing goals of each year's Trout Program and to determine how best to meet the trout obligation. Approval of the annual Trout Program will take place prior to May 1st and in time for WDFW to modify the following year's planting schedule. If Douglas cannot raise all or part of the trout covered under the Trout Program at the Wells Fish Hatchery, then Douglas will purchase the remaining portion of the program per Section 4.1.

5.1.2 Wildlife Area Operation and Maintenance (O&M) Funding

Douglas will provide annual O&M funding for the Wells Wildlife Area Program as described in Section 4.3 (Wells Wildlife Area Program). Douglas will meet with WDFW by April 1 of each year to discuss the wildlife mitigation program, annual objectives and budget for the state fiscal year (July 1 to June 30). The annual budget, due by May 15, will include: salaries and benefits, goods and services, equipment repair and replacement, property taxes, fire protection contracts, land rental, training and travel. The Douglas Board of Commissioners will consider the budget before July 1. Upon approval of the yearly budget, Douglas will pay, on a time and material basis, reasonable monthly billings from WDFW for the operation of the Wells Wildlife Area. All billings will be paid within 30 days of receipt of a correct bill with adequate documentation. All billings must be submitted to Douglas before September 15th for the previous fiscal year. The total amount billed each year will not exceed $200,000 (2007 dollars), for the maintenance and operation of the Wells Wildlife Area for that fiscal year. This amount does not include costs related to the Capital Equipment Replacement Fund and does not include costs associated with the Habitat Restoration Fund. The dollar figure provided above shall be adjusted for inflation on the 1st day of January of each year based upon the Consumer Price Index for all Urban Consumers, U.S. City Averages, All Items, Not Seasonally Adjusted. The price index is published by the U.S. Department of Labor, Bureau of Labor Statistics. If said index is discontinued or becomes unavailable, a comparable index, mutually agreed upon by both Parties, will be substituted.

5.1.3 Habitat Restoration Funding

Douglas will provide WDFW with Habitat Restoration Funding to restore habitat damaged by fire on the Wells Wildlife Area in the amount not to exceed $50,000 (2012 dollars) over the term of this Agreement. The dollar figure provided above shall be adjusted for inflation as described in Section 5.1.2 (Wildlife Area O & M Funding). Use of the fund will be by mutual agreement between Douglas and WDFW. WDFW will bill separately for seed, nursery stock, fertilizer, and herbicide costs for the restoration work.

5.1.4 Capital Equipment Replacement Funding

Douglas will provide WDFW with funds to replace capital equipment necessary for the maintenance of the Wells Wildlife Area over the term of the Agreement. Equipment listed in Appendix A will be replaced when it has reached the end of its Useful Life.

Useful Life is defined as the time when equipment repairs exceed the current value of the equipment. WDFW agrees to maintain all equipment (e.g., oil, lubrication, filters and hour meter) in working condition and maintain records of hours of use and cost of repairs. These records will be used to assist with the decision to replace or continue repairing equipment. Replacement of equipment will be by mutual agreement by Douglas and WDFW. Douglas will pay only the dealer's invoice cost of the equipment replacement, upon receipt of a correct invoice from WDFW with a copy of the dealer's invoice.

WDFW agrees to surplus each piece of equipment, unless mutually agreed to retain, replaced by Douglas and provide Douglas with title to the equipment. The surplus equipment will be sold during Douglas's Annual Surplus Sale. Douglas will retain the proceeds from any equipment sold.

5.1.5 Off-Site Use of Wells Wildlife Area Equipment

Sharing of equipment listed in Appendix A with other wildlife areas is not normal day to day operations of the Wells Wildlife Area. Equipment sharing is intended to benefit the Wells Wildlife Area or for emergencies when equipment breaks and time sensitive farming operations must be completed. Equipment purchased through this Agreement can only be taken off of the Wells Wildlife Area following approval of both Parties and pursuant to WDFW being required to keep accurate and adequate records to demonstrate that equipment is being shared equitably between programs.

5.1.6 Use of Project Lands within the Wells Wildlife Area

During the term of this Agreement, Douglas grants to WDFW the right to manage Wells Project lands between the Project Boundary and Wells Reservoir within the boundaries of the Bridgeport Bar, Washburn Island and Okanogan units of the Wells Wildlife Area. WDFW's right to use Project lands is subject to the requirement of Section 5.2.6.4 and 8.0 (Cultural Resources) of this Agreement, and is subject to Douglas's rights, as owner, to use all Wells Project lands for Project purposes.

5.1.7 Additional Grant Funding

Douglas is encouraged to apply for grants and special funding to provide habitat enhancement on the Wells Wildlife Area to meet goals compatible with the Wells Wildlife Area Program in this Agreement. Douglas agrees to provide WDFW with a copy of the draft grant application prior to it being submitted for funding.

5.2 WDFW's Responsibilities

5.2.1 License Application

WDFW agrees to support the Aquatic and Terrestrial measures proposed in the Wells License Application for the New Operating License. This Agreement does not prevent WDFW from providing technical support and expert testimony to the Washington Department of Ecology in connection with the CWA § 401 water quality certification for the Wells Hydroelectric Project.

5.2.2 License Term

WDFW agrees to support Douglas's request for a New Operating License for a term of 50 years.

5.2.3 Water Quality Certification

WDFW agrees to reference only the goals and objectives contained within the management plans attached to the Aquatic Settlement Agreement and the measure(s) contained within this Agreement when working with Washington Department of Ecology to develop the original conditions of the CWA § 401 water quality certification for the New Operating License for the Wells Hydroelectric Project.

5.2.4 FPA Section 10(a) and 10(j)

WDFW agrees to refrain from requesting or advocating for additional FPA section 10(a) and 10(j) conditions or measures for Wildlife Resources, Resident Fish, Resident Fish habitat and lost Resident Fish harvest opportunities during the relicensing proceedings related to the issuance of a New Operating License for the Wells Project.

5.2.5 Trout Agreement

5.2.5.1 WDFW will meet with Douglas in April of each year to establish the annual rearing goals and transportation protocols for each year's Trout Program and to determine how to best meet the trout obligation. A draft budget for the Wells Fish Hatchery is due on March 1st of each year. Approval of the annual Trout Program will take place prior to May 1st and in time for Douglas to modify the hatchery budget for the Wells Fish Hatchery.

5.2.5.2 WDFW agrees to publicly recognize Douglas's contributions to the enhancement of recreational fishing opportunities in Okanogan and Douglas counties by agreeing to allow Douglas to post signage at the lakes enhanced by this program. Language for such signage shall be agreed to by both Parties prior to posting.

5.2.6 Wells Wildlife Program

5.2.6.1 WDFW will provide Douglas with a proposed budget, not exceeding $200,000 (2007 dollars), and will provide a general description of how the proposed budget addresses the goals of the program (see Section 4.3) for the Wells Wildlife Area by March 1st of each year. The dollar figure provided above shall be adjusted for inflation based upon the language provided in Section 5.1.2 (Wildlife Area O & M Funding).

5.2.6.2 WDFW will provide complete documentation of all expenditures with each monthly bill. Documentation includes: time records, invoices paid for goods and services, vehicle mileage reports and equipment time logs and reimbursed expenditures. All billings for the previous fiscal year must be submitted to Douglas before September 15th.

5.2.6.3 WDFW is encouraged to apply for grants and special funding to provide habitat enhancement on the Wells Wildlife Area to meet State management goals compatible with the Wells Wildlife Area Program in this Agreement. WDFW agrees to provide Douglas with a copy of the draft grant application prior to it being submitted for funding for Douglas's concurrence.

5.2.6.4 WDFW will not release or propagate any rare, threatened or endangered (RTE) species below the Project Boundary, not currently found within Project Boundary, without written permission from Douglas. If WDFW releases or raises RTE terrestrial or botanical species on the Wells Wildlife Area, Douglas will not incur any expenses related to those species.

5.2.6.5 To ensure consistency with this Agreement, WDFW will provide Douglas with an opportunity to review and modify any action that is expected to take place within the Wells Project Boundary.

6.0 DISPUTE RESOLUTION

6.1 Informal Dispute Resolution

If a dispute arises out of or relates to this Agreement, the Parties agree to first use their best efforts to cooperatively resolve such dispute. Douglas and WDFW shall use their best efforts to resolve disputes arising in the normal course of business at the lowest organizational level between each Party's staff with appropriate authority to resolve such disputes. When a dispute arises between Douglas and WDFW which cannot be resolved in the normal course of business, each Party shall notify the other of the dispute, with a Notice specifying the disputed issues.

The Notice specifying the disputed issues shall initially be sent to WDFW's Regional Program Manager (Fish Program for trout issues or Wildlife Program for wildlife issues) and Douglas's Supervisor of Relicensing, who shall have 10 business days to resolve the dispute. The discussion at this level may be extended by agreement, or at the conclusion of 10 business days either Party may send a Notice specifying the disputed issues to the second level, WDFW's Regional Director and Douglas's Chief of Environmental and Regulatory Services. The second level shall have 15 business days to resolve the dispute. Discussion at this level may be extended by agreement, or at the conclusion of 15 business days either Party may send a Notice specifying the disputed issues to WDFW's Director and Douglas's General Manager. If the Director and General Manager cannot resolve the dispute within 20 days either Party may proceed to Section 6.2 (Arbitration and Venue).

6.2 Arbitration and Venue

If the Parties are unable to settle the dispute, it is hereby agreed that the dispute shall then be referred to a mutually acceptable arbitrator, or if one cannot be agreed upon, to the nearest office of Washington Arbitration & Mediation Service (WAMS) for resolution within ninety (90) days of a written request for arbitration submitted by either Party. The Parties agree that if they cannot agree on a mutually acceptable arbitrator within ten (10) business days of the request for arbitration by either party, the dispute will be referred to WAMS for preparation of a Strike List for arbitrator selection. All arbitration proceedings shall be conducted in accordance with the Rules of Arbitration of WAMS or applicable administrative service, RCW 7.04 and reasonable discovery provisions as may be stipulated or ordered. The arbitrator's decision shall be final and binding and judgment may be entered thereon, with all remedies otherwise available in court also available in arbitration. The parties agree to equally share the costs of the arbitration process.

WDFW and Douglas agree that the existence of a dispute notwithstanding, they will continue without delay to carry out all their respective responsibilities under this Agreement that are not affected by the dispute.

If the subject of the dispute is the amount due and payable by Douglas hereunder, WDFW shall continue providing the work pending resolution of the dispute provided Douglas pays WDFW the amount Douglas, in good faith, believes is due and payable, and places in escrow the difference between such amount and the amount WDFW, in good faith, believes is due and payable.

The only legal action permissible under this Agreement is one based on the premise that the arbitration award exceeded the scope of the arbitrator's authority under the Revised Code of Washington. The sole and exclusive jurisdiction and venue of any such legal action shall be in the Superior Court in and for the State of Washington.

6.3 Choice of Laws

This Agreement shall be governed by, and construed, interpreted and enforced in accordance with, the substantive law of the State of Washington (without reference to any principles of conflicts of laws).

7.0 LIMITATIONS OF REOPENING

WDFW shall not invoke or rely upon any reopener clause set forth in the New Operating License for the purposes of 1) obtaining additional Resident Fish or Wildlife Resource measures or 2) obtaining changes in project structures or operations pertaining to Resident Fish, Resident Fish habitat and Wildlife Resources.

However, WDFW may raise issues and advocate measures for Wildlife Resources and Resident Fish through the Aquatic and Terrestrial work groups. Wildlife and Resident Fish mitigation requirements raised outside of this Agreement, through the various resource work groups, should, whenever logistically feasible, be addressed through the implementation of this Agreement provided that those issues are related to the goals of this Agreement and do not significantly diminish or conflict with the ability of WDFW to achieve all of the goals of this Agreement. Mitigation requirements raised outside of this Agreement that significantly conflict or diminish the ability of WDFW to achieve the goals of this Agreement may require Douglas to provide mitigation outside of the Agreement.

8.0 CULTURAL RESOURCES

Douglas is required to comply with federal and state cultural resource protection laws and regulations for activities on lands owned by Douglas. WDFW is required to comply with applicable federal and state cultural resource protection laws and regulations for activities on lands owned by WDFW. WDFW is further required to follow the requirements of the Wells Historic Properties Management Plan (HPMP) for activities on Douglas owned lands.

9.0 FORCE MAJEURE

Neither Party shall be liable to the other for, or be considered to be in breach of or in default under this Agreement because of, any failure or delay in performance by such Party under this Agreement to the extent such failure or delay is caused by or results from any cause or condition which is beyond such Party's reasonable control, to the extent which such Party is unable to prevent or overcome such failure or delay by exercise of reasonable diligence (any such cause or condition, a "Force Majeure"), including but not limited to: failure or threat of failure of facilities or equipment; fire, lightning, flood, earthquake, volcanic activity, wind, drought, storm and other natural disasters or acts of the elements; court order and act, or failure to act, of civil, military or governmental authority; change in governmental law or regulation; strike, lockout and other labor dispute; epidemic, riot, insurrection, sabotage, terrorism, war and other civil disturbance or disobedience; and labor or material shortage.

The Party whose performance is affected by Force Majeure shall notify the other Party in writing within 24 hours, or as soon thereafter as practicable, after becoming aware of any event that such affected Party contends constitutes Force Majeure. Such notice will identify the event causing the delay or anticipated delay, estimate the anticipated length of delay, state the measures taken or to be taken to minimize the delay, and estimate the timetable for implementation of the measures. The affected Party shall make all reasonable efforts to promptly resume performance of this Agreement and, when able, to resume performance of its obligations and give the other Party written notice to that effect. Upon receipt of notice of a Force Majeure event, any Party may request that the Parties engage in discussion in an effort to modify this Agreement in a mutually satisfactory manner.

10.0 LIABILITY OF PARTIES

Each Party to this Agreement shall be responsible for its own acts or omissions. Except as provided in the preceding sentence, no Party to this Agreement shall be responsible to the other Party for the acts or omissions of entities or individuals not a party to this Agreement.

11.0 NOTICES

11.1 Means of Notification

Unless this Agreement specifically requires otherwise, any notice, demand or request provided for in this Agreement, or served, given or made in connection with it, shall be in writing and shall be deemed properly served, given or made if delivered in person or sent by telegraph, telex, or fax or by acknowledged delivery, or sent by registered or certified mail, postage prepaid to the person specified below:

To WDFW:
Washington Department of Fish and Wildlife
Director
600 Capitol Way North
Olympia, WA 98501-1091

Washington Department of Fish and Wildlife
Regional Director, Region 2
1550 Alder Street NW
Ephrata, WA 98823-9699

To Douglas:
Public Utility District No. 1 of Douglas County
General Manager
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4497

12.0 ASSIGNMENT OF AGREEMENT

Neither this Agreement nor any right, interest or obligation hereunder may be assigned, sold, transferred or conveyed by either Douglas or WDFW without the prior written consent of the other, which Party may withhold its consent in its sole discretion, and any attempted assignment not in compliance therewith shall be void, except assignments and transfers which occur by operation of law. No assignment or transfer of this Agreement, or any interest therein, shall relieve the Parties of any obligation incurred hereunder.

13.0 MISCELLANEOUS

13.1 Further Assurances

Subject to the terms and conditions of this Agreement, each Party shall each use commercially reasonable efforts to take, or cause to be taken all actions and to do, or cause to be done, all things necessary, proper and advisable under applicable law to consummate and make effective this Agreement and, including efforts to obtain all required consents and approvals. Neither Douglas nor WDFW shall, without the prior written consent of the other, take or fail to take any action that would reasonably be expected to prevent or materially impede, interfere with or delay this Agreement.

From time to time after the date hereof, whether prior to or after the execution and without further consideration, the Parties shall, each at its own expense, execute and deliver such documents and provide such information to the other as such Party may reasonably request in order to accomplish, consummate and perform their respective obligations under this Agreement.

13.2 No Consequential, Incidental or Punitive Damages

Consistent with the Recitals to this Agreement, Douglas and WDFW desire to minimize to the extent possible the potential for future disagreements between them with respect to Project No. 2149 from matters arising under this Agreement. Douglas and WDFW also recognize the potential magnitude of the potential consequential, incidental or punitive damages that might arise from this Agreement and desire to eliminate the risks each might face were such categories of damages not excluded. For these reasons, Douglas and WDFW agree that the remedies available to them shall be limited as provided below.

13.2.1 Douglas and WDFW agree that for any claim arising from a theory based on contract law, in no event shall either Douglas or WDFW be liable to each other hereunder for any potential consequential, incidental or punitive damages.

13.2.2 Douglas and WDFW agree that for any claim arising from a theory based on tort law, in no event shall either Douglas or WDFW be liable to each other hereunder for potential consequential, incidental or punitive damages.

13.3 Severability

If any provision of this Agreement is held to be illegal, invalid or unenforceable under any present or future law, and if the rights or obligations of either Party under this Agreement will not be materially and adversely affected thereby, (i) such provision will be fully severable, (ii) this Agreement shall be construed and enforced as if such illegal, invalid or unenforceable provision had never comprised a part thereof, (iii) the remaining provisions of this Agreement shall remain in full force and effect and will not be affected by the illegal, invalid or unenforceable provision or by its severance herefrom and (iv) in lieu of such illegal, invalid or unenforceable provision, the Parties shall, in good faith, negotiate a mutually acceptable, legal, valid and enforceable provision as similar in terms to such illegal, invalid or unenforceable provision as may be possible, and shall promptly take all actions necessary to amend the Agreement to include the mutually acceptable, legal, valid and enforceable provision.

13.4 Waivers

Except as otherwise provided herein, no provision of this Agreement may be waived except in writing. No failure by any Party to exercise, and no delay in exercising, short of the statutory period, any right, power or remedy under this Agreement shall operate as a waiver thereof. Any waiver at any time by a Party of its right with respect to a default under this Agreement, or with respect to any other matter arising in connection therewith, shall not be deemed a waiver with respect to any subsequent default or matter.

13.5 No Third-Party Beneficiaries

None of the promises, rights or obligations contained in this Agreement shall inure to the benefit of any person or entity not a Party to this Agreement; and no action may be commenced or prosecuted against any Party by any third party claiming to be a third-party beneficiary of this Agreement or the transactions contemplated hereby.

13.6 No Reliance

Each Party acknowledges that in entering into this Agreement, it has not relied on any statement, representation or promise of the other Party or any other person or entity, except as expressly stated in this Agreement.

13.7 Assumption of Risk

In entering into this Agreement, each of the Parties assumes the risk of any mistake of fact or law, and if either or both of the Parties should subsequently discover that any understanding of the facts or the law was incorrect, none of the Parties shall be entitled to, nor shall attempt to, set aside this Agreement or any portion thereof.

13.8 Waiver of Defenses

Douglas and WDFW release each other from any and all Claims relating to the formation and negotiation of this Agreement, including reformation, rescission, mistake of fact, or mistake of law. The Parties further agree that they waive and will not raise in any court, administrative body or other tribunal any Claim in avoidance of or defense to the enforcement of this Agreement other than the express conditions set forth in this Agreement.

13.9 Independent Counsel

The Parties acknowledge that they have been represented by independent counsel in connection with this Agreement, they fully understand the terms of this Agreement and they voluntarily agree to those terms for the purposes of making a full compromise and settlement of the subject matter of this Agreement.

13.10 Headings

The headings used for the sections herein are for convenience and reference purposes only and shall in no way affect the meaning or interpretation of the provisions of this Agreement.

13.11 Interpretations

In this Agreement, unless a clear contrary intention appears: (a) the singular number includes the plural number and vice versa; (b) reference to any person includes such person's successors and assigns but, if applicable, only if such successors and assigns are permitted by this Agreement, and reference to a person in a particular capacity excludes such person in any other capacity; (c) reference to any gender includes each other gender; (d) reference to any agreement (including this Agreement), document or instrument means such agreement, document or instrument as amended or modified and in effect from time to time in accordance with the terms thereof and, if applicable, the terms hereof; (e) reference to any Section, Schedule or Exhibit means such Section, Schedule or Exhibit to this Agreement, and references in any Section, Schedule, Exhibit or definition to any clause means such clause of such Section, Schedule, Exhibit or definition; (f) "hereunder", "hereof", "hereto", "herein" and words of similar import are references to this Agreement as a whole and not to any particular section or other provision hereof unless specifically stated; (g) relative to the determination of any period of time, "from" means "from and including", "to" means "to but excluding" and "through" means "through and including"; (h) "including" (and with correlative meaning "include") means including without limiting the generality of any description preceding such term; and (i) reference to any law (including statutes and ordinances) means such law as amended, modified, codified or reenacted, in whole or in part, and in effect from time to time, including rules and regulations promulgated thereunder.

13.12 Legal Authority

Each party represents and warrants to the other Party that it has full authority and power to enter into this Agreement, that the Party's representatives who sign below are duly authorized by it to enter into this Agreement, and that nothing herein violates any law, regulation, judicial or regulatory order, or agreement applicable to such warranting Party.

13.13 Agreement Execution

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed by their proper officers respectively being thereunto duly authorized, and their respective corporate seals to be hereto affixed, the 17th day of December, 2007.

PUBLIC UTILITY DISTRICT NO. 1 of DOUGLAS COUNTY

By: Lynn M. Heminger
Lynn M. Heminger, President

By: Ronald E. Skagen
Ronald E. Skagen, Vice President

By: T. James Davis
T. James Davis, Secretary

STATE OF WASHINGTON
DEPARTMENT OF FISH & WILDLIFE

By: ______________________________

By: ______________________________

By: ______________________________

APPENDIX A
CAPITAL EQUIPMENT REPLACEMENT SCHEDULE

Appendix A Capital Equipment List for Replacement Under Section 5.1.4[1]

3/4 Ton Pickup Truck
1 Ton Pickup Truck with Flatbed
1/2 Ton Pickup
Snow Plow for one Pickup
Irrigation Trailer
70 hp Tractor and implements[2] over $5,000

Maintenance or replacement costs for the Washburn Island irrigation system in excess of $10,000 shall be split 50:50 between Douglas and WDFW

Wheel Line Replacement ~ 7,700 feet
Handlines 100 units
Irrigation for shrub plantings

30 Hp Irrigation Pumps (2)
20 HP Irrigation Pumps (3)
50 HP Irrigation Pump
100 HP Irrigation Pump

Building - Major Repairs ≥ $10,000
Fuel Tanks and Pumps

[1] The dollar figures contained within Appendix A shall be adjusted for inflation as described in Section 5.1.2 (Wildlife Area O & M Funding).
[2] Implements used with the 70 hp tractor include: front end loader, disc, drill, field cultivator, packer, 3-point sprayer, harrow, rotovator, shrub planter and corn planter.

Appendix E-12

Recreation Agreements

City of Bridgeport
City of Pateros
City of Brewster

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AGREEMENT BETWEEN THE CITY
OF BRIDGEPORT AND PUBLIC UTILITY DISTRICT NO. 1
OF DOUGLAS COUNTY, WASHINGTON

This Agreement made and entered into this 9th day of September ______, 2009, by and between the City of Bridgeport, Washington, a Municipal corporation ("City"), and Public Utility District No. 1 of Douglas County, Washington, a Municipal corporation ("District").

RECITALS

1. The District operates the Wells Hydroelectric Project on the Columbia River under License No. 2149 ("Existing License"), from the Federal Energy Regulatory Commission, (FERC).

2. In compliance with the Existing License the City and the District entered into an Agreement dated June 15, 1987, regarding the construction, ownership and operation of recreational facilities located on adjoining City and District property ("Prior Agreement"). Recreational facilities known as Bridgeport Marina Park were constructed pursuant to the Prior Agreement. This Agreement shall replace and supersede that Prior Agreement.

3. The City has expressed interest in and is specifically qualified and capable of providing administration, operation, and maintenance services for the Bridgeport Marina Park facilities, and intends to provide the administration, operation, and maintenance of the Bridgeport Marina Park and any additional facilities constructed and paid for by the District.

NOW, THEREFORE, in consideration of the mutual covenants and agreements herein provided, the parties agree as follows:

AGREEMENT

1. Property. The City represents that it owns or has the right to use the real property described in Exhibit A and depicted on Exhibit B, attached hereto, upon which exist certain recreational facilities. The District owns certain property abutting the Columbia River and contiguous with the City's real property denoted in Exhibit A that contains additional recreational facilities. The District's property is more particularly described in Exhibit C and Exhibit D attached hereto. The facilities located on the property described above constitute Bridgeport Marina Park. The City agrees to grant an easement to the District to use the park as a project recreation site in the form attached as Exhibit E.

2. Permits. If the District constructs additional recreational facilities for Bridgeport Marina Park then the District shall be solely responsible for obtaining all necessary permits and easements from the appropriate governmental agencies for the construction of such recreational facilities. The District shall further act as the lead agency insofar as environmental laws and regulations are concerned.

3. FERC Compliance. This entire agreement is effective immediately but District funding and/or implementation of measures herein shall be contingent upon FERC approval and the issuance of a new license to the District for the operation of the Wells Hydroelectric Project. The City shall support the application for a new license, refrain from seeking additional measures associated with the relicensing of the Wells Project, and ensure that all documents filed with FERC or any other agency or forum are

consistent with this agreement. This agreement shall be effective throughout the term of a new license and the City shall not remove any of the park facilities or shutdown the park during that period. In the event the FERC does not approve or issue such a license, this entire agreement shall be null and void and the District shall be excused from performance hereunder.

4. <u>Operation, Maintenance and Administration</u>. The City shall be responsible for the "normal maintenance" of the recreational facilities within the property described on Exhibit A and C, and depicted on Exhibit B and D, including, but not limited to, parking, lawns, RV sites, restrooms, lights, water, power, sewer/septic and playground equipment. "Normal Maintenance" shall include the day to day maintenance and repairs of less than $10,000. The City agrees that it will administer, operate and maintain all facilities described above to the standards contained in Exhibit F. The District shall be responsible for major maintenance of the facilities referenced above in excess of $10,000 and for capital improvements related to those same facilities. This does not include the City well or pump station that are the City's sole responsibility. The District shall be responsible for all maintenance, repair and improvement of the Wells Hydroelectric Project assets such as the docks, boat ramps and rip rap.

5. <u>Legal Responsibility</u>. Any additional recreational facilities constructed by the District pursuant to this agreement shall be the property of and under the exclusive ownership of the entity that owns the underlying real property as denoted in Exhibits A and C. The City shall continue to bear the sole risk of loss of or damage to any additional facilities which are located on the property described in Exhibit A. The District shall have no responsibility or legal liability whatsoever arising out of the City's

administration, operation or maintenance of any recreational facilities on the property described in Exhibits A and C.

6. Liability Insurance. The City shall at the City's expense maintain comprehensive liability insurance on the park in an amount not less than One Million Dollars ($1,000,000.00). The District shall be an additional insured on such policy. The City shall deliver a copy of any such insurance policy to the District.

7. Indemnity. The City hereby releases and agrees to hold harmless, indemnify and defend the District and its officers, agents, employees and contractors from, against and for any and all liabilities, obligations, suits, claims, demands, actions, costs and expenses of any kind which may be imposed upon or asserted against the District by reason of any accident, injury or damage to any person and/or property arising from the administration, operation, maintenance or use of the recreational facilities, except to the extent such accident, injury or damage arises from the negligence of the District or its officers, agents, employees or contractors. The City shall name the District as an additional named insured on any comprehensive general liability policy covering the administration, operation, maintenance or use of the additional recreational facilities, provided that naming the District as an additional named insured does not significantly increase the cost of that insurance. In the event that it does significantly increase the cost of that insurance the City agrees (1) to provide the District at least thirty (30) days' notice before the District is no longer an additional named insured under that policy and (2) allow the District to bear the cost of it being an additional named insured.

8. Future Development. Any future additional development and landscaping performed by the City on the property described in Exhibits A and C shall be in

accordance with first-class construction and landscaping practices and shall be compatible with all existing facilities and landscaping.

9. Future Expansion. The District will expand Marina Park to accommodate an additional 10 RV spaces. If the appropriate permits can be acquired, the park will be expanded to the north, along the river. If permits cannot be acquired, then the City and the District will work together to identify an acceptable alternative location for the additional 10 RV spaces within or adjacent to Marina Park. Once constructed by the District, the new spaces shall be subject to all terms within this Agreement.

10. Well. The City has a well and pumphouse on its property as depicted on Exhibit B. The City shall have the right to use those facilities and maintain them as needed. The District has no obligations relative to the well and pumphouse.

11. No Partnership. This agreement shall not be interpreted or construed to create an association, joint venture or partnership between the parties or to impose any partnership obligations or liability upon any party. Further, no party shall have any right, power or authority to enter into any contract or commitment for or on behalf of, to act as or be an agent or representative of, or otherwise to bind any other party.

12. Notices. All notices to be given pursuant to this agreement shall be addressed to the Mayor of the City of Bridgeport, Washington, City Hall, Bridgeport, Washington 98813, and to the General Manager, Douglas County Public Utility District No. 1 of Douglas County, Washington, 1151 Valley Mall Parkway, East Wenatchee, Washington, 98802, or as may from time to time be directed by notice from the other party. Notice shall be deemed to have been given when enclosed in a properly sealed

envelope or wrapper, addressed as aforesaid and deposited, postage prepaid, in a post office or branch post office of the United States Government.

13. Binding Effect. This agreement shall be binding upon and inure to the benefit of the parties and their respective successors and assigns. Neither the City's rights or duties under the terms of this agreement shall be delegable or assignable without prior written approval of the District. No delegation of the City's rights shall relieve the City of its obligations under this Agreement.

14. Law-Venue. The parties hereto agree that this agreement shall be governed by the laws of the State of Washington, and that in the event legal action becomes necessary to enforce any provisions hereof, venue shall be in Douglas County, Washington.

15. Attorney Fees and Costs. In the event any party employs legal counsel to enforce any covenant of this Agreement, or to pursue any other remedy on default as provided herein, or by law, the substantially prevailing party shall be entitled to recover all reasonable attorneys' fees and all other costs and expenses not limited to court action. Such sum shall be included in any judgment or decree entered.

16. Compliance. The parties, in fulfilling their obligations hereunder, shall conform to and comply with all laws, rules, regulations, conditions or restrictions promulgated by the FERC or any other governmental agency or other governmental entity having jurisdiction over the Project.

17. Non-Waiver. The failure of any party to insist upon or enforce strict performance by the other party of any of the provisions of this agreement or to exercise any rights under this agreement shall not be construed as a waiver or relinquishment to

any extent of such party's right to assert or rely upon any such provisions or rights in any other instance.

18. Implementation. Each party shall, upon written request of the other party, take such action (including, but not limited to, the execution, acknowledging and delivery of documents) as may be reasonably required for the implementation or continuing performance of this agreement.

19. Invalid Provision. The invalidity or unenforceability of any provision of this agreement shall not affect the other provisions of this agreement, and this agreement shall be construed in all respects as if such invalid or unenforceable provision were omitted.

20. Survival. The obligations of the City which may reasonably be interpreted or construed as surviving the completion, termination or cancellation of this agreement shall survive the completion, termination or cancellation of this agreement so long as the District is the licensee of the Project.

IN WITNESS WHEREOF, the said parties have hereunto set their hands on this 18 day of Sept., 2009.

CITY OF BRIDGEPORT, WASHINGTON A Municipal Corporation	PUBLIC UTILITY DISTRICT NO. 1 OF DOUGLAS COUNTY, WASHINGTON A Municipal Corporation
By [signature]	By T. James Davis T. James Davis
By [signature]	By Lynn M. Heminger Lynn M. Heminger
By [signature]	By Ronald E. Skagen Ronald E. Skagen

STATE OF WASHINGTON)
) ss.
COUNTY OF Douglas)

I certify that I know or have satisfactory evidence that Steven Jenkins ______ is the person who appeared before me and said person acknowledged that he/she signed this instrument, on oath stated that he/she was authorized to execute the instrument and acknowledged it as the Mayor of City of Bridgeport to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 18th day of September, 2009.

DEBORAH JAN DURAND
Commission Expires
NOTARY
PUBLIC
AUG. 05, 2013
STATE OF WASHINGTON

Deborah Jan Durand

Typed/Printed Name Deborah Jan Durand
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 8/5/2013

STATE OF WASHINGTON)
) ss.
COUNTY OF Douglas)

I certify that I know or have satisfactory evidence that Lisa Carol Stark ______ is the person who appeared before me and said person acknowledged that he/she signed this instrument, on oath stated that he/she was authorized to execute the instrument and acknowledged it as the finance director of City of Bridgeport to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 18th day of September, 2009.

DEBORAH JAN DURAND
Commission Expires
NOTARY
PUBLIC
AUG. 05, 2013
STATE OF WASHINGTON

Deborah Jan Durand

Typed/Printed Name Deborah Jan Durand
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 8-5-2013

STATE OF WASHINGTON)
) ss.
COUNTY OF Douglas)

I certify that I know or have satisfactory evidence that Joyce Jean Hardie ______ is the person who appeared before me and said person acknowledged that he/she signed this instrument, on oath stated that he/she was authorized to execute the instrument and acknowledged it as the ______________________ of City of Bridgeport to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 18th day of September, 2009.

DEBORAH JAN DURAND
Commission Expires
NOTARY
PUBLIC
AUG. 05, 2013
STATE OF WASHINGTON

Deborah Jan Durand
Typed/Printed Name Deborah Jan Durand
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 8/5/2013

STATE OF WASHINGTON)
) ss.
COUNTY OF Douglas)

I certify that I know or have satisfactory evidence that T. James Davis is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as a Commissioner of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 28 day of September, 2009.

GARY R. IVORY
COMMISSION EXPIRES
NOTARY
PUBLIC
11-19-09
STATE OF WASHINGTON

Gary R. Ivory
Typed/Printed Name Gary R. Ivory
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 11-19-2009

STATE OF WASHINGTON)
) ss.
COUNTY OF Douglas)

I certify that I know or have satisfactory evidence that Lynn M. Heminger is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as a Commissioner of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 28th day of September, 2009.

GARY R. IVORY NOTARY PUBLIC COMMISSION EXPIRES 11-19-09 STATE OF WASHINGTON

Typed/Printed Name Gary R. Ivory
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 11-19-2009

STATE OF WASHINGTON)
) ss.
COUNTY OF Douglas)

I certify that I know or have satisfactory evidence that Ronald E. Skagen is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as a Commissioner of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 28th day of September, 2009.

GARY R. IVORY NOTARY PUBLIC COMMISSION EXPIRES 11-19-09 STATE OF WASHINGTON

Typed/Printed Name Gary R. Ivory
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 11-19-2009

Exhibit A

EXHIBIT A

Erlandsen

SURVEYING | PLANNING | ENGINEERING | GIS

210 N Bridge Street
P.O. Box 739
Brewster, WA 98812

Phone: 509.689.2529
Fax: 509.689.2520

www.erlandsen.com

Bridgeport-Marina Park

Town of Bridgeport - Ownership

Those portions of Blocks J, K, and L of Riverside Addition to the Town of Bridgeport, as shown on a map on file in Book 'A' of Plats, at page 261 thereof, records of the Auditor of Douglas County, Washington, lying Southwesterly of the Wells Hydroelectric Project Boundary as show on a map recorded Oct. 11, 1965 as Auditor's File No.144107 and also shown on a Record of Survey recorded in Book 29/25, pages 65 through 70, both records of the Auditor of Douglas County, Washington, TOGETHER WITH those portions of the following described streets:

That portion of Jefferson Street lying Northeasterly of the centerline of said Jefferson Street and being bounded on the Northwest by the Northwesterly line of vacated 7th street and bounded on the Southeast by the Southeasterly line of vacated 10th Street.

That portion of vacated 7th Street bounded on the Northeast by said Wells Hydroelectric Project Boundary and bounded on the Southwest by the centerline of said Jefferson Street;

That portion of vacated 8th Street bounded on the Northeast by said Wells Hydroelectric Project Boundary and bounded on the Southwest by the centerline of said Jefferson Street;

That portion of vacated 9th Street bounded on the Northeast by said Wells Hydroelectric Project Boundary and bounded on the Southwest by the centerline of said Jefferson Street;

That portion of vacated 10th Street bounded on the Northeast by said Wells Hydroelectric Project Boundary and bounded on the Southwest by the centerline of said Jefferson Street;

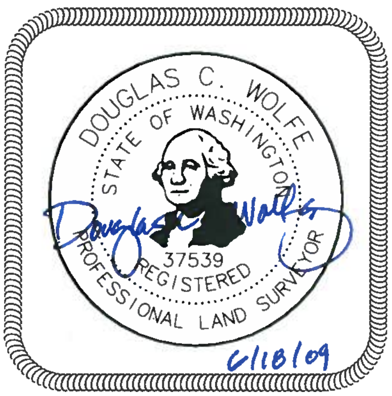
EXCEPTING therefrom, that certain parcel of land described in a Warranty Deed in favor of the United States of America, recorded April 2, 1962 as Auditor's File Number 135666, records of the Auditor of Douglas County, Washington.

Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS

210 N Bridge Street
P.O. Box 739
Brewster, WA 98812

Phone: 509.689.2529
Fax: 509.689.2520

www.erlandsen.com



Prepared by: DCW
Checked by: RCS
Date: 6/18/2009

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Exhibit B

EXHIBIT B

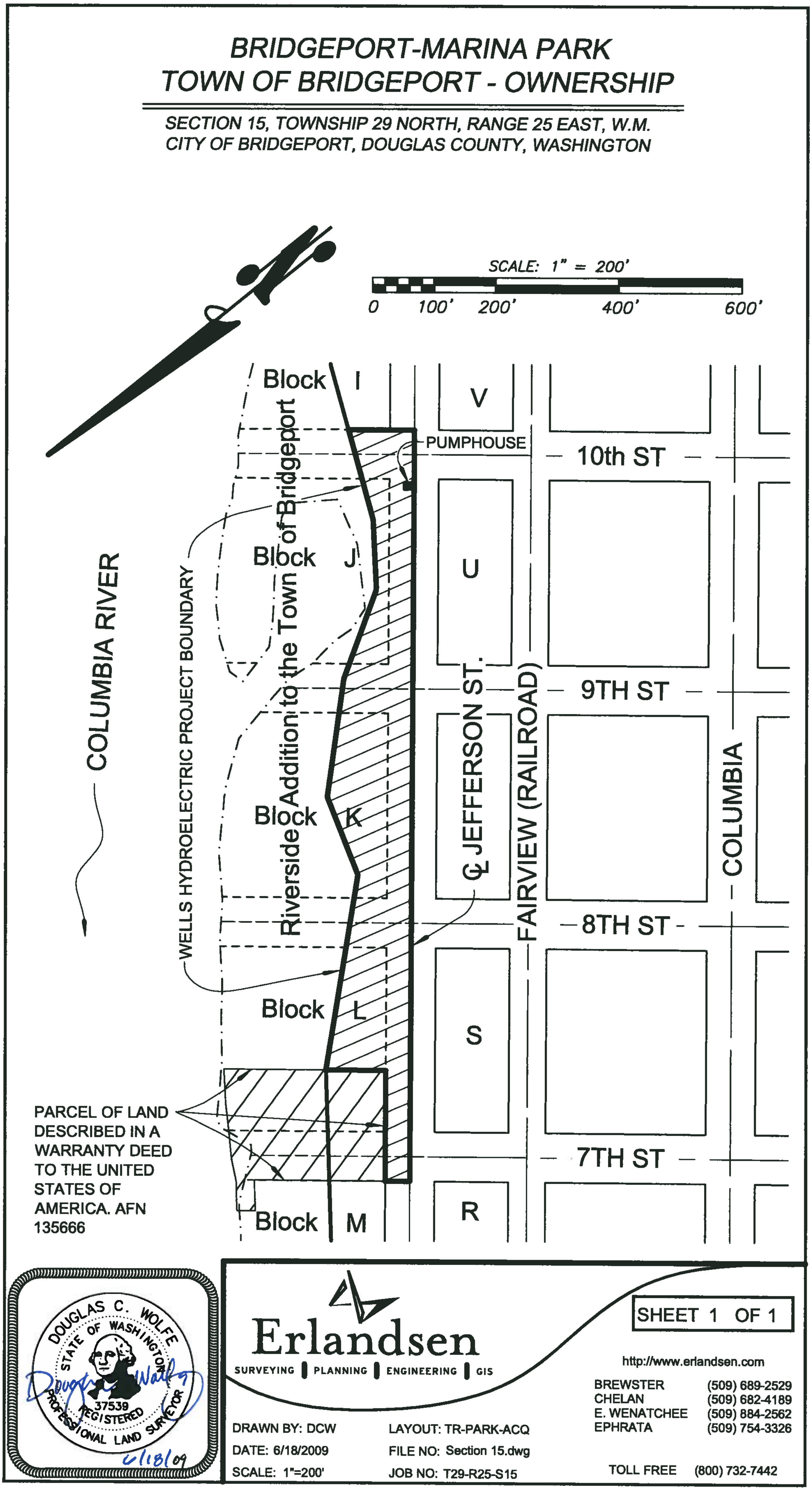
BRIDGEPORT-MARINA PARK
TOWN OF BRIDGEPORT - OWNERSHIP
SECTION 15, TOWNSHIP 29 NORTH, RANGE 25 EAST, W.M.
CITY OF BRIDGEPORT, DOUGLAS COUNTY, WASHINGTON
SCALE: 1" = 200'
0 100' 200' 400' 600'
Block I
Block J
Block K
Block L
Block M
V
U
S
R
PUMPHOUSE
10th ST
9TH ST
8TH ST
7TH ST
COLUMBIA RIVER
WELLS HYDROELECTRIC PROJECT BOUNDARY
Riverside Addition to the Town of Bridgeport
℄ JEFFERSON ST.
FAIRVIEW (RAILROAD)
COLUMBIA
PARCEL OF LAND DESCRIBED IN A WARRANTY DEED TO THE UNITED STATES OF AMERICA. AFN 135666
DOUGLAS C. WOLFE
STATE OF WASHINGTON
37539
REGISTERED PROFESSIONAL LAND SURVEYOR
6/18/09
Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS
SHEET 1 OF 1
http://www.erlandsen.com
BREWSTER (509) 689-2529
CHELAN (509) 682-4189
E. WENATCHEE (509) 884-2562
EPHRATA (509) 754-3326
DRAWN BY: DCW
DATE: 6/18/2009
SCALE: 1"=200'
LAYOUT: TR-PARK-ACQ
FILE NO: Section 15.dwg
JOB NO: T29-R25-S15
TOLL FREE (800) 732-7442

Exhibit C

EXHIBIT C

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SURVEYING | PLANNING | ENGINEERING | GIS

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P.O. Box 739
Brewster, WA 98812

Phone: 509.689.2529
Fax: 509.689.2520

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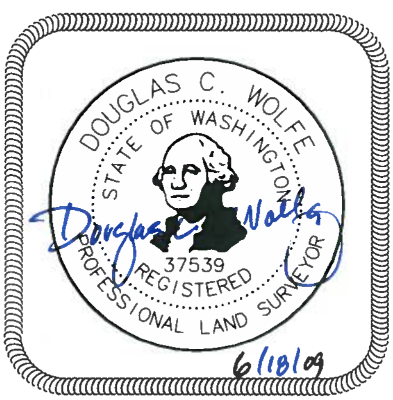
Bridgeport – Marina Park

P.U.D. No. 1 of Douglas County Ownership

Those portions of vacated 8th, 9th and 10th streets, and Blocks J, K, and L of Riverside Addition to the Town of Bridgeport, as shown on a map on file in Book 'A' of Plats, at page 261 thereof, records of the Auditor of Douglas County, Washington, lying Northeasterly of the Wells Hydroelectric Project Boundary as shown on a map recorded Oct. 11, 1965 as Auditor's File No.144107 and also shown on a Record of Survey recorded in Book 29/25, pages 65 through 70, both records of the Auditor of Douglas County, Washington.

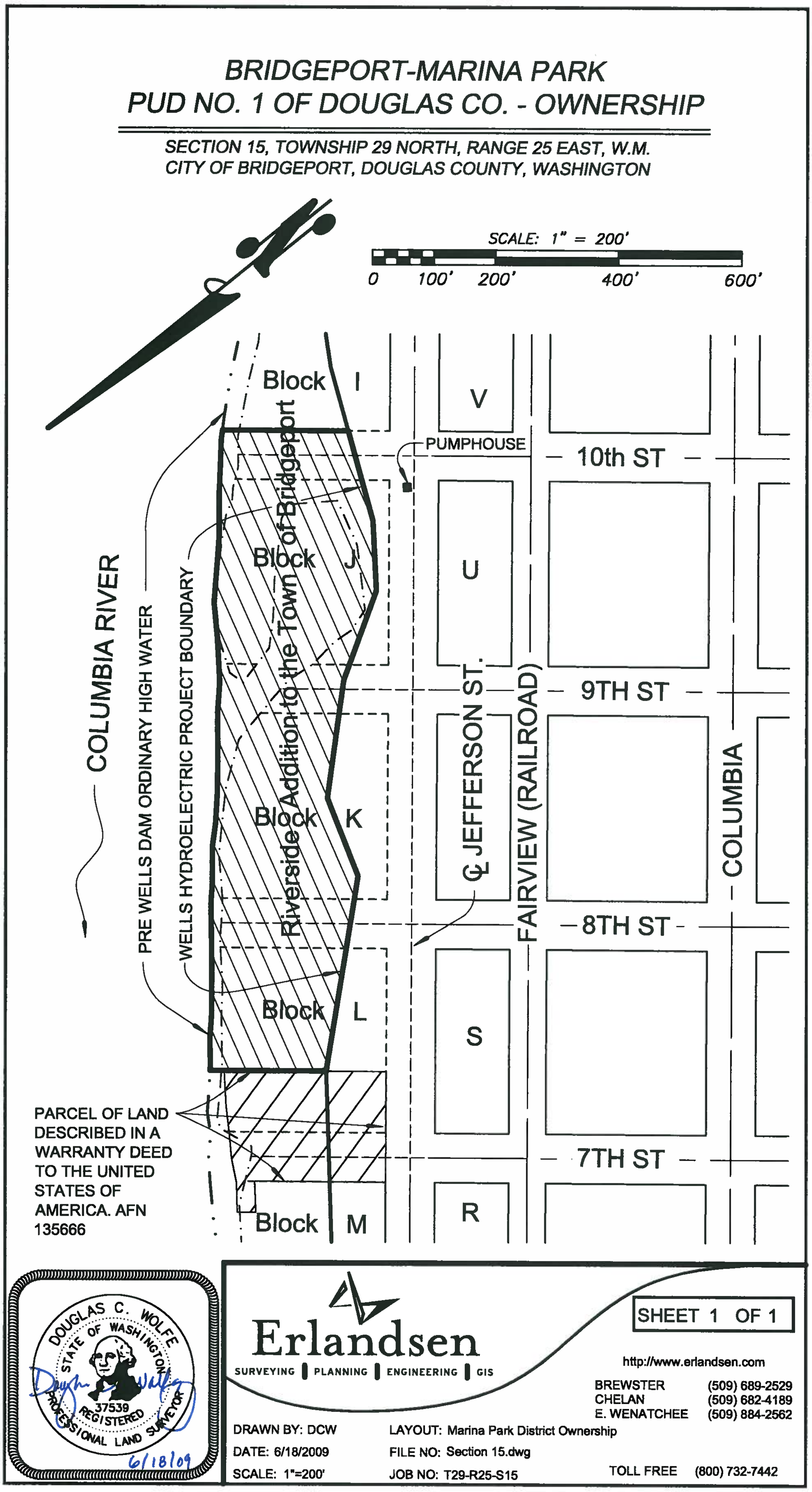
EXCEPTING therefrom, that certain parcel of land described in a Warranty Deed in favor of the United States of America, recorded April 2, 1962 as Auditor's File Number 135666, records of the Auditor of Douglas County, Washington.



Prepared by: DCW
Checked by: EBG
Date: 6/18/2009

Exhibit D

EXHIBIT D



BRIDGEPORT-MARINA PARK
PUD NO. 1 OF DOUGLAS CO. - OWNERSHIP
SECTION 15, TOWNSHIP 29 NORTH, RANGE 25 EAST, W.M.
CITY OF BRIDGEPORT, DOUGLAS COUNTY, WASHINGTON
SCALE: 1" = 200'
0
100'
200'
400'
600'
Block I
V
PUMPHOUSE
10th ST
Riverside Addition to the Town of Bridgeport
Block J
U
9TH ST
COLUMBIA RIVER
PRE WELLS DAM ORDINARY HIGH WATER
WELLS HYDROELECTRIC PROJECT BOUNDARY
Block K
℄ JEFFERSON ST.
FAIRVIEW (RAILROAD)
COLUMBIA
8TH ST
Block L
S
PARCEL OF LAND DESCRIBED IN A WARRANTY DEED TO THE UNITED STATES OF AMERICA. AFN 135666
7TH ST
Block M
R
DOUGLAS C. WOLFE
STATE OF WASHINGTON
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REGISTERED PROFESSIONAL LAND SURVEYOR
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SHEET 1 OF 1
http://www.erlandsen.com
BREWSTER (509) 689-2529
CHELAN (509) 682-4189
E. WENATCHEE (509) 884-2562
DRAWN BY: DCW
DATE: 6/18/2009
SCALE: 1"=200'
LAYOUT: Marina Park District Ownership
FILE NO: Section 15.dwg
JOB NO: T29-R25-S15
TOLL FREE (800) 732-7442

Exhibit E

Return Address:

Donald L. Dimmitt
Jeffers, Danielson, Sonn & Aylward, P.S.
P.O. Box 1688
Wenatchee, WA 98801

EASEMENT
(for Recreational Resources)

Grantor (City): City of Bridgeport, a Washington municipal corporation
Grantee (District): Public Utility District No. 1 of Douglas County, Washington, a Washington municipal corporation
Legal Description (abbreviated): Burdened Property: Portions of Blocks J, K and L of Riverside Addition and City of Bridgeport, Douglas County, Washington. Additional legal on page 2.
Assessor's Tax Parcel ID#: Burdened Property:

Parties

1.1 City. City of Bridgeport, a Washington municipal corporation.

1.2 District. Public Utility District No. 1 of Douglas County, Washington, a Washington municipal corporation.

Easement

2.1 Grant of Easement. City hereby conveys and warrants to District a nonexclusive easement as described herein of the type described herein for the purposes described herein.

2.2 Purpose. The purpose of this easement is for the use of recreational facilities known as Bridgeport Marina Park as a project recreation site of the District.

2.3 Consideration. This easement is for and in consideration of the District's agreement to be responsible for major maintenance and capital improvements to the facilities as detailed by separate agreement between the parties.

Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
2600 Chester Kimm Road / P.O. Box 1688
Wenatchee, WA 98807-1688
(509) 662-3685 / (509) 662-2452 FAX

2.4 Benefited Property. This easement is to benefit the Wells Hydroelectric Project No. 2149.

2.5 Burdened Property. This easement is to burden the following described real property situated in the County of Douglas, State of Washington:

The property described on Exhibit A and depicted on Exhibit B.

2.6 Location of Easement. The location of the easement is described as follows:

The property described on Exhibit A and depicted on Exhibit B.

2.7 Term of Easement. The term of this easement is for the term of the District's License No. 2149 from the Federal Energy Regulatory Commission, any extension of that license or any new license granted to the District.

2.8 Maintenance and Repair. The cost of any maintenance and repair of the above easement is covered by separate agreement.

2.9 Attorney Fees and Costs. In the event any party employs legal counsel to enforce any covenant of this easement, or to pursue any other remedy on default as provided herein, or by law, the substantially prevailing party shall be entitled to recover all reasonable attorneys' fees, appraisal fees, title search fees, other necessary expert witness fees and all other costs and expenses not limited to court action. Such sum shall be included in any judgment or decree entered.

2.10 Appurtenant Easement. The benefits and burdens granted and imposed by this instrument shall run with the lands described herein.

2.11 Venue. The venue of any action taken to enforce any part of this easement shall be in Douglas County, Washington.

2.12 Number; Gender; Permissive Versus Mandatory Usage. Where the context permits, references to the singular shall include the plural and vice versa, and to the neuter gender shall include the feminine and masculine. Use of the word "may" shall denote an

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Attorneys at Law
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Wenatchee, WA 98807-1688
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option or privilege and shall impose no obligation upon the party which may exercise such option or privilege; use of the word "shall" shall denote a duty or an obligation.

2.13 Captions and Construction. The captions in this Easement are for the convenience of the reader and are not to be considered in the interpretation of its terms.

"CITY"

CITY OF BRIDGEPORT
A Washington Municipality

By _______________

Date: 10 Sept 09

"DISTRICT"

PUBLIC UTILITY DISTRICT NO. 1
OF DOUGLAS COUNTY
A Washington Municipality

By _______________
William C. Dobbins, General Manager

Date: September 28, 2009

Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
2600 Chester Kimm Road / P.O. Box 1688
Wenatchee, WA 98807-1688
(509) 662-3685 / (509) 662-2452 FAX

STATE OF WASHINGTON)
) ss.
COUNTY OF Douglas)

I certify that I know or have satisfactory evidence that William C. Dobbins is the person who appeared before me and said person acknowledged that he/she signed this instrument, on oath stated that he/she was authorized to execute the instrument and acknowledged it as the ____________________ of City of Bridgeport to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this _____ day of _________________, 2009.

____
Typed/Printed Name ________________
NOTARY PUBLIC
In and for the State of Washington
My appointment expires ______________

STATE OF WASHINGTON)
) ss.
COUNTY OF Douglas)

I certify that I know or have satisfactory evidence that William C. Dobbins is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the General Manager of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 28 day of September, 2009.

GARY R. IVORY
COMMISSION EXPIRES
NOTARY
PUBLIC
11-19-09
STATE OF WASHINGTON

Gary R. Ivory
Typed/Printed Name Gary R. Ivory
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 11-19-2009

Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
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Bridgeport-Marina

Tracts 919, 920, 921, 922, & 930

Exhibit 'A'

Those portions of Blocks J, K, and L of Riverside Addition to the Town of Bridgeport, as shown on a map on file in Book 'A' of Plats, at page 261 thereof, records of the Auditor of Douglas County, Washington, lying Southwesterly of the Wells Hydroelectric Project Boundary as show on a map recorded Oct. 11, 1965 as Auditor's File No.144107 and also shown on a Record of Survey recorded in Book 29/25, pages 65 through 70, both records of the Auditor of Douglas County, Washington, TOGETHER WITH those portions of the following described streets:

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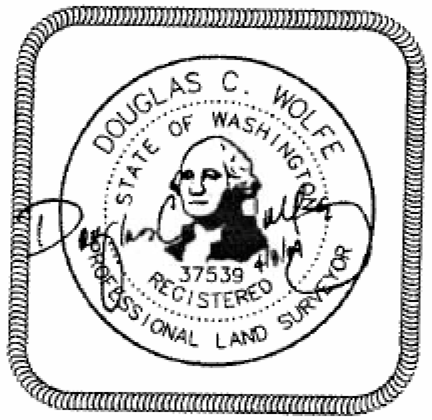

Prepared by: DCW
Checked by: RCS
Date: 4/8/2009

Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
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Wenatchee, WA 98807-1688
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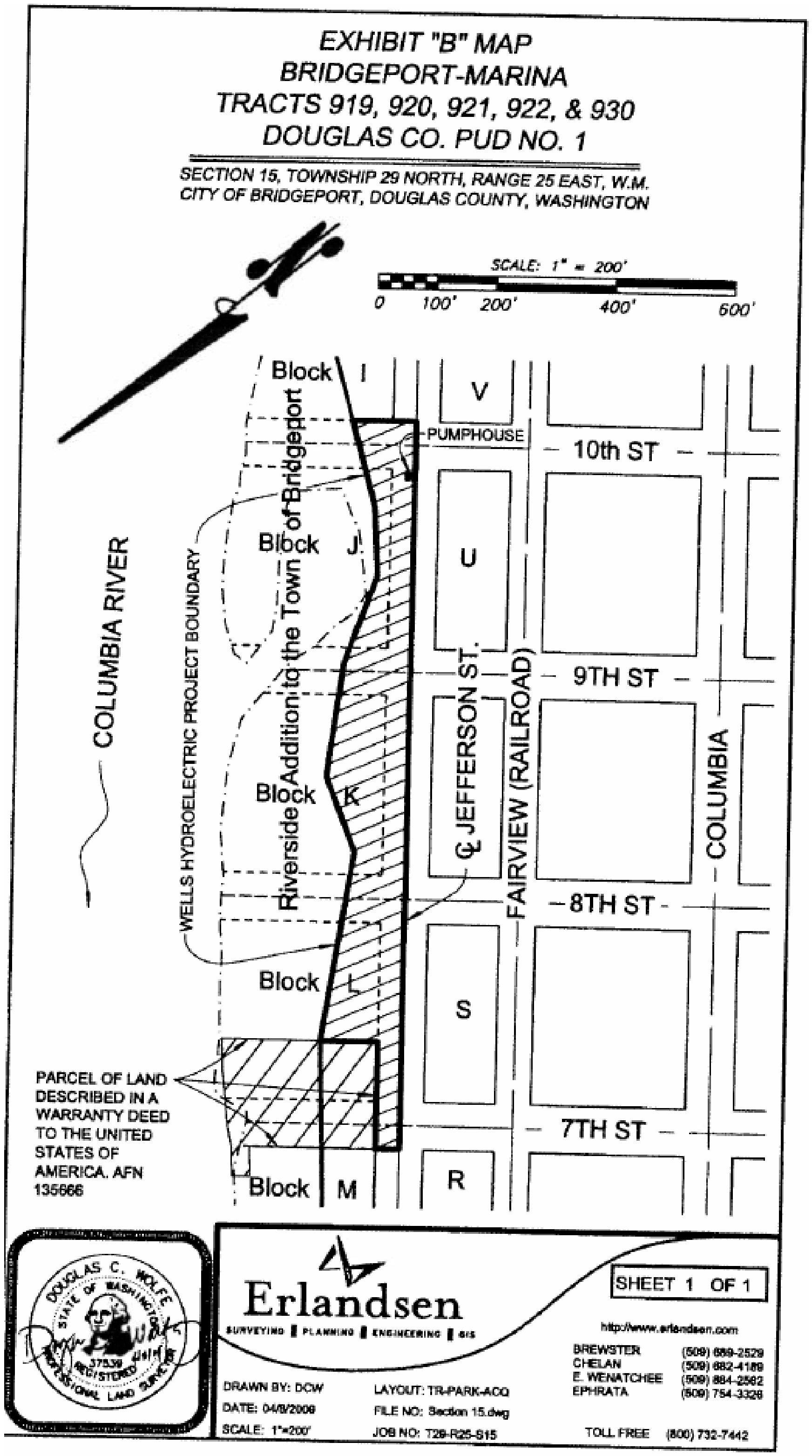

Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
2600 Chester Kimm Road / P.O. Box 1688
Wenatchee, WA 98807-1688
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Exhibit F

Exhibit F

Marina Park Operation and Maintenance Standards

Maintenance Activity	Frequency
Buildings/restrooms/shelters: Structures will be sanitary and maintained in good repair. If a structure is deemed in need of repair, it will be closed until repairs are completed.	During the high-use season (April – October), all facilities will be inspected at regular intervals (several times per week, as necessary). During the low-use season, facilities such as those located in the cities will be inspected less frequently but at regular intervals, and dispersed facilities will be inspected periodically. The interior and exterior of all structures will be painted as needed; this is expected to be about every three years. Buildings will receive structural inspection at least once in 10 years, unless a safety issue is reported and confirmed sooner.
Boat Ramps: Surfaces are to be kept in good and serviceable condition, and free of debris.	Boat ramps will be inspected at regular intervals during the high-use season of April through November.
Boat Docks and swimming platforms: Dock and platform surfaces, hardware, bumper strips, and other components will be maintained to provide safe and effective use.	Docks will be inspected for wear, obstacles, and damage/vandalism at regular intervals. Maintenance and repairs will be performed on an as-needed basis.
Picnic sites/camp sites: Inspect for cleanliness, damage, and vandalism. Tables will be sturdy and ready for use. Grills and fire pits will be in good working condition.	Picnic sites/camp sites will be inspected frequently (daily or weekly) during April through September, weekly or as needed in October and November and intermittently during the remainder of the year.
Trash/litter collection: The park areas will be kept clean. Trash containers will be emptied regularly.	Trash containers will be emptied at least once per week at city facilities and at least once every two weeks at dispersed facilities. Trash containers will also be emptied following holiday weekends during April through November.
Trails: Trail surfaces will be maintained in good condition and barriers will be removed to allow use of the trail. Trees and shrubs along the trails will be trimmed or removed seasonally and weeds will be controlled as needed.	Trails will be inspected weekly during the April through November season and intermittently the remainder of the year.
Park grounds/turf: Grass areas and gardens will be kept up through use of irrigation, fertilization, weed removal, and pesticide application where necessary. Grass will be mowed based on need. Signs will be installed during and after application of pesticides. Trees will be trimmed as needed.	Grass in parks will be mowed regularly. Roadsides and other natural areas at park facilities will be mowed as needed.
Snow removal: Snow will be removed from roads, parking areas, and the boat launch.	Snow will be removed within one day or as soon as feasible following a snow event.

Copy

AGREEMENT BETWEEN THE CITY

OF PATEROS AND PUBLIC UTILITY DISTRICT NO. 1

OF DOUGLAS COUNTY, WASHINGTON

This Agreement is made and entered into this 16th day of March, 2010, by and between the City of Pateros, Washington, a Municipal corporation ("City"), and Public Utility District No. 1 of Douglas County, Washington, a Municipal corporation ("District").

RECITALS

1. The District operates the Wells Hydroelectric Project ("Wells Project") on the Columbia River under License No. 2149 ("Original License"), from the Federal Energy Regulatory Commission, ("FERC"). The District is pursuing a new license ("Second License") for the Wells Project using the FERC Integrated Licensing Process.

2. In compliance with the Original License, the City and the District entered into an Agreement dated June 15, 1987, regarding the construction, ownership and operation of recreational facilities located on adjoining City and District property ("Prior Agreement"). Recreational facilities known as Pateros Memorial Park, Pateros Peninsula Park, Winter Boat Launch, Methow Boat Launch, and Riverside Drive Recreation Access were constructed pursuant to the Prior Agreement. This Agreement shall replace and supersede that Prior Agreement.

3. The District has the responsibility of ensuring that the Wells Project's recreation facilities are operated and maintained in a manner that is consistent

with the FERC license and consistent with the operation and maintenance standards in Exhibit A.

4. The District has expressed interest in compensating the City for providing administration, operation, and maintenance services for the Pateros Memorial Park, Pateros Peninsula Park, Winter Boat Launch, Methow Boat Launch, and Riverside Drive Recreation Access.

NOW, THEREFORE, in consideration of the mutual covenants and agreements herein provided, the parties agree as follows:

AGREEMENT

1. Property. The City represents that it owns or has the right to use the real property described in Exhibits B and C, attached hereto, upon which exist certain recreational facilities. The District owns certain property abutting the Columbia River and contiguous with the City's real property that contains additional recreational facilities. The District's property is described in Exhibits D, E and F attached hereto. The facilities located on the property constitute the Memorial Park, Peninsula Park, Winter Boat Launch, Methow Boat Launch and Riverside Drive Recreation Access. The City agrees to grant an easement in the form attached as Exhibit G to the District to use the parks as Wells Project recreation sites.

2. Permits. If the District constructs additional recreational facilities for the property described above then the District shall be solely responsible for obtaining all necessary permits and easements from the appropriate governmental agencies for the construction of such recreational facilities. The District shall further act as the lead agency insofar as environmental laws and regulations are concerned.

3. FERC Compliance. This entire Agreement is effective immediately but District funding and/or implementation of measures herein shall be contingent upon FERC approval and the issuance of a Second License to the District for the operation of the Wells Hydroelectric Project. The City shall support the District's application for a new 50-year license, refrain from seeking additional measures associated with the relicensing of the Wells Project, and ensure that all documents filed with FERC or any other agency or forum are consistent with this Agreement. Nothing in this agreement shall prohibit the City from advocating for new or additional measures during the term of the Second License. This Agreement shall be effective throughout the term of a Second License and the City shall not remove any of the park facilities or shut down the parks during that period. In the event the FERC does not approve or issue such a license, this entire Agreement shall be null and void and the District shall be excused from performance hereunder.

4. Operation, Maintenance and Administration. The District shall compensate the City for all reasonable administration, operation, and maintenance to the recreational facilities within the property described in Exhibits B, C, D, E and F, including, but not limited to, parking, lawns, restrooms, lights, water, power, sewer/septic, playground equipment, shelters and playfields for the term of the District's Second License.

The District shall be responsible for major maintenance items through the Recreation Management Plan update process. The Plan will be updated every six years based on documented changes in visitor use and needs (including facility upgrades) and/or new regulations relevant to recreation at the Wells Project. The District shall also be responsible for any unanticipated major maintenance in excess of $10,000 and for capital improvements related to those same facilities. This cap shall be adjusted according to the following schedule and will not be deducted from the annual O&M compensation described in Section 7:

Year	Capital Improvement Cap	Year	Capital Improvement Cap
2012	$10,000	2042	$19,000
2022	$13,000	2052	$22,000
2032	$16,000		

The District shall be responsible for all maintenance, repair and improvements of the Wells Hydroelectric Project assets such as docks, piers, boat launch ramps, riprap and bank protection. The City agrees that it will administer, operate and maintain all the recreational facilities described above to the standards contained in Exhibit A, and in a manner that is consistent with the Second License. The District shall inspect these recreation facilities quarterly to ensure that maintenance standards are being met.

5. <u>Performance.</u> In the event the District determines that the City is not performing to the aforementioned standards, the District shall have the option to demand that the City cure any alleged deficiencies in performance. To invoke this option, the District shall provide the City a written demand detailing the alleged performance deficiencies. The City shall have thirty (30) days from receipt to cure any deficiencies. Should the District be dissatisfied with any attempted cure, it shall have the right to terminate this Agreement and arrange an alternative means to administer, operate and maintain the recreational facilities described above. The District shall provide the City a 90-day notice prior to termination of this Agreement. In this event, the parties acknowledge that the easement attached as Exhibit G shall remain in effect to allow the

District and/or its assigns the ability to administer, operate and maintain the recreational facilities as a Wells Project recreation site of the District.

6. Administration. The City shall, without expense to the District, retain sole responsibility for administration of recreation facilities located on City property including, but not limited to, hours of operation, scheduling of reservations and special events, and rules and regulations. Administration of the recreation facilities shall be consistent with the City's municipal code and with the maintenance standards defined in Exhibit A.

7. Compensation.

7.1 The City will provide the District with a proposed annual budget, not exceeding $60,000 (2010 dollars), and will provide a scope of work of how the proposed budget addresses the standards contained in Exhibit A by March 1st of each year. The City and the District shall meet annually to discuss the proposed budget and scope of work. The budget cap shall be adjusted for inflation on the 1st day of January of each year based upon the Consumer Price Index for all Urban Consumers, U.S. City Averages, All Items, Not Seasonally Adjusted. The price index is published by the U.S. Department of Labor, Bureau of Labor Statistics. If said index is discontinued or becomes unavailable, a comparable index, mutually agreed upon by both Parties, will be substituted.

7.2 At its option, the District shall either make a single, annual lump-sum payment equal to the mutually agreed upon budget less any carryover from the previous year or monthly payments to the City equal to one-twelfth of the same amount.

7.3 The City shall maintain a clear and accurate record of actual expenses related to operation and maintenance of facilities managed under this Agreement. A report of monthly and year to date expenses shall be provided to the District on a quarterly basis.

7.4 Any excess of payments made by the District above the actual expenses of maintaining the facilities managed under this Agreement shall be carryover and shall be applied against the following year budget as described in 7.2.

7.5 Upon request the City shall provide any documentation in support of reported actual expenses related to operation of the facilities managed under this Agreement.

7.6 Upon mutual written consent of both parties, funds in excess to the needs of the actual O&M activities in the parks may be accrued and used toward the purchase of specific and agreed upon capital assets required for the maintenance of the recreation facilities, including but not limited to, landscaping equipment, mowers, irrigation upgrades, etc. Capital assets purchased under this provision of the Agreement shall be returned to the District upon termination of this Agreement or when each asset has reached the end of its useful life.

8. Legal Responsibility. Any additional recreational facilities constructed by the District pursuant to this Agreement shall be the property of and under the exclusive ownership of the entity that owns the underlying real property as denoted in Exhibits B through F. The City shall continue to bear the sole risk of loss of or damage to any additional facilities which are located on the property described in Exhibits B and C. The District shall have no responsibility or legal liability whatsoever arising out of the City's

administration, operation or maintenance of any recreational facilities on the property described in Exhibits B through F.

9. Liability Insurance. The City shall at the City's expense maintain commercial general liability insurance on the parks in an amount not less than Three Million Dollars ($3,000,000.00). This level of liability insurance shall be adjusted over time according to the following schedule:

Year	Liability Coverage	Year	Liability Coverage
2022	$4 million	2042	$6 million
2032	$5 million	2052	$7 million

The District shall be an additional insured on such policy. The City shall deliver a copy of any such insurance certificate to the District annually or upon renewal. The District's requirements for insurance limits do not establish a dollar limit on the liability of the City if it is the financially responsible party for an incident, accident or injury.

10. Indemnity. The City hereby releases and agrees to hold harmless, indemnify and defend the District and its officers, agents, employees and contractors from, against and for any and all liabilities, obligations, suits, claims, demands, actions, costs and expenses of any kind which may be imposed upon or asserted against the District by reason of any accident, injury or damage to any person and/or property arising from the administration, operation, maintenance or use of the recreational facilities, except to the extent such accident, injury or damage arises from the negligence of the District or its officers, agents, employees or contractors. The City shall name the District as an additional insured on any commercial general liability policy covering the administration, operation, maintenance or use of the recreational facilities, provided that naming the District as an additional insured does not significantly increase the cost of that

insurance. In the event that it does significantly increase the cost of that insurance the City agrees (1) to provide the District at least thirty (30) days notice before the District is no longer an additional insured under that policy and (2) allow the District to bear the cost of it being an additional insured. This indemnity agreement was mutually negotiated by the parties to this Agreement.

11. Future Development. Any future additional development and landscaping performed by the City on the property described in Exhibits B through F shall be in accordance with first-class construction and landscaping practices and shall be compatible with all existing facilities and landscaping. New facilities shall be permitted on City-owned properties described in Exhibits B and C, provided the facilities meet the above construction standards, are for the purpose of enhancing public recreation, and have been approved by the City.

12. Water Rights. The District shall pursue the acquisition of adequate water rights, and explore the potential for using recycled City water, to provide irrigation for recreation facility properties described herein. If water rights for the recreation facilities cannot be acquired by May 31, 2017, then the parties shall meet to determine the final solution to the existing use of the city's water to irrigate the District's recreation facilities.

13. No Partnership. This Agreement shall not be interpreted or construed to create an association, joint venture or partnership between the parties or to impose any partnership obligations or liability upon any party. Further, no party shall have any right, power or authority to enter into any contract or commitment for or on behalf of, to act as or be an agent or representative of, or otherwise to bind any other party.

14. Notices. All notices to be given pursuant to this Agreement shall be addressed to the Mayor of the City of Pateros, Washington, City Hall, 113 Lakeshore Drive, P.O. Box 8, Pateros, Washington 98846; and to the General Manager, Public Utility District No. 1 of Douglas County, Washington, 1151 Valley Mall Parkway, East Wenatchee, Washington, 98802, or as may from time to time be directed by written notice from the other party. Notice shall be in writing and deemed to have been given when enclosed in a properly sealed envelope or wrapper, addressed as aforesaid and deposited, postage prepaid, in a post office or branch post office of the United States Government or served in person.

15. Binding Effect. This Agreement shall be binding upon and inure to the benefit of the parties and their respective successors and assigns. Neither the City's rights nor duties under the terms of this Agreement shall be delegable or assignable without prior written approval of the District. No delegation of the City's rights shall relieve the City of its obligations under this Agreement.

16. Law-Venue. The parties hereto agree that this Agreement shall be governed by the laws of the State of Washington, and that in the event legal action becomes necessary to enforce any provisions hereof, venue shall be in Chelan County, Washington. The parties consider Chelan County to be a neutral venue.

17. Attorney Fees and Costs. In the event any party employs legal counsel to enforce any covenant of this Agreement, or to pursue any other remedy on default as provided herein, or by law, the substantially prevailing party shall be entitled to recover all reasonable attorneys' fees and all other costs and expenses not limited to court action. Such sum shall be included in any judgment or decree entered.

18. Compliance. The parties, in fulfilling their obligations hereunder, shall conform to and comply with all laws, rules, regulations, conditions or restrictions promulgated by the FERC or any other governmental agency or other governmental entity having jurisdiction over the Wells Project.

19. Non-Waiver. The failure of any party to insist upon or enforce strict performance by the other party of any of the provisions of this Agreement or to exercise any rights under this Agreement shall not be construed as a waiver or relinquishment to any extent of such party's right to assert or rely upon any such provisions or rights in any other instance.

20. Implementation. Each party shall, upon written request of the other party, take such action (including, but not limited to, the execution, acknowledgment and delivery of documents) as may be reasonably required for the implementation or continuing performance of this Agreement.

21. Invalid Provision. The invalidity or unenforceability of any provision of this Agreement shall not affect the other provisions of this Agreement, and this Agreement shall be construed in all respects as if such invalid or unenforceable provision were omitted.

22. Survival. The obligations of the City which may reasonably be interpreted or construed as surviving the completion, termination or cancellation of this Agreement shall survive the completion, termination or cancellation of this Agreement so long as the District is the licensee of the Wells Project.

IN WITNESS WHEREOF, the said parties have hereunto set their hands on this _

15 day of March, 2010.

CITY OF PATEROS, WASHINGTON
A Municipal Corporation

By Gail A Howe
Gail A. Howe, Mayor

PUBLIC UTILITY DISTRICT NO. 1 OF DOUGLAS COUNTY, WASHINGTON
A Municipal Corporation

By
T. James Davis

By Lynn M. Heminger
Lynn M. Heminger

By Ronald E. Skagen
Ronald E. Skagen

STATE OF WASHINGTON)
) ss.
COUNTY OF Okanogan)

I certify that I know or have satisfactory evidence that Gail A. Howe, is the person who appeared before me and said person acknowledged that she signed this instrument, on oath stated that she was authorized to execute the instrument and acknowledged it as the Mayor of City of Pateros to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 16 day of March, 2010.

Notary Public
State of Washington
LINDA MARSH
MY COMMISSION EXPIRES
February 13, 2014

Linda Marsh
Typed/Printed Name Linda Marsh
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 2-13-2014

STATE OF WASHINGTON)
) ss.
COUNTY OF ____________)

I certify that I know or have satisfactory evidence that T. James Davis, is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as a Commissioner of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this _____ day of _________________, 2010.

____
Typed/Printed Name _______________
NOTARY PUBLIC
In and for the State of Washington
My appointment expires _______________

STATE OF WASHINGTON)
) ss.
COUNTY OF Douglas)

I certify that I know or have satisfactory evidence that Lynn M. Heminger, is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as a Commissioner of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 15 day of March, 2010.

GARY R. IVORY
COMMISSION EXPIRES
NOTARY
PUBLIC
11-19-13
STATE OF WASHINGTON

Typed/Printed Name Gary R. Ivory
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 11-19-13

STATE OF WASHINGTON)
) ss.
COUNTY OF ___________)

I certify that I know or have satisfactory evidence that Ronald E. Skagen, is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as a Commissioner of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this _____ day of _________________, 2010.

____
Typed/Printed Name __________________
NOTARY PUBLIC
In and for the State of Washington
My appointment expires ________________

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Exhibit A

Exhibit A

Operation and Maintenance Standards

Maintenance Activity	Frequency
Buildings/restrooms/shelters: Structures will be sanitary and maintained in good repair. If a structure is deemed in need of repair, it will be closed until repairs are completed.	During the high-use season (April – October), all facilities will be inspected at regular intervals (several times per week, as necessary). During the low-use season, facilities such as those located in the cities will be inspected less frequently but at regular intervals, and dispersed facilities will be inspected periodically. The interior and exterior of all structures will be painted as needed; this is expected to be about every three years. Buildings will receive structural inspection at least once in 10 years, unless a safety issue is reported and confirmed sooner.
Boat Ramps: Surfaces are to be kept in good and serviceable condition, and free of debris.	Boat ramps will be inspected at regular intervals during the high-use season of April through November.
Boat Docks and swimming platforms: Dock and platform surfaces, hardware, bumper strips, and other components will be maintained to provide safe and effective use.	Docks will be inspected for wear, obstacles, and damage/vandalism at regular intervals. Maintenance and repairs will be performed on an as-needed basis.
Picnic sites/camp sites: Inspect for cleanliness, damage, and vandalism. Tables will be sturdy and ready for use. Grills and fire pits will be in good working condition.	Picnic sites/camp sites will be inspected frequently (daily or weekly) during April through September, weekly or as needed in October and November and intermittently during the remainder of the year.
Trash/litter collection: The park areas will be kept clean. Trash containers will be emptied regularly.	Trash containers will be emptied at least once per week at city facilities and at least once every two weeks at dispersed facilities. Trash containers will also be emptied following holiday weekends during April through November.
Trails: Trail surfaces will be maintained in good condition and barriers will be removed to allow use of the trail. Trees and shrubs along the trails will be trimmed or removed seasonally and weeds will be controlled as needed.	Trails will be inspected weekly during the April through November season and intermittently the remainder of the year.
Park grounds/turf: Grass areas and gardens will be kept up through use of irrigation, fertilization, weed removal, and pesticide application where necessary. Grass will be mowed based on need. Signs will be installed during and after application of pesticides. Trees will be trimmed as needed.	Grass in parks will be mowed regularly. Roadsides and other natural areas at park facilities will be mowed as needed.
Snow removal: Snow will be removed from roads, parking areas, and the boat launch.	Snow will be removed within one day or as soon as feasible following a snow event.

Exhibit B

Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS

210 N Bridge Street
P.O. Box 739
Brewster, WA 98812

Phone: 509.689.2529
Fax: 509.689.2520

www.erlandsen.com

Pateros Memorial Park

City of Pateros Ownership

All distances and areas shown on the following described parcel of land are grid values per NAD 83/1991 adjustment, Washington State Coordinate System, North Zone. To obtain ground distances and areas multiply by a factor of 1.00009184.

Block 6 of Pateros Replat No. 3, as shown on a map recorded in Book 'G' of Plats, at Page 29 thereof, records of the Auditor of Okanogan County, Washington.

EXCEPT that portion of said Block 6 being more particularly described as follows:

BEGINNING at the most Easterly corner of said Block 6;

Thence South 39°25'29" West along the Southeasterly line of said Block 6, a distance of 45.15 feet;

Thence North 50°44'48" West, a distance of 89.82 feet to the Northwesterly line of said Block 6;

Thence North 39°24'22" East along the Northwesterly line of said Block 6, a distance of 45.39 feet to the most Northerly corner of said Block 6;

Thence South 50°35'38" East along the Northeasterly line of said Block 6, a distance of 89.84 feet to the most Easterly corner of said Block 6 and the POINT OF BEGINNING.

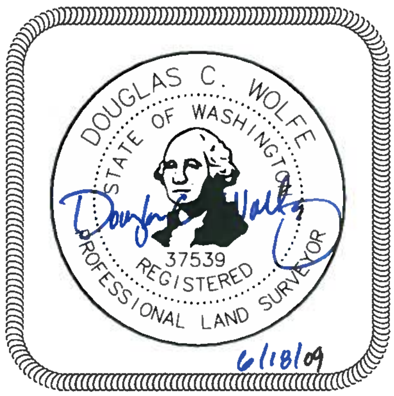
Erlandsen

SURVEYING | PLANNING | ENGINEERING | GIS

210 N Bridge Street
P.O. Box 739
Brewster, WA 98812

Phone: 509.689.2529
Fax: 509.689.2520

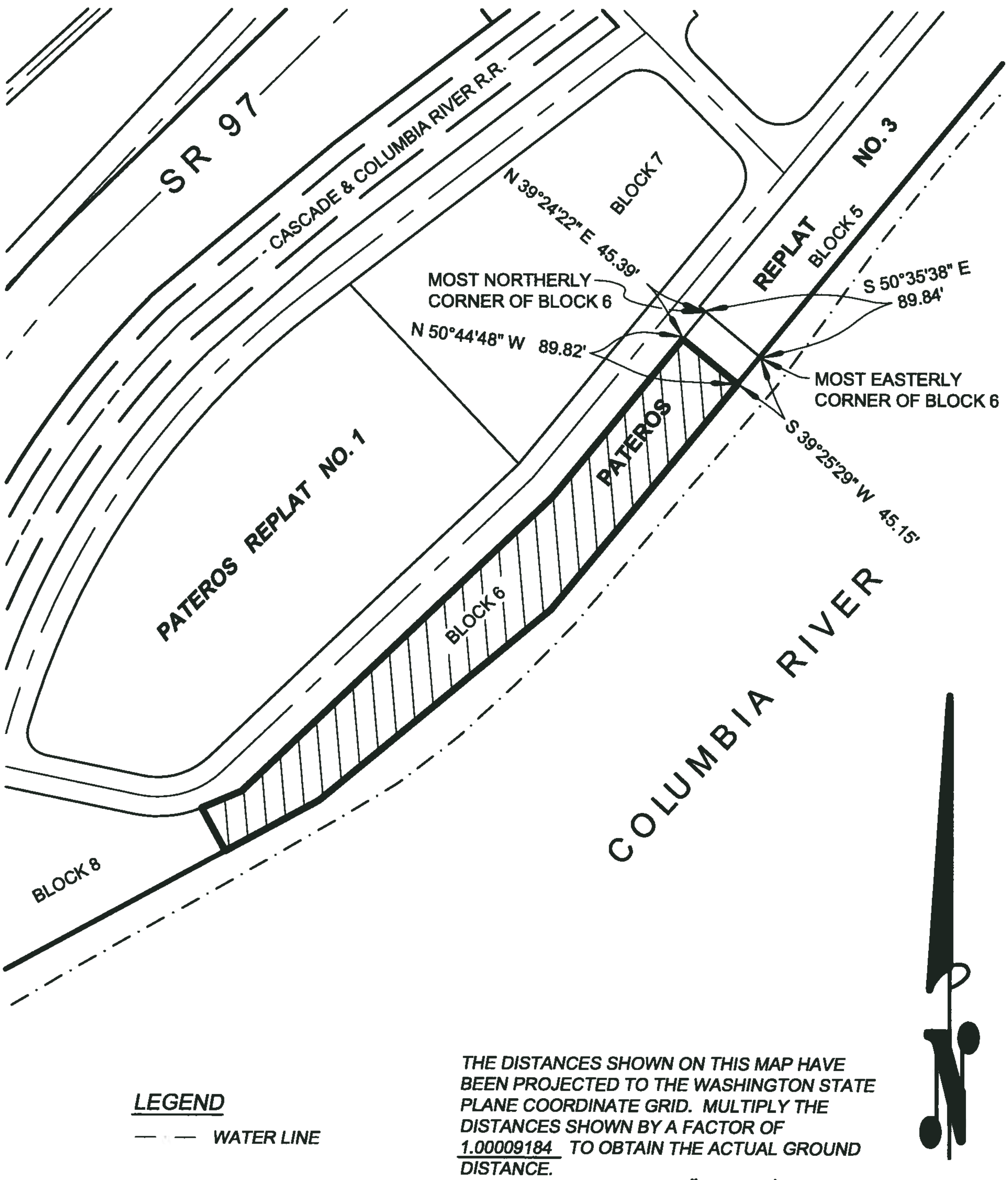
www.erlandsen.com



Prepared by: DCW
Checked by: RCS
Date: 6/18/2009

PATEROS MEMORIAL PARK
CITY OF PATEROS - OWNERSHIP

PORTION OF BLOCK 6, PATEROS REPLAT NO. 3
CITY OF PATEROS, OKANOGAN COUNTY, WASHINGTON



LEGEND

— · — WATER LINE

THE DISTANCES SHOWN ON THIS MAP HAVE BEEN PROJECTED TO THE WASHINGTON STATE PLANE COORDINATE GRID. MULTIPLY THE DISTANCES SHOWN BY A FACTOR OF 1.00009184 TO OBTAIN THE ACTUAL GROUND DISTANCE.

SCALE: 1" = 200'

0 100' 200' 400' 600'

DOUGLAS C. WOLFE
STATE OF WASHINGTON
37539
REGISTERED PROFESSIONAL LAND SURVEYOR
Douglas C. Wolfe
6/18/09

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SURVEYING | PLANNING | ENGINEERING | GIS

SHEET 1 OF 1

http://www.erlandsen.com

BREWSTER	(509) 689-2529
CHELAN	(509) 682-4189
E. WENATCHEE	(509) 884-2562
EPHRATA	(509) 754-3326

TOLL FREE (800) 732-7442

DRAWN BY: DCW
DATE: 6/18/2009
SCALE: 1"=200'

LAYOUT: TR-363-ACQ
FILE NO: Section 36.dwg
JOB NO: 95650.0

Exhibit C

Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS

210 N Bridge Street
P.O. Box 739
Brewster, WA 98812

Phone: 509.689.2529
Fax: 509.689.2520

www.erlandsen.com

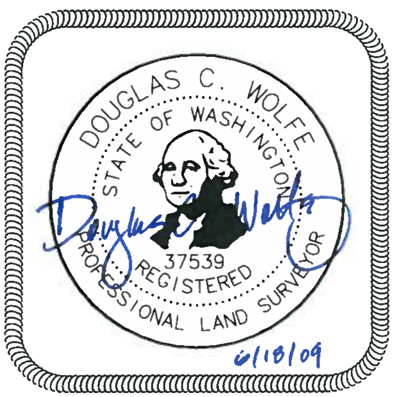
Pateros Peninsula Park

City of Pateros Ownership

Blocks 9, 11, and 16 of Pateros Replat No. 4 as shown on a map on file in Book 'G' of Plats, at Page 30 thereof, records of the Auditor of Okanogan County, Washington, TOGETHER WITH that portion of Riverside Drive as shown on said map of Pateros Replat No. 4, lying Northeasterly of the following described line:

BEGINNING at the most Southerly corner of said Block 11;

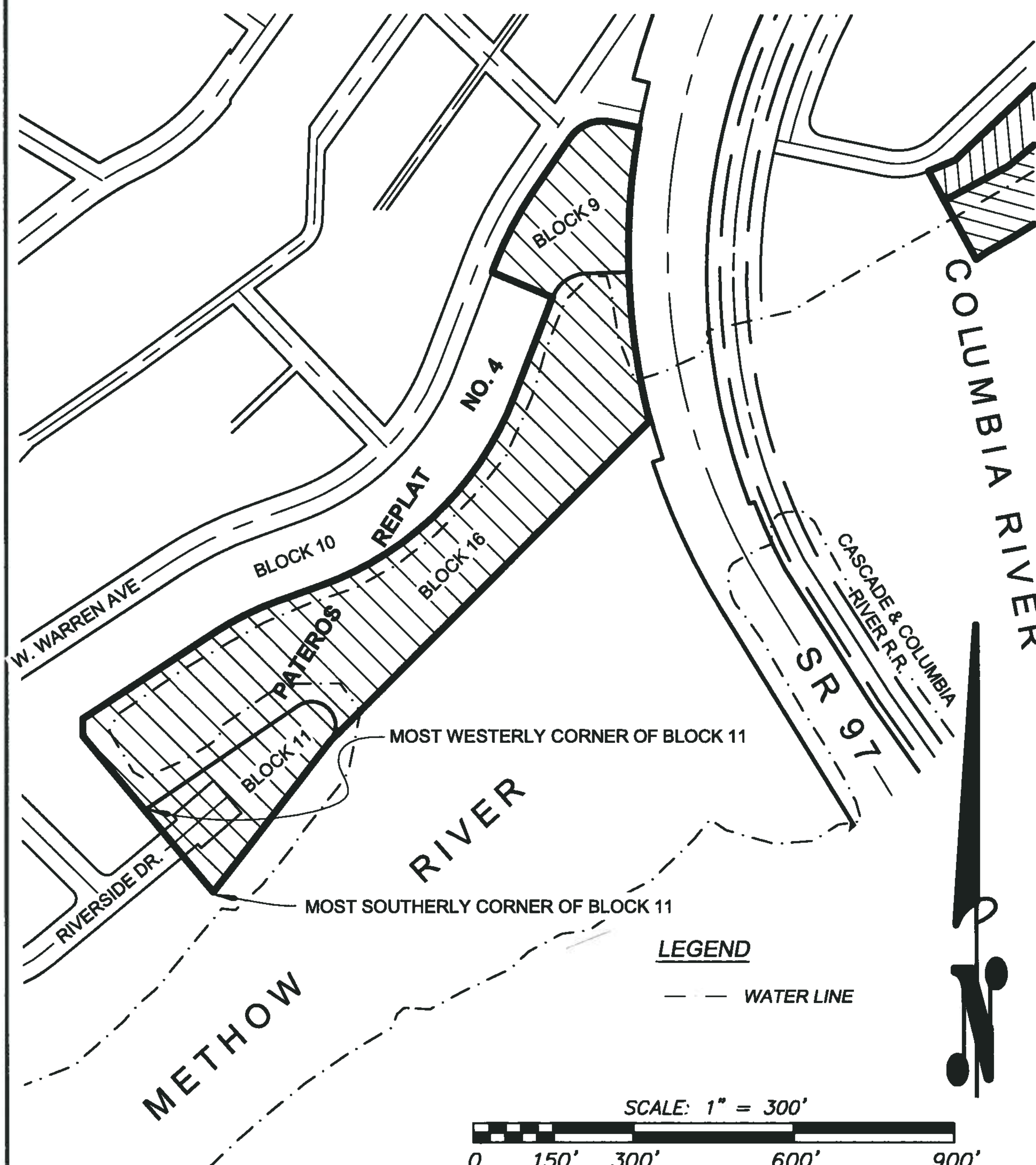
Thence Northwesterly to the most Westerly corner of said Block 11 and the TERMINUS of this line.



Prepared by: DCW
Checked by: RCS
Date: 6/18/2009

PATEROS-PENINSULA PARK
CITY OF PATEROS OWNERSHIP

PORTIONS OF PATEROS REPLAT NO. 4
CITY OF PATEROS, OKANOGAN COUNTY, WASHINGTON



DOUGLAS C. WOLFE STATE OF WASHINGTON 37539 REGISTERED PROFESSIONAL LAND SURVEYOR

6/18/09

Erlandsen

SURVEYING | PLANNING | ENGINEERING | GIS

SHEET 1 OF 1

http://www.erlandsen.com

BREWSTER	(509) 689-2529
CHELAN	(509) 682-4189
E. WENATCHEE	(509) 884-2562
EPHRATA	(509) 754-3326
OMAK	(509) 422-1781
TOLL FREE	(800) 732-7442

DRAWN BY: DCW
DATE: 6/18/2009
SCALE: 1"=300'

LAYOUT: TR-344-ACQ
FILE NO: Section 36.dwg
JOB NO: 95650.0

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Exhibit D

Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS

210 N Bridge Street
P.O. Box 739
Brewster, WA 98812

Phone: 509.689.2529
Fax: 509.689.2520

www.erlandsen.com

Pateros Memorial Park

P.U.D. No. 1 of Douglas County Ownership

All distances and areas shown on the following described parcel of land are grid values per NAD 83/1991 adjustment, Washington State Coordinate System, North Zone. To obtain ground distances and areas multiply by a factor of 1.00009156.

That portion of Government Lot 5 of Section 36, Township 30 North, Range 23 East of the Willamette Meridian, being bound on the Southeasterly side by the line of ordinary high water as shown on Sheets 6 and 7 of 39, Wells Hydroelectric Project Revised Exhibit 'K' drawings dated April 1, 1981 on file with Public Utility District No. 1 of Douglas County, bounded on the Northwesterly side by the Southeasterly line of Blocks 6 and 8 of Pateros Replat No. 3, as shown on a map recorded in Book 'G' of Plats, at Page 29 thereof, records of the Auditor of Okanogan County, Washington, together with the proposed Wells Hydroelectric Boundary lying Westerly of said Block 8 as shown on a Record of Survey recorded September 11, 2009 in Book 'S' of Surveys, at pages 219 through 226 thereof, AFN 3148282, records of the Auditor of Okanogan County, Washington, bounded on the Southwesterly side by Westerly right-of-way line of S.R. 97 and bound on the Northeasterly side by the following described line:

COMMENCING at the most Easterly corner of said Block 6;

Thence South 39°25'29" West along said Southeasterly line of said Block 6, a distance of 45.15 feet to the POINT OF BEGINNING;

Thence South 50°44'48" East to the line of ordinary high water as shown on said Sheet 7 of 39, Wells Hydroelectric Project Revised Exhibit 'K' drawings dated April 1, 1981 and the TERMINUS of this line.

Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS

210 N Bridge Street
P.O. Box 739
Brewster, WA 98812

Phone: 509.689.2529
Fax: 509.689.2520

www.erlandsen.com

DOUGLAS C. WOLFE
STATE OF WASHINGTON
37539
REGISTERED
PROFESSIONAL LAND SURVEYOR

3/10/2010

Prepared by: DCW
Checked by: DKG
Date: 3/9/2010

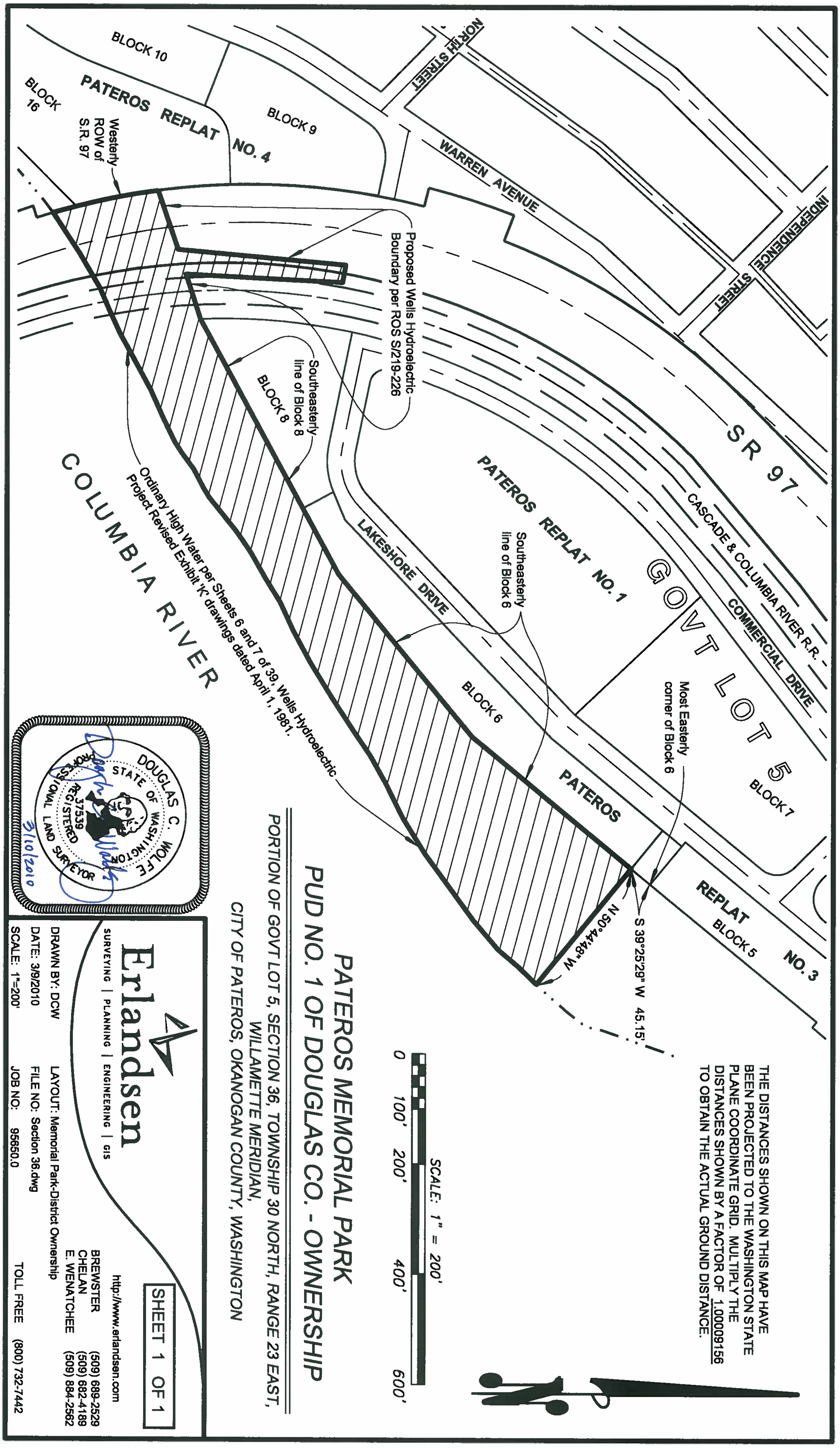
BLOCK 10
BLOCK 16
PATEROS REPLAT NO. 4
BLOCK 9
NORTH STREET
WARREN AVENUE
INDEPENDENCE STREET
Westerly ROW of S.R. 97
Proposed Wells Hydroelectric Boundary per ROS S/219-226
Southeasterly line of Block 8
BLOCK 8
SR 97
PATEROS REPLAT NO. 1
CASCADE & COLUMBIA RIVER R.R.
GOVT LOT 5
COMMERCIAL DRIVE
LAKESHORE DRIVE
Southeasterly line of Block 6
BLOCK 6
Most Easterly corner of Block 6
BLOCK 7
PATEROS REPLAT NO. 3
BLOCK 5
COLUMBIA RIVER
Ordinary High Water per Sheets 6 and 7 of 39, Wells Hydroelectric Project Revised Exhibit 'K' drawings dated April 1, 1981.
N 50°44'48" W
S 39°25'29" W 45.15'
THE DISTANCES SHOWN ON THIS MAP HAVE BEEN PROJECTED TO THE WASHINGTON STATE PLANE COORDINATE GRID. MULTIPLY THE DISTANCES SHOWN BY A FACTOR OF 1.00009156 TO OBTAIN THE ACTUAL GROUND DISTANCE.
SCALE: 1" = 200'
0 100' 200' 400' 600'
PATEROS MEMORIAL PARK
PUD NO. 1 OF DOUGLAS CO. - OWNERSHIP
PORTION OF GOVT LOT 5, SECTION 36, TOWNSHIP 30 NORTH, RANGE 23 EAST,
WILLAMETTE MERIDIAN,
CITY OF PATEROS, OKANOGAN COUNTY, WASHINGTON
DOUGLAS C. WOLFE
STATE OF WASHINGTON
REGISTERED
37539
PROFESSIONAL LAND SURVEYOR
3/10/2010
Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS
http://www.erlandsen.com
BREWSTER (509) 689-2529
CHELAN (509) 682-4189
E. WENATCHEE (509) 884-2562
TOLL FREE (800) 732-7442
SHEET 1 OF 1
DRAWN BY: DCW
DATE: 3/9/2010
SCALE: 1"=200'
LAYOUT: Memorial Park-District Ownership
FILE NO: Section 36.dwg
JOB NO: 95650.0

Exhibit E

Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS

250 Simon Street SE
East Wenatchee, WA 98802

Phone: 509.884.2562
Fax: 509.884.2814

www.erlandsen.com

Riverside Drive Recreation Site Boundary Description (Pateros)

Public Utility District No. 1 of Douglas County Ownership

Note: The following description has been prepared for use in a Park Agreement between the City of Pateros and Public Utility District No.1 of Douglas County and should only be used for that purpose. This description is based on documentation acquired from Public Utility District No.1 of Douglas County without benefit of a Chain of Title and/or Title Report. Should this description be used for any other purpose, a Chain of Title and Title Report should be obtained to confirm ownership.

A parcel of land located within a portion of Government Lot 2, Section 2, Township 29 North, Range 23 East of the Willamette Meridian, City of Pateros, Okanogan County, Washington, said parcel being bound on the North side by the South line of Block 15, Pateros Replat No. 4, according to the plat thereof recorded in Volume 'G' of Plats, at page 30, records of said County; bound on the East side by the East line of said Block 15 extended southerly; bound on the West side by the West line of said Block 15 extended southerly; and bound on the South side by the line of ordinary high water on the left bank of the Methow River.

Prepared By: Erik B. Gahringer, PLS
Checked By: Danny K. Gildehaus, PLS
Date: December 1, 2009

ERIK B. GAHRINGER
STATE OF WASHINGTON
37543
REGISTERED
PROFESSIONAL LAND SURVEYOR
12/1/09

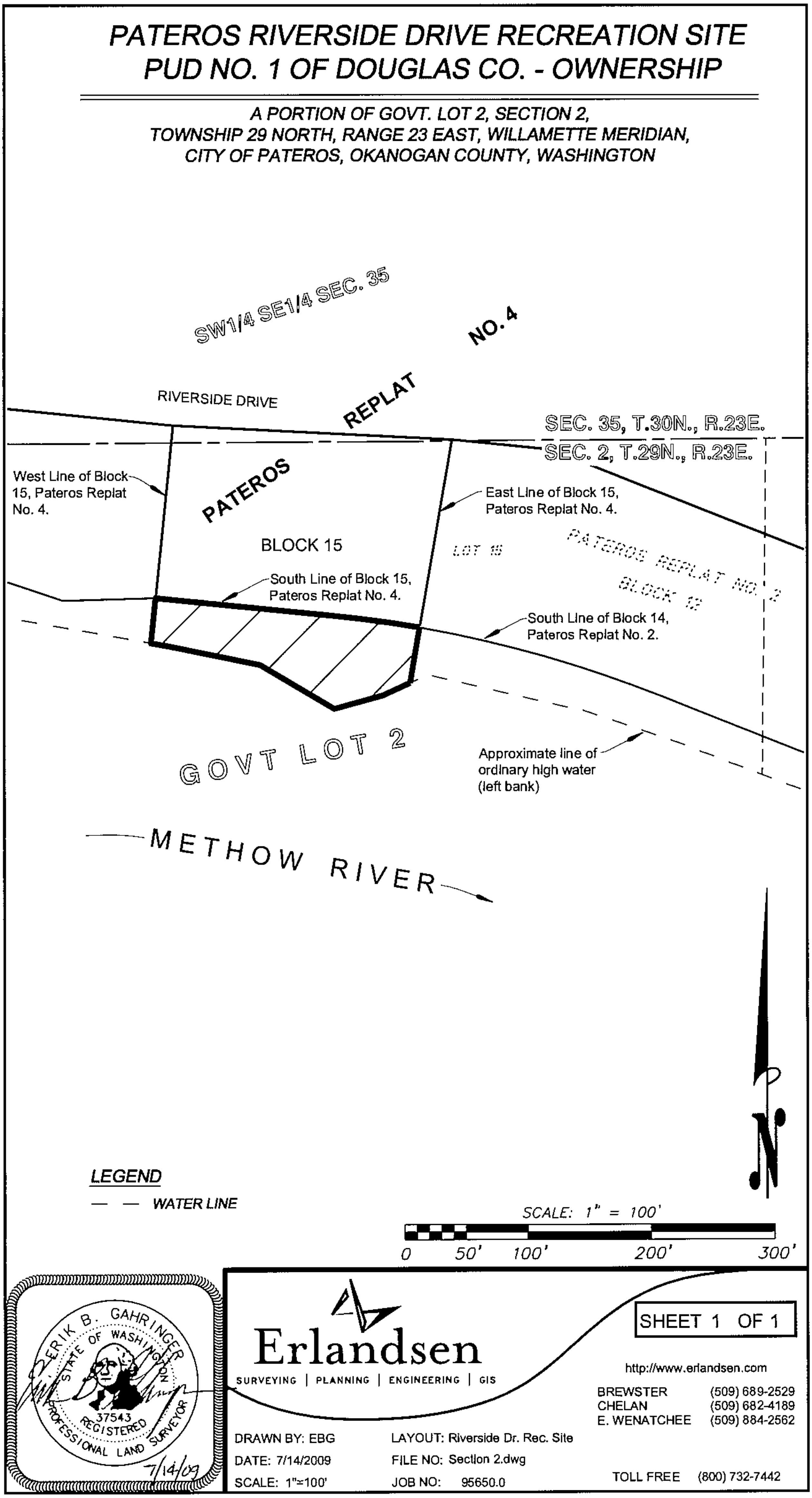
PATEROS RIVERSIDE DRIVE RECREATION SITE
PUD NO. 1 OF DOUGLAS CO. - OWNERSHIP
A PORTION OF GOVT. LOT 2, SECTION 2,
TOWNSHIP 29 NORTH, RANGE 23 EAST, WILLAMETTE MERIDIAN,
CITY OF PATEROS, OKANOGAN COUNTY, WASHINGTON
SW1/4 SE1/4 SEC. 35
PATEROS REPLAT NO. 4
RIVERSIDE DRIVE
SEC. 35, T.30N., R.23E.
SEC. 2, T.29N., R.23E.
West Line of Block 15, Pateros Replat No. 4.
East Line of Block 15, Pateros Replat No. 4.
BLOCK 15
LOT 15
PATEROS REPLAT NO. 2
BLOCK 12
South Line of Block 15, Pateros Replat No. 4.
South Line of Block 14, Pateros Replat No. 2.
GOVT LOT 2
Approximate line of ordinary high water (left bank)
METHOW RIVER
N
LEGEND
WATER LINE
SCALE: 1" = 100'
0 50' 100' 200' 300'
ERIK B. GAHRINGER
STATE OF WASHINGTON
37543
REGISTERED
PROFESSIONAL LAND SURVEYOR
7/14/09
Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS
SHEET 1 OF 1
http://www.erlandsen.com
BREWSTER (509) 689-2529
CHELAN (509) 682-4189
E. WENATCHEE (509) 884-2562
DRAWN BY: EBG
DATE: 7/14/2009
SCALE: 1"=100'
LAYOUT: Riverside Dr. Rec. Site
FILE NO: Section 2.dwg
JOB NO: 95650.0
TOLL FREE (800) 732-7442

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Exhibit F

Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS

250 Simon Street SE
East Wenatchee, WA 98802

Phone: 509.884.2562
Fax: 509.884.2814

www.erlandsen.com

Winter Boat Launch Boundary Description (Pateros)

Public Utility District No. 1 of Douglas County Ownership

Note: The following description has been prepared for use in a Park Agreement between the City of Pateros and Public Utility District No.1 of Douglas County and should only be used for that purpose. This description is based on documentation acquired from Public Utility District No.1 of Douglas County without benefit of a Chain of Title and/or Title Report. Should this description be used for any other purpose, a Chain of Title and Title Report should be obtained to confirm ownership.

A parcel of land being that portion of the southeast quarter of the northwest quarter and Government Lot 2 and 5, Section 36, Township 30 North, Range 23 East of the Willamette Meridian, Okanogan County, Washington, bound on the northwesterly side by the southeasterly boundary line of Pateros Replat No. 3, according to the plat thereof recorded in Volume 'G' of Plats, at page 29, records of said County; bound on the northeasterly side by the southeasterly extension of the southwesterly line of Block 1, said Replat; bound on the southwesterly side by a line perpendicular to the southeasterly boundary line of said Pateros Replat No. 3, and extending southeasterly from the most northeasterly corner of Lot 13, Block 5, said Replat; and bound on the southeasterly side by the line of ordinary high water as shown on Sheet 7 of 39, Wells Hydroelectric Project Revised Exhibit 'K' drawings dated April 1, 1981 on file with Public Utility District No. 1 of Douglas County.

Prepared By: Erik B. Gahringer, PLS
Checked By: Danny K. Gildehaus, PLS
Date: December 1, 2009

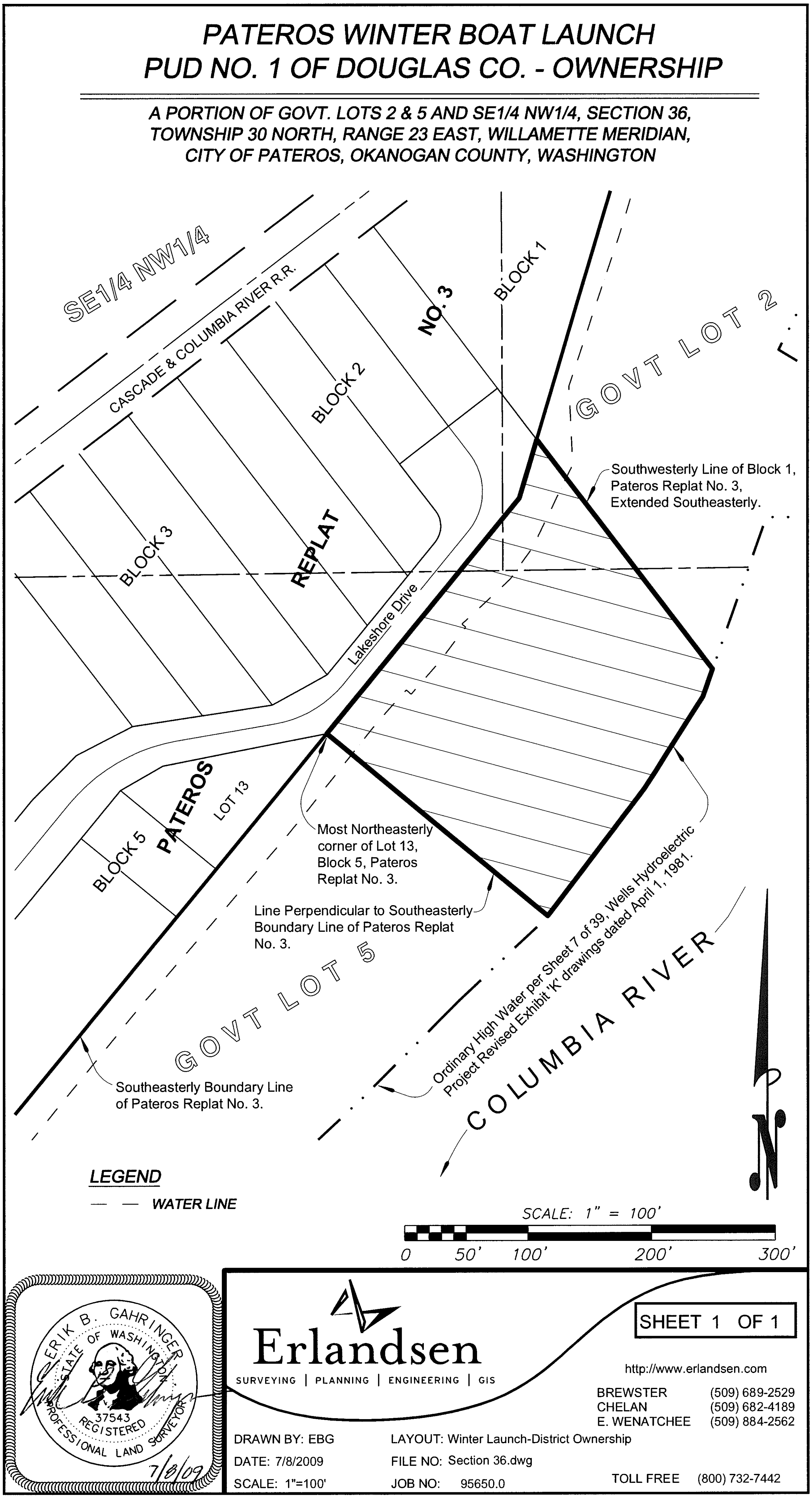
PATEROS WINTER BOAT LAUNCH
PUD NO. 1 OF DOUGLAS CO. - OWNERSHIP
A PORTION OF GOVT. LOTS 2 & 5 AND SE1/4 NW1/4, SECTION 36, TOWNSHIP 30 NORTH, RANGE 23 EAST, WILLAMETTE MERIDIAN, CITY OF PATEROS, OKANOGAN COUNTY, WASHINGTON
SE1/4 NW1/4
CASCADE & COLUMBIA RIVER R.R.
NO. 3
BLOCK 1
BLOCK 2
BLOCK 3
REPLAT
GOVT LOT 2
Southwesterly Line of Block 1, Pateros Replat No. 3, Extended Southeasterly.
Lakeshore Drive
PATEROS
LOT 13
BLOCK 5
Most Northeasterly corner of Lot 13, Block 5, Pateros Replat No. 3.
Line Perpendicular to Southeasterly Boundary Line of Pateros Replat No. 3.
Ordinary High Water per Sheet 7 of 39, Wells Hydroelectric Project Revised Exhibit 'K' drawings dated April 1, 1981.
GOVT LOT 5
COLUMBIA RIVER
Southeasterly Boundary Line of Pateros Replat No. 3.
N
LEGEND
WATER LINE
SCALE: 1" = 100'
0 50' 100' 200' 300'
ERIK B. GAHRINGER
STATE OF WASHINGTON
37543
REGISTERED PROFESSIONAL LAND SURVEYOR
7/8/09
Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS
SHEET 1 OF 1
http://www.erlandsen.com
BREWSTER (509) 689-2529
CHELAN (509) 682-4189
E. WENATCHEE (509) 884-2562
DRAWN BY: EBG
DATE: 7/8/2009
SCALE: 1"=100'
LAYOUT: Winter Launch-District Ownership
FILE NO: Section 36.dwg
JOB NO: 95650.0
TOLL FREE (800) 732-7442

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Exhibit G

Return Address:

Donald L. Dimmitt
Jeffers, Danielson, Sonn & Aylward, P.S.
P.O. Box 1688
Wenatchee, WA 98801

EASEMENT
(for Recreational Resources)

Grantor (City): City of Pateros, a Washington municipal corporation
Grantee (District): Public Utility District No. 1 of Douglas County, Washington, a Washington municipal corporation
Legal Description (abbreviated): **Burdened Property:** Portions of Block 6 of Pateros Replat No. 3 and Blocks 9, 11 and 16 of Pateros Replat No. 4, Okanogan County, Washington. Additional legal description on page 2.
Assessor's Tax Parcel ID#: **Burdened Property:**

Parties

1.1 City. City of Pateros, a Washington municipal corporation.

1.2 District. Public Utility District No. 1 of Douglas County, Washington, a Washington municipal corporation.

Easement

2.1 Grant of Easement. City hereby conveys and warrants to District a nonexclusive easement as described herein of the type described herein for the purposes described herein.

2.2 Purpose. The purpose of this easement is for use of recreational facilities known as Pateros Memorial Park and Pateros Peninsula Park as project recreation sites of the District.

Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
2600 Chester Kimm Road / P.O. Box 1688
Wenatchee, WA 98807-1688
(509) 662-3685 / (509) 662-2452 FAX

2.3 Consideration. This easement is for and in consideration of the District's agreement to compensate the City for operation, maintenance and capital improvements to the facilities as detailed by separate agreement between the parties.

2.4 Benefited Property. This easement is to benefit the Wells Hydroelectric Project No. 2149.

2.5 Burdened Property. This easement is to burden the following described real property situated in the County of Okanogan, State of Washington:

The property described on Exhibits A and B.

2.6 Location of Easement. The location of the easement is described as follows:

The property described on Exhibits A and B.

2.7 Term of Easement. The term of this easement is for the term of the District's License No. 2149 from the Federal Energy Regulatory Commission, any extension of that license and any new license granted to the District.

2.8 Maintenance and Repair. The cost of any maintenance and repair of the above easement is covered by separate agreement.

2.9 Attorney Fees and Costs. In the event any party employs legal counsel to enforce any covenant of this easement, or to pursue any other remedy on default as provided herein or by law, the substantially prevailing party shall be entitled to recover all reasonable attorneys' fees, appraisal fees, title search fees, other necessary expert witness fees and all other costs and expenses not limited to court action. Such sum shall be included in any judgment or decree entered.

2.10 Appurtenant Easement. The benefits and burdens granted and imposed by this instrument shall run with the lands described herein.

2.11 Venue. The venue of any action taken to enforce any part of this easement shall be in Okanogan County, Washington.

Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
2600 Chester Kimm Road / P.O. Box 1688
Wenatchee, WA 98807-1688
(509) 662-3685 / (509) 662-2452 FAX

2.12 Number; Gender; Permissive Versus Mandatory Usage. Where the context permits, references to the singular shall include the plural and vice versa, and to the neuter gender shall include the feminine and masculine. Use of the word "may" shall denote an option or privilege and shall impose no obligation upon the party which may exercise such option or privilege; use of the word "shall" shall denote a duty or an obligation.

2.13 Captions and Construction. The captions in this Easement are for the convenience of the reader and are not to be considered in the interpretation of its terms.

"CITY"

CITY OF PATEROS
A Washington Municipality

By Gail A Howe, Mayor

Date: March 15, 2010

"DISTRICT"

PUBLIC UTILITY DISTRICT NO. 1
OF DOUGLAS COUNTY
A Washington Municipality

By W C Dobbins
William C. Dobbins, General Manager

Date: March 22, 2010

Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
2600 Chester Kimm Road / P.O. Box 1688
Wenatchee, WA 98807-1688
(509) 662-3685 / (509) 662-2452 FAX

STATE OF WASHINGTON)
) ss.
COUNTY OF ______________)

I certify that I know or have satisfactory evidence that ______________________ is the person who appeared before me and said person acknowledged that he/she signed this instrument, on oath stated that he/she was authorized to execute the instrument and acknowledged it as the ____________________ of City of Pateros to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this _____ day of __________________, 2010.

____
Typed/Printed Name ______________________
NOTARY PUBLIC
In and for the State of Washington
My appointment expires ___________________

STATE OF WASHINGTON)
) ss.
COUNTY OF _____________)

I certify that I know or have satisfactory evidence that William C. Dobbins is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the General Manager of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this _____ day of __________________, 2010.

____
Typed/Printed Name ______________________
NOTARY PUBLIC
In and for the State of Washington
My appointment expires ___________________

Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
2600 Chester Kimm Road / P.O. Box 1688
Wenatchee, WA 98807-1688
(509) 662-3685 / (509) 662-2452 FAX

EXHIBIT A

Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS

210 N Bridge Street
P.O. Box 739
Brewster, WA 98812

Phone: 509.689.2529
Fax: 509.689.2520

www.erlandsen.com

Pateros Memorial Park

City of Pateros Ownership

All distances and areas shown on the following described parcel of land are grid values per NAD 83/1991 adjustment, Washington State Coordinate System, North Zone. To obtain ground distances and areas multiply by a factor of 1.00009184.

Block 6 of Pateros Replat No. 3, as shown on a map recorded in Book 'G' of Plats, at Page 29 thereof, records of the Auditor of Okanogan County, Washington.

EXCEPT that portion of said Block 6 being more particularly described as follows:

BEGINNING at the most Easterly corner of said Block 6;

Thence South 39°25'29" West along the Southeasterly line of said Block 6, a distance of 45.15 feet;

Thence North 50°44'48" West, a distance of 89.82 feet to the Northwesterly line of said Block 6;

Thence North 39°24'22" East along the Northwesterly line of said Block 6, a distance of 45.39 feet to the most Northerly corner of said Block 6;

Thence South 50°35'38" East along the Northeasterly line of said Block 6, a distance of 89.84 feet to the most Easterly corner of said Block 6 and the POINT OF BEGINNING.

Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
2600 Chester Kimm Road / P.O. Box 1688
Wenatchee, WA 98807-1688
(509) 662-3685 / (509) 662-2452 FAX

EXHIBIT A

Erlandsen
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Prepared by: DCW
Checked by: RCS
Date: 6/18/2009

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Attorneys at Law
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Wenatchee, WA 98807-1688
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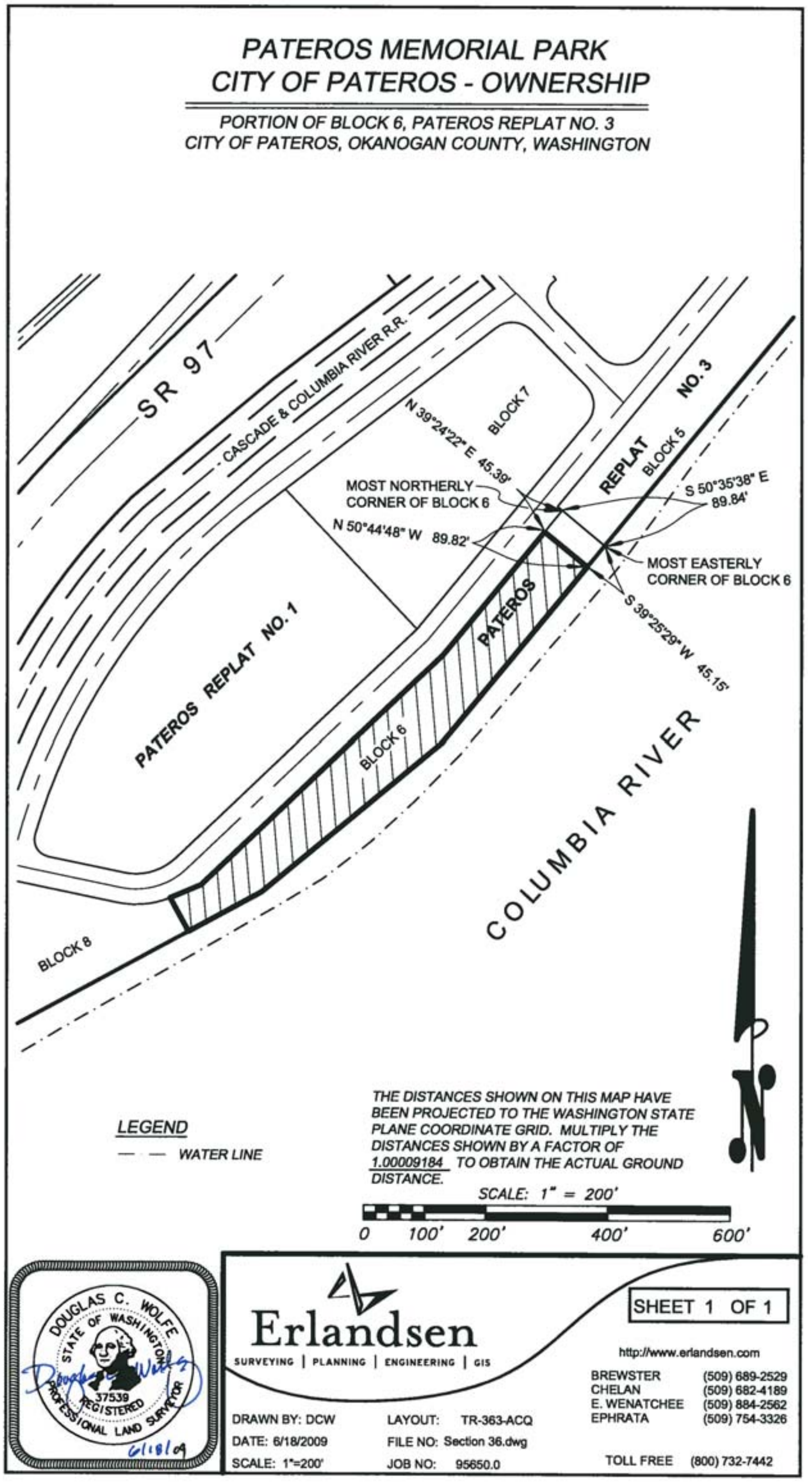
EXHIBIT A



Jeffers, Danielson, Sonn & Aylward, P.S.
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Wenatchee, WA 98807-1688
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EXHIBIT B

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Phone: 509.689.2529
Fax: 509.689.2520

www.erlandsen.com

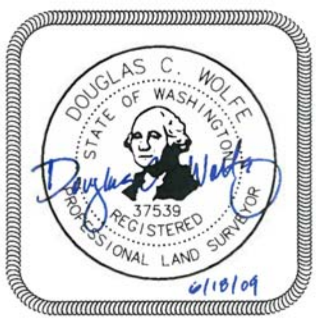
Pateros Peninsula Park

City of Pateros Ownership

Blocks 9, 11, and 16 of Pateros Replat No. 4 as shown on a map on file in Book 'G' of Plats, at Page 30 thereof, records of the Auditor of Okanogan County, Washington, TOGETHER WITH that portion of Riverside Drive as shown on said map of Pateros Replat No. 4, lying Northeasterly of the following described line:

BEGINNING at the most Southerly corner of said Block 11;

Thence Northwesterly to the most Westerly corner of said Block 11 and the TERMINUS of this line.



Prepared by: DCW
Checked by: RCS
Date: 6/18/2009

Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
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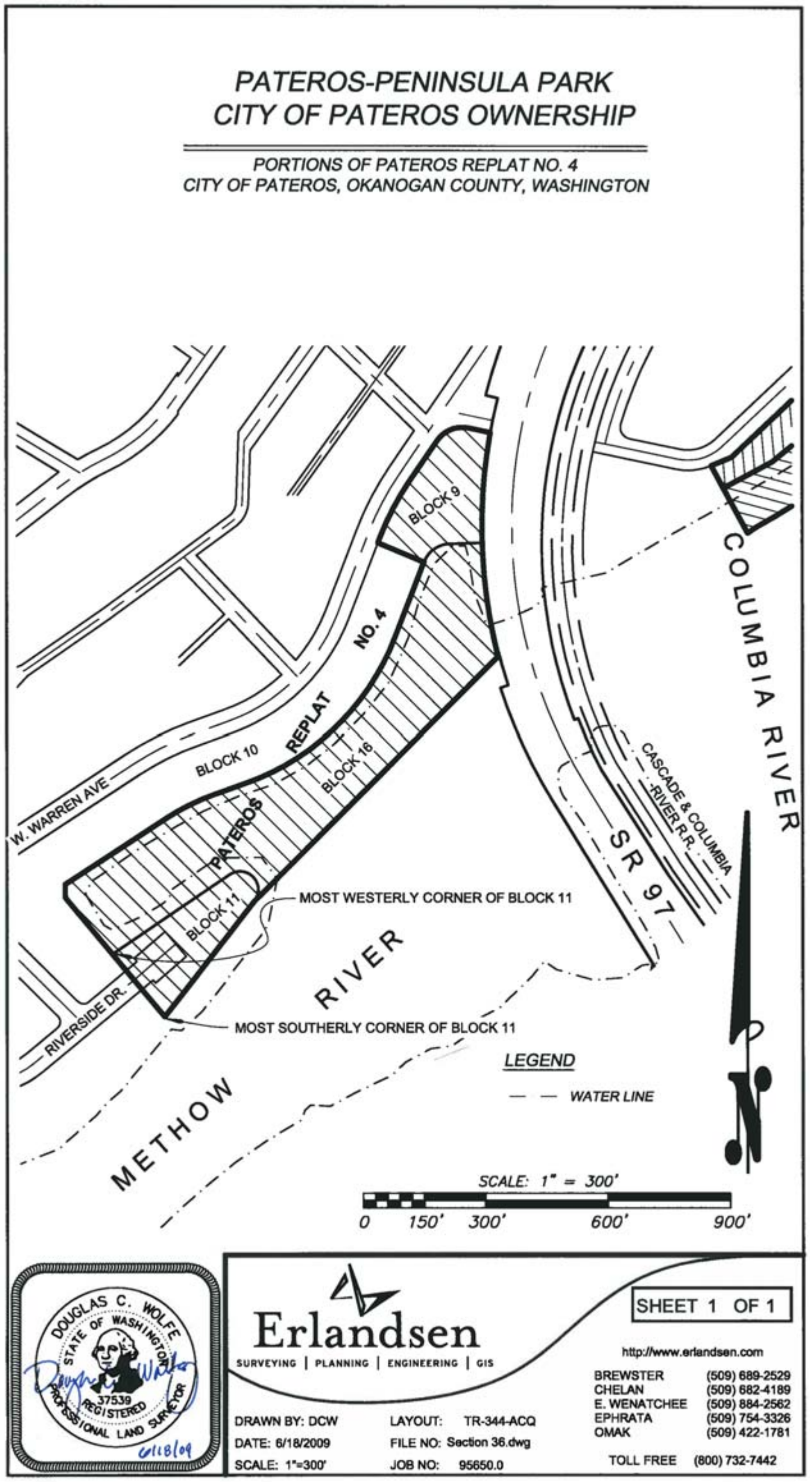
EXHIBIT B



Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
2600 Chester Kimm Road / P.O. Box 1688
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AGREEMENT BETWEEN THE CITY

OF BREWSTER AND PUBLIC UTILITY DISTRICT NO. 1

OF DOUGLAS COUNTY, WASHINGTON

This Agreement is made and entered into this 10th day of May, 2010, by and between the City of Brewster, Washington, a Municipal corporation ("City"), and Public Utility District No. 1 of Douglas County, Washington, a Municipal corporation ("District").

RECITALS

1. The District operates the Wells Hydroelectric Project ("Wells Project") on the Columbia River under License No. 2149 ("Original License"), from the Federal Energy Regulatory Commission, ("FERC"). The District is pursuing a new license ("Second License") for the Wells Project using the FERC Integrated Licensing Process.

2. In compliance with the Original License, the City and the District entered into an Agreement dated June 15, 1987, regarding the construction, ownership and operation of recreational facilities located on adjoining City and District property ("Prior Agreement"). Recreational facilities known as Brewster-Columbia Cove Park were constructed pursuant to the Prior Agreement. This Agreement shall replace and supersede that Prior Agreement.

3. The District has the responsibility of ensuring that the Wells Project's recreation facilities are operated and maintained in a manner that is consistent

with the FERC license and consistent with the operation and maintenance standards in Exhibit A.

4. The District has expressed interest in compensating the City for providing administration, operation, and maintenance services for the Brewster-Columbia Cove and Waterfront Trail facilities.

NOW, THEREFORE, in consideration of the mutual covenants and agreements herein provided, the parties agree as follows:

AGREEMENT

1. Property. The City represents that it owns or has the right to use the real property described in Exhibits B and D, attached hereto, upon which exist certain recreational facilities. The District owns certain property abutting the Columbia River and contiguous with the City's real property that contains additional recreational facilities. The District's property is described in Exhibits C and E attached hereto. The facilities located on the property constitute the Brewster-Columbia Cove Park and Waterfront Trail. The City agrees to grant an easement in the form attached as Exhibit G to the District to use these City properties as Wells Project recreation sites.

The District owns certain property adjacent to Brewster-Columbia Cove Park for which the City has interest in developing a recreational vehicle (RV) camping facility. The District property is described in Exhibit F attached hereto. The District agrees to grant an easement in the form attached as Exhibit H to the City to develop this property for a City recreation site.

2. Permits. If the District constructs additional recreational facilities for Brewster-Columbia Cove Park then the District shall be solely responsible for obtaining

all necessary permits and easements from the appropriate governmental agencies for the construction of such recreational facilities. The District shall further act as the lead agency insofar as environmental laws and regulations are concerned.

3. FERC Compliance. This entire Agreement is effective immediately but District funding and/or implementation of measures herein shall be contingent upon FERC approval and the issuance of a Second License to the District for the operation of the Wells Hydroelectric Project. The City shall support the District's application for a new 50-year license, refrain from seeking additional measures associated with the relicensing of the Wells Project, and ensure that all documents filed with FERC or any other agency or forum are consistent with this Agreement. Nothing in this agreement shall prohibit the City from advocating for new or additional measures during the term of the Second License. This Agreement shall be effective throughout the term of a Second License and the City shall not remove any of the park facilities or shutdown the park during that period. In the event the FERC does not approve or issue such a license, this entire Agreement shall be null and void and the District shall be excused from performance hereunder.

4. Operation, Maintenance and Administration. The District shall compensate the City for all reasonable administration, operation, and maintenance to the recreational facilities within the property described in Exhibits B and C, including, but not limited to, parking, lawns, restrooms, lights, water, power, sewer/septic, playground equipment, shelters and playfields for the term of the District's Second License. In addition, the City shall maintain the Waterfront Trail located within the property described in Exhibits D and E.

The District shall be responsible for major maintenance items through the Recreation Management Plan update process. The Plan will be updated every six years based on documented changes in visitor use and needs (including facility upgrades) and/or new regulations relevant to recreation at the Wells Project. The District shall also be responsible for any unanticipated major maintenance of the facilities referenced above in excess of $10,000 and for capital improvements related to those same facilities. This cap shall be adjusted according to the following schedule and will not be deducted from the annual O&M compensation described in Section 7:

Year	Capital Improvement Cap	Year	Capital Improvement Cap
2012	$10,000	2042	$19,000
2022	$13,000	2052	$22,000
2032	$16,000		

The District shall be responsible for all maintenance, repair and improvements of the Wells Hydroelectric Project assets such as docks, piers, boat launch ramps, and riprap and bank protection. The City agrees that it will administer, operate and maintain all the recreational facilities described above to the standards contained in Exhibit A, and in a manner that is consistent with the Second License. The District shall inspect these recreation facilities quarterly to ensure that maintenance standards are being met.

5. Performance. In the event the District determines that the City is not performing to the aforementioned standards, the District shall have the option to demand that the City cure any alleged deficiencies in performance. To invoke this option, the District shall provide the City a written demand detailing the alleged performance deficiencies. The City shall have thirty (30) days from receipt to cure any deficiencies. Should the District be dissatisfied with any attempted cure, it shall have the right to

terminate this Agreement and arrange an alternative means to administer, operate and maintain the recreational facilities described above. The District shall provide the City a 90-day notice prior to termination of this Agreement. In this event, the parties acknowledge that the easements attached as Exhibits G and H shall both remain in effect to allow the District and City the ability to administer, operate and maintain their respective recreational facilities.

6. Administration. The City shall, without expense to the District, retain sole responsibility for administration of recreation facilities located on City property including, but not limited to, hours of operation, scheduling of reservations and special events, and rules and regulations. Administration of the recreation facilities shall be consistent with the City's municipal code, as the same exists now or may hereafter be amended, and with the maintenance standards defined in Exhibit A.

7. Compensation.

7.1 The City will provide the District with a proposed annual budget, not exceeding $60,000 (2010 dollars), and will provide a scope of work of how the proposed budget addresses the standards contained in Exhibit A by March 1st of each year. The City and the District shall meet annually to discuss the proposed budget and scope of work. The budget cap shall be adjusted for inflation on the 1st day of January of each year based upon the Consumer Price Index for all Urban Consumers, U.S. City Averages, All Items, Not Seasonally Adjusted. The price index is published by the U.S. Department of Labor, Bureau of Labor Statistics. If said index is discontinued or becomes unavailable, a comparable index, mutually agreed upon by both Parties, will be substituted.

7.2 At its option, the District shall either make a single, annual lump-sum payment equal to the mutually agreed upon budget less any carryover from the previous year or monthly payments to the City equal to one-twelfth of the same amount.

7.3 The City shall maintain a clear and accurate record of actual expenses related to operation and maintenance of facilities managed under this Agreement. A report of monthly and year to date expenses shall be provided to the District on a quarterly basis.

7.4 Any excess of payments made by the District above the actual expenses of maintaining Brewster-Columbia Cove Park and Waterfront Trail shall be carryover and shall be applied against the following year budget as described in 7.2.

7.5 Upon request the City shall provide any documentation in support of reported actual expenses related to operation of Brewster-Columbia Cove Park and Waterfront Trail.

7.6 Upon mutual written consent of both parties, funds in excess to the needs of the actual O&M activities in the parks may be accrued and used toward the purchase of specific and agreed upon capital assets required for the maintenance of the recreation facilities, including but not limited to, landscaping equipment, mowers, irrigation upgrades, etc.

8. Legal Responsibility. Any additional recreational facilities constructed by the District pursuant to this Agreement shall be the property of and under the exclusive ownership of the entity that owns the underlying real property as denoted in Exhibits B through E. The City shall continue to bear the sole risk of loss of or damage to any additional facilities which are located on the property described in Exhibit B and D. The

District shall have no responsibility or legal liability whatsoever arising out of the City's administration, operation or maintenance of any recreational facilities on the property described in Exhibits B through E.

9. Liability Insurance. The City shall at the City's expense maintain commercial general liability insurance on the park in an amount not less than Three Million Dollars ($3,000,000.00). This level of liability insurance shall be adjusted over time according to the following schedule:

Year	Liability Coverage	Year	Liability Coverage
2022	$4 million	2042	$6 million
2032	$5 million	2052	$7 million

The District shall be an additional insured on such policy. The City shall deliver a copy of any such insurance certificate to the District annually or upon renewal. The District's requirements for insurance limits do not establish a dollar limit on the liability of the City if it is the financially responsible party for an incident, accident or injury.

10. Indemnity. The City hereby releases and agrees to hold harmless, indemnify and defend the District and its officers, agents, employees and contractors from, against and for any and all liabilities, obligations, suits, claims, demands, actions, costs and expenses of any kind which may be imposed upon or asserted against the District by reason of any accident, injury or damage to any person and/or property arising from the administration, operation, maintenance or use of the recreational facilities, except to the extent such accident, injury or damage arises from the negligence of the District or its officers, agents, employees or contractors. The City shall name the District as an additional insured on any commercial general liability policy covering the administration, operation, maintenance or use of the recreational facilities, provided that

naming the District as an additional insured does not significantly increase the cost of that insurance. In the event that it does significantly increase the cost of that insurance the City agrees (1) to provide the District at least thirty (30) days notice before the District is no longer an additional insured under that policy and (2) allow the District to bear the cost of it being an additional insured. This indemnity agreement was mutually negotiated by the parties to this Agreement.

11. Future Development. Any future additional development and landscaping performed by the City on the property described in Exhibits B through E shall be in accordance with first-class construction and landscaping practices and shall be compatible with all existing facilities and landscaping. New facilities shall be permitted on City-owned properties described in Exhibits B and D, provided the facilities meet the above construction standards, are for the purpose of enhancing public recreation, and have been approved by the City.

12. Water Rights. The District shall pursue the acquisition of adequate water rights, and explore the potential for using recycled City water, to provide irrigation for recreation facility properties described herein. If water rights for the recreation facilities cannot be acquired by May 31, 2017, then the parties shall meet to determine the final solution to the existing use of the city's water to irrigate the District's recreation facilities.

13. No Partnership. This Agreement shall not be interpreted or construed to create an association, joint venture or partnership between the parties or to impose any partnership obligations or liability upon any party. Further, no party shall have any right,

power or authority to enter into any contract or commitment for or on behalf of, to act as or be an agent or representative of, or otherwise to bind any other party.

14. Notices. All notices to be given pursuant to this Agreement shall be addressed to the Mayor of the City of Brewster, Washington, City Hall, 105 South 3rd Street, Brewster, Washington 98812; and to the General Manager, Douglas County Public Utility District No. 1 of Douglas County, Washington, 1151 Valley Mall Parkway, East Wenatchee, Washington, 98802, or as may from time to time be directed by written notice from the other party. Notice shall be in writing and deemed to have been given when enclosed in a properly sealed envelope or wrapper, addressed as aforesaid and deposited, postage prepaid, in a post office or branch post office of the United States Government or served in person.

15. Binding Effect. This Agreement shall be binding upon and inure to the benefit of the parties and their respective successors and assigns. Neither the City's rights nor duties under the terms of this Agreement shall be delegable or assignable without prior written approval of the District. No delegation of the City's rights shall relieve the City of its obligations under this Agreement.

16. Law-Venue. The parties hereto agree that this Agreement shall be governed by the laws of the State of Washington, and that in the event legal action becomes necessary to enforce any provisions hereof, venue shall be in Chelan County, Washington. The parties consider Chelan County to be a neutral venue.

17. Attorney Fees and Costs. In the event any party employs legal counsel to enforce any covenant of this Agreement, or to pursue any other remedy on default as provided herein, or by law, the substantially prevailing party shall be entitled to recover

all reasonable attorneys' fees and all other costs and expenses not limited to court action. Such sum shall be included in any judgment or decree entered.

18. Compliance. The parties, in fulfilling their obligations hereunder, shall conform to and comply with all laws, rules, regulations, conditions or restrictions promulgated by the FERC or any other governmental agency or other governmental entity having jurisdiction over the Wells Project.

19. Non-Waiver. The failure of any party to insist upon or enforce strict performance by the other party of any of the provisions of this Agreement or to exercise any rights under this Agreement shall not be construed as a waiver or relinquishment to any extent of such party's right to assert or rely upon any such provisions or rights in any other instance.

20. Implementation. Each party shall, upon written request of the other party, take such action (including, but not limited to, the execution, acknowledgment and delivery of documents) as may be reasonably required for the implementation or continuing performance of this Agreement.

21. Invalid Provision. The invalidity or unenforceability of any provision of this Agreement shall not affect the other provisions of this Agreement, and this Agreement shall be construed in all respects as if such invalid or unenforceable provision were omitted.

22. Survival. The obligations of the City which may reasonably be interpreted or construed as surviving the completion, termination or cancellation of this Agreement shall survive the completion, termination or cancellation of this agreement so long as the District is the licensee of the Wells Project.

IN WITNESS WHEREOF, the said parties have hereunto set their hands on this _

10th day of May, 2010.

CITY OF BREWSTER, WASHINGTON
A Municipal Corporation

By
Lee Webster, Mayor

PUBLIC UTILITY DISTRICT NO. 1 OF DOUGLAS COUNTY, WASHINGTON
A Municipal Corporation

By
T. James Davis

By
Lynn M. Heminger

By
Ronald E. Skagen

STATE OF WASHINGTON)
) ss.
COUNTY OF OKANOGAN)

I certify that I know or have satisfactory evidence that Lee Webster, is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the MAYOR of City of Brewster to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 5th day of MAY, 2010.

Typed/Printed Name SANDRA O. MIRANDA
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 07/09/2011

STATE OF WASHINGTON)
) ss.
COUNTY OF ____________)

I certify that I know or have satisfactory evidence that T. James Davis, is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as a Commissioner of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this _____ day of _________________, 2010.

____
Typed/Printed Name ___________________
NOTARY PUBLIC
In and for the State of Washington
My appointment expires ________________

STATE OF WASHINGTON)
) ss.
COUNTY OF Douglas)

I certify that I know or have satisfactory evidence that Lynn M. Heminger, is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as a Commissioner of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 10th day of May, 2010.

GARY R. IVORY
COMMISSION EXPIRES
NOTARY
PUBLIC
11-19-13
STATE OF WASHINGTON

Typed/Printed Name Gary R. Ivory
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 11-19-13

STATE OF WASHINGTON)
) ss.
COUNTY OF Douglas)

I certify that I know or have satisfactory evidence that Ronald E. Skagen, is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as a Commissioner of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 10th day of May, 2010.

GARY R. IVORY
COMMISSION EXPIRES
NOTARY
PUBLIC
11-19-13
STATE OF WASHINGTON

Typed/Printed Name Gary R Ivory
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 11-19-13

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Exhibit A

Exhibit A

Operation and Maintenance Standards

Maintenance Activity	Frequency
Buildings/restrooms/shelters: Structures will be sanitary and maintained in good repair. If a structure is deemed in need of repair, it will be closed until repairs are completed.	During the high-use season (April – October), all facilities will be inspected at regular intervals (several times per week, as necessary). During the low-use season, facilities such as those located in the cities will be inspected less frequently but at regular intervals, and dispersed facilities will be inspected periodically. The interior and exterior of all structures will be painted as needed; this is expected to be about every three years. Buildings will receive structural inspection at least once in 10 years, unless a safety issue is reported and confirmed sooner.
Boat Ramps: Surfaces are to be kept in good and serviceable condition, and free of debris.	Boat ramps will be inspected at regular intervals during the high-use season of April through November.
Boat Docks and swimming platforms: Dock and platform surfaces, hardware, bumper strips, and other components will be maintained to provide safe and effective use.	Docks will be inspected for wear, obstacles, and damage/vandalism at regular intervals. Maintenance and repairs will be performed on an as-needed basis.
Picnic sites/camp sites: Inspect for cleanliness, damage, and vandalism. Tables will be sturdy and ready for use. Grills and fire pits will be in good working condition.	Picnic sites/camp sites will be inspected frequently (daily or weekly) during April through September, weekly or as needed in October and November and intermittently during the remainder of the year.
Trash/litter collection: The park areas will be kept clean. Trash containers will be emptied regularly.	Trash containers will be emptied at least once per week at city facilities and at least once every two weeks at dispersed facilities. Trash containers will also be emptied following holiday weekends during April through November.
Trails: Trail surfaces will be maintained in good condition and barriers will be removed to allow use of the trail. Trees and shrubs along the trails will be trimmed or removed seasonally and weeds will be controlled as needed.	Trails will be inspected weekly during the April through November season and intermittently the remainder of the year.
Park grounds/turf: Grass areas and gardens will be kept up through use of irrigation, fertilization, weed removal, and pesticide application where necessary. Grass will be mowed based on need. Signs will be installed during and after application of pesticides. Trees will be trimmed as needed.	Grass in parks will be mowed regularly. Roadsides and other natural areas at park facilities will be mowed as needed.
Snow removal: Snow will be removed from roads, parking areas, and the boat launch.	Snow will be removed within one day or as soon as feasible following a snow event.

Exhibit B

Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS

210 N Bridge Street
P.O. Box 739
Brewster, WA 98812

Phone: 509.689.2529
Fax: 509.689.2520

www.erlandsen.com

Brewster-Columbia Cove Park

City of Brewster Ownership

Note: The following description has been prepared for use in a Park Agreement between the City of Brewster and Public Utility District No.1 of Douglas County and should only be used for that purpose. This description is based on documentation acquired from Public Utility District No.1 of Douglas County without benefit of a Chain of Title and/or Title Report. Should this description be used for any other purpose, a Chain of Title and Title Report should be obtained to confirm ownership.

All distances and areas shown on the following described parcel of land are grid values per NAD 83/1991 adjustment, Washington State Coordinate System, North Zone. To obtain ground distances and areas multiply by a factor of 1.00009334.

A portion of Park Addition to Brewster, as shown on a map on file in Book 'F' of Plats, at page 4 thereof, records of the Auditor of Okanogan County, Washington, TOGETHER WITH those portions of the Southwest Quarter of the Southeast Quarter and the Southeast Quarter of the Southwest Quarter of Section 14, and Government Lots 2 and 3 of Section 23, all located in Township 30 North, Range 24 East of the Willamette Meridian, and more particularly described as follows:

COMMENCING at a 3 ¼" aluminum cap in a monument case stamped "WELLS PROJECT BOUNDARY, ERLANDSEN, L.S. 23599, T30N, R24E, WP, S-14, S-23, 2009" on the common line between said Sections 14 and 23 which bears South 88°41'18" West along said common line, a distance of 937.51 feet from a 2" bronze cap stamped "ERLANDSEN & ASSOC." located at the East 1/16th corner of said Sections 14 and 23;

Thence South 01° 13' 44" East, a distance of 161.86 feet to a 2 ½" aluminum cap stamped "DOUGLAS PUD, WELLS PROJECT BOUNDARY, LS 23599" and the POINT OF BEGINNING;

Thence retracing the previous course, North 01° 13' 44" West, a distance of 161.86 feet to the said 3 ¼" aluminum cap on the common line between said Sections 14 and 23;

Thence North 01° 13' 44" West, a distance of 3.20 feet;

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Thence North 77° 33' 35" East, a distance of 31.39 feet;

Thence North 13° 08' 18" West, a distance of 106.85 feet;

Thence North 04° 31' 23" East, a distance of 15.62 feet;

Thence North 14° 59' 00" West, a distance of 141.13 feet to a curve to the left;

Thence Northwesterly along said curve to the left, having a radius of 160.00 feet, through a central angle of 38° 47' 39", an arc length of 108.33 feet;

Thence North 53° 46' 39" West, a distance of 159.62 feet;

Thence North 51° 04' 01" West, a distance of 170.26 feet;

Thence, North 37° 11' 21" West, a distance of 64.63 feet to a 3" brass cap in concrete stamped "WELLS HYDRO PROJECT, PUD NO. 1 DOUGLAS CO" on the North-South centerline of said Section 14 and the most Northerly corner of a parcel of land described in a Correction Deed in favor of the Town of Brewster, recorded April 1, 1988 as Auditor's File No. 747958, records of the Auditor of Okanogan County Washington, the above mentioned parcel of land is shown on a Record of Survey, recorded Nov. 19, 1986 in Book 'G' of Surveys, at page 111 thereof, records of the Auditor of Okanogan County Washington;

The following nine (9) courses being along the Northerly, Westerly, Southerly and Easterly lines of the land described in said Correction Deed;

Thence South 04° 20' 11" West, a distance of 11.15 feet;

Thence South 56° 30' 31" West, a distance of 242.35 feet;

Thence South 49° 37' 18" West, a distance of 127.69 feet;

Thence South 69° 41' 02" West, a distance of 134.97 feet;

Thence South 88° 38' 19" West, a distance of 176.13 feet;

Thence South 02° 49' 09" West, a distance of 159.23 feet;

Thence South 71° 53' 49" East, a distance of 652.77 feet, to a point on the East line of said Government Lot 2;

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Thence North 00° 07' 50" West along said East line, a distance of 25.37 feet to the quarter corner common to Sections 14 and 23;

Thence North 00° 54' 04" West along the East line of the Southwest quarter of said Section 14, a distance of 516.94 feet to the Project Boundary of the Wells Hydroelectric Project as shown on the Revised Exhibit 'K' Drawings, dated April 1, 1981 on file with Public Utility District No.1, Douglas County, Washington;

Thence, along said Project Boundary the following six (6) courses and distances;

Thence North 55° 50' 48" East, a distance of 11.83 feet;

Thence South 45° 46' 51" East, a distance of 268.26 feet;

Thence South 28° 47' 08" West, a distance of 240.99 feet;

Thence South 04° 58' 52" East, a distance of 123.67 feet to a point on said common line between Sections 14 and 23 that bears South 88°41'18" West, a distance of 291.04 feet from a 3 ¼" aluminum cap in a monument case stamped "WELLS PROJECT BOUNDARY, ERLANDSEN, L.S. 23599, T30N, R24E, WP, S-14, S-23, 2009";

Thence continuing South 04° 58' 52" East, a distance of 58.01 feet;

Thence South 71° 24' 20" East, a distance of 305.34 feet to the POINT OF BEGINNING;

DOUGLAS C. WOLFE
STATE OF WASHINGTON
37539
REGISTERED
PROFESSIONAL LAND SURVEYOR
8/11/09

Prepared by: DKG
Checked by: DCW
Date: 8/11/2009

BREWSTER-COLUMBIA COVE PARK
CITY OF BREWSTER OWNERSHIP

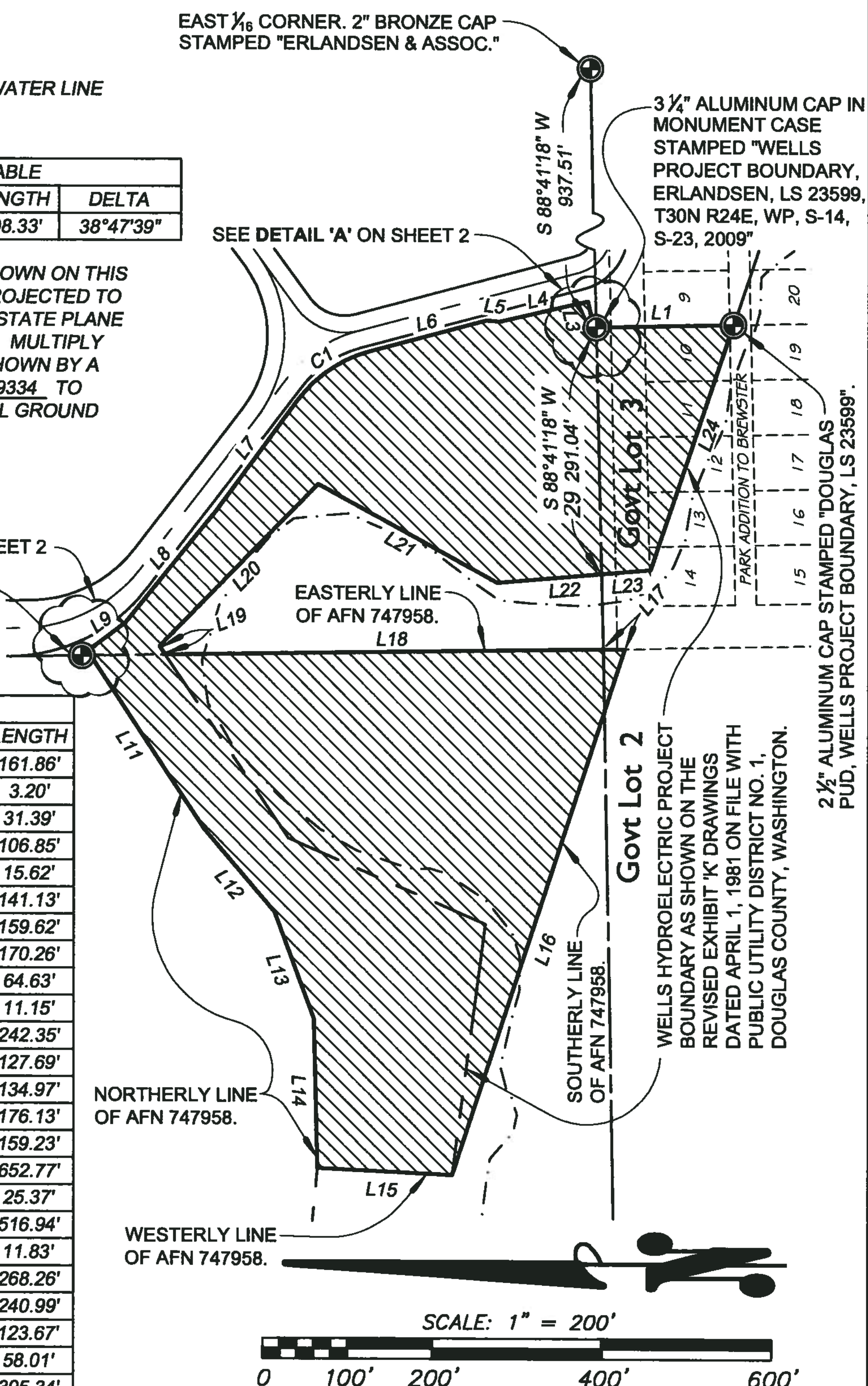
PORTIONS OF SECTIONS 14 AND 23, TOWNSHIP 30 NORTH, RANGE 24 EAST, W.M.
CITY OF BREWSTER, OKANOGAN COUNTY, WASHINGTON

LEGEND

— - — WATER LINE

CURVE TABLE			
CURVE	RADIUS	LENGTH	DELTA
C1	160.00'	108.33'	38°47'39"

THE DISTANCES SHOWN ON THIS MAP HAVE BEEN PROJECTED TO THE WASHINGTON STATE PLANE COORDINATE GRID. MULTIPLY THE DISTANCES SHOWN BY A FACTOR OF 1.00009334 TO OBTAIN THE ACTUAL GROUND DISTANCE.



LINE TABLE		
LINE	BEARING	LENGTH
L1	N 01°13'44" W	161.86'
L2	N 01°13'44" W	3.20'
L3	N 77°33'35" E	31.39'
L4	N 13°08'18" W	106.85'
L5	N 04°31'23" E	15.62'
L6	N 14°59'00" W	141.13'
L7	N 53°46'39" W	159.62'
L8	N 51°04'01" W	170.26'
L9	N 37°11'21" W	64.63'
L10	S 04°20'11" W	11.15'
L11	S 56°30'31" W	242.35'
L12	S 49°37'18" W	127.69'
L13	S 69°41'02" W	134.97'
L14	S 88°38'19" W	176.13'
L15	S 02°49'09" W	159.23'
L16	S 71°53'49" E	652.77'
L17	N 00°07'50" W	25.37'
L18	N 00°54'04" W	516.94'
L19	N 55°50'48" E	11.83'
L20	S 45°46'51" E	268.26'
L21	S 28°47'08" W	240.99'
L22	S 04°58'52" E	123.67'
L23	S 04°58'52" E	58.01'
L24	S 71°24'20" E	305.34'

DOUGLAS C. WOLFE
STATE OF WASHINGTON
37539
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8/11/09

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SHEET 1 OF 2

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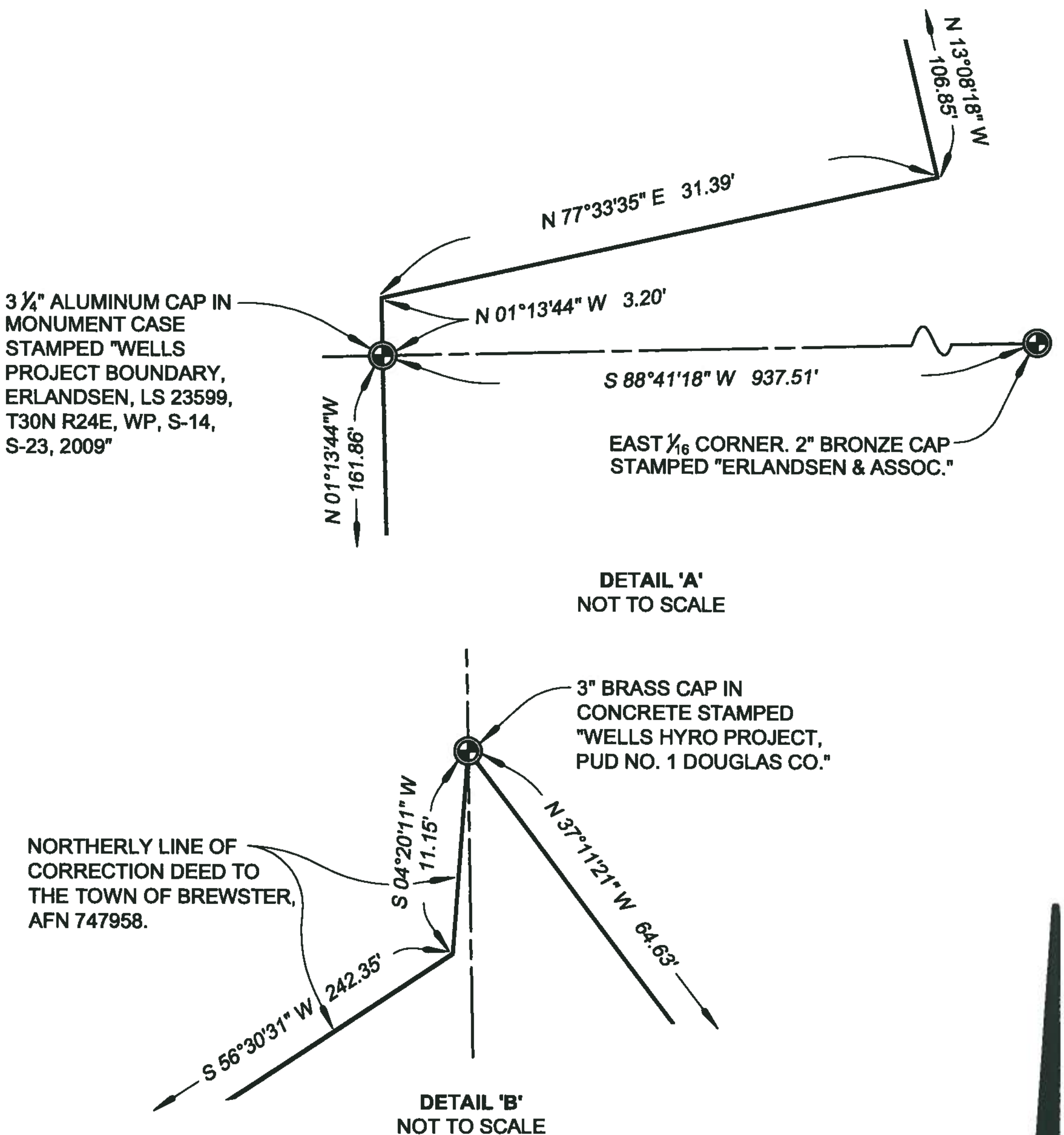
EPHRATA	(509) 754-3326
OMAK	(509) 422-1781
TOLL FREE	(800) 732-7442

DRAWN BY: DCW
DATE: 8/11/2009
SCALE: 1"=200'
LAYOUT: TR-64-ACQ
FILE NO: Section 14.dwg
JOB NO: 95650.0

BREWSTER-COLUMBIA COVE PARK
CITY OF BREWSTER OWNERSHIP

PORTIONS OF SECTIONS 14 AND 23, TOWNSHIP 30 NORTH, RANGE 24 EAST, W.M.
CITY OF BREWSTER, OKANOGAN COUNTY, WASHINGTON



THE DISTANCES SHOWN ON THIS MAP HAVE BEEN PROJECTED TO THE WASHINGTON STATE PLANE COORDINATE GRID. MULTIPLY THE DISTANCES SHOWN BY A FACTOR OF 1.00009334 TO OBTAIN THE ACTUAL GROUND DISTANCE.

N

DOUGLAS C. WOLFE
STATE OF WASHINGTON
37539
REGISTERED PROFESSIONAL LAND SURVEYOR
Douglas C. Wolfe
8/11/09

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TOLL FREE	(800) 732-7442

DRAWN BY: DCW
DATE: 8/11/2009
SCALE: NONE
LAYOUT: TR-64-ACQ
FILE NO: Section 14.dwg
JOB NO: 95650.0

Exhibit C

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Brewster-Columbia Cove Park

Public Utility District No. 1 of Douglas County Ownership

Note: The following description has been prepared for use in a Park Agreement between the City of Brewster and Public Utility District No.1 of Douglas County and should only be used for that purpose. This description is based on documentation acquired from Public Utility District No.1 of Douglas County without benefit of a Chain of Title and/or Title Report. Should this description be used for any other purpose, a Chain of Title and Title Report should be obtained to confirm ownership.

All distances and areas shown on the following described parcel of land are grid values per NAD 83/1991 adjustment, Washington State Coordinate System, North Zone. To obtain ground distances and areas multiply by a factor of 1.00009334.

A portion of Park Addition to Brewster, as shown on a map on file in Book 'F' of Plats, at page 4 thereof, records of the Auditor of Okanogan County, Washington, TOGETHER WITH those portions of the Southwest Quarter of the Southeast Quarter of Section 14, and Government Lot 3 of Section 23, all located in Township 30 North, Range 24 East of the Willamette Meridian, and being more particularly described as follows:

COMMENCING at a 3 ¼" aluminum cap in a monument case stamped "WELLS PROJECT BOUNDARY, ERLANDSEN, L.S. 23599, T30N, R24E, WP, S-14, S-23, 2009" on the common line between said Sections 14 and 23 which bears South 88°41'18" West along said common line, a distance of 937.51 feet from a 2" bronze cap stamped "ERLANDSEN & ASSOC." located at the East 1/16th corner of said Sections 14 and 23;

Thence South 88°41'18" West, along said common line, a distance of 291.04 feet to the Project Boundary of the Wells Hydroelectric Project as shown on the Revised Exhibit 'K' Drawings, dated April 1, 1981 on file with Public Utility District No.1, Douglas County, Washington and the POINT OF BEGINNING;

Thence South 04° 58' 52" East along said Project Boundary, a distance of 58.01 feet;

Thence leaving said Project Boundary, North 72° 00' 24" West, a distance of 98.40 feet to a point on the East line of Government Lot 2 of said Section 23 being the most

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Southerly corner of a parcel of land described in a Correction Deed in favor of the Town of Brewster, recorded April 1, 1988 as Auditor's File No. 747958, records of the Auditor of Okanogan County Washington, the above mentioned parcel of land is shown on a Record of Survey, recorded Nov. 19, 1986 in Book 'G' of Surveys, at page 111 thereof, records of the Auditor of Okanogan County Washington;

The following two (2) courses being along the Easterly line of the parcel of land described in said Correction Deed;

Thence North 00° 07' 50" West along the East line of said Government Lot 2, a distance of 25.37 feet to the quarter corner common to said Sections 14 and 23;

Thence North 00° 54' 04" West along the East line of the Southwest quarter of said Section 14, a distance of 516.94 feet to said Project Boundary of the Wells Hydroelectric Project;

The following four (4) courses being along said Project Boundary:

Thence, North 55° 50' 04" East, a distance of 11.83 feet;

Thence South 45° 46' 51" East, a distance of 268.26 feet;

Thence South 28° 47' 08" West, a distance of 240.99 feet;

Thence South 04° 58' 52" East, a distance of 123.66 feet to the POINT OF BEGINNING;

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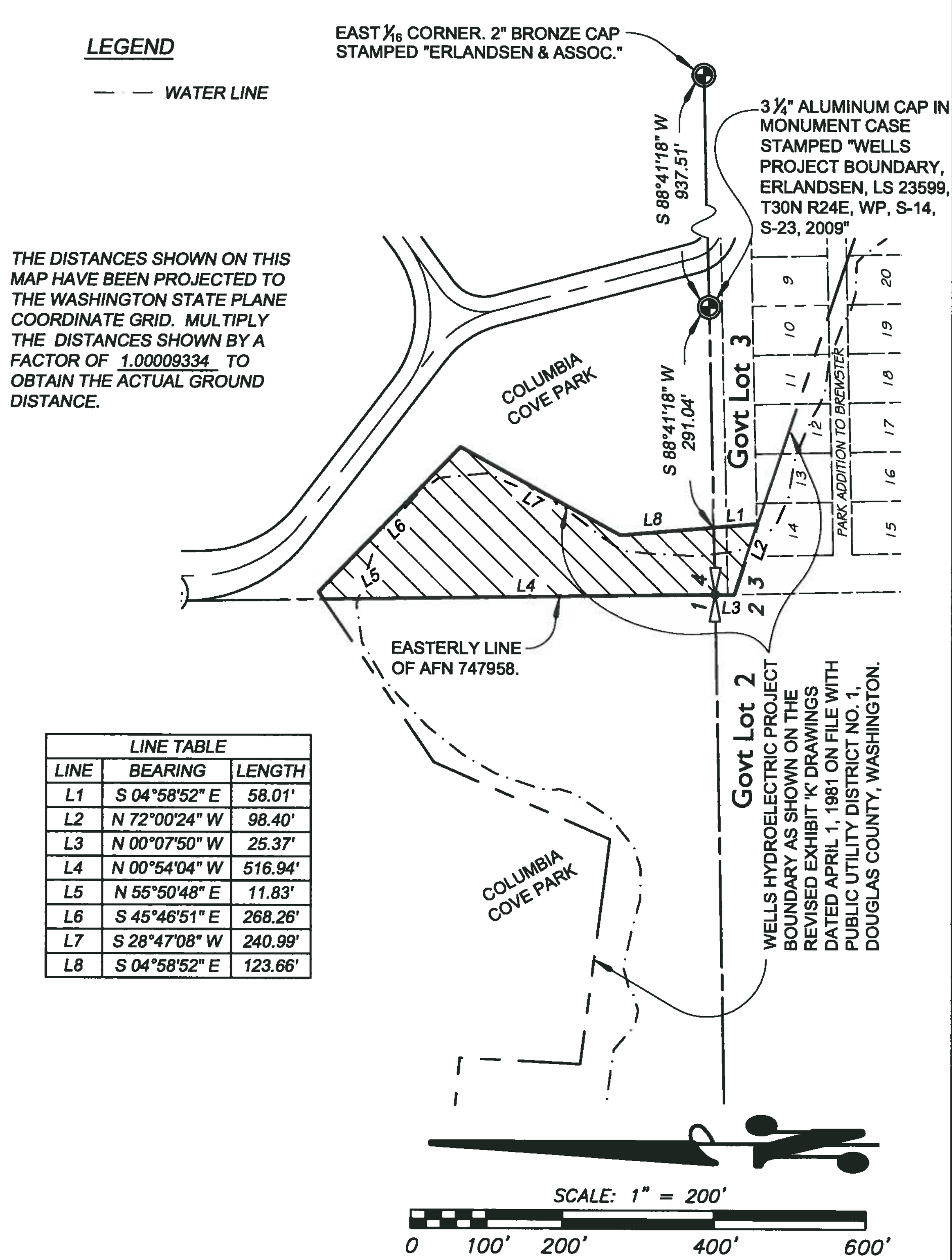
DOUGLAS C. WOLFE
STATE OF WASHINGTON
37539
REGISTERED
PROFESSIONAL LAND SURVEYOR

8/11/09

Prepared by: DKG
Checked by: DCW
Date: 8/11/2009

BREWSTER-COLUMBIA COVE PARK
PUD NO. 1 OF DOUGLAS CO. - OWNERSHIP

PORTIONS OF SECTIONS 14 AND 23, TOWNSHIP 30 NORTH, RANGE 24 EAST, W.M.
CITY OF BREWSTER, OKANOGAN COUNTY, WASHINGTON



LINE TABLE

LINE	BEARING	LENGTH
L1	S 04°58'52" E	58.01'
L2	N 72°00'24" W	98.40'
L3	N 00°07'50" W	25.37'
L4	N 00°54'04" W	516.94'
L5	N 55°50'48" E	11.83'
L6	S 45°46'51" E	268.26'
L7	S 28°47'08" W	240.99'
L8	S 04°58'52" E	123.66'

DOUGLAS C. WOLFE
STATE OF WASHINGTON
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EPHRATA	(509) 754-3326
OMAK	(509) 422-1781
TOLL FREE	(800) 732-7442

DRAWN BY: DKG/DCW
DATE: 8/11/2009
SCALE: 1"=200'
LAYOUT: PUD-PARK
FILE NO: Section 14.dwg
JOB NO: 95650.0

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Exhibit D

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250 Simon Street SE
East Wenatchee, WA 98802

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Fax: 509.884.2814

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Brewster Waterfront Trail Boundary Description

City of Brewster Ownership

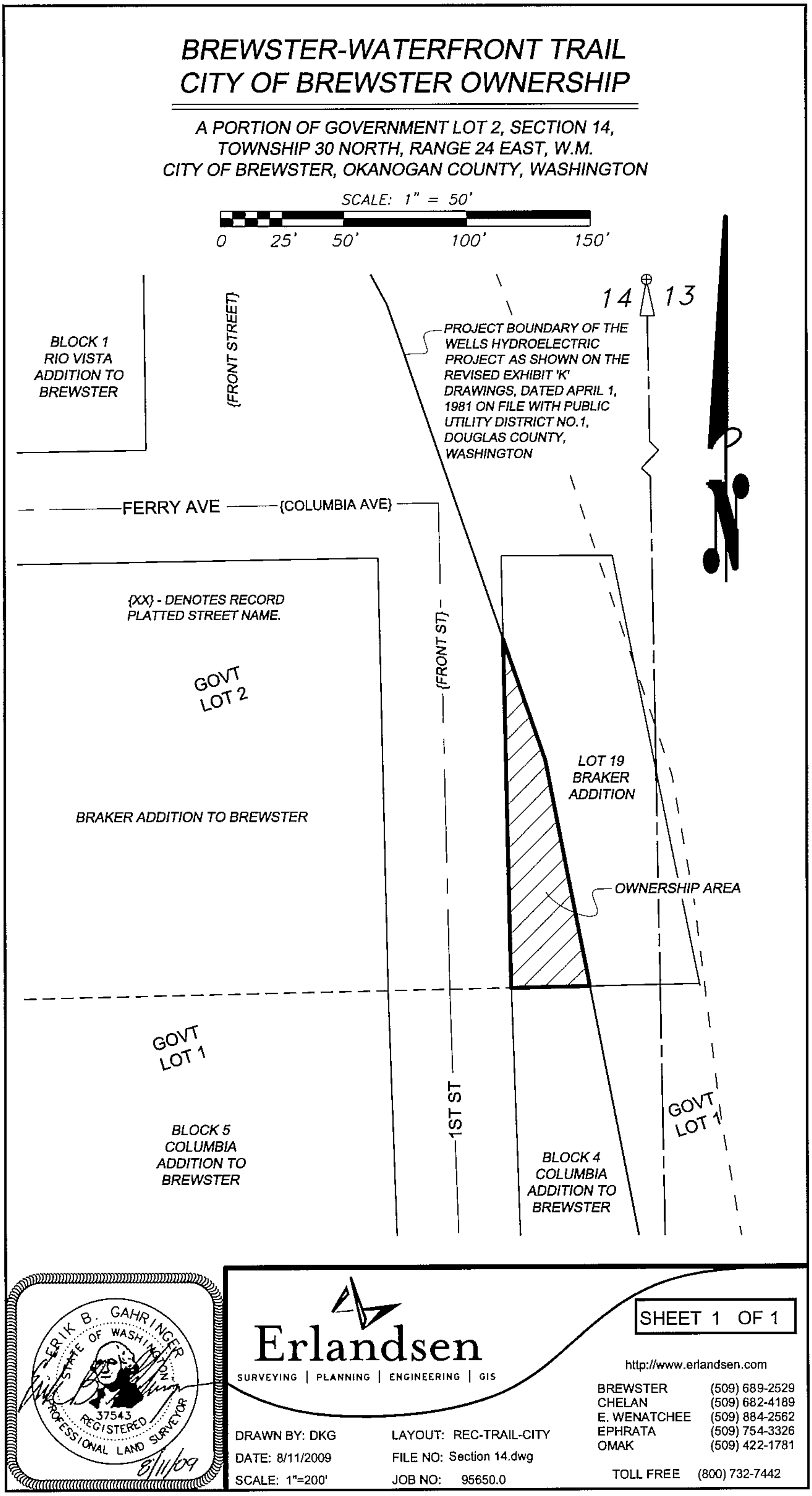
Note: The following description has been prepared for use in a Park Agreement between the City of Brewster and Public Utility District No.1 of Douglas County and should only be used for that purpose. This description is based on documentation acquired from Public Utility District No.1 of Douglas County without benefit of a Chain of Title and/or Title Report. Should this description be used for any other purpose, a Chain of Title and Title Report should be obtained to confirm ownership.

A parcel of land located within a portion of the southeast quarter of Section 14, all in Township 30 North, Range 24 East of the Willamette Meridian, City of Brewster, Okanogan County, Washington, said parcel being described as follows:

> That portion of Lot 19 of Braker Addition to Brewster, as shown on a map on file in Book 'F' of Plats, at page 28, records of the Auditor of Okanogan County, Washington, lying in a westerly direction and above the Project Boundary of the Wells Hydroelectric Project as shown on the Revised Exhibit 'K' Drawings, dated April 1, 1981 on file with Public Utility District No.1 of Douglas County.

Prepared By: Danny K. Gildehaus, PLS
Checked By: Erik B. Gahringer, PLS
Date: August 11, 2009

ERIK B. GAHRINGER
STATE OF WASHINGTON
37543
REGISTERED
PROFESSIONAL LAND SURVEYOR
8/11/09


BREWSTER-WATERFRONT TRAIL
CITY OF BREWSTER OWNERSHIP
A PORTION OF GOVERNMENT LOT 2, SECTION 14,
TOWNSHIP 30 NORTH, RANGE 24 EAST, W.M.
CITY OF BREWSTER, OKANOGAN COUNTY, WASHINGTON
SCALE: 1" = 50'
0 25' 50' 100' 150'
14 13
BLOCK 1 RIO VISTA ADDITION TO BREWSTER
{FRONT STREET}
PROJECT BOUNDARY OF THE WELLS HYDROELECTRIC PROJECT AS SHOWN ON THE REVISED EXHIBIT 'K' DRAWINGS, DATED APRIL 1, 1981 ON FILE WITH PUBLIC UTILITY DISTRICT NO.1, DOUGLAS COUNTY, WASHINGTON
FERRY AVE
{COLUMBIA AVE}
{XX} - DENOTES RECORD PLATTED STREET NAME.
{FRONT ST}
GOVT LOT 2
LOT 19 BRAKER ADDITION
BRAKER ADDITION TO BREWSTER
OWNERSHIP AREA
GOVT LOT 1
1ST ST
GOVT LOT 1
BLOCK 5 COLUMBIA ADDITION TO BREWSTER
BLOCK 4 COLUMBIA ADDITION TO BREWSTER
ERIK B. GAHRINGER
STATE OF WASHINGTON
37543
REGISTERED PROFESSIONAL LAND SURVEYOR
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E. WENATCHEE (509) 884-2562
EPHRATA (509) 754-3326
OMAK (509) 422-1781
TOLL FREE (800) 732-7442
DRAWN BY: DKG
DATE: 8/11/2009
SCALE: 1"=200'
LAYOUT: REC-TRAIL-CITY
FILE NO: Section 14.dwg
JOB NO: 95650.0

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Exhibit E

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250 Simon Street SE
East Wenatchee, WA 98802

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Fax: 509.884.2814

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Brewster Waterfront Trail Boundary Description

Public Utility District No. 1 of Douglas County Ownership

Note: The following description has been prepared for use in a Park Agreement between the City of Brewster and Public Utility District No.1 of Douglas County and should only be used for that purpose. This description is based on documentation acquired from Public Utility District No.1 of Douglas County without benefit of a Chain of Title and/or Title Report. Should this description be used for any other purpose, a Chain of Title and Title Report should be obtained to confirm ownership.

A parcel of land located within a portion of the southwest quarter of Section 13, and the northeast quarter and the southeast quarter of Section 14, all in Township 30 North, Range 24 East of the Willamette Meridian, City of Brewster, Okanogan County, Washington, said parcel being all, or a portion, of platted Lots, Blocks, and Streets, described as follows:

> All of Lot 13 of Block 4 of Columbia Addition to Brewster, as shown on a map on file in Book 'E' of Plats, at page 50 thereof, records of the Okanogan County Auditor;

AND those parcels being a portion of platted Lots, Blocks, and Streets lying in an easterly direction and below the Project Boundary of the Wells Hydroelectric Project as shown on the Revised Exhibit 'K' Drawings, dated April 1, 1981 on file with Public Utility District No.1 of Douglas County, said parcels being more particularly described as follows:

> That portion of the platted right of way of Front Street, now known as 1st Street and that portion of Lot 19 of Braker Addition to Brewster, as shown on a map on file in Book 'F' of Plats, at page 28, records of said county; that portion of the platted right of way of Front Street as depicted on the Rio Vista Addition to Brewster, as shown on a map on file in Book 'F' of Plats, at page 19 , records of said County; that portion of Block 13 and the platted right of way of River Street, Columbia Avenue, now know as Ferry Avenue, Esther Avenue, now know as Griggs Avenue, Jay Avenue, now known as Hanson Avenue, all as depicted on the First Addition to Bruster (Town of Brewster), as shown on a map on file in Book 'A' of Plats, at page 36, records of said County; that portion of Block 1 and the platted right of way of River Street, Ansel Avenue, now know as Indian Avenue, Bruce Avenue, now known as Main Avenue, and Cliff Avenue, now known as Jay Avenue, all as depicted on the plat for the Town of Bruster (Town of Brewster), as shown on a map on file in Book 'A' of Plats, at page 25, records of said County;

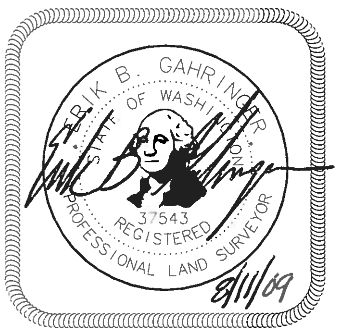
The foregoing described parcel being bound on the North by the northern right of way line of Cliff Avenue, now known as Jay Avenue, extended easterly; bound on the South by the South line of Lot 13, said Braker Addition; bound on the West by said Project Boundary and the West line of said Lot 13, and bound on the East by the Ordinary High Water Mark of the Columbia River.

page 1 of 2.

Brewster Waterfront Trail (Park) Boundary Description
page 2 of 2.

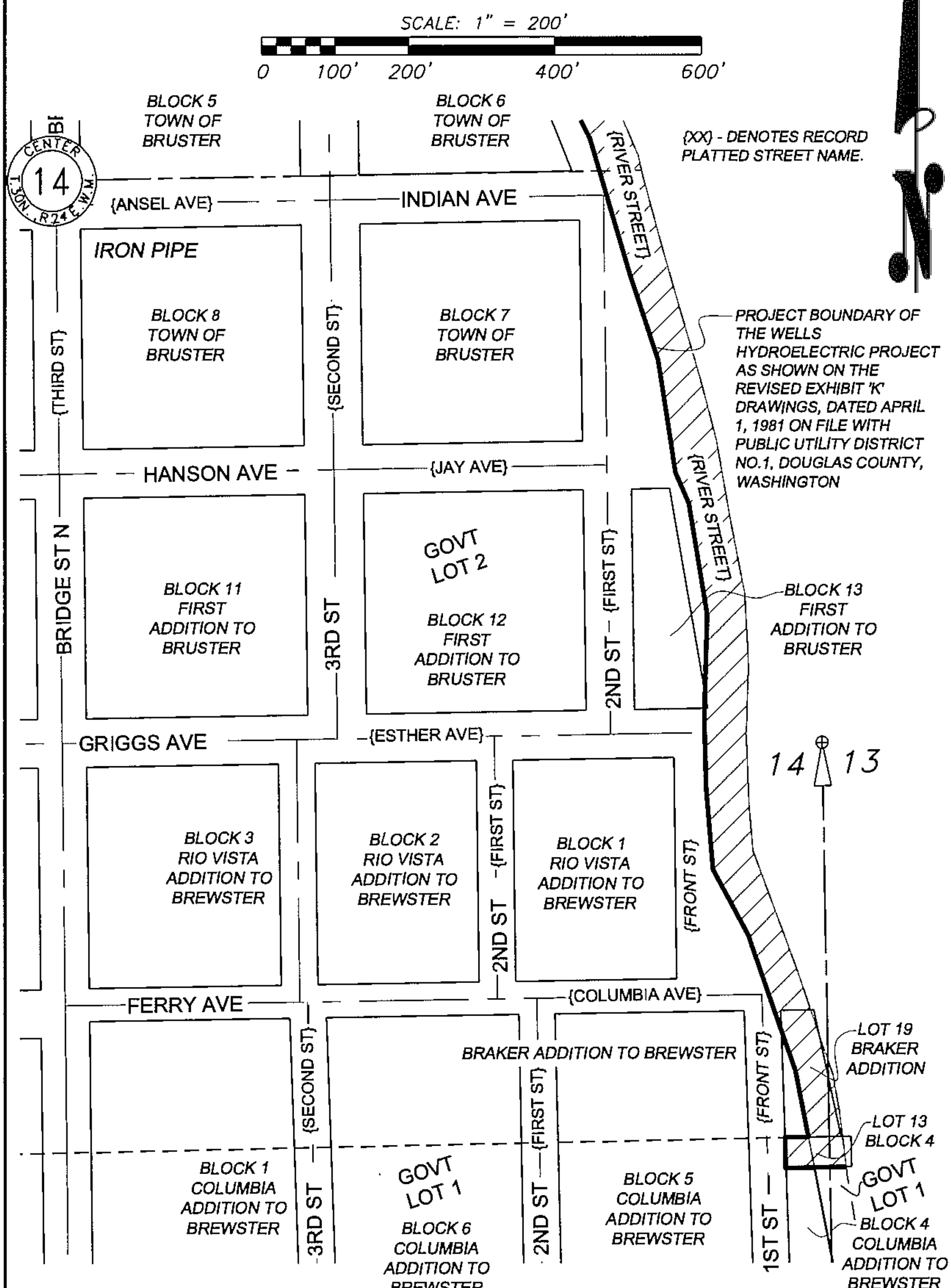
(continued)

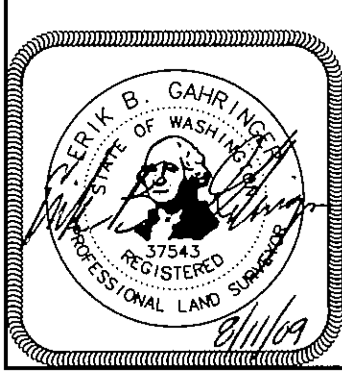
Prepared By: Erik B. Gahringer, PLS
Checked By: Danny K. Gildehaus, PLS
Date: August 11, 2009



BREWSTER-WATERFRONT TRAIL
P.U.D. NO. 1 OF DOUGLAS COUNTY OWNERSHIP

PORTIONS OF SECTIONS 13 AND 14, TOWNSHIP 30 NORTH, RANGE 24 EAST, W.M.
CITY OF BREWSTER, OKANOGAN COUNTY, WASHINGTON





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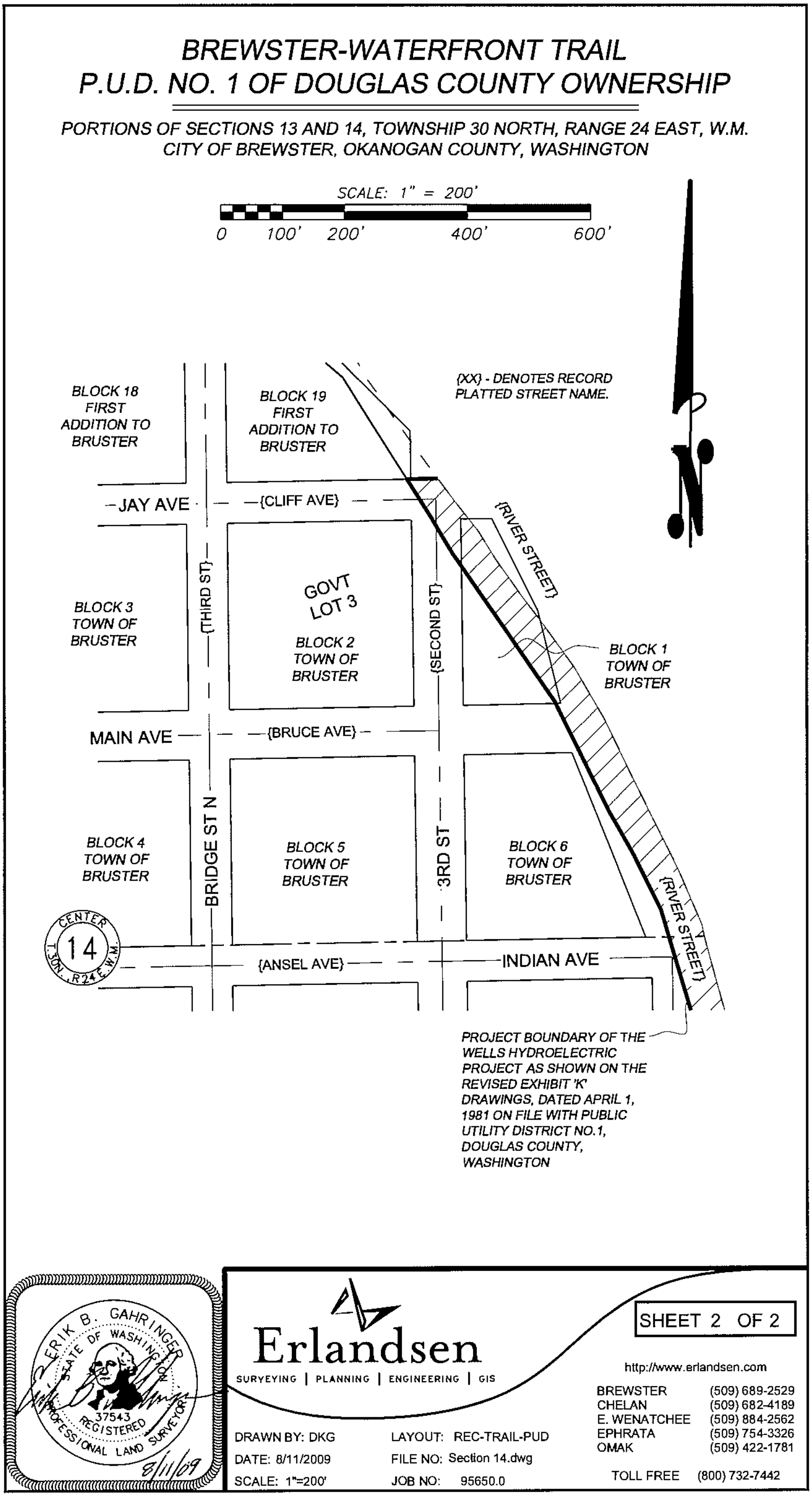
OMAK	(509) 422-1781

TOLL FREE (800) 732-7442

DRAWN BY: DKG
LAYOUT: REC-TRAIL-PUD
DATE: 8/11/2009
FILE NO: Section 14.dwg
SCALE: 1"=200'
JOB NO: 95650.0


BREWSTER-WATERFRONT TRAIL
P.U.D. NO. 1 OF DOUGLAS COUNTY OWNERSHIP
PORTIONS OF SECTIONS 13 AND 14, TOWNSHIP 30 NORTH, RANGE 24 EAST, W.M.
CITY OF BREWSTER, OKANOGAN COUNTY, WASHINGTON
SCALE: 1" = 200'
0
100'
200'
400'
600'
N
{XX} - DENOTES RECORD PLATTED STREET NAME.
BLOCK 18 FIRST ADDITION TO BRUSTER
BLOCK 19 FIRST ADDITION TO BRUSTER
JAY AVE
{CLIFF AVE}
{RIVER STREET}
BLOCK 3 TOWN OF BRUSTER
{THIRD ST}
GOVT LOT 3
BLOCK 2 TOWN OF BRUSTER
{SECOND ST}
BLOCK 1 TOWN OF BRUSTER
MAIN AVE
{BRUCE AVE}
BLOCK 4 TOWN OF BRUSTER
BRIDGE ST N
BLOCK 5 TOWN OF BRUSTER
3RD ST
BLOCK 6 TOWN OF BRUSTER
{RIVER STREET}
CENTER 14 T.30N., R.24E. W.M.
{ANSEL AVE}
INDIAN AVE
PROJECT BOUNDARY OF THE WELLS HYDROELECTRIC PROJECT AS SHOWN ON THE REVISED EXHIBIT 'K' DRAWINGS, DATED APRIL 1, 1981 ON FILE WITH PUBLIC UTILITY DISTRICT NO.1, DOUGLAS COUNTY, WASHINGTON
ERIK B. GAHRINGER STATE OF WASHINGTON 37543 REGISTERED PROFESSIONAL LAND SURVEYOR
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OMAK (509) 422-1781
TOLL FREE (800) 732-7442
DRAWN BY: DKG
DATE: 8/11/2009
SCALE: 1"=200'
LAYOUT: REC-TRAIL-PUD
FILE NO: Section 14.dwg
JOB NO: 95650.0

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Exhibit F

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Brewster-Columbia Cove Park

RV Park Property Description

All distances and areas shown on the following described parcel of land are grid values per NAD 83/1991 adjustment, Washington State Coordinate System, North Zone. To obtain ground distances and areas multiply by a factor of 1.00009334.

A portion of Lot 4 of Foyle Orchards, Inc. Short Plat No. 96-10, as shown on a map on file in Book 'A-2' of Short Plats, at pages 200 and 201 thereof, records of the Auditor of Okanogan County, Washington, TOGETHER WITH a portion of the Southeast Quarter of the Southwest Quarter of Section 14, Township 30 North, Range 24 East of the Willamette Meridian, being more particularly described as follows:

BEGINNING at a 3" brass cap in concrete stamped "WELLS HYDRO PROJECT, PUD NO. 1 DOUGLAS CO" on the Easterly line of the Southwest quarter of said Section 14 at the most Northerly corner of a parcel of land described in a Correction Deed in favor of the Town of Brewster, recorded April 1, 1988 as Auditor's File No. 747958, records of the Auditor of Okanogan County, Washington. Said brass cap bears South 00° 54' 04" East along the East line of said Southwest quarter a distance of 2044.42 feet from the center quarter of said Section 14, being an iron pipe as shown on a Record of Survey recorded September 11, 2009 in Book 'S' of Surveys, at pages 215 through 218 thereof, said records of the Auditor of Okanogan County;

The following five (5) courses being along the Northerly line of the land described in said Correction Deed;

Thence South 04° 20' 11" West, a distance of 11.15 feet;

Thence South 56° 30' 31" West, a distance of 242.35 feet;

Thence South 49° 37' 18" West, a distance of 127.69 feet;

Thence South 69° 41' 02" West, a distance of 134.97 feet;

Thence South 88° 38' 19" West, a distance of 176.13 feet;

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Thence North 02° 49' 09" East, a distance of 208.20 feet;

Thence South 90° 00' 00" East, a distance of 283.79 to a rebar with plastic cap stamped "L.S. 31449" at the Southeast corner of Lot 4 of said Foyle Orchards, Inc. Short Plat.

Thence North 01° 00' 00" West along the East line of said Lot 4 a distance of 10.54 feet to a 5/8" rebar at the Southwest corner of that certain parcel of land described in a Real Estate Contract in favor of Brewster School District #111 recorded July 26, 1977 as Auditor's File No. 635975, records of the Auditor of Okanogan County, Washington;

Thence North 53° 33' 07" East along the Southerly line of that certain parcel of land described in said Real Estate Contract, a distance of 380.95 feet to the Southeast corner of that certain parcel of land described in said Real Estate Contract and the East line of said Southwest quarter;

Thence South 00° 54' 04" East along said East line of the Southwest quarter, a distance of 166.21 feet to the POINT OF BEGINNING.

EXCEPT that portion of the Southeast Quarter of the Southwest Quarter of Section 14, Township 30 North, Range 24 East of the Willamette Meridian, being more particularly described as follows:

COMMENCING at a 3" brass cap in concrete stamped "WELLS HYDRO PROJECT, PUD NO. 1 DOUGLAS CO" on the Easterly line of the Southwest quarter of said Section 14 at the most Northerly corner of a parcel of land described in a Correction Deed in favor of the Town of Brewster, recorded April 1, 1988 as Auditor's File No. 747958, records of the Auditor of Okanogan County, Washington. Said brass cap bears South 00° 54' 04" East along the East line of said Southwest quarter a distance of 2044.42 feet from the center quarter of said Section 14, being an iron pipe as shown on a Record of Survey recorded September 11, 2009 in Book 'S' of Surveys, at pages 215 through 218 thereof, said records of the Auditor of Okanogan County;

Thence North 00° 54' 04" West along the East line of said Southwest quarter a distance of 166.21 feet to the Southeasterly corner of that certain parcel of land described in a Real Estate Contract in favor of Brewster School District #111 recorded July 26, 1977 as Auditor's File No. 635975, records of the Auditor of Okanogan County, Washington;

Thence South 53° 33' 07" West along the Southerly line of that parcel of land described in said Real Estate Contract a distance of 72.32 feet to the POINT OF BEGINNING;

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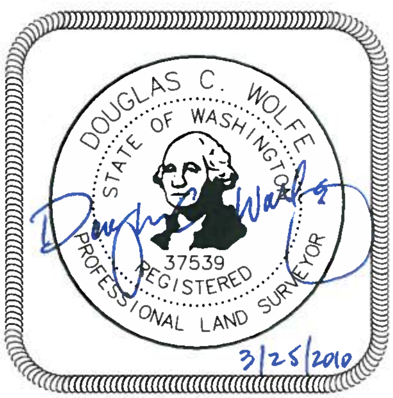
Thence continuing along the Southerly line of that parcel of land described in said Real Estate Contract South 53° 33' 07" West, a distance of 253.45 feet;

Thence North 72° 19' 27" East, a distance of 91.38 feet;

Thence North 53° 31' 39" East, a distance of 83.14 feet;

Thence North 34° 14' 00" East, a distance of 88.78 feet to the POINT OF BEGINNING.

The above described parcel of land contains 2.39 acres more or less.



Prepared by: DCW
Checked by: EBG
Date: 3/25/2010

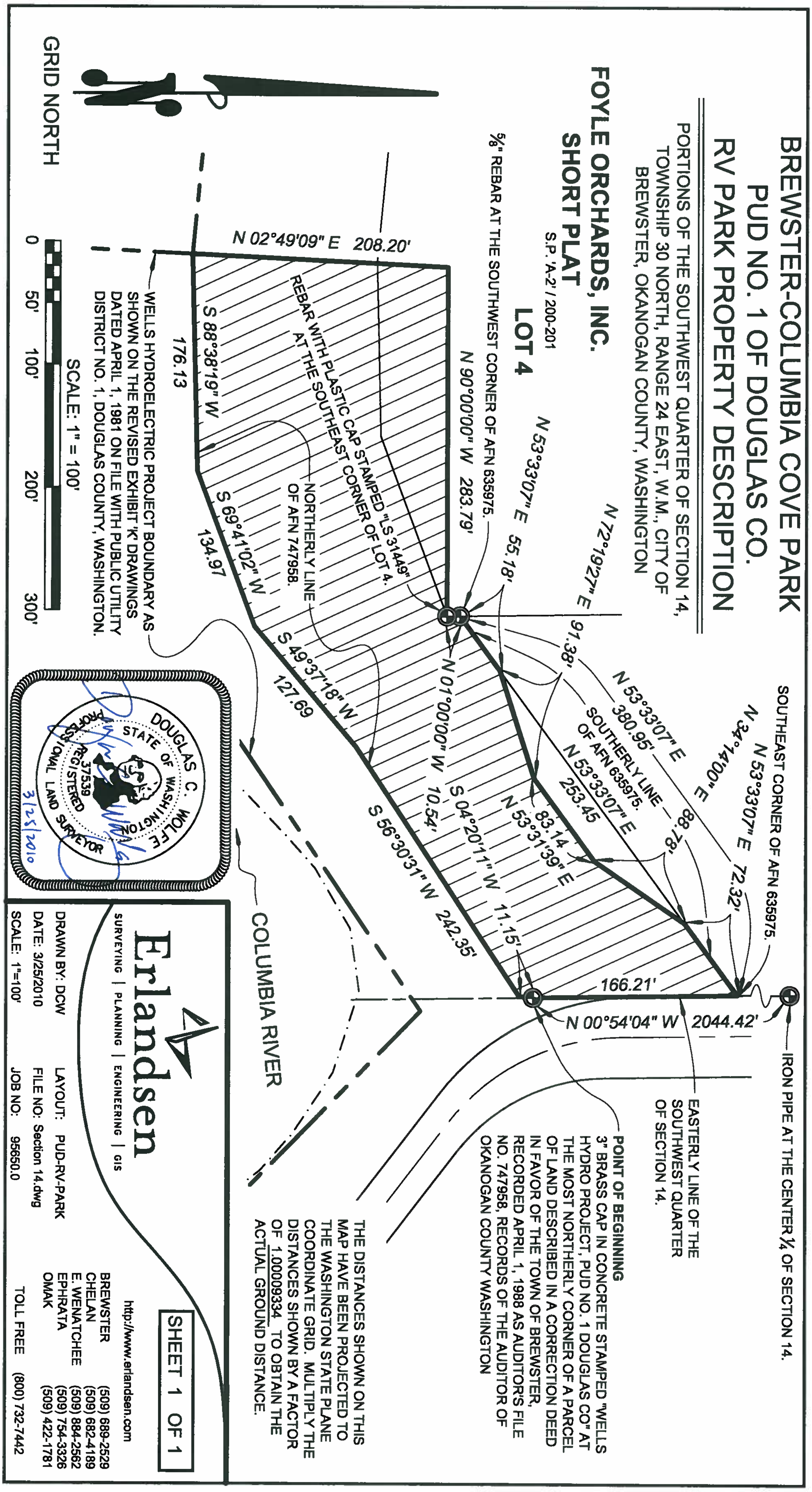

BREWSTER-COLUMBIA COVE PARK
PUD NO. 1 OF DOUGLAS CO.
RV PARK PROPERTY DESCRIPTION
PORTIONS OF THE SOUTHWEST QUARTER OF SECTION 14, TOWNSHIP 30 NORTH, RANGE 24 EAST, W.M., CITY OF BREWSTER, OKANOGAN COUNTY, WASHINGTON
FOYLE ORCHARDS, INC. SHORT PLAT
S.P. 'A-2' / 200-201
LOT 4
5/8" REBAR AT THE SOUTHWEST CORNER OF AFN 635975.
GRID NORTH
N 02°49'09" E 208.20'
176.13
S 88°38'19" W
REBAR WITH PLASTIC CAP STAMPED "LS 31449" AT THE SOUTHEAST CORNER OF LOT 4.
NORTHERLY LINE OF AFN 747958.
N 90°00'00" W 283.79'
N 53°33'07" E 55.18'
N 72°19'27" E 91.38'
S 69°41'02" W 134.97
S 49°37'18" W 127.69
N 01°00'00" W 10.54'
S 04°20'11" W 11.15'
N 53°31'39" E 83.14
N 53°33'07" E 253.45
SOUTHERLY LINE OF AFN 635975.
N 53°33'07" E 380.95'
N 34°14'00" E 88.78'
N 53°33'07" E 72.32'
SOUTHEAST CORNER OF AFN 635975.
S 56°30'31" W 242.35'
166.21'
N 00°54'04" W 2044.42'
IRON PIPE AT THE CENTER ¼ OF SECTION 14.
EASTERLY LINE OF THE SOUTHWEST QUARTER OF SECTION 14.
POINT OF BEGINNING
3" BRASS CAP IN CONCRETE STAMPED "WELLS HYDRO PROJECT, PUD NO. 1 DOUGLAS CO" AT THE MOST NORTHERLY CORNER OF A PARCEL OF LAND DESCRIBED IN A CORRECTION DEED IN FAVOR OF THE TOWN OF BREWSTER, RECORDED APRIL 1, 1988 AS AUDITOR'S FILE NO. 747958, RECORDS OF THE AUDITOR OF OKANOGAN COUNTY WASHINGTON
WELLS HYDROELECTRIC PROJECT BOUNDARY AS SHOWN ON THE REVISED EXHIBIT 'K' DRAWINGS DATED APRIL 1, 1981 ON FILE WITH PUBLIC UTILITY DISTRICT NO. 1, DOUGLAS COUNTY, WASHINGTON.
SCALE: 1" = 100'
0 50' 100' 200' 300'
COLUMBIA RIVER
THE DISTANCES SHOWN ON THIS MAP HAVE BEEN PROJECTED TO THE WASHINGTON STATE PLANE COORDINATE GRID. MULTIPLY THE DISTANCES SHOWN BY A FACTOR OF 1.00009334 TO OBTAIN THE ACTUAL GROUND DISTANCE.
DOUGLAS C. WOLFE
STATE OF WASHINGTON
37539
PROFESSIONAL REGISTERED LAND SURVEYOR
3/25/2010
Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS
DRAWN BY: DCW
DATE: 3/25/2010
SCALE: 1"=100'
LAYOUT: PUD-RV-PARK
FILE NO: Section 14.dwg
JOB NO: 95650.0
SHEET 1 OF 1
http://www.erlandsen.com
BREWSTER (509) 689-2529
CHELAN (509) 682-4189
E. WENATCHEE (509) 884-2562
EPHRATA (509) 754-3326
OMAK (509) 422-1781
TOLL FREE (800) 732-7442

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Exhibit G

Return Address:

Donald L. Dimmitt
Jeffers, Danielson, Sonn & Aylward, P.S.
P.O. Box 1688
Wenatchee, WA 98801

EASEMENT
(for Recreational Resources)

Grantor (City): City of Brewster, a Washington municipal corporation
Grantee (District): Public Utility District No. 1 of Douglas County, Washington, a Washington municipal corporation
Legal Description (abbreviated): **Burdened Property:** Portions of Park Addition to Brewster and the SW ¼ of SE ¼ and SE ¼ of SW ¼ of Section 13, and Gov. Lot 3 of Section 23, all in T 30N, R24 EWM, Okanogan County, Washington. Additional legal description on page 2.
Assessor's Tax Parcel ID#: **Burdened Property:**

Parties

1.1 City. City of Brewster, a Washington municipal corporation.

1.2 District. Public Utility District No. 1 of Douglas County, Washington, a Washington municipal corporation.

Easement

2.1 Grant of Easement. City hereby conveys and warrants to District a nonexclusive easement as described herein of the type described herein for the purposes described herein.

2.2 Purpose. The purpose of this easement is for use of recreational facilities known as Brewster Columbia Cove and Brewster Waterfront Trail as a project recreation site of the District.

2.3 Consideration. This easement is for and in consideration of the District's agreement to compensate the City for operation, maintenance and capital improvements to the

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facilities as detailed by separate agreement between the parties.

2.4 Benefited Property. This easement is to benefit the Wells Hydroelectric Project No. 2149.

2.5 Burdened Property. This easement is to burden the following described real property situated in the County of Douglas, State of Washington:

The property described on Exhibit A and Exhibit B.

2.6 Location of Easement. The location of the easement is described as follows:

The property described on Exhibit A and Exhibit B.

2.7 Term of Easement. The term of this easement is for the term of the District's License No. 2149 from the Federal Energy Regulatory Commission, any extension of that license and any new license granted to the District.

2.8 Maintenance and Repair. The cost of any maintenance and repair of the above easement is covered by separate agreement.

2.9 Attorney Fees and Costs. In the event any party employs legal counsel to enforce any covenant of this easement, or to pursue any other remedy on default as provided herein or by law, the substantially prevailing party shall be entitled to recover all reasonable attorneys' fees, appraisal fees, title search fees, other necessary expert witness fees and all other costs and expenses not limited to court action. Such sum shall be included in any judgment or decree entered.

2.10 Appurtenant Easement. The benefits and burdens granted and imposed by this instrument shall run with the lands described herein.

2.11 Venue. The venue of any action taken to enforce any part of this easement shall be in Douglas County, Washington.

2.12 Number; Gender; Permissive Versus Mandatory Usage. Where the context permits, references to the singular shall include the plural and vice versa, and to the

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neuter gender shall include the feminine and masculine. Use of the word "may" shall denote an option or privilege and shall impose no obligation upon the party which may exercise such option or privilege; use of the word "shall" shall denote a duty or an obligation.

2.13 Captions and Construction. The captions in this Easement are for the convenience of the reader and are not to be considered in the interpretation of its terms.

"CITY"

CITY OF BREWSTER
A Washington Municipality

By ______________________

Date: May 5th, 2010

"DISTRICT"

PUBLIC UTILITY DISTRICT NO. 1
OF DOUGLAS COUNTY
A Washington Municipality

By ______________________
William C. Dobbins, General Manager

Date: May 10, 2010

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STATE OF WASHINGTON)
) ss.
COUNTY OF OKANOGAN)

I certify that I know or have satisfactory evidence that LEE WEBSTER is the person who appeared before me and said person acknowledged that he/she signed this instrument, on oath stated that he/she was authorized to execute the instrument and acknowledged it as the MAYOR of City of Brewster to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 5th day of MAY, 2009.

Typed/Printed Name SANDRA D. MIRANDA
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 07/09/2011

STATE OF WASHINGTON)
) ss.
COUNTY OF Douglas)

I certify that I know or have satisfactory evidence that William C. Dobbins is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the General Manager of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 10th day of May, 2009.

Typed/Printed Name Gary R Ivory
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 11-19-13

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EXHIBIT A

Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS

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Brewster-Columbia Cove Park

City of Brewster Ownership

Note: The following description has been prepared for use in a Park Agreement between the City of Brewster and Public Utility District No.1 of Douglas County and should only be used for that purpose. This description is based on documentation acquired from Public Utility District No.1 of Douglas County without benefit of a Chain of Title and/or Title Report. Should this description be used for any other purpose, a Chain of Title and Title Report should be obtained to confirm ownership.

All distances and areas shown on the following described parcel of land are grid values per NAD 83/1991 adjustment, Washington State Coordinate System, North Zone. To obtain ground distances and areas multiply by a factor of 1.00009334.

A portion of Park Addition to Brewster, as shown on a map on file in Book 'F' of Plats, at page 4 thereof, records of the Auditor of Okanogan County, Washington, TOGETHER WITH those portions of the Southwest Quarter of the Southeast Quarter and the Southeast Quarter of the Southwest Quarter of Section 14, and Government Lots 2 and 3 of Section 23, all located in Township 30 North, Range 24 East of the Willamette Meridian, and more particularly described as follows:

COMMENCING at a 3 ¼" aluminum cap in a monument case stamped "WELLS PROJECT BOUNDARY, ERLANDSEN, L.S. 23599, T30N, R24E, WP, S-14, S-23, 2009" on the common line between said Sections 14 and 23 which bears South 88°41'18" West along said common line, a distance of 937.51 feet from a 2" bronze cap stamped "ERLANDSEN & ASSOC." located at the East 1/16th corner of said Sections 14 and 23;

Thence South 01° 13' 44" East, a distance of 161.86 feet to a 2 ½" aluminum cap stamped "DOUGLAS PUD, WELLS PROJECT BOUNDARY, LS 23599" and the POINT OF BEGINNING;

Thence retracing the previous course, North 01° 13' 44" West, a distance of 161.86 feet to the said 3 ¼" aluminum cap on the common line between said Sections 14 and 23;

Thence North 01° 13' 44" West, a distance of 3.20 feet;

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Thence North 77° 33' 35" East, a distance of 31.39 feet;

Thence North 13° 08' 18" West, a distance of 106.85 feet;

Thence North 04° 31' 23" East, a distance of 15.62 feet;

Thence North 14° 59' 00" West, a distance of 141.13 feet to a curve to the left;

Thence Northwesterly along said curve to the left, having a radius of 160.00 feet, through a central angle of 38° 47' 39", an arc length of 108.33 feet;

Thence North 53° 46' 39" West, a distance of 159.62 feet;

Thence North 51° 04' 01" West, a distance of 170.26 feet;

Thence, North 37° 11' 21" West, a distance of 64.63 feet to a 3" brass cap in concrete stamped "WELLS HYDRO PROJECT, PUD NO. 1 DOUGLAS CO" on the North-South centerline of said Section 14 and the most Northerly corner of a parcel of land described in a Correction Deed in favor of the Town of Brewster, recorded April 1, 1988 as Auditor's File No. 747958, records of the Auditor of Okanogan County Washington, the above mentioned parcel of land is shown on a Record of Survey, recorded Nov. 19, 1986 in Book 'G' of Surveys, at page 111 thereof, records of the Auditor of Okanogan County Washington;

The following nine (9) courses being along the Northerly, Westerly, Southerly and Easterly lines of the land described in said Correction Deed;

Thence South 04° 20' 11" West, a distance of 11.15 feet;

Thence South 56° 30' 31" West, a distance of 242.35 feet;

Thence South 49° 37' 18" West, a distance of 127.69 feet;

Thence South 69° 41' 02" West, a distance of 134.97 feet;

Thence South 88° 38' 19" West, a distance of 176.13 feet;

Thence South 02° 49' 09" West, a distance of 159.23 feet;

Thence South 71° 53' 49" East, a distance of 652.77 feet, to a point on the East line of said Government Lot 2;

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EXHIBIT A

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Thence North 00° 07' 50" West along said East line, a distance of 25.37 feet to the quarter corner common to Sections 14 and 23;

Thence North 00° 54' 04" West along the East line of the Southwest quarter of said Section 14, a distance of 516.94 feet to the Project Boundary of the Wells Hydroelectric Project as shown on the Revised Exhibit 'K' Drawings, dated April 1, 1981 on file with Public Utility District No.1, Douglas County, Washington;

Thence, along said Project Boundary the following six (6) courses and distances;

Thence North 55° 50' 48" East, a distance of 11.83 feet;

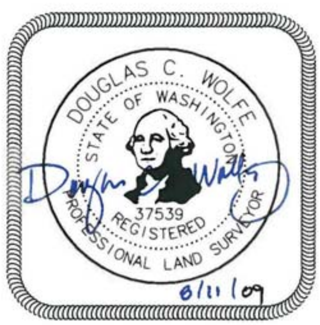
Thence South 45° 46' 51" East, a distance of 268.26 feet;

Thence South 28° 47' 08" West, a distance of 240.99 feet;

Thence South 04° 58' 52" East, a distance of 123.67 feet to a point on said common line between Sections 14 and 23 that bears South 88°41'18" West, a distance of 291.04 feet from a 3 ¼" aluminum cap in a monument case stamped "WELLS PROJECT BOUNDARY, ERLANDSEN, L.S. 23599, T30N, R24E, WP, S-14, S-23, 2009";

Thence continuing South 04° 58' 52" East, a distance of 58.01 feet;

Thence South 71° 24' 20" East, a distance of 305.34 feet to the POINT OF BEGINNING;



Prepared by: DKG
Checked by: DCW
Date: 8/11/2009

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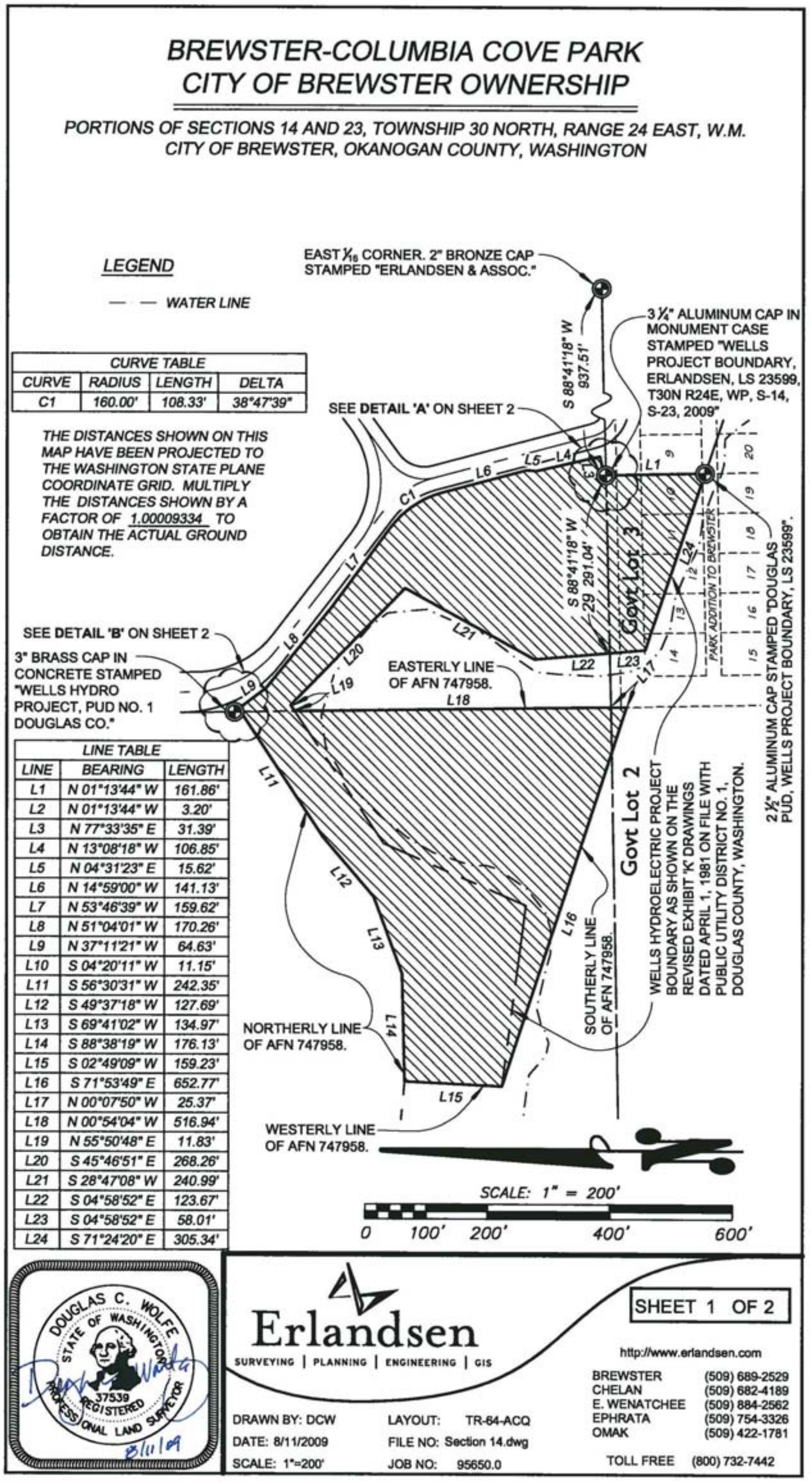
EXHIBIT A



CURVE TABLE

CURVE	RADIUS	LENGTH	DELTA
C1	160.00'	108.33'	38°47'39"

LINE TABLE

LINE	BEARING	LENGTH
L1	N 01°13'44" W	161.86'
L2	N 01°13'44" W	3.20'
L3	N 77°33'35" E	31.39'
L4	N 13°08'18" W	106.85'
L5	N 04°31'23" E	15.62'
L6	N 14°59'00" W	141.13'
L7	N 53°46'39" W	159.62'
L8	N 51°04'01" W	170.26'
L9	N 37°11'21" W	64.63'
L10	S 04°20'11" W	11.15'
L11	S 56°30'31" W	242.35'
L12	S 49°37'18" W	127.69'
L13	S 69°41'02" W	134.97'
L14	S 88°38'19" W	176.13'
L15	S 02°49'09" W	159.23'
L16	S 71°53'49" E	652.77'
L17	N 00°07'50" W	25.37'
L18	N 00°54'04" W	516.94'
L19	N 55°50'48" E	11.83'
L20	S 45°46'51" E	268.26'
L21	S 28°47'08" W	240.99'
L22	S 04°58'52" E	123.67'
L23	S 04°58'52" E	58.01'
L24	S 71°24'20" E	305.34'

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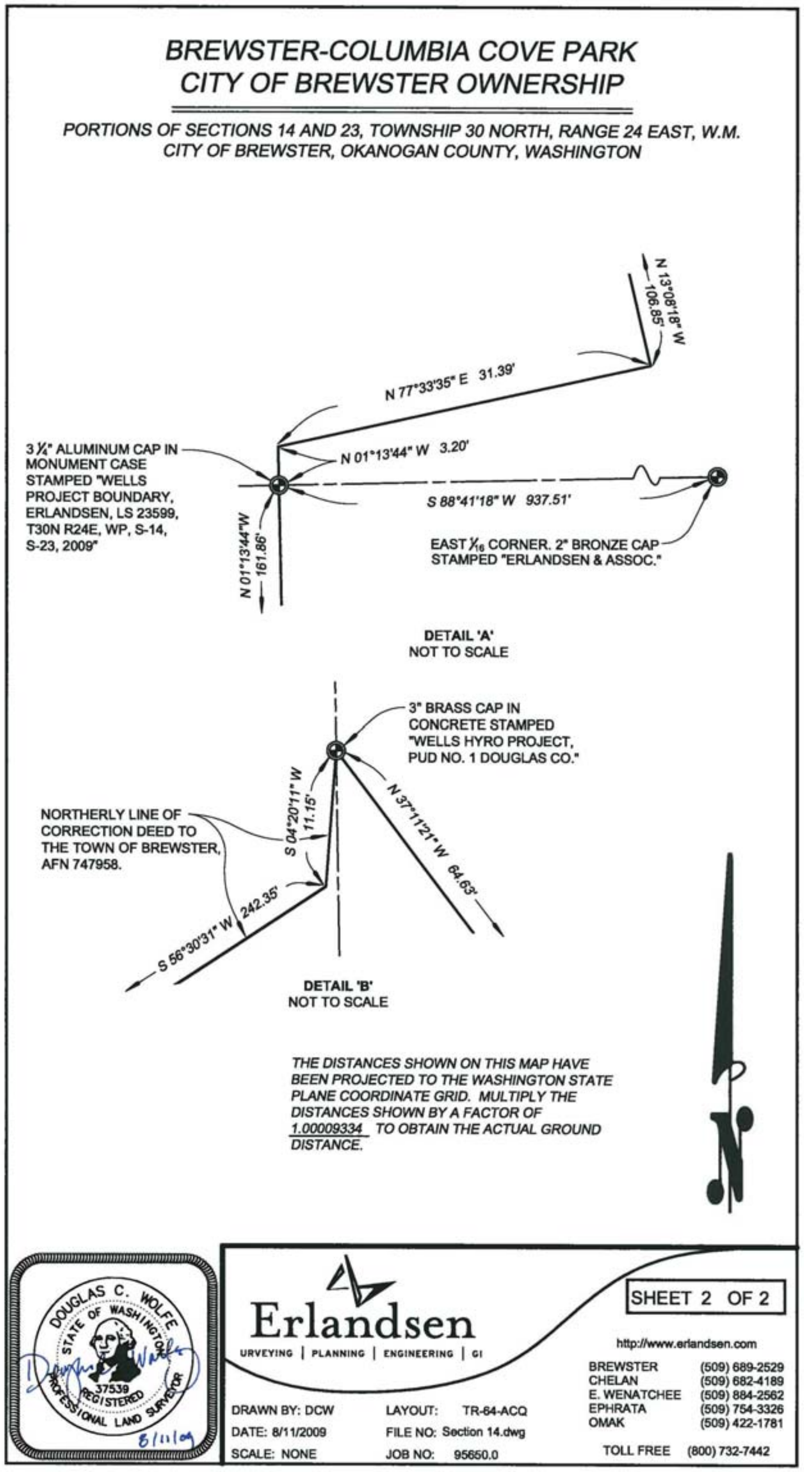
EXHIBIT A



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Wenatchee, WA 98807-1688
(509) 662-3685 / (509) 662-2452 FAX

EXHIBIT B

Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS

250 Simon Street SE
East Wenatchee, WA 98802

Phone: 509.884.2562
Fax: 509.884.2814

www.erlandsen.com

Brewster Waterfront Trail Boundary Description

City of Brewster Ownership

Note: The following description has been prepared for use in a Park Agreement between the City of Brewster and Public Utility District No.1 of Douglas County and should only be used for that purpose. This description is based on documentation acquired from Public Utility District No.1 of Douglas County without benefit of a Chain of Title and/or Title Report. Should this description be used for any other purpose, a Chain of Title and Title Report should be obtained to confirm ownership.

A parcel of land located within a portion of the southeast quarter of Section 14, all in Township 30 North, Range 24 East of the Willamette Meridian, City of Brewster, Okanogan County, Washington, said parcel being described as follows:

> That portion of Lot 19 of Braker Addition to Brewster, as shown on a map on file in Book 'F' of Plats, at page 28, records of the Auditor of Okanogan County, Washington, lying in a westerly direction and above the Project Boundary of the Wells Hydroelectric Project as shown on the Revised Exhibit 'K' Drawings, dated April 1, 1981 on file with Public Utility District No.1 of Douglas County.

Prepared By: Danny K. Gildehaus, PLS
Checked By: Erik B. Gahringer, PLS
Date: August 11, 2009

Jeffers, Danielson, Sonn & Aylward, P.S.
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EXHIBIT B

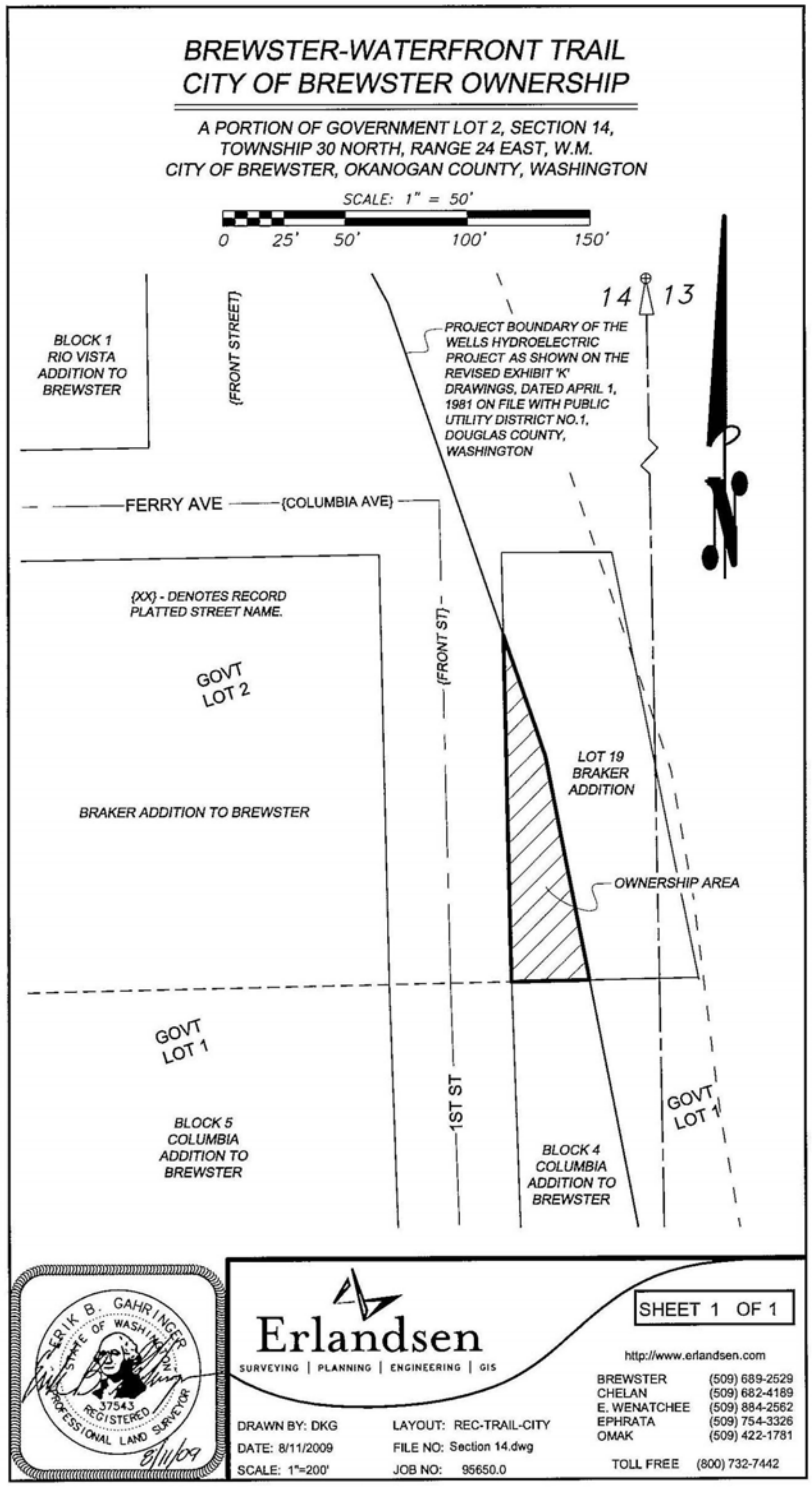

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Exhibit H

Return Address:

Donald L. Dimmitt
Jeffers, Danielson, Sonn & Aylward, P.S.
P.O. Box 1688
Wenatchee, WA 98801

EASEMENT
(For RV Camping Facility)

Grantor (City): Public Utility District No. 1 of Douglas County, Washington, a Washington municipal corporation
Grantee (District): City of Brewster, a Washington municipal corporation
Legal Description (abbreviated): Burdened Property: Portions of Lot 4 Foyle Orchards, Inc., Short Plat No. 96-10 and a portion of SE ¼ of SW ¼ of Section 14, all in T 30N, R24 EWM, Okanogan County, Washington. Additional legal on page 2.
Assessor's Tax Parcel ID#: Burdened Property:

Parties

1.1 District. Public Utility District No. 1 of Douglas County, Washington, a Washington municipal corporation.

1.2 City. City of Brewster, a Washington municipal corporation.

Easement

2.1 Grant of Easement. District hereby conveys and warrants to City a nonexclusive easement as described herein of the type described herein for the purposes described herein.

2.2 Purpose. The purpose of this easement is to allow development of an RV camping facility.

2.3 Consideration. This easement is for and in consideration of the City's grant of an easement to District of other facilities.

2.4 Benefited Property. This easement is to benefit the City.

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Attorneys at Law
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Wenatchee, WA 98807-1688
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2.5 Burdened Property. This easement is to burden the following described real property situated in the County of Douglas, State of Washington:

The property described on Exhibit A.

2.6 Location of Easement. The location of the easement is described as follows:

The property described on Exhibit A.

2.7 Term of Easement. The term of this easement is for the term of the District's License No. 2149 from the Federal Energy Regulatory Commission, any extension of that license or any new license granted to the District.

2.8 Maintenance and Repair. The cost of any maintenance and repair of the above easement is the obligation of the City.

2.9 Risk of Loss. The City shall bear the sole risk of loss of or damage to any facilities which are located on the easement. The District shall have no responsibility or legal liability whatsoever arising out of the City's construction, administration, operation or maintenance of any RV camping facilities on the easement.

2.10 Liability Insurance. The City shall at the City's expense maintain comprehensive liability insurance on the RV parking facility in an amount not less than One Million Dollars ($1,000,000.00). The District shall be an additional insured on such policy. The City shall deliver a copy of any such insurance policy to the District.

2.11 Indemnity. The City hereby releases and agrees to hold harmless, indemnify and defend the District and its officers, agents, employees and contractors from, against and for any and all liabilities, obligations, suits, claims, demands, actions, costs and expenses of any kind which may be imposed upon or asserted against the District by reason of any accident, injury or damage to any person and/or property arising from the construction, administration, operation, maintenance or use of the RV camping facilities.

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2.12 Compliance. The City shall conform to and comply with all laws, rules, regulations, conditions or restrictions promulgated by the FERC or any other governmental agency or other governmental entity having jurisdiction over the easement property.

2.13 Attorney Fees and Costs. In the event any party employs legal counsel to enforce any covenant of this easement, or to pursue any other remedy on default as provided herein, or by law, the substantially prevailing party shall be entitled to recover all reasonable attorneys' fees, appraisal fees, title search fees, other necessary expert witness fees and all other costs and expenses not limited to court action. Such sum shall be included in any judgment or decree entered.

2.14 Appurtenant Easement. The benefits and burdens granted and imposed by this instrument shall run with the lands described herein.

2.15 Venue. The venue of any action taken to enforce any part of this easement shall be in Douglas County, Washington.

2.16 Number; Gender; Permissive Versus Mandatory Usage. Where the context permits, references to the singular shall include the plural and vice versa, and to the neuter gender shall include the feminine and masculine. Use of the word "may" shall denote an option or privilege and shall impose no obligation upon the party which may exercise such option or privilege; use of the word "shall" shall denote a duty or an obligation.

2.17 Captions and Construction. The captions in this Easement are for the convenience of the reader and are not to be considered in the interpretation of its terms.

"DISTRICT"

PUBLIC UTILITY DISTRICT NO. 1
OF DOUGLAS COUNTY
A Washington Municipality

By W C Dobbins
William C. Dobbins, General Manager

Date: May 10, 2010

Jeffers, Danielson, Sonn & Aylward, P.S.
Attorneys at Law
2600 Chester Kimm Road / P.O. Box 1688
Wenatchee, WA 98807-1688
(509) 662-3685 / (509) 662-2452 FAX

"CITY"

CITY OF BREWSTER
A Washington Municipality

By [signature]

Date: 5/5/2010

STATE OF WASHINGTON)
) ss
COUNTY OF ~~OKANOGAN~~ Douglas)

I certify that I know or have satisfactory evidence that William C. Dobbins is the person who appeared before me and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the General Manager of Public Utility District No. 1 of Douglas County, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 10th day of MAY, 2010.

GARY R. IVORY
COMMISSION EXPIRES
NOTARY
PUBLIC
11-19-13
STATE OF WASHINGTON

[signature]
Typed/Printed Name Gary R Ivory
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 11-19-13

STATE OF WASHINGTON)
) ss.
COUNTY OF OKANOGAN)

I certify that I know or have satisfactory evidence that LEE WEBSTER is the person who appeared before me and said person acknowledged that he/she signed this instrument, on oath stated that he/she was authorized to execute the instrument and acknowledged it as the MAYOR of City of Brewster to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated this 5th day of MAY, 2010.

[signature]
Typed/Printed Name SANDRA O. MIRANDA
NOTARY PUBLIC
In and for the State of Washington
My appointment expires 07/09/2011

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Attorneys at Law
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EXHIBIT A

Erlandsen
SURVEYING | PLANNING | ENGINEERING | GIS

210 N Bridge Street
P.O. Box 739
Brewster, WA 98812

Phone: 509.689.2529
Fax: 509.689.2520

www.erlandsen.com

Brewster-Columbia Cove Park

RV Park Property Description

All distances and areas shown on the following described parcel of land are grid values per NAD 83/1991 adjustment, Washington State Coordinate System, North Zone. To obtain ground distances and areas multiply by a factor of 1.00009334.

A portion of Lot 4 of Foyle Orchards, Inc. Short Plat No. 96-10, as shown on a map on file in Book 'A-2' of Short Plats, at pages 200 and 201 thereof, records of the Auditor of Okanogan County, Washington, TOGETHER WITH a portion of the Southeast Quarter of the Southwest Quarter of Section 14, Township 30 North, Range 24 East of the Willamette Meridian, being more particularly described as follows:

BEGINNING at a 3" brass cap in concrete stamped "WELLS HYDRO PROJECT, PUD NO. 1 DOUGLAS CO" on the Easterly line of the Southwest quarter of said Section 14 at the most Northerly corner of a parcel of land described in a Correction Deed in favor of the Town of Brewster, recorded April 1, 1988 as Auditor's File No. 747958, records of the Auditor of Okanogan County, Washington. Said brass cap bears South 00° 54' 04" East along the East line of said Southwest quarter a distance of 2044.42 feet from the center quarter of said Section 14, being an iron pipe as shown on a Record of Survey recorded September 11, 2009 in Book 'S' of Surveys, at pages 215 through 218 thereof, said records of the Auditor of Okanogan County;

The following five (5) courses being along the Northerly line of the land described in said Correction Deed;

Thence South 04° 20' 11" West, a distance of 11.15 feet;

Thence South 56° 30' 31" West, a distance of 242.35 feet;

Thence South 49° 37' 18" West, a distance of 127.69 feet;

Thence South 69° 41' 02" West, a distance of 134.97 feet;

Thence South 88° 38' 19" West, a distance of 176.13 feet;

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Thence North 02° 49' 09" East, a distance of 208.20 feet;

Thence South 90° 00' 00" East, a distance of 283.79 to a rebar with plastic cap stamped "L.S. 31449" at the Southeast corner of Lot 4 of said Foyle Orchards, Inc. Short Plat.

Thence North 01° 00' 00" West along the East line of said Lot 4 a distance of 10.54 feet to a 5/8" rebar at the Southwest corner of that certain parcel of land described in a Real Estate Contract in favor of Brewster School District #111 recorded July 26, 1977 as Auditor's File No. 635975, records of the Auditor of Okanogan County, Washington;

Thence North 53° 33' 07" East along the Southerly line of that certain parcel of land described in said Real Estate Contract, a distance of 380.95 feet to the Southeast corner of that certain parcel of land described in said Real Estate Contract and the East line of said Southwest quarter;

Thence South 00° 54' 04" East along said East line of the Southwest quarter, a distance of 166.21 feet to the POINT OF BEGINNING.

EXCEPT that portion of the Southeast Quarter of the Southwest Quarter of Section 14, Township 30 North, Range 24 East of the Willamette Meridian, being more particularly described as follows:

COMMENCING at a 3" brass cap in concrete stamped "WELLS HYDRO PROJECT, PUD NO. 1 DOUGLAS CO" on the Easterly line of the Southwest quarter of said Section 14 at the most Northerly corner of a parcel of land described in a Correction Deed in favor of the Town of Brewster, recorded April 1, 1988 as Auditor's File No. 747958, records of the Auditor of Okanogan County, Washington. Said brass cap bears South 00° 54' 04" East along the East line of said Southwest quarter a distance of 2044.42 feet from the center quarter of said Section 14, being an iron pipe as shown on a Record of Survey recorded September 11, 2009 in Book 'S' of Surveys, at pages 215 through 218 thereof, said records of the Auditor of Okanogan County;

Thence North 00° 54' 04" West along the East line of said Southwest quarter a distance of 166.21 feet to the Southeasterly corner of that certain parcel of land described in a Real Estate Contract in favor of Brewster School District #111 recorded July 26, 1977 as Auditor's File No. 635975, records of the Auditor of Okanogan County, Washington;

Thence South 53° 33' 07" West along the Southerly line of that parcel of land described in said Real Estate Contract a distance of 72.32 feet to the POINT OF BEGINNING;

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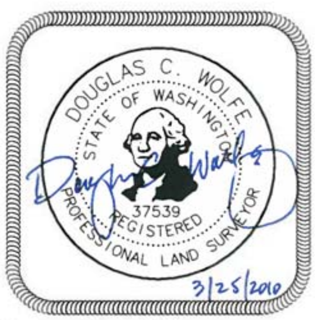
Thence continuing along the Southerly line of that parcel of land described in said Real Estate Contract South 53° 33' 07" West, a distance of 253.45 feet;

Thence North 72° 19' 27" East, a distance of 91.38 feet;

Thence North 53° 31' 39" East, a distance of 83.14 feet;

Thence North 34° 14' 00" East, a distance of 88.78 feet to the POINT OF BEGINNING.

The above described parcel of land contains 2.39 acres more or less.



Prepared by: DCW
Checked by: EBG
Date: 3/25/2010

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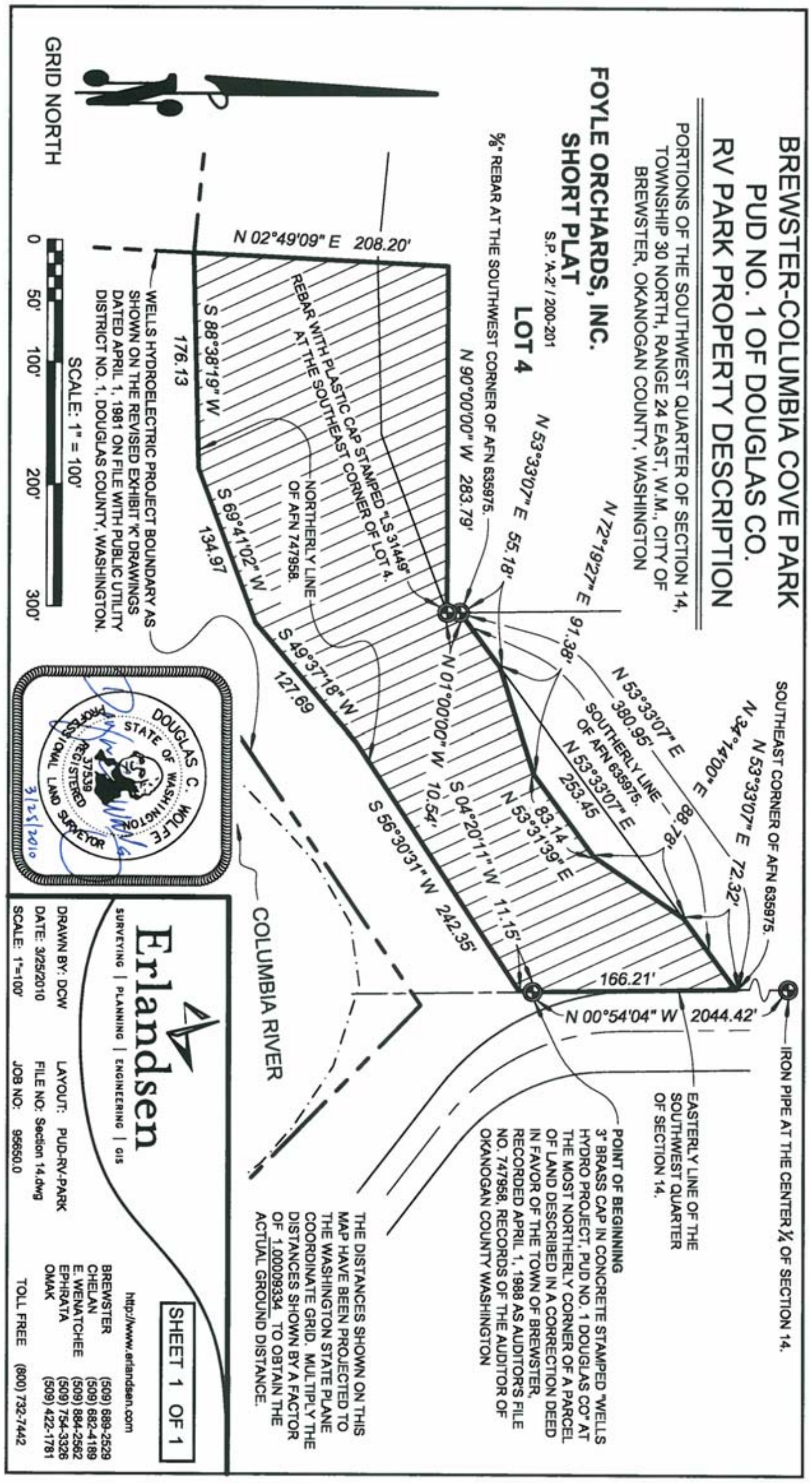

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Appendix E-13

Douglas PUD Land Use Policy

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PUBLIC ULTILITY DISTRICT NO. 1 OF DOUGLAS COUNTY
LAND USE POLICY
JULY 15, 1993
(REVISED DECEMBER 17, 2007)
(UPDATED FEBRUARY 1, 2010)

Public Utility District No. 1 of Douglas County (Douglas PUD) owns and operates the Wells Hydroelectric Project (Wells Project) which is authorized under the Federal Power Act by the Federal Energy Regulatory Commission's (FERC) License #2149, as amended. All lands within the Wells Project Boundary are governed by the FERC License. Douglas PUD is organized and operates under Title 54 of the Revised Code of Washington. Douglas PUD also owns land and land rights for its electric, communication and water transmission and distribution systems.

The following are general land use policies which address all of Douglas PUD lands and land rights. The purpose of this policy is to provide guidance for land use management decisions and to:

1. Maintain compliance with FERC License obligations for the Wells Project;
2. Meet applicable federal and state requirements for non-Wells Project lands;
3. Provide for good stewardship of both project and non-Wells Project lands;
4. Provide for consideration of wildlife and/or riparian habitat;
5. Provide for the continued operation of the transmission and distribution system;
6. Provide for consideration of significant historical, cultural and natural features;
7. Evaluate all existing uses of Wells Project and non-Wells Project land and land rights;
8. Comply with existing agreements;
9. Develop a process by which a policy violation can be resolved.

GENERAL POLICIES

A. The use of Wells Project lands shall be governed by the Wells Project FERC License #2149. Douglas PUD shall use its best efforts to comply with all applicable State and federal laws and regulations.

B. A goal of Douglas PUD is to comply with federal and state laws for protection of cultural resources located on Wells Project or Douglas PUD lands in coordination with appropriate agencies.

C. A goal of Douglas PUD is to develop only those recreational facilities that will not interfere with the preservation of natural ecosystems associated with the Wells Project.

D. A goal of Douglas PUD is to sustain the existing natural systems associated with the Wells Project or other Douglas PUD lands.

E. The public shall be allowed access, where practicable, to the waters of Wells Reservoir and adjacent Wells Project lands owned by Douglas PUD. Access shall be without regard to race, color, sex, religion or national origin and shall be in accordance with Policy goals 3, 4 and 6. 5.

F. When making land use or related permit decisions on Wells Project lands that affect reservoir habitat for anadromous salmonids, Douglas PUD shall consider the cumulative impact effects in order to meet the conservation objectives of the Habitat Conservation Plan, the requirements of the FERC License and other applicable laws and regulations. Douglas PUD will notify and consider comments from the signatories to the Wells Project HCP regarding land use permit applications on Wells Project lands.

G. Douglas PUD shall notify all applicants for Douglas PUD permits to use or occupy Wells Project lands or water that such use or occupancy may result in an incidental take of species listed or proposed for listing as endangered or threatened under the Endangered Species Act, requiring advanced authorization from National Marine Fisheries Service or U.S. Fish and Wildlife Service.

<u>Rules Governing Public Use</u>

1. No refuse or litter shall be placed on Douglas PUD lands. The individual responsible for placing any refuse or litter on Douglas PUD lands shall be responsible for its removal. Douglas PUD, after requesting the responsible individual to remove the refuse or litter, shall have the option of removing same at the expense of the responsible individual.

2. Construction activities on Douglas PUD lands are prohibited, except by special permit issued by Douglas PUD. Construction activities include, but are not limited to, removal or destruction of vegetation or grading of the earth.

3. Destruction, defacement or removal of any vegetation or soil (includes sand, rock, minerals, etc.) on or from Douglas PUD property is prohibited.

4. Destruction, excavation, defacement, removal or disturbance of archaeological or historical sites, monuments, graves or boundary markers, material or artifacts is prohibited.

H. Use of Douglas PUD lands or waters within the Wells Project Boundary other than public use shall require a permit.

Rules Governing Permits

1. Application for permits shall be submitted to the Public Utility District No. 1 of Douglas County, 1151 Valley Mall Parkway, East Wenatchee, WA 98802-4497. Permit applications will be reviewed by Douglas PUD to ensure compliance with the FERC License provisions for the Wells Project or applicable federal or state statutes for the electrical or water distribution systems. Decisions may be appealed to Douglas PUD's Commission. All Permits will be in writing and must be approved by Douglas PUD's Commission.

2. Permits on Wells Project lands will be issued only if the proposed use and occupancy meets the requirements of the FERC license and considers protection of the environmental, scenic, historic, cultural or recreational values of the land. Permits are non-transferable and expire upon the sale or transfer of title or subdivision of subject or adjacent land. All permits will expire upon expiration of the Wells Project FERC License. Upon sale or transfer of adjacent lands or termination of a permit, Douglas PUD will re-evaluate the use of the associated Wells Project land to determine the best use of said lands for the future. A permit fee schedule, which may be amended from time to time, will be established by Douglas PUD's Commission.

3. The lands on which agricultural use and occupancy permits are issued must be maintained in accordance with good agricultural practices by Permittee and must comply with all applicable federal and state laws, including the Federal Power Act and specifically FERC License 2149. The use of the lands permitted shall not endanger health, create a public nuisance or otherwise be incompatible with overall Wells Project purpose.

4. Failure to adhere to conditions of the permit may result in cancellation of the permit and/or legal action. Non-permitted use of Douglas PUD lands or waters other than public use, as outlined in Section E hereof, may result in legal action or refusal of a request for permit.

5. Douglas PUD will monitor the uses and occupancies granted by the permit and shall take remedial action when non-compliance is discovered. Douglas PUD reserves the right to cancel the permit and to require removal of any structure, facility, landscaping or agricultural crop located on Wells Project lands, at Permittee expense, IF:

    a. Permittee fails to comply with the terms and conditions of the permit.
    b. Permittee interferes with Douglas PUD's operation of any hydroelectric or electric, communication or water distribution facility.
    c. Continued use or occupancy is incompatible with any new conditions or terms imposed by FERC.
    d. Continued use or occupancy is incompatible with changes in use of surrounding and/or adjacent lands.

6. Permits will be approved and issued by the Douglas PUD's Commission. Before granting a permit the Property Supervisor, after consulting the Chief Engineer for the Wells Project, or the Distribution Engineering Supervisor (depending upon the particular lands involved), must certify that the permit is in the best interest of Douglas PUD and will not adversely affect any current or future Douglas PUD operations. The Property Supervisor will maintain files containing documents and correspondence related to permits, leases, easements and sales of Douglas PUD lands.

7. Douglas PUD shall retain fee simple ownership and possession of all Douglas PUD lands that are subject to franchise, easements, water rights, permits and rights of occupancy and use.

8. If land conveyances occur, an annual report to FERC will be prepared by the Property Supervisor showing all easements, leases, sales and purchases of Wells Project land. Annually, the Property Supervisor will review Wells Project lands to determine if any lands are surplus to Douglas PUD. Following FERC guidelines for sales of surplus lands, these lands will be sold at public sale in order to return them to the tax rolls.

I. The Property Supervisor will be responsible for the acquisition of all Douglas PUD property. The Property Supervisor will provide a written recommendation for purchase, to the Douglas PUD General Manager for approval and submittal to the Douglas PUD Commission. The Property Supervisor's recommendation will require the approval of the Chief Engineer for the Wells Project or the Distribution Engineering Supervisor (dependent upon lands involved) and the Natural Resources Supervisor.

   A condemnation proceeding will only be initiated after an attempt at reasonable negotiations or in the event clear title cannot be secured.

J. Douglas PUD may choose to meet land management objectives through construction of fences or other approved barriers on Douglas PUD lands. Fencing or barriers may be used to assure protection of shoreline riparian and wetland habitat, control public access to sensitive wildlife, cultural or historic areas or to limit access to Douglas PUD facilities that may represent a danger to the public. Private individuals may NOT construct fences on Douglas PUD Property unless authorized by a Douglas PUD-issued permit.

<u>Permitting Process</u>

1. The use of Wells Project lands shall be consistent with and in accordance with the Wells Project FERC License No. 2149. Most Wells Project lands are open for public recreation. All permits for use of Wells Project lands, including fences and docks, will allow for public access. Private docks and fences will not be allowed on Douglas PUD lands without a Land Use Permit.

2. All applications for Land Use Permits will be subject to the General Policies and Rules of Douglas PUD's Land Use Policy as adopted or subsequently amended.

3. The proposed permit will be subject to review and comment as required by various agreements between Douglas PUD and other agencies.

4. Following the submittal of all necessary regulatory permits, Douglas PUD will review the application for compliance with the Land Use Policy, consider regulatory agency and tribal comments and develop a recommendation. The permit and a recommendation for action or denial will be submitted to the PUD Commission for action.

5. The required regulatory permits may include any of the following: Endangered Species Act permits, City/County – shoreline, flood plain, conditional use, substantial development, variance, Army Corps of Engineers – sections 10, 404 & 401, Washington Department of Fish and Wildlife – hydraulic project approval (HPA), Department of Ecology (DOE) –water quality certification, and Colville Confederated Tribes HPA.

6. Applications for permits requiring approval by the FERC will not be forwarded for FERC consideration until all the necessary documentation is submitted to Douglas PUD, Douglas PUD staff has reviewed the application for compliance with Douglas PUD policies and a recommendation has been presented to, and approved by the Douglas PUD Commission.

7. All Land Use Permits shall be approved by the Douglas PUD Commission prior to implementation of proposed activities.

PUBLIC UTILITY DISTRICT NO. 1 OF DOUGLAS COUNTY
LAND USE POLICY
SUPPLEMENT NO. 1, ADMINISTRATIVE RULES
GOVERNING DOCKS AND PIERS
REVISED DECEMBER 17, 2007
UPDATED FEBRUARY 1, 2010

1. ALLOWABLE DOCKS

A. Docks and piers are defined as:

Any structure, fixture, improvement, barge, substantial development, vessel or other platform, whether powered or not powered, whether licensed or not licensed; that is temporary, semi-permanent or permanently moored, affixed or attached to the shoreline; which is customarily or typically used for moorage of vessels, watercraft or floating craft, for recreational uses which include but are not limited to swimming, diving and jumping into the water and/or as a staging location for water associated activities such as waterskiing, fishing, personal watercraft or simple flotation devices; which may interfere or obstruct the use of surface waters or which may extend over surface waters within the Wells Project.

B. Single Party Docks.

1. A permit for a single party dock may be requested by the owner of land adjacent to Wells Project lands. Permits for single party docks are not transferable and must be renewed if the property is sold or transferred.

2. Single party docks may be allowed within the city limits of the Cities of Brewster, Bridgeport and Pateros, as those boundaries exist on or before October 15, 2007.

3. In accordance with FERC's standard land use license article, single party docks may be permitted by Douglas PUD for "noncommercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 watercraft at a time where said facility is intended to serve a single-family dwelling."

4. Single party docks are prohibited outside the city limits of Brewster, Bridgeport and Pateros as those boundaries exist on or before October 15th, 2007.

C. Joint Use Docks (docks serving two properties)

1. A permit for a joint use dock may be requested if there is a recorded agreement between the parties applying for the permit. Permits for joint use docks are not transferable and must be renewed if either property changes ownership. Two single party docks may be converted to a joint use dock permit.

2. Joint use docks may be allowed within the city limits of the Cities of Brewster, Bridgeport and Pateros.

3. Joint use docks are prohibited outside the city limits of Brewster, Bridgeport and Pateros as those boundaries exist on or before October 15th, 2007.

D. Community Docks (docks serving three or more properties)

1. A permit for a community dock may be requested by a land developer platting or subdividing property or a home owner's association for land adjacent to Wells Project lands. All applicants for community docks must provide a common area within the plat or subdivision for access to the shoreline and the dock.

2. Permits for community docks will be issued to the developer in the name of the homeowner's association or directly to the homeowner's association. The developer or the homeowner's association will be responsible for obtaining the insurance required by the permit.

3. Community docks will be encouraged where necessary for protection of life, health or property or where Douglas PUD determines that it is necessary or desirable for the proper operation of the Wells Project.

4. Community docks are prohibited outside the city limits of Brewster, Bridgeport and Pateros as those boundaries exist on or before October 15th, 2007.

1. <u>INSURANCE</u>

A. Dock and pier permits being requested by the owner and/or homeowner's association of land adjacent to Wells Project lands, must furnish proof of liability insurance at the time of permit request. The proof of liability insurance shall be furnished in the following amounts:

1. Single party docks/piers: $1,000,000.00 (One Million Dollars).

2. Joint use docks/piers: $1,000,000.00 (One Million Dollars), for each adjacent land owner or; $2,000,000.00 (Two Million Dollars), for a joint policy.

3. Community docks/piers: $4,000,000.00 (Four Million Dollars).

B. The applicant also agrees that during the term of this permit a liability insurance policy will be provided covering all operations on the land in an amount not less than prescribed above for the specified permit request. The Permittee will provide Douglas PUD a certificate of insurance evidencing such coverage annually.

3. <u>RESTRICTED AREAS</u>

A. Wetlands, Woody Riparian and Native Vegetation

1. Private docks and piers will not be allowed in shoreline cattail/wetland areas unless the following conditions are met:

a. A mitigation plan is developed and approved by Douglas PUD that addresses the replacement of an area at least equal to the area to be disturbed.

b. The mitigation plan must address the conditions of Douglas PUD, and must consider the comments, if any, of the Washington State Department of Fish and Wildlife, signatories to the Wells Project Habitat Conservation Plan (HCP), Washington State Department of Ecology, the Corps of Engineers, and all local, state and federal agencies with shoreline jurisdiction

c. The approved mitigation plan must be implemented at the Permittee's expense prior to any construction activities related to the dock or pier installation.

C. Cultural Resources

1. No boat docks or piers will be allowed in areas of significant cultural resource value. Federal regulations mandate that these areas are not to be disclosed to the general public.

2. All applications, for dock and pier installations that will result in ground-disturbing activities, will be subject to a site review by a qualified archaeologist prior to construction. Construction activities are subject to the results of the site review. Costs for archaeological review shall be the responsibility of the Permittee.

D. Parks and Trail Areas

1. No additional private docks or piers will be permitted in areas designated as parks or in areas through which improved public access trails pass. Permits for existing facilities are not transferable upon a change of ownership. Areas considered as parks and trails are:

a. Memorial Park, Pateros;

b. Peninsula Park, Pateros;

c. Columbia Cove Park, Brewster;

d. Waterfront Trail, Brewster;

e. Marina Park, Bridgeport;

f. Any new recreation facilities constructed by Douglas PUD in association with the Wells Project.

4. <u>DOCK AND PIER INSTALLATION AND CONSTRUCTION</u>

A. Landscaping on Douglas PUD's Wells Project lands shall be requested by the applicant at the same time and on the same form as when requesting dock or pier approval.

B. The point of attachment to the shoreline shall adequately address erosion control.

C. Dock configuration and installation shall conform to the terms and conditions set forth in all regulatory permits as issued by the overseeing governmental agencies.

PUBLIC UTILITY DISTRICT NO. 1 OF DOUGLAS COUNTY
LAND USE POLICY
SUPPLEMENT NO. 2, ADMINISTRATIVE RULES
GOVERNING FENCES
UPDATED FEBRUARY 1, 2010

POLICY GOAL

The goal of this policy is to maintain open public access to Wells Project lands and compliance with the articles of FERC License No. 2149.

1. FENCES

A. Fences will be allowed only by permit issued by Douglas PUD. Fences will be permitted to the abutting upland owner by Douglas PUD in the following areas; within the cities of Pateros, Brewster, and Bridgeport.

B. Permits for fences are not transferable and new owners must submit an application requesting continuation of the use.

C. Outside the city limits of Brewster, Bridgeport, and Pateros, new fences will not be allowed after April 8, 2003.

D. Private fences installed outside of the city limits of Brewster, Bridgeport, or Pateros prior to April 8, 2003 will be allowed to remain until the ownership of the Permittee changes or Douglas PUD determines cancellation of the permit is in the best interest of Douglas PUD. At Douglas PUD's discretion, the property owner(s) or Douglas PUD shall remove fencing when either of the above actions occur.

E. Douglas PUD reserves the right to place, erect, and install fencing on any and all Douglas PUD owned property at any given time.

2. INSURANCE

A. Persons seeking a fence permit must furnish proof of liability insurance at the time of permit request. Each owner benefiting from a single party fence permit shall furnish proof of liability insurance, in the amount of $500,000.00. A homeowners' association shall furnish proof of liability insurance in the amount of $1,000,000.00, for a community fence permit.

B. The applicant must agree to maintain the liability insurance policy covering all operations on the land called for in 3A for the entire term of the Permit. The Permittee will annually provide Douglas PUD a certificate of insurance evidencing such coverage.

3. FENCE INSTALLATION AND CONSTRUCTION

A. Reasonable public access to Wells Project lands must be accommodated to the satisfaction of Douglas PUD.

B. All construction materials must be approved by Douglas PUD in advance.

C. Fence configuration and installation must be approved by Douglas PUD in advance.

D. All fences must allow for a minimum of 10 feet of width for access between the top of the bank or the ordinary high water mark (whichever is greatest) and the end of the fence. If the Wells Project Boundary is less than 10 feet from the top of the bank or the ordinary high water mark, then a fence will not be allowed on Douglas PUD lands.