ASSESSMENT OF DDT AND PCBs IN FISH TISSUE AND SEDIMENT IN THE LOWER OKANOGAN RIVER
(Okanogan Toxins Study)

WELLS HYDROELECTRIC PROJECT

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ABSTRACT

The Okanogan Toxins Study was conducted as part of the relicensing of the Wells Project in accordance with the Integrated Licensing Process (ILP) promulgated by the Federal Energy Regulatory Commission (FERC). The objective of the study was to determine the concentration of the persistent bioaccumulative pollutants 1,1,1-trichloro-2,2-*bis*[*p*-chlorophenyl]ethane (DDT) and polychlorinated biphenyls (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 augments previous information collected by the Washington Department of Ecology during the development of the Lower Okanogan River Basin DDT and PCBs Total Maximum Daily Load (TMDL) report, and will help document DDT and PCBs concentrations in the sediment and fish tissues in the Okanogan River. In addition, the information collected during this study may be used to inform the development of an appropriate information and education program to address the human health risks related to recreational use by the public in the lower 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. Fish collected during the study were weighed, measured, and filet samples collected and delivered to Analytical Resources, Incorporated (ARI) in Seattle, Washington, for analyses of DDT and PCBs concentrations.

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). To characterize the surface sediments most likely to be encountered by recreational river users, three grab samples were collected from the upper 10 cm of the sediments at each site with a vanVeen or Ekman grab sampler. At each site, an aliquot of sediment from each grab sample was analyzed for total organic carbon (TOC), grain size, total solids, PCBs (Aroclors), and DDT analogs.

PCBs were undetected in all sediment samples at the 3.9 to 4.0 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 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. 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 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. The higher concentrations exceed levels that have led the Washington Department of Health (WDOH) to issue fish consumption advisories for the Yakima River.

Similar results for DDT were observed for smallmouth bass. Larger fish with higher lipids levels were captured during this study compared to the TMDL study. On average, these larger fish also had higher DDT concentrations than the fish analyzed during the TMDL study. Total DDT ranged from 79 to 2,553 µg/kg in smallmouth bass from the current study compared to 28 to 288 µg/kg in smallmouth bass from the TMDL study.

The differences between DDT concentrations in fish tissues collected in the two studies may be attributable to differences in age, as indicated by size, and to differences in lipids content. The larger fish not only contained more lipids, where organic chemicals bioaccumulate, but they also have had additional years to bioaccumulate DDT.

Higher PCBs concentrations were also 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 carp from the Wenatchee River and in mountain whitefish from the Walla Walla River that have led to fish consumption advisories (WDOH 2008).

1.0 INTRODUCTION

1.1 General Description of the Wells Hydroelectric Project

The Wells Hydroelectric Project (Wells Project) is located at river mile (RM) 515.6 on the Columbia River in the State of Washington (Figure 1.1-1). 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 (COE); and 42 miles upstream from the Rocky Reach Hydroelectric Project owned and operated by Public Utility District No. 1 of Chelan County (Chelan PUD). The nearest town is Pateros, Washington, which is located approximately 8 miles upstream from the Wells Dam.

The Wells Project is the chief generating resource for Public Utility District No. 1 of Douglas County (Douglas PUD). It includes ten generating units with a nameplate rating of 774,300 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. 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.

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 surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet and usable storage of 97,985 acre feet at the normal maximum water surface elevation of 781 above mean sea level (msl) (Figure 1.1-1).

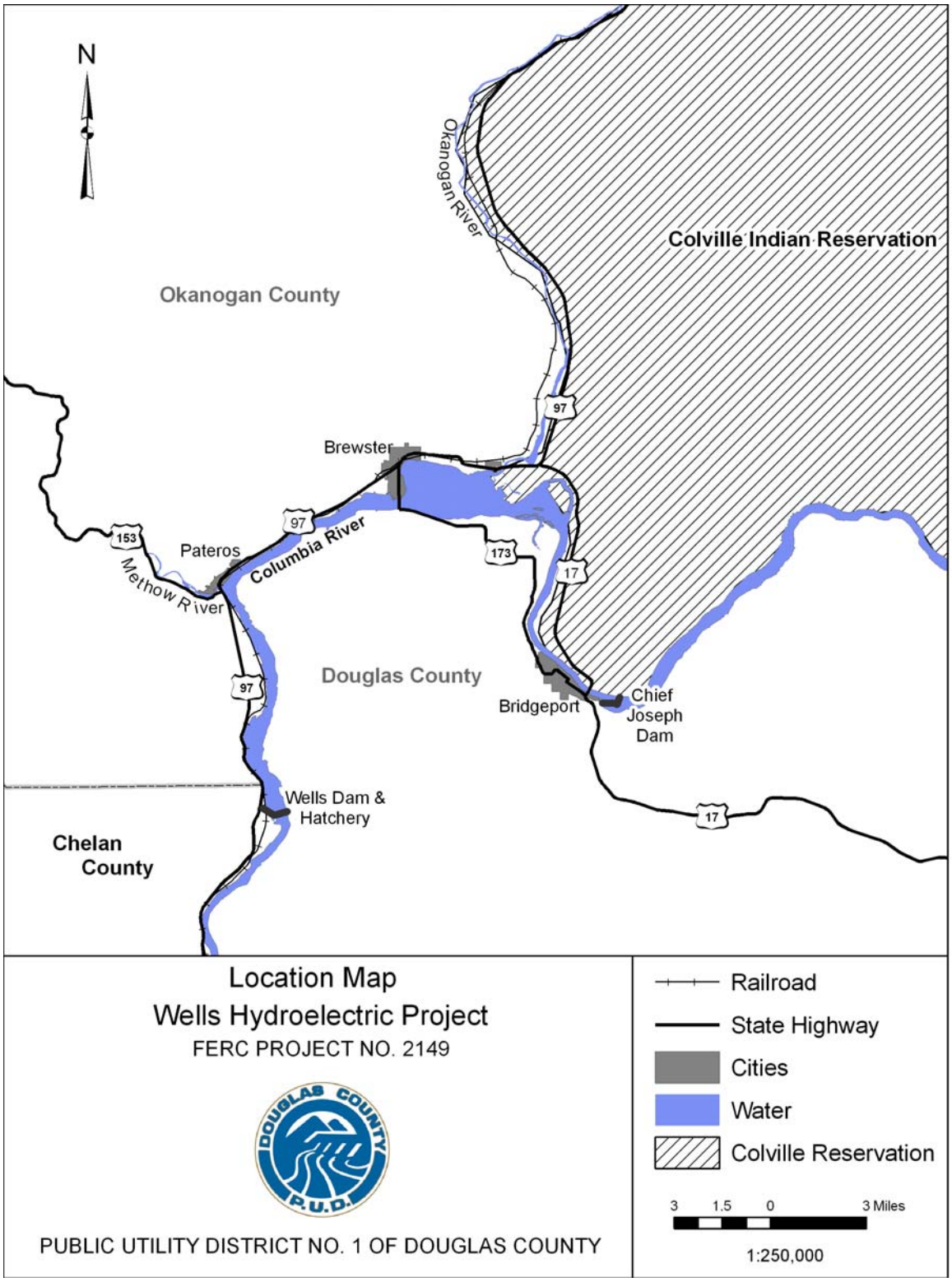

Figure 1.1-1 Location map of the Wells Project.

1.2 Relicensing Process

The current Wells Project license will expire on May 31, 2012. Douglas PUD is using the Integrated Licensing Process (ILP) promulgated by Federal Energy Regulatory Commission (FERC) Order 2002 (18 CFR Part 5). Stakeholders consisting of representatives from state and federal agencies, tribes, local governments, non-governmental organizations and the general public have been participating in the Wells Project ILP, from a very early stage, to identify information needs related to the relicensing of the Wells Project.

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 Project, to identify resource issues and to develop preliminary study plans prior to filing the Notice of Intent (NOI) and Pre-Application Document (PAD). The RWGs were formed to discuss issues related to the Wells Project and its operations.

The primary goals of the RWGs were to identify resource issues and potential study needs in advance of Douglas PUD filing the NOI and PAD. Through 35 meetings, each RWG cooperatively developed a list of Issue Statements, Issue Determination Statements and Agreed-Upon Study Plans. An Issue Statement is an agreed-upon definition of a resource issue raised by a stakeholder. An Issue Determination Statement reflects the RWGs' efforts to apply FERC's seven study criteria to mutually determine the applicability of each individual Issue Statement. Agreed-Upon Study Plans are the finished products of the informal RWG process.

Douglas PUD submitted the NOI and PAD to FERC on December 1, 2006. The PAD included the RWGs' 12 Agreed-Upon Study Plans. The filing of these documents initiated the relicensing process for the Wells Project under FERC's regulations governing the ILP.

On May 16, 2007, Douglas PUD submitted a Proposed Study Plan (PSP) Document. The PSP Document consisted of the Applicant's Proposed Study Plans, Responses to Stakeholder Study Requests and a schedule for conducting the Study Plan Meeting. 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 review and 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 PSP Document comments.

On October 11, 2007, FERC issued its Study Plan Determination based on its 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 has opted to complete all 12 studies to better prepare for the 401 Water Quality Certification process conducted by the Washington State Department of Ecology (Ecology) and to fulfill its commitment to the RWGs who collaboratively developed the 12 Agreed-Upon Study Plans with

Douglas PUD. These study plans have been implemented during the designated ILP study period. The results from the study plans have been developed into 12 Study Reports. Each report is included in Douglas PUD's Initial Study Report (ISR) Document, which is scheduled for filing with FERC on October 15, 2008.

This report completes the Okanogan Toxins Study.

2.0 GOALS AND OBJECTIVES

The objective of the study is to determine the concentrations of the insecticide 1,1,1-trichloro-2,2-*bis*[*p*-chlorophenyl]ethane (DDT) and polychlorinated biphenyls (PCBs) in selected resident fish species and in swimming areas of the lower Okanogan River (up to RM 15.5) within the Wells Project boundary.

Tasks to be completed toward the achievement of the goal include:

- Collect and analyze sediment samples for DDT and PCBs from specific recreational sites (i.e., swim areas and boat launches) in the lower Okanogan River Project area.
- Collect and analyze fish tissue for DDT and PCBs from fish species of interest that may be consumed by tribal and recreational anglers.

The information gathered from this monitoring effort will assist the Aquatic RWG in determining the concentration of DDT and PCBs in selected resident fish species and in swimming areas of the lower Okanogan River within the Wells Project boundary. The information may inform the development of an appropriate information and education program to address the human health risks of public recreational use in the lower Okanogan River.

3.0 STUDY AREA

The study area consists of the lower Okanogan River from its confluence with the Columbia River upstream to RM 15.5 (Figure 1.1-1).

4.0 BACKGROUND AND EXISTING INFORMATION

The Okanogan River originates in the Cascade Mountains north of the Canadian border in British Columbia. The Okanogan River is characterized by a series of lakes north of the international boundary and a free flowing river flowing out of Osoyoos Lake for 78 miles to its confluence with the Columbia River (Ecology 2004). The lower 15.5 miles of the Okanogan River before it joins with the Columbia River is considered within the Wells Project boundary.

4.1 Previous Okanogan River DDT And PCBs Studies

Beginning in the early 1970s, Canadian investigators began documenting high levels of DDT in fish collected from British Columbia lakes along the mainstem Okanogan River (Northcote et al. 1972). In 1983, Ecology collected data which revealed DDT and PCBs contamination in fish from the Okanogan River below the Canadian border (Hopkins et al. 1985). A number of

Ecology surveys have since verified DDT and PCBs contamination in the basin (Johnson and Norton 1990; Davis and Serdar 1996; Johnson et al. 1997; Serdar et al. 1998; Serdar 2003).

The Ecology Environmental Assessment Program prepared an assessment of total maximum daily loads (TMDLs) of DDT and PCBs in the lower Okanogan River basin, including Osoyoos Lake. For the purposes of the Ecology assessment, the lower Okanogan River was defined as the portion of the river from the U.S. - Canadian border at Lake Osooyos (RM 80.2) downriver to the town of Monse (RM 5.0). Sampling conducted during 2001 and 2002 examined DDT and PCBs concentrations in the water column of the mainstem Okanogan River, water in tributary streams, sewage treatment plant (STP) effluent and sludge, and cores of bottom sediments. Composite samples of three species of fish – carp (*Cyprinus carpio*), mountain whitefish (*Prosopium williamsoni*), and smallmouth bass (*Micropterus dolomieu*) also were analyzed for DDT and PCBs. Data from these samples were used in conjunction with historical data to develop the TMDLs (Serdar 2003).

Results of the 2001and 2002 sampling (Serdar 2003) suggest that:

- DDT concentrations in the Okanogan mainstem water column typically decreased from upriver sites (Zosel Dam) to downriver sites (Malott). PCBs were not detected in the mainstem Okanogan River.
- Only small loads of DDT and PCBs are delivered to Osoyoos Lake and the lower Okanogan River through tributary streams and STPs.
- Generally, lipids-normalized t-DDT and t-PCBs concentrations in fish tissue decreased from sites upriver to downriver (Oroville, Riverside-Omak, Monse), with the exception of large-sized smallmouth bass that had higher concentrations downriver at the Monse site.
- t-DDT and t-PCBs concentration trends decreased in the 1980s followed by steady concentrations in the last decade in the lower Okanogan system.
- DDT concentrations in the Osoyoos Lake core sediments were an order of magnitude higher than core sediments of approximately equal age from the Okanogan River near the mouth (Monse).
- PCBs concentrations in core samples were low, with concentrations around 1 mg/kg t-PCBs. Concentrations from both sites (Osoyoos Lake and the lower Okanogan River at Monse) were similar suggesting that low-level PCBs sources such as STPs between the lake and the river mouth keep depositional areas enriched with low levels of PCBs.

Little is known about sources of PCBs contamination in the lower Okanogan River basin, except that no major sources appear evident. It is notable that while PCBs in edible fish tissues may be a human health concern at the levels reported, it is common to find similar levels in other Washington waters where no discernible sources of PCBs exist (Davis and Johnson 1994).

Re-suspended Osoyoos Lake sediments account for nearly all of the measured DDT loads in the lower Okanogan River, which may explain the disparity between DDT load delivery and measured loads in the water column of the lower mainstem Okanogan River. The Colville Tribes conducted a longitudinal transect of DDT in 40 lower Okanogan River sediments from Osoyoos Lake outlet to the mouth in 2001 (Hurst and Stone 2002). Aside from two locations,

little DDT was found. Sixty percent of sites had t-DDT concentrations below the detection limit (0.5 μg/kg), and another 35% had a concentration of 1-10 μg/kg (mostly less than 2 μg/kg). Two sites with significant concentrations were found just below the Osoyoos Lake outlet and just downriver of Elgin Creek (RM 28.4). Acute toxicity is not considered to be a concern at concentrations in the lower Okanogan River basin.

According to Serdar (2003), there are few realistic options for obtaining meaningful reductions in DDT and PCBs loading to Osoyoos Lake and the lower Okanogan River. It appears that most loading to fish occurs internally through direct or indirect exposure to sediments. Natural attenuation will eventually reduce levels through dilution and capping, especially downriver of the Similkameen River confluence.

In conjunction with the TMDL technical assessment (Serdar 2003) and TMDL (Ecology 2004), Ecology submitted a Detailed Implementation Plan (Ecology 2006) to the EPA in July 2006 as required by the Clean Water Act. This report provides direction to assure that DDT and PCBs concentrations in the waters and fish tissues from the Okanogan River and its tributaries continue to improve, with the goal of meeting the regulatory standards. The report's primary recommendations are the continued monitoring of fish tissues at five-year intervals and preventative measures to minimize the amount of contaminants entering the river from the surrounding watershed.

With assistance from the Confederated Tribes of the Colville Reservation, Ecology is currently conducting fish tissue collection and analyses as effectiveness monitoring for the lower Okanogan River DDT and PCBs TMDL (Coffin 2008). Their Quality Assurance Project Plan (QAPP) specifies collection of carp, mountain whitefish, and smallmouth bass by electrofishing or netting in the summer of 2008 from three river reaches, including the Monse reach in the Wells Project area. Because laboratory analyses of the Ecology fish tissue samples are scheduled for completion in December (Coffin 2008), results from the study are not expected before 2009.

Ecology's long-term monitoring station, located near Malott (RM 17) just upriver of the Wells Project boundary, also samples monthly for conventional parameters and metals; however, water samples, fish tissue and sediment cores are not collected for analysis of toxins.

4.2 Sediment Management Standards

The latest revision to Washington's Sediment Management Standards (SMS, Chapter 173-204 WAC) were adopted on December 29, 1995, with the purpose of reducing and ultimately eliminating adverse effects on biological resources and significant health threats to humans from surface sediment contamination. While there are chemical criteria established for marine sediment standards in the code, the standards for freshwater sediments are reserved (Chapter 173-204-340 WAC). The SMS states that Ecology shall determine on a case-by-case basis the criteria, methods and procedures necessary to comply with the intent of the code.

While there are no established regulatory criteria for DDT and PCBs in freshwater sediments, there are several sets of sediment quality values that have been used to indicate potential toxic

effects to aquatic life. In research published by Ecology, Michelsen (2003) examined the levels of protection and reliability of apparent effects thresholds and other sediment quality values in predicting toxic effects. Based on those analyses, sediment quality standards and cleanup screening levels for total PCBs in freshwater sediment were recommended. These non-regulatory sediment quality values are used in this document to provide an indication of the relative magnitude of concentrations found in lower Okanogan River sediments.

4.3 Washington State Fish Consumption Advisories

In 1992, EPA promulgated the National Toxics Rule (NTR) which established numeric, chemical-specific water quality criteria for all priority pollutants, including DDT and PCBs. Some of the NTR criteria are applicable in Washington, which has not developed water quality standards to protect human health from exposure to toxicants (Ecology 2003). The NTR criteria are used to identify water quality concentrations that are not expected to lead to unacceptable health risks for people eating fish, and include equations that can be used to calculate acceptable fish tissue concentrations. However, the values used by EPA to derive the NTR water quality criteria are not necessarily used by public health agencies [e.g., Washington Department of Health (WDOH)] to establish fish consumption advisories. Agencies responsible for assessing the need for fish consumption advisories often examine local conditions such as consumption rates and they may consider different contaminant potencies and health endpoints than those used by EPA for criteria development (Ecology 2003). The only fish consumption advisory that currently applies to the lower Okanogan River is the state-wide advisory for mercury contamination in largemouth and smallmouth bass (WDOH 2008).

WDOH has evaluated the results of fish contamination data from various studies and issued fish consumption advisories for several eastern Washington rivers, including some advisories based on DDT and PCBs contamination in carp, smallmouth bass and mountain whitefish (WDOH 2008). The fish tissue concentrations that were the basis for these advisories provide an indication of how WDOH may evaluate DDT and PCBs levels in lower Okanogan River fish. Total DDT concentrations up to 4,340 µg/kg in the Yakima River (Joy and Patterson 1997) led to an advisory to limit consumption of carp and other bottom fish to one meal per week (WDOH 2008). Total PCBs tissue concentrations up to 410 µg/kg in carp (Johnson et al. 2004) led to an advisory to limit consumption of this fish species taken from the Walla Walla River to one meal per month. In the Wenatchee River, total PCBs aroclors up to 1,300 µg/kg (Seiders et al. 2007) led to a "do not eat" consumption advisory for mountain whitefish (WDOH 2008).

4.4 Aquatic Resource Work Group

As part of the relicensing process for the Wells Project, Douglas PUD established an Aquatic Resource Work Group (RWG) which began meeting informally in November, 2005. This voluntary effort was initiated to provide stakeholders with information about the Wells Project, to collaboratively identify potential resource issues related to Project operations and relevant to relicensing, and to develop preliminary study plans to be included in the Wells Pre-Application Document (PAD) (Douglas PUD 2006).

Through a series of meetings, the Aquatic RWG cooperatively developed a list of Issue Statements, Issue Determination Statements and Agreed-Upon Study Plans. An Issue Statement is an agreed-upon definition of a resource issue raised by a stakeholder. An Issue Determination Statement reflects the RWG's efforts to review the existing Project information and to determine whether an issue matches with FERC's seven criteria and would be useful in making future relicensing decisions. Agreed-Upon Study Plans are the finished products of the informal RWG process.

Based upon these meetings and discussions, the Aquatic RWG proposed to conduct a study to determine the concentration of DDT and PCBs in recreational fish species and in swimming areas of the lower Okanogan River within the Wells Project boundary. This study will help to inform future relicensing decisions through the 401 water quality certification process and will fill data gaps that have been identified by the Aquatic RWG.

The Issue Statement and Issue Determination Statement listed below were included in the PAD (section number included) filed with FERC on December 1, 2006:

4.5 Issue Statement

4.5.1 Issue Statement (PAD Section 6.2.1.4)

Project operations may affect the input, movement, accumulation and retention of toxins (sediment dynamics and water column) originating from the Okanogan River subbasin and their potential effects on aquatic organisms and humans.

4.5.2 Issue Determination Statement (PAD Section 6.2.1.4)

The Okanogan River likely contains toxins within the sediment and in the water column. These pollutants are discharged into the river from mining, industrial and agricultural activities upriver of the Project boundary. There are numerous reports by the Washington State Department of Ecology and the Colville Tribes documenting the presence and levels of toxins within the Okanogan Basin. Of the five assessments conducted on toxins in the Okanogan River most have focused on the presence of toxins within the water column, sediment and within the fish found in the Okanogan River.

The lower Okanogan DDT PCB Detailed Implementation Plan (Ecology 2006) submitted to and approved by the Environmental Protection Agency for the purpose of providing direction to assure that DDT and PCBs concentrations are reduced to levels that meet regulatory standards recommends continued monitoring of fish tissues from the lower Okanogan River.

The resource work group agrees that a study is needed during the two-year ILP study period. The study would assess the concentration of DDT and PCBs found within fish tissues collected from the lower Okanogan River. This study would also collect sediment samples from specific recreation areas located between the mouth of the Okanogan River upriver to RM 15.5.

4.6 Project Nexus

Ecology is responsible for the protection and restoration of the state's waters. Ecology has adopted water quality standards that set limits on pollution in lakes, rivers, and marine waters in order to protect water quality. Ecology's assessment of the state's waterbodies lists the status of water quality for a particular location in one of five categories (Category 1-5) recommended by the Environmental Protection Agency (EPA). This assessment represents the integrated report for Sections 303(d) and 305(b) of the Clean Water Act. Categories 1-4 represent the status of waters for the 305(b) report, while Category 5 represents those waters placed on the 303(d) list. Waters placed on Category 5 require the preparation of TMDLs, which are an integral tool in the work to clean up polluted waters.

The lower Okanogan River within the Project boundary was 303(d) listed in 1998 for high levels of total PCBs, 4,4'-DDE and 4,4'-DDD in fish tissues. As a result of this listing, a TMDL was developed to address these impaired parameters in this location (Ecology 2004). Currently, the EPA-approved 303(d) list submitted in 2004 no longer includes these parameters for the lower Okanogan River as they have been re-assessed as Category 4a (impaired waters with a TMDL) waters in the Washington State Water Quality Assessment 305(b) report. The information resulting from an assessment of fish tissue and sediments in the lower Okanogan River will assist the Aquatic RWG in the development of licensing requirements through the 401 water quality certification process.

5.0 METHODOLOGY

A Quality Assurance Project Plan (QAPP), revised to incorporate review comments from Ecology, identified the organization, schedule, data quality objectives, sampling design, monitoring locations, field procedures, quality control, and data management and reporting associated with implementing the DDT and PCBs assessment proposed by the RWG (Parametrix 2008).

5.1 Sampling Locations

After reviewing potential sites on aerial photographs, sediment sampling locations were selected during an early May site reconnaissance targeting accessible recreation sites along the lower Okanogan River within the Wells Project boundary (RM 15.5 to RM 0.0). The reconnaissance included traveling up the Okanogan River from its mouth to just beyond the Wakefield Bridge where the river became too shallow to safely navigate (Figure 5.1-1), and viewing upriver locations from shore. Among the boat launches and undeveloped recreation sites along the river, five locations (designated SED1 through SED5) were selected as the most likely to places where people might come in contact with sediments during swimming or wading (Figure 5.1-1). Table 5.1-1 lists location coordinates for each sampling site in North American Datum 83 (NAD 83). Photographs and brief descriptions of the sediment sampling locations are included in Appendix A.

Three different river reaches of relatively equal length were designated for fish sample collection within the Project area: river mouth to Monse Bridge (RM 5.0), Monse Bridge to Wakefield

Bridge (RM 10.5), and Wakefield Bridge to the mouth of Chiliwist Creek (RM 14.0) (Figure 5.1-1).

Figure 5.1-1 Locations of sediment sampling sites and fish collection reaches on the lower Okanogan River.

Table 5.1-1 Lower Okanogan River sediment sampling location coordinates, NAD 83.

Sampling Site	Location	Latitude			Longitude		
		Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
SED1	Monse Bridge boat launch	48	8	61	119	40	31
SED2	Below Crazy Rapids pump station	48	11	36	119	40	59
SED3	Informal swimming area	48	9	78	119	40	23
SED4	Beach below Wakefield Bridge	48	12	54	119	42	97
SED5	Mouth of Chiliwist Creek	48	15	92	119	43	56

5.2 Study Design

Human health concerns related to exposure to contaminated sediments and the consumption of fish drive concerns about DDT and PCBs contamination in the lower Okanogan River basin. Even though little can be done to remove DDT or PCBs contamination from the Okanogan, it is important to determine the concentrations in fish, since they provide potential exposure routes to humans. Fish species selected for study 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. Recreational river users and aquatic life may also be exposed to contaminants through contact with surface sediments. The following components of the toxins assessment were designed to address the study objectives.

- Sampling locations for fish and sediment during the study targeted accessible reaches of the lower Okanogan River within the Wells Project boundary (RM 15.5 to RM 0.0).
- Study implementation began with a reconnaissance of the lower Okanogan River to identify specific sampling locations. The reconnaissance conducted both by boat and onshore, occurred in May 2008 before high flows from spring snowmelt began.
- Fish and sediment sample collection was originally planned to occur during one week in the summer of 2008, after spring snowmelt receded.
- Under conditions of a Washington State Scientific Collection Permit obtained before sampling began, field crews attempted to catch five to eight individual fish from each of three species from within each reach: carp, mountain whitefish, and smallmouth bass.
- Fish collection methods attempted were: angling, trot lines, beach seining, and bow fishing.

- Collection efforts targeted the same size fish as were sampled in the TMDL Study (Serdar 2003): total length 410 to 645 mm carp, 179 to 433 mm smallmouth bass, and 198 to 400 mm mountain whitefish.
- Following the TMDL assessment procedures, up to three composite fillet samples of each species from each of the three reaches were prepared by scaling the fish and removing the entire fillet from the left side of the fish body. Skin was removed from carp prior to filleting. Each composite fillet sample consisted of fillets from up to eight fish.
- Fully homogenized composite tissue samples were stored frozen, and then analyzed by ARI for percent lipids, PCBs (Aroclors), and DDT analogs following the laboratory procedures used in Ecology's TMDL assessment.
- Sampling sites for sediment included five recreational sites of concern (e.g., swimming areas and boat launches) between the Okanogan River mouth and RM 15.5, and targeted areas of fine sediment deposition.
- To characterize the surface sediments most likely to be encountered by recreational river users, three (3) grab samples were collected from the upper approximately 10 cm of the sediments at each site with a vanVeen or Ekman (SED1, RM 5.0) grab sampler.
- Homogenized sediment from each sampling site was placed in sample containers, transported on ice to ARI, and analyzed for TOC, grain size, total solids, PCBs (Aroclors), and DDT analogs following the laboratory procedures used in Ecology's TMDL assessment.

5.3 Data Quality Objectives

The overall data quality objectives were to acquire sediment and fish tissue data for the lower Okanogan River for the following purposes:

- Characterize the concentrations of DDT and PCBs in sediments from recreation sites on the lower Okanogan River.
- Sample the concentrations of DDT and PCBs in fish tissues from the lower Okanogan River.

The suitability of sediment and fish tissue data for these purposes is determined by comparisons with specific target data quality objectives for precision, accuracy, representativeness, completeness, and comparability (PARCC).

Target data quality objectives and measurement quality objectives for accuracy and precision in this assessment of DDT and PCBs (Table 5.3-1) are the same as those in Ecology's TMDL Assessment of DDT and PCBs in the Okanogan River (Ecology, 2003). The reporting limits (RLs) in Table 5.3-1 are based on the RLs achieved in the TMDL Study (Ecology, 2003) and the limits of contract laboratory capabilities. The measurement quality objectives for the TMDL study were based on precision and bias estimates from previous successful studies (Johnson et al. 1997; Serdar et al. 1998).

Table 5.3-1. Measurement quality objectives for fish tissue and sediment sample analyses.[1]

Parameter	Accuracy	Precision	Bias	Reporting Limits[2]
Fish Tissue				
DDT Analogs	40%	10%	20%	5.0
PCBs (Aroclors)	40%	10%	20%	5.0
Aroclor 1221	50%	15%	20%	10.0
Lipids	20%	5%	10%	0.1%
Sediment				
DDT Analogs	50%	15%	20%	5.0
PCBs (Aroclors)	50%	15%	20%	5.0
Aroclor 1221	50%	15%	20%	10.0
TOC	25%	10%	5%	0.1% (wet wt)

[1] Based on the data and measurement quality objectives from the TMDL Study QAPP (Ecology 2002) and the reporting limits achieved in the TMDL Study (Serdar 2003).
[2] Units are µg/kg-wet weight for fish tissue and µg/kg-dry weight for sediment.

5.4 Sampling Procedures

Documentation for all field events included maintaining a bound field log to record sample collection information, including names of field crew members, sampling dates, arrival and departure times, weather, and other pertinent observations.

5.4.1 Fish Tissue

Individual fish were assigned a sample number, measured (fork and total lengths) and weighed, as was done in the TMDL assessment. Fish were double-wrapped in aluminum foil, sealed in a plastic bag, and frozen or kept on ice for transport to the Parametrix field operations laboratory. Fish tissues were homogenized using three passes through a food processor, with ground tissue thoroughly mixed after each pass through the grinder. Homogenized tissue samples were frozen in jars for delivery to ARI.

5.4.2 Sediments

Sediment sampling locations were field-located to target areas of fine sediment deposition where recreation activities are most likely to disturb sediments; the sampling was representative of the areas of most likely human contact rather than representative of all sediments in the lower Okanogan River. Comparability between sampling locations was accomplished by collecting

and analyzing the sediment grabs using the same equipment, personnel, and methods in the field and laboratory.

Each station was located and on-shore landmarks were identified as reference points for returning to the immediate vicinity of the actual sampling position. A Trimble Geo XH handheld differential global positioning system (DGPS) was used to log the coordinates of the positions at each sampling station (site). For all sampling positions, latitude and longitude was recorded to the nearest 0.01 second. The accuracy of the horizontal coordinates was within 1 ft. Water depth was recorded to the nearest 0.1 ft at each sampling station.

Sediment samples were collected using a modified 0.1-m^2 stainless steel vanVeen or Ekman grab sampler deployed from a sampling vessel equipped with a davit and winch (Figure 5.4-1). Similar to Ecology's TMDL assessment, no field replicate samples were collected and analyzed. Procedures for using the vanVeen sampler (or equivalent) were consistent with Puget Sound Estuary Program (PSEP) protocols (PSWQAT, 1997) including inspecting sediment grabs to ensure that they satisfy acceptability criteria. Sediment grabs that did not meet the criteria were rejected. The sediment depth in the grab was measured and the appearance, odor, and types of materials present were recorded and photographed. Field notes and logbook entries were made, as necessary, before, during, and after the sampling process to ensure thorough and accurate record keeping. Any unrepresentative material (e.g., wood debris, rocks, man-made items, etc.) was removed.

Figure 5.4-1 Preparing to collect sediment grab samples from SED1 near the Monse Bridge boat launch.

Three grab samples were collected from the upper 10 cm (approximately) of the sediments at each site. Sediment from the first grab sample was placed in a decontaminated stainless-steel mixing bowl using a decontaminated spoon and avoiding sediment that came into contact with the sides and bottom of the grab vessel. The bowl was covered with aluminum foil, and held on ice until a sufficient volume of sediment was collected for all analyses. Sediment from the second and third grabs was added to the sediment already in the decontaminated bowl using the same methods described for the first grab sample. The grab sampler does not require decontamination between samples collected at the same station.

When the total required volume of sediment was achieved, the composite of multiple grabs at a single station was homogenized to a uniform appearance by stirring. The homogenized sediment was then placed into sample containers provided by the analytical laboratory. One 16-ounce jar was filled for PCBs (Aroclors) and DDT analogs, one 16-ounce jar was filled for grain size, one 4-ounce jar was filled for TOC and Total Solids and one additional 16-ounce jar was filled for archiving. All sediment samples were placed in a cooler and held at approximately 4°C until they were delivered to ARI.

Bowls, spoons, and other sampling utensils that came in contact with sediment samples were stainless steel. All sediment bowls and spoons were decontaminated in the Parametrix laboratory prior to the sampling event and sealed in aluminum foil. One set of sampling utensils (bowl, two spoons) was dedicated for use at each sampling site. Equipment for reuse, such as the vanVeen grab sampler, was decontaminated aboard the vessel between sampling locations.

A sample log was maintained throughout the sampling event. The log included the station code, grab number, time of sample, fathometer depth (ft), and depth to the mudline, as measured using a weighted fiberglass tape measure. Observations of the sediment surface and any deeper layers were also recorded, including layer depths, color, sediment type, odor, type and amount of any debris observed in the sample, and any evidence of contamination. Individual grab sample locations had a position logged in the DGPS memory and coordinates were recorded on the data log form.

5.4.3 Sample Handling Procedures for Sediment and Fish Tissue

Sample handling procedures are designed to ensure sample integrity is maintained between the time of collection and the time that laboratory analysis begins. These procedures include sample storage, chain-of-custody (COC), and sample delivery.

All sample containers and labels were supplied by ARI. Self-adhesive labels were attached to the outside of all sediment sample containers. Before filling each container, the following information was recorded on the label in waterproof ink: sample identification number, project name, station number, sampling date and time, initials of sampling personnel, and preservative (if any). Labels were covered with clear plastic tape to protect them from loss or damage.

All sediment samples were placed in a cooler and held at approximately 4°C until they were received by ARI. Fish samples were kept on ice at approximately 4°C until processed. Fully homogenized fish tissues were stored frozen (−20°C) in two 8-ounce glass jars with Teflon lid liners certified for trace organics analysis. One container was submitted for analysis and the other archived at -20°C.

All samples were hand delivered to ARI within 24 hours following completion of the sampling and/or processing event. Individual sample containers were placed in individual plastic bags and packed to prevent breakage in transport coolers. COC procedures documented the transfer of all samples to ARI. Triplicate COC forms were used to record each sample container at the end of each sampling day. At a minimum, the forms identified the sample collection date and times, the project name and number, and the number of preserved and unpreserved sample containers. It was the Field Operations Director's responsibility to ensure that each form was accurately completed and signed at the time of sample transfer.

After each COC form was completed and signed, the Field Operations Director removed and retained the third copy of each triplicate form. The remaining duplicate COC forms were placed in waterproof bags and taped to the insides of the sample coolers containing all of the samples recorded on each COC form. The samples were then ready for transport to ARI. Sample coolers were sealed with COC tape and kept in a secure location when not in the presence of the Field Operations Director or an assigned field crew member.

Upon receipt of the samples at ARI, the condition of the samples was inspected and recorded and the COC forms were signed by ARI staff and the Parametrix staff person who delivered the samples. After each COC form was signed, the second copy of each COC form was returned to the project files by the Parametrix staff person. The signed, original COC form (i.e., the top copy) was kept by ARI to accompany the samples.

Upon sample receipt, the laboratories comply with storage temperatures and maximum holding times required for the specific analyses to be performed (Table 5.4-1). Chemistry analyses proceeded within 12 days after sample receipt for sediments and within 25 days after sample receipt for fish tissue.

Table 5.4-1 Sample containers, storage temperatures and maximum holding times.

Sample Analysis	Container	Storage Temperature		Maximum Holding Time
FISH TISSUE				
DDT Analogs	8-oz glass jar[1] Teflon lid liner	Cool to 4°C until processed	Freeze at -20°C	7 days until extraction 14 days until analysis (1year -if frozen)
PCBs Aroclors®	8-oz glass jar[2] Teflon lid liner	Cool to 4°C until processed	Freeze at -20°C	7 days until extraction 14 days until analysis (1year -if frozen)
Lipids	8-oz glass jar[2] Teflon lid liner	Cool to 4°C until processed	Freeze at -20°C	7 days until extraction 14 days until analysis (1year -if frozen)
SEDIMENT				
DDT Analogs	16-oz glass jar	Cool, 4°C		14 days until extraction; 40 days after extraction
PCBs Aroclors®	16-oz glass jar[3]	Cool, 4°C		14 days until extraction; 40 days after extraction
Total Organic Carbon	4-oz glass jar	Cool, 4°C		28 days
Total Solids	4-oz glass jar[4]	Cool, 4°C		14 days
Grain Size	16-oz jar	Cool, 4°C		6 months

[1] With Certificate of Analysis
[2] One 8-oz jar was submitted for all tissue analyses and one 8-oz jar was archived at -20°C
[3] One 16-oz jar was submitted for all pesticide and PCBs analyses
[4] One 4-oz jar was submitted for TOC and Total Solids

5.5 Laboratory Procedures

An independent contract laboratory, Analytical Resources Incorporated of Tukwila, Washington, performed the sediment and fish tissue sample analyses. Analytical quality control was monitored using standard laboratory QC analyses as described in ARI's internal QA manual and specific analytical Standard Operating Procedures (SOPs). Preparation methods, analytical methods, and reporting limits are shown in Table 5.5-1 for all sediment and fish tissue laboratory analyses.

Table 5.5-1 Recommended Sample Preparation Methods, Analytical Methods, and Method Reporting Limits

Chemical	Recommended Sample Preparation Methods	Recommended Analytical Methods	Method Reporting Limits[1]
FISH TISSUE			
DDT Analogs (µg/kg dry wt)			
4,4'-DDE	3540[3]	EPA SW-8081[3]	5.0
4,4'-DDD	3540[3]	EPA SW-8081[3]	5.0
4,4'-DDT	3540[3]	EPA SW-8081[3]	5.0
PCBs (µg/kg dry wt)			
PCBs Aroclors®	3540/3550	EPA SW-8082[3]	5.0
Aroclor 1221	3540/3550	EPA SW-8082[3]	10.0
Conventional Tissue Variable			
Lipids (%)	Hexane/methylene chloride	gravimetric EPA 608.5	0.1%
SEDIMENT			
DDT Analogs (µg/kg wet wt)			
4,4'-DDE	3540[3]	EPA SW-8081[3]	5.0
4,4'-DDD	3540[3]	EPA SW-8081[3]	5.0
4,4'-DDT	3540[3]	EPA SW-8081[3]	5.0
PCBs (µg/kg wet wt)			
PCBs Aroclors®	3540/3550	EPA SW-8082[3]	5
Aroclor 1221	3540/3550	EPA SW-8082[3]	10.0
Conventional Sediment Variables			
Total Organic Carbon (%)	--[4]	9060	0.1%
Total Solids	--[4]	PSEP[2]	0.1% (wet wt)
Grain Size	--[4]	Plumb (1981)	1%

1. Laboratory MRLs (Method Reporting Limits) on a Dry Weight Basis for sediment and on a Wet Weight basis for tissue.
2. Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound, Puget Sound Estuary Program, 1997
3. Soxhlet Extraction and Methods 8081 and 8082, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA, 1987

6.0 RESULTS

Summaries of all sediment and fish tissue results for DDT analogs and PCBs are tabulated in the report appendices, together with ancillary data on sediment characteristics (i.e., total solids, TOC and grain size distribution) fish measurements, and fish tissue sample lipids concentrations.

6.1 Sediment Sample Analyses

The organic content of sediments increased from 0.1 percent at SED5 downriver to 1.2 percent at SED1, and total solids content decreased from 74 percent at SED5 downriver to 48 percent at SED1 (Table 6.1-1). Sediment grain size also decreased progressing downriver. Silt and clay fractions comprised 40 percent of the sediment at SED1 but were not measurable at SED4 and SED5. The remaining sediment was predominantly sand with finer sands found downriver and medium sand sampled upriver. Figure 6.1-1 shows the characteristics of a van-Veen sediment grab sample from SED-2 located near the informal boat launch downriver from the Crazy Rapids pump house.

Table 6.1-1 Summary of physical characteristics of Okanogan River sediment samples

	SED1	SED2	SED3	SED4	SED5
Total Solids (%)	48.20	62.00	66.80	71.80	73.90
TOC (%)	1.17	0.683	0.314	0.137	0.113
Clay (%)	2.5	2.7	1.1	0.0	0.0
Silt (%)	37.9	20	6.8	0.0	0.0
Sand (%)	58.1	74	91.7	100.0	99.4
Gravel (%)	1.5	3.3	0.4	0.0	0.6

Figure 6.1-1 Sediment van-Veen grab sample containing silt and clay, collected at site SED2.

DDT analogs were the only toxin detected in sediment samples. All PCBs were undetected at the 3.9 µg/kg reporting limit, or 4.0 µg/kg reporting limit for SED4. Total DDT analog concentrations were 19.3 µg/kg at SED1, 2.2 µg/kg at SED2, 4.7 µg/kg at SED3, and undetected at the upper two sampling locations (SED4 and SED5). DDT analogs were not detected in samples from the SED4 and SED5 upper reach locations (Table 6.1-2). At SED3, 4-4'-DDE was detected at 3.2 µg/kg and 4-4'-DDD was detected at 1.5 µg/kg. Only 4-4'-DDE was detected at SED2, at 2.2 µg/kg. At SED1, 4-4'-DDE was detected at 14 µg/kg, 4-4'-DDD was detected at 3.6 µg/kg, and 4-4'-DDT was detected at 1.7 µg/kg.

Table 6.1-2 Summary of DDT analog concentrations in lower Okanogan River sediment samples.

	SED1	SED2	SED3	SED4	SED5
4,4'-DDE	14	2.2 J	3.2	<2.0	<1.9
4,4'-DDD	3.6	<2.0	1.5 J	<2.0	<1.9
4,4'-DDT	1.7 J	<2.0	<1.9	<2.0	<1.9
Total DDT	19.3 J	2.2 J	4.7 J	<2.0	<1.9

J = sample concentration qualified as an estimate

6.2 Fish Tissue Samples

This section summarizes the outcome of fish tissue sampling and analyses, including the numbers and sizes of fish caught, and the percent lipids and concentrations of DDT and PCBs detected in fish tissue samples.

6.2.1 Fish Collection Results

Although the effort expended to collect fish amounted to 60 personnel days and fish collection efforts were started ahead of the July schedule stated in the QAPP (Parametrix 2008), not all of the targeted fish were captured (Figure 6.2-1). Suitable habitat for whitefish is limited within the Wells Project segments of the Okanogan River. Carp were also not captured in the Malott section of river upstream from Wakefield Bridge, and only a limited number of very large carp were captured in the lower two reaches.

Table 6.2-1 Numbers of fish collected by river reach and species.

	Fish Species		
Okanogan River Reach	Smallmouth Bass	Carp	Mountain Whitefish
Malott (Chiliwist to Wakefield Bridge)	17	0	0
Monse (Wakefield Bridge to Monse Bridge)	17	3	0
Highway 97 (Monse Bridge to River Mouth)	18	7	0

Archery was the only successful method for collecting carp. The carp collected with archery were much larger than carp collected during previous studies using electrofishing equipment (Table 6.2-2). Carp ranged from 602 to 840 mm (average 742 mm) long and weighed from 3,180 to 12,500 grams (average 6,920 grams). Smallmouth bass ranged from 164 to 445 mm (average 254 mm) and weighed from 54 to 2,177 grams (average 337 grams). Four of the 52 bass were large specimens from 916 to 2,177 grams, and one bass was 547 grams. Sizes of the other 47 bass were distributed between 54 and 400 grams. Carp collected from the Highway 97 reach were all larger than the carp caught in the Monse reach.

Table 6.2-2 Lower Okanogan River fish collected for DDT and PCBs analyses.

Sample Number	Fish Number	Location	Species	Number Composited	Length (mm)	Weight (g)
H97-C-R1		Highway 97	CARP	2		
(Replicate 1)	1				815	11,500
	2				733	4,800
H97-C-R2		Highway 97	CARP	2		
(Replicate 2)	1				765	7,000
	2				757	7,300
H97-C-R3		Highway 97	CARP	2		
(Replicate 3)	1				840	9,700
	2				721	5,600
H97-C-R4		Highway 97	CARP	1		
(Replicate 4)	1				835	12,500
MON-C-R1		Monse	CARP	1		
(Replicate 1)	1				650	3,220
MON-C-R2		Monse	CARP	1		
(Replicate 2)	1				602	3,180
MON-C-R3		Monse	CARP	1		
(Replicate 3)	1				705	4,400
H97-B-R1		Highway 97	BASS	5		
(Replicate 1)	1				445	1,315
	2				195	74
	3				299	311
	4				290	256
	5				238	153
H97-B-R2		Highway 97	BASS	8		
(Replicate 2)	1				178	65
	2				189	82
	3				230	153
	4				219	133
	5				258	218
	6				262	241
	7				317	388
	8				210	122
H97-B-R3		Highway 97	BASS	5		
(Replicate 3)	1				290	380
	2				245	190

Table 6.2-2 Lower Okanogan River fish collected for DDT and PCB analyses. (continued)

Sample Number	Fish Number	Location	Species	Number Composited	Length (mm)	Weight (g)
	3				290	380
	4				436	2,177
	5				240	176
MON-B-R1	- - -	Monse	BASS	5		
(Replicate 1)	1				310	391
	2				282	346
	3				310	400
	4				282	278
	5				205	119
MON-B-R2	- - -	Monse	BASS	5		
(Replicate 2)	1				260	232
	2				164	54
	3				190	85
	4				170	71
	5				258	201
	6				209	116
MON-B-R3		Monse	BASS	5		
(Replicate 3)	1				172	71
	2				218	142
	3				191	105
	4				251	235
	5				213	133
MAL-B-R1		Malott	BASS	5		
(Replicate 1)	1				405	1,247
	2				371	916
	3				201	102
	4				241	198
	5				250	210
MAL-B-R2		Malott	BASS	7		
(Replicate 2)	1				271	261
	2				170	71
	3				258	230
	4				219	156
	5				176	77
	6				233	145
	7				178	77
MAL-B-R3		Malott	BASS	5		
(Replicate 3)	1				440	1,038
	2				360	547
	3				201	99
	4				260	227
	5				186	85

6.2.2 Fish Tissue Sample Results for Lipids, DDT, PCBs

Lipids concentrations were extremely high (16.4 to 44.1 percent) in fish tissue samples from the large carp collected in the Highway 97 reach (Table 6.2-3). The highest lipids concentration was from the largest fish, as evident when the fish were skinned in the process of obtaining filet samples (Figure 6.2-1). Lipids concentrations in smaller carp collected from the Monse reach ranged from 0.42 to 5.55 percent.

Lipids concentrations in smallmouth bass were lower than all but one carp sample, ranging from 1.25 to 2.27 percent (Table 6.2-3). Lipids concentrations were similar in bass samples from the three different reaches. Lipids concentrations were strongly correlated with fish weight (r^2 = 0.929, $P < 0.0001$).

Table 6.2-3 Lipids concentrations in lower Okanogan River fish.

Sample #	Fish Species	River Reach	Lipids (%)
H97-C-R1	Carp	Hwy 97	16.4
H97-C-R2	Carp	Hwy 97	30.3
H97-C-R3	Carp	Hwy 97	25.6
H97-C-R4	Carp	Hwy 97	44.1
MON-C-R1	Carp	Monse	5.18
MON-C-R2	Carp	Monse	0.42
MON-C-R3	Carp	Monse	5.55
H97-B-R1	Bass	Hwy 97	2.06
H97-B-R2	Bass	Hwy 97	1.79
H97-B-R3	Bass	Hwy 97	1.67
MON-B-R1	Bass	Monse	2.27
MON-B-R2	Bass	Monse	1.68
MON-B-R3	Bass	Monse	1.27
MAL-B-R1	Bass	Malott	2.10
MAL-B-R2	Bass	Malott	1.25
MAL-B-R3	Bass	Malott	1.40

Figure 6.2-1 Large carp collected from Highway 97 reach with high fat content evident after skinning.

DDT concentrations were generally much higher in carp than in smallmouth bass, with the highest concentrations found in the larger carp (Table 6.2-4). In all samples, total DDT was primarily the 4,4'-DDE analog, secondarily 4,4'-DDD, and only a small fraction, if detected at all, was 4,4'-DDT. Total DDT ranged from 120 to 25,726 µg/kg in carp and 79 to 2,553 µg/kg in smallmouth bass. Higher DDT concentrations were generally associated with larger fish (Figures 6.2-2 and 6.2-3).

The importance of lipids content in influencing the bioaccumulation of nonionic organic chemicals in aquatic organisms is well documented (EPA 2003). Recognizing the importance of lipids in assessing bioaccumulation has led to the practice of normalizing chemical concentrations in tissue by lipids content. Lipids normalizing, the process of dividing the total chemical concentrations in tissue samples by the fraction of the tissue that is lipids, is usually performed to account for variation in bioaccumulation between species (or individuals within a species) that results from differences in lipids content alone. Normalizing total DDT concentrations from lower Okanogan River carp samples both from this study and from the TMDL assessment indicate that differences in total DDT concentrations are largely attributable to the much higher lipids content in the 2008 samples (Table 6.2-5). While the total DDT concentrations in µg/kg-wet weight were up to nearly two orders of magnitude higher in the

2008 carp, the range of lipids-normalized results (9,910 to 156,866 µg/kg-lipids in the current study compared to 7,638 to 51,667 µg/kg-lipids in the TMDL assessment) were generally in the same order of magnitude.

Table 6.2-4 Concentrations of DDT analogs in fish from the lower Okanogan River (µg/kg).

Sample #	Fish Species	River Reach	4,4'-DDE	4,4'-DDD		4,4'-DDT		Total DDT
H97-C-R1	Carp	Hwy 97	18,000	7,700	J	26	J	25,726
H97-C-R2	Carp	Hwy 97	15,000	6,800	J	32		21,832
H97-C-R3	Carp	Hwy 97	14,000	7,400	J	32		21,432
H97-C-R4	Carp	Hwy 97	5,600	1,100		28	J	7,528
MON-C-R1	Carp	Monse	4,300	1,100	J	7.3		5,507
MON-C-R2	Carp	Monse	120	<4.6	U	<4.6	U	120
MON-C-R3	Carp	Monse	470	80		<5	U	550
H97-B-R1	Bass	Hwy 97	710	140	J	13		863
H97-B-R2	Bass	Hwy 97	190	25		7.3		222
H97-B-R3	Bass	Hwy 97	490	36		16		542
MON-B-R1	Bass	Monse	230	<24	U	<24	U	230
MON-B-R2	Bass	Monse	130	11		6.8		148
MON-B-R3	Bass	Monse	73	6.2		<4.9	U	79
MAL-B-R1	Bass	Malott	2,000	460	J	13		2,553
MAL-B-R2	Bass	Malott	74	15	J	26		115
MAL-B-R3	Bass	Malott	160	18		<4.8	U	178

J = Estimated concentration

U = Analyte not detected at the reported concentration

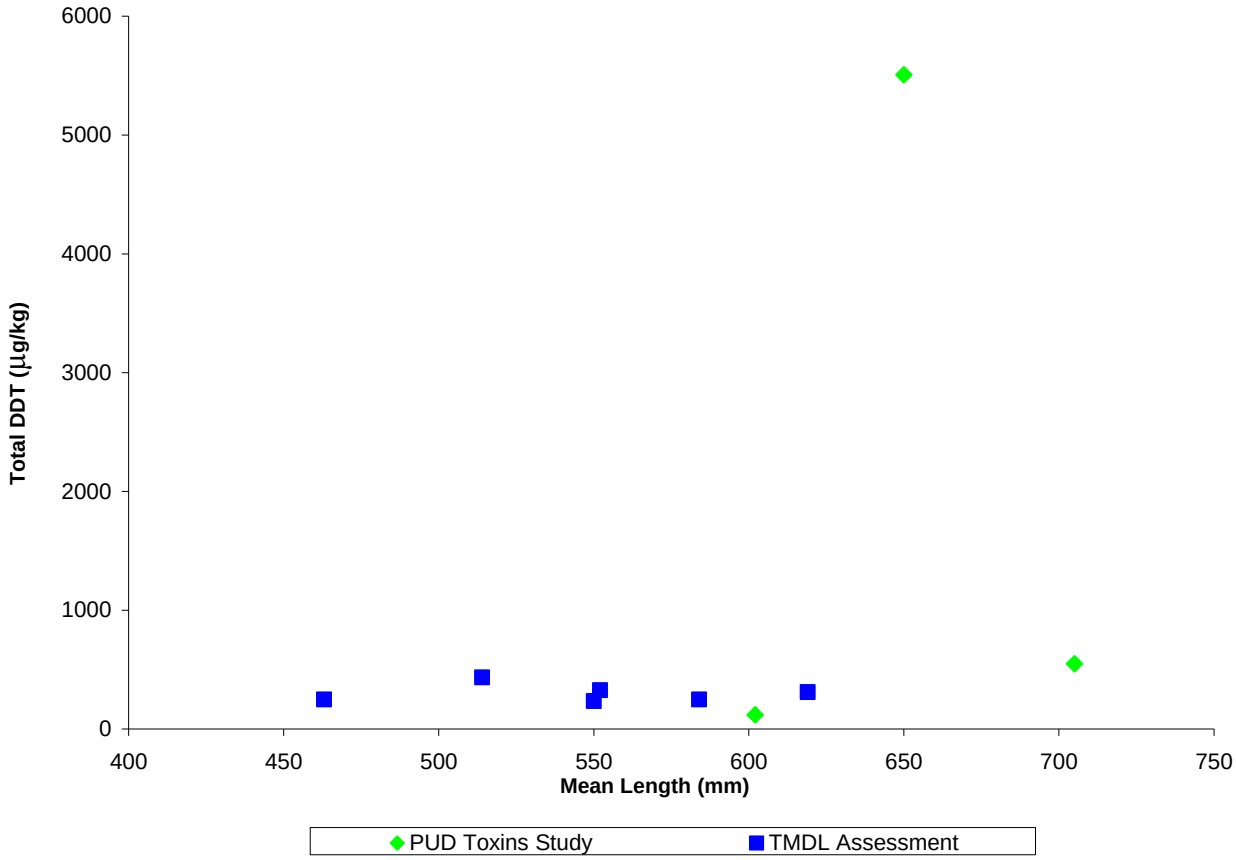

Figure 6.2-2 **Lower Okanogan River total DDT concentrations in carp tissue from comparable-length fish, including data reported by Serdar (2003).**

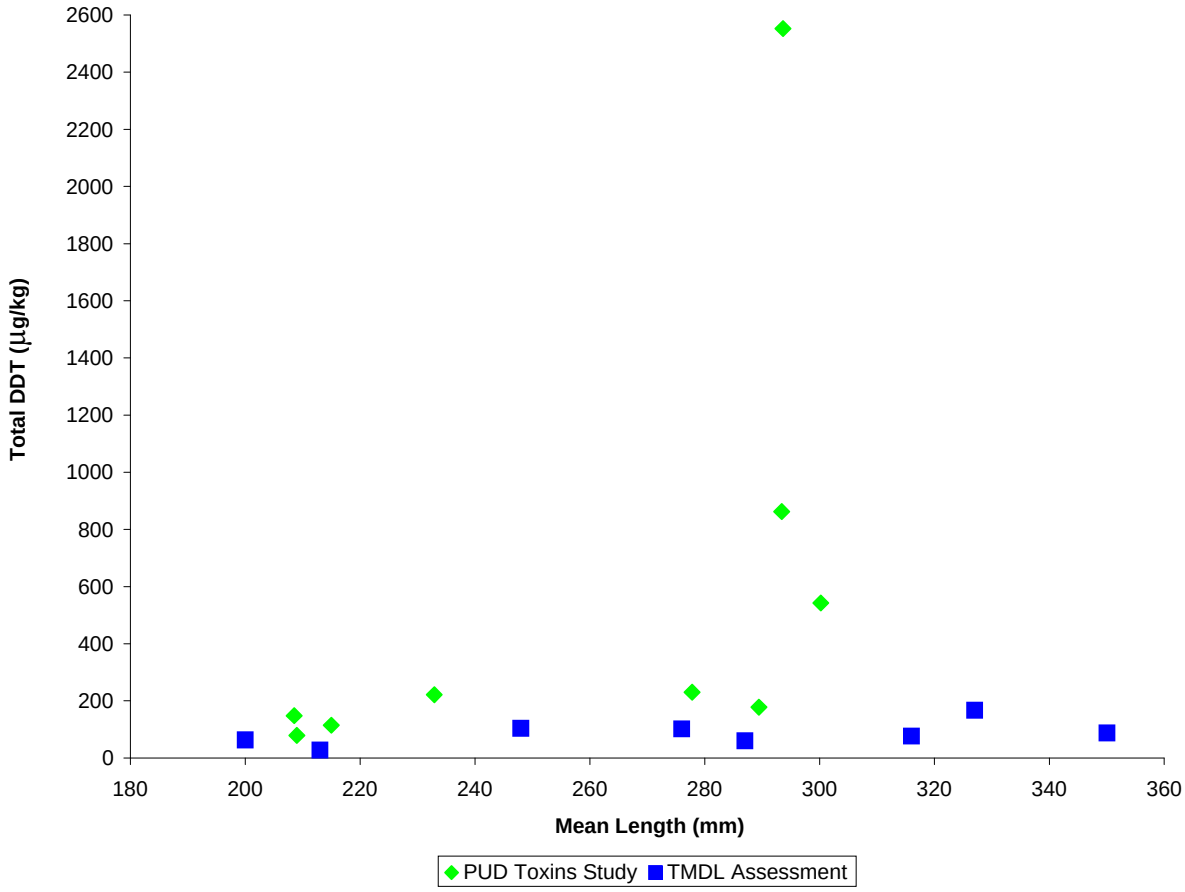

Figure 6.2-3 Lower Okanogan River total DDT concentrations in smallmouth bass from comparable-length fish, including data reported by Serdar (2003).

Table 6.2-5 Total DDT concentrations normalized to lipids content, including results from the TMDL Assessment (Serdar 2003).

Sample #	Total DDT	Lipids	Total DDT (µg/kg lipids)
H97-C-R1	25,726	0.164	156,866
H97-C-R2	21,832	0.303	72,053
H97-C-R3	21,432	0.256	83,719
H97-C-R4	7,528	0.441	17,070
MON-C-R1	5,507	0.0518	106,313
MON-C-R2	120	0.0042	28,571
MON-C-R3	550	0.0555	9,910
H97-B-R1	863	0.021	41,893
H97-B-R2	222	0.018	12,402
H97-B-R3	542	0.017	32,455
MON-B-R1	230	0.023	10,132
MON-B-R2	148	0.017	8,810
MON-B-R3	79	0.013	6,220
MAL-B-R1	2,553	0.021	121,571
MAL-B-R2	115	0.013	9,200
MAL-B-R3	178	0.014	12,714
TMDL Assessment[1]	Carp		
128230	327	0.0104	31,442
128231	434	0.0084	51,667
128232	249	0.0155	16,065
128233	311	0.0343	9,067
128234, 128235	249	0.0300	8,300
128236	236	0.0309	7,638
TMDL Assessment[1]	Bass		
128246	288	0.0321	8,972
128247	77	0.0139	5,540
128248	104	0.0160	6,500
128250	88	0.0117	7,521
128251	60	0.0142	4,225
128252	28	0.0095	2,947
128253	167	0.0135	12,370
128254	102	0.0112	9,107
128255	63	0.0070	9,000

[1] Sample data from Serdar 2003

PCBs concentrations detected in carp were generally higher than concentrations detected in smallmouth bass (Table 6.2-6). PCBs concentrations were also higher in fish with high lipids concentrations (correlation coefficient = 0.7925, P = 0.0007). In all samples, the PCBs isomers detected were Aroclor 1260 and Aroclor 1254. Total PCBs ranged from 8.8 to 246 µg/kg in carp and <4.0 to 79 µg/kg in smallmouth bass. Higher total PCBs concentrations were generally associated with larger fish (6.2-4 and 6.2-5), a pattern not evident in bass from the TMDL assessment (Serdar 2003).

Table 6.2-6 Concentrations of PCBs in fish from the lower Okanogan River (µg/kg).

Sample #	Fish Species	River Reach	Aroclor 1254		Aroclor 1260		Aroclor 1248		Other Aroclors		Total PCBs	
H97-C-R1	Carp	Hwy 97	<55	Y	24		<3.9	U	<3.9	U	24	
H97-C-R2	Carp	Hwy 97	<120	Y	<60	Y	<12	U	<12	U	<120	Y
H97-C-R3	Carp	Hwy 97	<93	Y	43	J	<12	U	<12	U	43	
H97-C-R4	Carp	Hwy 97	150		96		<16	U	<16	U	246	
MON-C-R1	Carp	Monse	<30	Y	20		<3.9	U	<3.9	U	20	
MON-C-R2	Carp	Monse	<16	Y	17		<4.0	U	<4.0	U	17	
MON-C-R3	Carp	Monse	<14	Y	8.8		<3.9	U	<3.9	U	8.8	
H97-B-R1	Bass	Hwy 97	20		9.4		<4.0	U	<4.0	U	29.4	
H97-B-R2	Bass	Hwy 97	36		<7.9	Y	<9.9	Y	<4.0	U	36	
H97-B-R3	Bass	Hwy 97	58		21		<6.6	U	<6.6	U	79	
MON-B-R1	Bass	Monse	20		18		<3.9	U	<3.9	U	38	
MON-B-R2	Bass	Monse	10		4.6		<3.9	U	<3.9	U	14.6	
MON-B-R3	Bass	Monse	<4.0	U	<4.0	U	<4.0	U	<4.0	U	<4.0	U
MAL-B-R1	Bass	Malott	<30	Y	8.9		<4.0	U	<4.0	U	8.9	
MAL-B-R2	Bass	Malott	<10	Y	4.2		<4.0	U	<4.0	U	4.2	
MAL-B-R3	Bass	Malott	<9.8	Y	4.1		<3.9	U	<3.9	U	4.1	

U = Analyte not detected at the reported concentration
Y = Analyte not detected, reporting limit raised due to chromographic interference
J = Estimated concentration

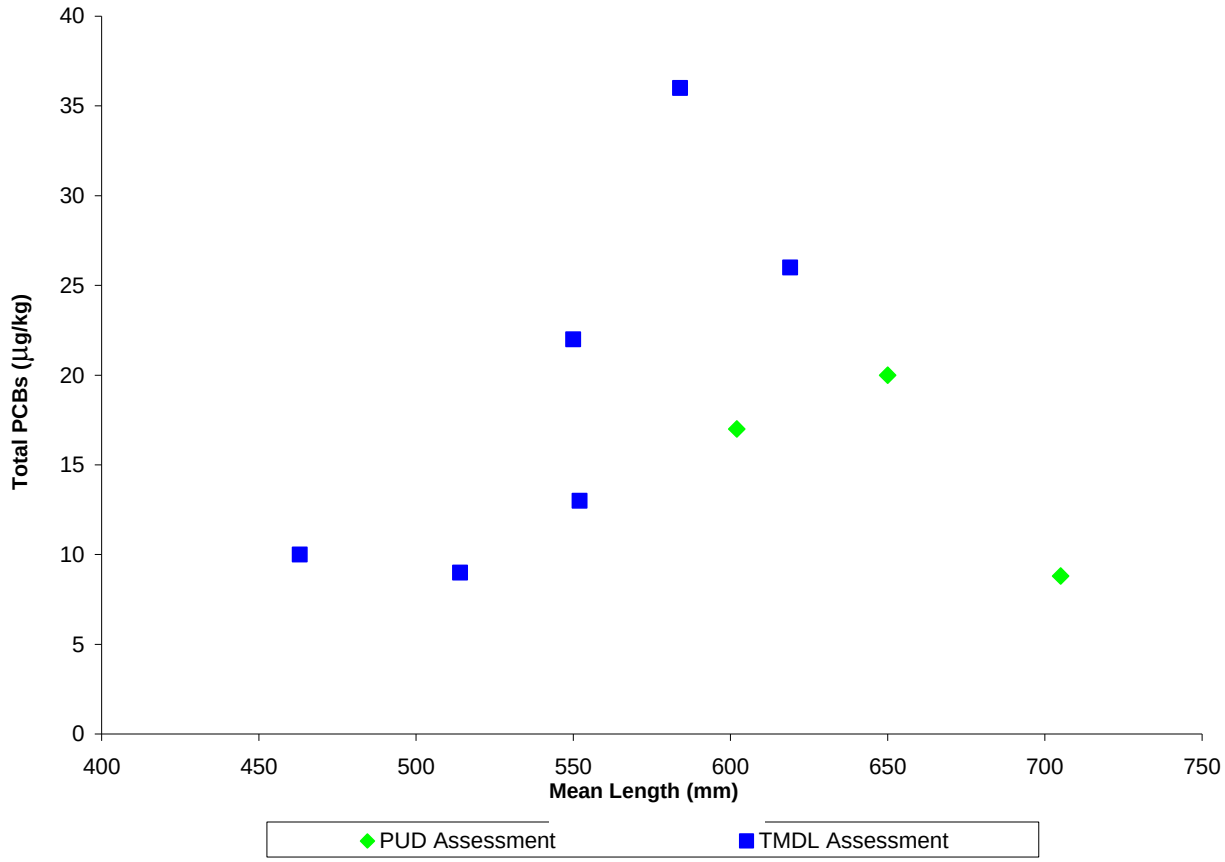

Figure 6.2-4 **Lower Okanogan River total PCBs concentrations in carp tissue from comparable-length fish, including data reported by Serdar (2003).**

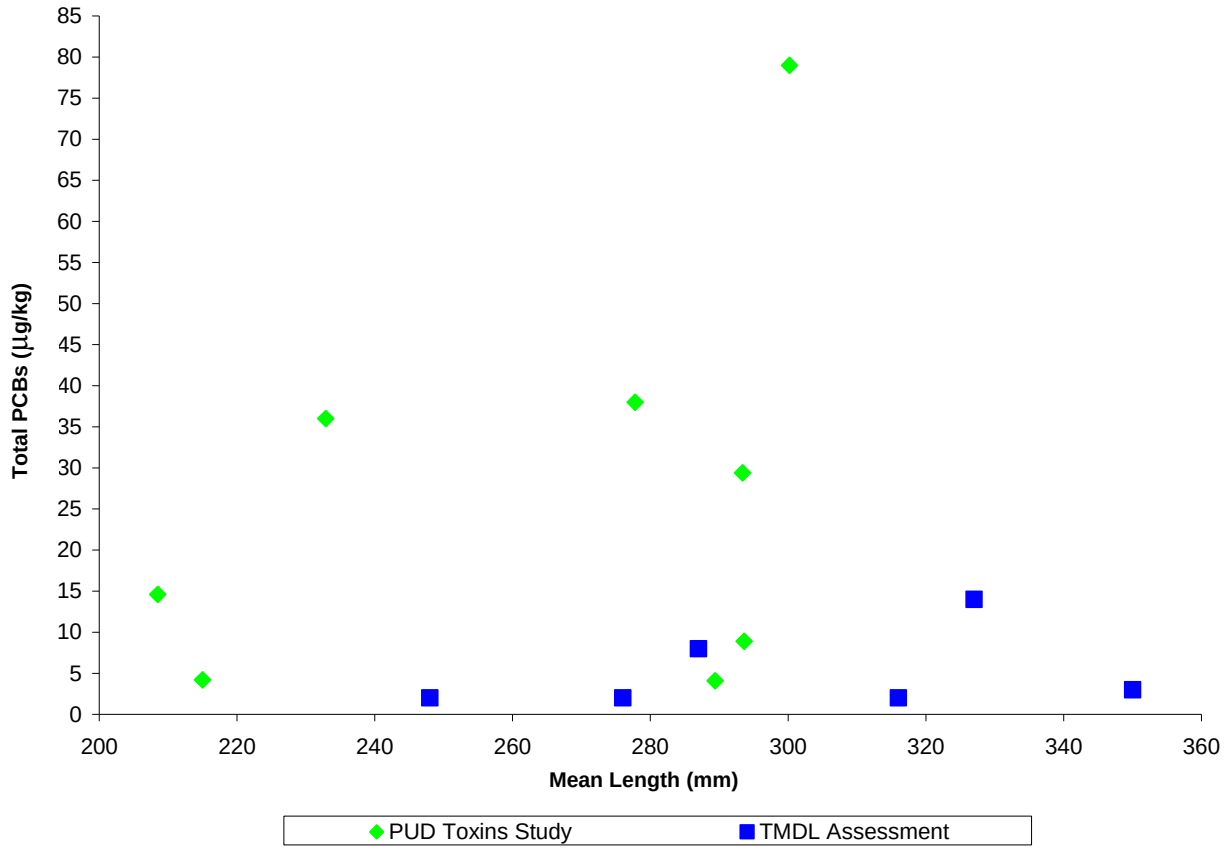

Figure 6.2-5 Lower Okanogan River total PCBs concentrations in smallmouth bass from comparable-length fish, including data reported by Serdar (2003).

Normalizing total PCBs concentrations to lipids content did not bring the results from the two studies closer together as it did with DDT (Table 6.2-6). The relative differences in the ranges of total PCBs concentrations between the two studies, whether for carp or smallmouth bass, were similar after normalizing.

Table 6.2-7 Total PCBs concentrations normalized to lipids content, including results from the TMDL Assessment (Serdar 2003).

Sample #	Total PCBs		Lipids	Total PCBs (µg/kg lipids)
H97-C-R1	24		0.164	146
H97-C-R2	<120	Y	0.303	nd
H97-C-R3	43		0.256	168
H97-C-R4	246		0.441	558
MON-C-R1	20		0.0518	386
MON-C-R2	17		0.0042	4,048
MON-C-R3	8.8		0.0555	159
H97-B-R1	29.4		0.0206	1,427
H97-B-R2	36		0.0179	2,011
H97-B-R3	79		0.0167	4,731
MON-B-R1	38		0.0227	1,674
MON-B-R2	14.6		0.0168	869
MON-B-R3	<4.0	U	0.0127	nd
MAL-B-R1	8.9		0.0210	424
MAL-B-R2	4.2		0.0125	336
MAL-B-R3	4.1		0.0140	293
TMDL Assessment[1]	Carp			
128230	13		0.0104	1,250
128231	9		0.0084	1,071
128232	10		0.0155	645
128233	26		0.0343	758
128234, 128235	36		0.0300	1,200
128236	22		0.0309	712
TMDL Assessment[1]	Bass			
128246	15		0.0321	467
128247	2		0.0139	144
128248	2		0.0160	125
128250	3		0.0117	256
128251	8		0.0142	563
128252	<2.8	U	0.0095	nd
128253	14		0.0135	1,037
128254	2		0.0112	179
128255	<2.8	U	0.0070	nd

[1] Sample data from Serdar 2003

U = Analyte not detected at the reported concentration

Y = Analyte not detected, reporting limit raised due to chromographic interference

nd = not detected

6.3 Quality Assurance Results

The technical memorandum in Appendix B summarizes the results of an internal quality assurance/quality control (QA/QC) review of analytical results for sediment and fish tissue samples collected in July and August 2008. Final laboratory data were submitted to Parametrix via two hardcopy Tier IV data reports (ARI Job No. NE61 on August 1, 2008 and ARI Job Nos. NI49/NJ20 on September 10, 2008). All data and analytical QC elements were reviewed against laboratory and method QC criteria, and qualifiers were applied where judged appropriate.

All sediment samples collected were prepared and analyzed using standard methods and all method holding times were met. The data packet submitted by the laboratory was complete; however, the report cover letter contains the wrong date for when the samples were submitted to ARI (January 23, 2008, rather than the correct date of July 9, 2008). No other errors or omissions were noted. No target analytes were detected in any of the respective method blanks. Laboratory Control Sample (LCS), matrix spike (MS), and matrix spike duplicate (MSD) recoveries for the target analytes were in control, indicating good analytical accuracy. Sample and spike replicate relative percent differences (RPD) or relative standard deviations (RSDs), as appropriate, were also in control indicating good analytical precision. Surrogate compound recoveries for the pesticide and PCBs analyses were also acceptable. No sediment data were qualified based on this review.

All fish tissue samples collected were prepared and analyzed using standard methods and all method holding times were met. The data packet submitted by the laboratory was complete except for a missing case narrative report. No other errors or omissions were noted. For the pesticide analyses, 13 of the 16 sample extracts required dilution and re-analysis due to levels of DDE and/or DDD that exceeded the calibration range of the analytical instrument. Over-range results were qualified “E” or “ES” by the laboratory, and were replaced by the non-qualified, in-range results generated by the corresponding dilution analyses. The laboratory also qualified several DDD and DDT results with a "P" indicating there was a high RPD between the two analytical columns. In these cases, the retention times for the analytes were correct on both columns, with no evidence of interference (e.g., skewed peaks, shoulders, etc.), indicating that the analytes were confirmed as being present but with some variability between the two columns with regards to the actual concentration. These values were considered estimates, with the “P” qualifier replaced with a “J”. For the PCBs analyses, reporting limits for several analytes/samples were raised due to either matrix interference or interference from the high levels of pesticide analytes. These occurrences were flagged by the laboratory with a “Y” qualifier and the results should be considered non-detects at the elevated reporting limit. No target analytes were detected in any of the respective method blanks. Laboratory Control Sample (LCS), matrix spike (MS), and matrix spike duplicate (MSD) recoveries for the target analytes were acceptable, indicating good analytical accuracy. Sample and spike replicate relative percent differences (RPD) or relative standard deviations (RSDs), as appropriate, were also in control indicating good analytical precision. Surrogate compound recoveries for the pesticide and PCBs analyses were also acceptable.

7.0 DISCUSSION

7.1 DDT and PCBs in Lower Okanogan River Sediments

All PCBs were undetected at the 4.0 µg/kg reporting limit. Sediment sample concentrations of PCBs (<4 µg/kg) were similar to results reported for PCBs concentrations in a 2001 core sample from the Okanogan River mouth (RM 2.3) collected for the TMDL technical assessment (Serdar 2003). Results from both the 2008 PUD funded study and the TMDL studies were more than one order of magnitude below the 60 µg/kg sediment quality standard value proposed by Michelsen (2003).

Sediment sample concentrations of DDT (<1.9 to 19.3J µg/kg) were also similar to the 2001 sediment core collected from the Okanogan River mouth (RM 2.3) 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 (Ecology 2003). Also similar to these study results, the TMDL core sample had higher concentrations of 4,4'-DDE compared to other DDT analogs, and 4,4'-DDT concentrations were lower than 4,4'-DDD and 4,4'-DDE concentrations. Michelsen (2003) did not calculate an SQS value for DDT. 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.

7.2 Lipids, DDT and PCBs in Lower Okanogan River Fish

Both the size and lipids content of lower Okanogan River carp collected for this study were much greater than in carp collected for the TMDL technical assessment (Serdar 2003). The mean weight of carp used in the TMDL study composite samples ranged from 1,348 to 3,345 grams, compared to a range of 3,180 to 12,500 grams for carp collected in this 2008 study. Associated with the larger size carp in this study were much higher fat contents in their tissues (Figure 6.2-1). Serdar (2003) reported 0.84 to 3.43 percent lipids in carp from the TMDL study compared to as much as 44.1 percent in carp from the current study.

DDT concentrations were higher in carp samples compared to smallmouth bass samples. DDT and lipids concentrations were also higher in larger carp. The carp sampled in this study were also much larger and had correspondingly higher concentrations of DDT than reported in the TMDL assessment (Serdar 2003). 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. The higher concentrations in the largest individual carp exceed levels (up to 4,340 µg/kg) that have led WDOH to issue fish consumption advisories for the Yakima River (Joy and Patterson 1997; WDOH 2008).

The mean weight of bass composites from the TMDL study ranged from 98 to 1,111 grams compared to a range of bass mean weight from the current study of 127 to 661 grams. Mean lipids in bass ranged from 0.70 to 3.21 percent in the TMDL study compared to a range of 1.25 to 2.27 percent in the current study.

Normalizing total DDT concentrations from lower Okanogan River carp samples both from this study and from the TMDL assessment indicate that differences in total DDT concentrations are largely attributable to the much higher lipids content in the 2008 samples (Table 6.2-5). While the total DDT concentrations in µg/kg-wet weight were up to nearly two orders of magnitude higher in the 2008 carp, the range of lipids-normalized results (9,910 to 156,866 µg/kg-lipids in the current study compared to 7,638 to 51,667 µg/kg-lipids in the TMDL assessment) were generally in the same order of magnitude.

The differences between DDT concentrations in fish tissues collected in the two studies can be attributed to differences in age, as indicated by size, in addition to differences in lipids content. The larger fish not only contained more lipids where organic chemicals bioaccumulate, but they have also had more years to bioaccumulate DDT.

Higher PCBs concentrations were also associated with the larger carp that had higher lipids content. Correlations between total PCBs and lipids content, mean weight and mean length were not significant in 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 carp from the Wenatchee River (up to 1,300 µg/kg, Seiders et al. 2007) and in mountain whitefish from the Walla Walla River (up to 410 µg/kg, Johnson et al. 2004) that have led to fish consumption advisories (WDOH 2008).

The information collected in this study is consistent with the recommendation found in the Detailed Implementation Plan for the lower Okanogan River and will be useful in the development of health advisories for the consumption of carp caught in the lower Okanogan River. Should DOH issue health advisories for the consumption of carp, there should be little impact on the angling public. WDFW law enforcement working the lower Okanogan River rarely observe angler retention of either carp or whitefish, although it is legal to do so. According to Okanogan Detachment Sergeant Jim Brown, during the last several years he recalled "only one or two" instances where anglers had retained these resident fish species; angler retention of resident fish in this area is almost exclusively bass (B. Patterson, personal communication).

8.0 STUDY VARIANCE

Variances from the FERC-approved study plan for the Okanogan River Toxins Study (Douglas PUD, 2007) included the following:

- In order to properly characterize the surface sediments most likely to be encountered by recreational river uses, grab samples were collected from only the upper 10 cm of the sediment as opposed to the 32 cm depth sediment cores for the TMDL Technical Assessment (Serdar 2003).
- The Okanogan River in May was near flood stage and could not safely be accessed. All sediment samples were collected on July 8, 2008, after spring snowmelt flows had receded. Also, due to high flows in May 2008, fish collection was conducted during late June and all of the month of July.
- This study included a much higher level of fish collection effort than what was proposed in the study plan and the QAPP. In total over 60 man days were consumed trying to meet the sample size levels for carp, whitefish and smallmouth bass.
- Due to recent ESA listings, electrofishing was not an approved collection method in the scientific collection permit. Instead, in an effort to meet sample size for the study, several other collection methods were utilized including beach seines, trot lines, archery and recreational angling gear. All smallmouth bass were collected by angling and all carp were collected using archery equipment. Unfortunately, even with the additional effort expended toward fish collection, the crews were unsuccessful in capturing whitefish from the lower Okanogan River.

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Appendix A

Sediment Sampling Locations Wells Hydroelectric Project

SEDIMENT SAMPLING LOCATIONS
WELLS HYDROELECTRIC PROJECT

SED 1 This site is located in the area near the boat launch on the west shore of the Okanogan River on the downstream side of the Monse Bridge, at approximately RM 5.

SED 2 This site is located near an informal swimming area and boat launch on the west shore of the Okanogan River about 200 ft downstream of the Crazy Rapids pump station, at approximately RM 6.

SED 3 This site is located near an informal swimming area launch on the west shore of the Okanogan River at approximately RM 8. An irrigation pump station is located at this site.

SED 4 This site is located near an informal swimming area with a sandy beach on the east shore of the Okanogan River about one quarter of a mile downstream from the railroad bridge, at approximately RM 10. The surrounding land at this site is comprised of sand dunes with ponderosa pine trees and scrub vegetation.

SED 5 This site is located in an informal swimming area with sand bars on both shores of the Okanogan River near the mouth of Chiliwist Creek, at approximately RM 14.

Appendix B

Laboratory Data for DDT and PCB in Sediment and Fish Tissue

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: MB-082608
METHOD BLANK

Lab Sample ID: MB-082608
LIMS ID: 08-18434
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: NA
Date Received: NA

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 15:54
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.0 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	5.0	< 5.0 U
72-54-8	4,4'-DDD	5.0	< 5.0 U
50-29-3	4,4'-DDT	5.0	< 5.0 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	116%
Tetrachlorometaxylene	73.8%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H-97-B-R1
DILUTION

Lab Sample ID: NI49A
LIMS ID: 08-18431
Matrix: Tissue
Data Release Authorized:
Reported: 09/08/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/18/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 16:35
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.2 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 20.0
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	98	710
72-54-8	4,4'-DDD	98	140 JP
50-29-3	4,4'-DDT	98	< 98 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	99.0%
Tetrachlorometaxylene	137%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H-97-B-R2
SAMPLE

Lab Sample ID: NI49B
LIMS ID: 08-18432
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/18/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 08/28/08 19:18
Instrument/Analyst: ECD3/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.0 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	5.0	120 E
72-54-8	4,4'-DDD	5.0	25
50-29-3	4,4'-DDT	5.0	7.3

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	93.5%
Tetrachlorometaxylene	84.5%

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ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H-97-B-R2
DILUTION

Lab Sample ID: NI49B
LIMS ID: 08-18432
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/18/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 16:55
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.0 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 5.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	25	190
72-54-8	4,4'-DDD	25	< 25 U
50-29-3	4,4'-DDT	25	< 25 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	107%
Tetrachlorometaxylene	172%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H-97-B-R3
SAMPLE

Lab Sample ID: NI49C
LIMS ID: 08-18433
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/18/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 08/28/08 19:39
Instrument/Analyst: ECD3/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.2 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	4.9	280 E
72-54-8	4,4'-DDD	4.9	36
50-29-3	4,4'-DDT	4.9	16

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	96.5%
Tetrachlorometaxylene	83.5%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H-97-B-R3
DILUTION

Lab Sample ID: NI49C
LIMS ID: 08-18433
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/18/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 17:15
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.2 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 10.0
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	49	490
72-54-8	4,4'-DDD	49	< 49 U
50-29-3	4,4'-DDT	49	< 49 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	110%
Tetrachlorometaxylene	102%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: MON-B-R1
SAMPLE

Lab Sample ID: NI49D
LIMS ID: 08-18434
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/29/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 17:35
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 5.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	24	230
72-54-8	4,4'-DDD	24	< 24 U
50-29-3	4,4'-DDT	24	< 24 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	79.2%
Tetrachlorometaxylene	75.4%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: MON-B-R2
SAMPLE

Lab Sample ID: NI49E
LIMS ID: 08-18435
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/29/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 08/28/08 21:01
Instrument/Analyst: ECD3/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.1 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	4.9	84 E
72-54-8	4,4'-DDD	4.9	11
50-29-3	4,4'-DDT	4.9	6.8

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	100%
Tetrachlorometaxylene	90.5%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: MON-B-R2
DILUTION

Lab Sample ID: NI49E
LIMS ID: 08-18435
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/29/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 18:36
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.1 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 5.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	25	130
72-54-8	4,4'-DDD	25	< 25 U
50-29-3	4,4'-DDT	25	< 25 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	117%
Tetrachlorometaxylene	104%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: MON-B-R3
SAMPLE

Lab Sample ID: NI49F
LIMS ID: 08-18436
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/29/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 18:56
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.3 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	4.9	73
72-54-8	4,4'-DDD	4.9	6.2
50-29-3	4,4'-DDT	4.9	< 4.9 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	95.2%
Tetrachlorometaxylene	82.2%

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Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: MAL-B-R1
SAMPLE

Lab Sample ID: NI49G
LIMS ID: 08-18437
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/31/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 08/28/08 21:42
Instrument/Analyst: ECD3/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.2 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	4.9	1,000 ES
72-54-8	4,4'-DDD	4.9	260 E
50-29-3	4,4'-DDT	4.9	13

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	95.2%
Tetrachlorometaxylene	81.0%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: MAL-B-R1
DILUTION

Lab Sample ID: NI49G
LIMS ID: 08-18437
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/31/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 19:16
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.2 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 20.0
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	98	1,800 E
72-54-8	4,4'-DDD	98	460 P
50-29-3	4,4'-DDT	98	< 98 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	100%
Tetrachlorometaxylene	104%

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ANALYTICAL RESOURCES INCORPORATED

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Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: MAL-B-R1
DILUTION2

Lab Sample ID: NI49G
LIMS ID: 08-18437
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/31/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 18:23
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.2 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 50.0
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	240	2,000
72-54-8	4,4'-DDD	240	540 P
50-29-3	4,4'-DDT	240	< 240 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	152%
Tetrachlorometaxylene	105%

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ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: MAL-B-R2
SAMPLE

Lab Sample ID: NI49H
LIMS ID: 08-18438
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/31/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 19:37
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	4.8	74
72-54-8	4,4'-DDD	4.8	15 P
50-29-3	4,4'-DDT	4.8	26

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	96.0%
Tetrachlorometaxylene	91.0%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: MAL-B-R3
SAMPLE

Lab Sample ID: NI49I
LIMS ID: 08-18439
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/31/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 08/28/08 22:24
Instrument/Analyst: ECD3/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	4.8	99 E
72-54-8	4,4'-DDD	4.8	18
50-29-3	4,4'-DDT	4.8	< 4.8 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	99.5%
Tetrachlorometaxylene	83.0%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: MAL-B-R3
DILUTION

Lab Sample ID: NI49I
LIMS ID: 08-18439
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/31/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 19:57
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 5.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	24	160
72-54-8	4,4'-DDD	24	< 24 U
50-29-3	4,4'-DDT	24	< 24 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	112%
Tetrachlorometaxylene	117%

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ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H97-C-R1
SAMPLE

Lab Sample ID: NJ20A
LIMS ID: 08-19147
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 08/29/08 00:07
Instrument/Analyst: ECD3/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	4.8	1,500 ES
72-54-8	4,4'-DDD	4.8	1,800 ES
50-29-3	4,4'-DDT	4.8	26 P

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	94.0%
Tetrachlorometaxylene	76.0%

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ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H97-C-R1
DILUTION

Lab Sample ID: NJ20A
LIMS ID: 08-19147
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 21:38
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 50.0
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	240	15,000 E
72-54-8	4,4'-DDD	240	6,400 E
50-29-3	4,4'-DDT	240	< 240 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	92.5%
Tetrachlorometaxylene	48.4%

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ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H97-C-R1
DILUTION2

Lab Sample ID: NJ20A
LIMS ID: 08-19147
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 17:02
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 250
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	1,200	18,000
72-54-8	4,4'-DDD	1,200	7,700 P
50-29-3	4,4'-DDT	1,200	< 1,200 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	D
Tetrachlorometaxylene	D

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Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H97-C-R2
SAMPLE

Lab Sample ID: NJ20B
LIMS ID: 08-19148
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 08/29/08 00:28
Instrument/Analyst: ECD3/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	4.8	1,500 ES
72-54-8	4,4'-DDD	4.8	1,700 ES
50-29-3	4,4'-DDT	4.8	32

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	83.8%
Tetrachlorometaxylene	104%

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ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H97-C-R2
DILUTION

Lab Sample ID: NJ20B
LIMS ID: 08-19148
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 21:58
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 50.0
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	240	12,000 E
72-54-8	4,4'-DDD	240	5,700 E
50-29-3	4,4'-DDT	240	< 240 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	89.0%
Tetrachlorometaxylene	89.2%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H97-C-R2
DILUTION2

Lab Sample ID: NJ20B
LIMS ID: 08-19148
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 17:22
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 250
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	1,200	15,000
72-54-8	4,4'-DDD	1,200	6,800 P
50-29-3	4,4'-DDT	1,200	< 1,200 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	D
Tetrachlorometaxylene	D

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ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H97-C-R3
SAMPLE

Lab Sample ID: NJ20C
LIMS ID: 08-19149
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 08/29/08 00:48
Instrument/Analyst: ECD3/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	4.8	1,500 ES
72-54-8	4,4'-DDD	4.8	1,800 ES
50-29-3	4,4'-DDT	4.8	32

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	89.8%
Tetrachlorometaxylene	91.5%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H97-C-R3
DILUTION

Lab Sample ID: NJ20C
LIMS ID: 08-19149
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 22:18
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 50.0
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	240	11,000 E
72-54-8	4,4'-DDD	240	5,900 E
50-29-3	4,4'-DDT	240	< 240 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	89.8%
Tetrachlorometaxylene	92.9%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
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Sample ID: H97-C-R3
DILUTION2

Lab Sample ID: NJ20C
LIMS ID: 08-19149
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 17:42
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.4 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 250
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	1,200	14,000
72-54-8	4,4'-DDD	1,200	7,400 P
50-29-3	4,4'-DDT	1,200	< 1,200 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	D
Tetrachlorometaxylene	D

ANALYTICAL RESOURCES INCORPORATED

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Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: H97-C-R4
SAMPLE

Lab Sample ID: NJ20D
LIMS ID: 08-19150
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 08/29/08 01:09
Instrument/Analyst: ECD3/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.3 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	4.8	1,200 ES
72-54-8	4,4'-DDD	4.8	910 ES
50-29-3	4,4'-DDT	4.8	28 P

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	69.2%
Tetrachlorometaxylene	73.2%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A **Sample ID: H97-C-R4**
Page 1 of 1 **DILUTION**

Lab Sample ID: NJ20D
LIMS ID: 08-19150
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 22:38
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.3 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 50.0
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	240	5,200 E
72-54-8	4,4'-DDD	240	1,100
50-29-3	4,4'-DDT	240	< 240 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	76.9%
Tetrachlorometaxylene	140%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: H97-C-R4
DILUTION2

Lab Sample ID: NJ20D
LIMS ID: 08-19150
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 18:43
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.3 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 100
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	480	5,600
72-54-8	4,4'-DDD	480	1,900 P
50-29-3	4,4'-DDT	480	< 480 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	D
Tetrachlorometaxylene	D

FORM I

0036

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: MON-C-R1
SAMPLE

Lab Sample ID: NJ20E
LIMS ID: 08-19151
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 08/29/08 01:30
Instrument/Analyst: ECD3/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.3 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	4.8	1,100 ES
72-54-8	4,4'-DDD	4.8	970 ES
50-29-3	4,4'-DDT	4.8	7.3

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	91.5%
Tetrachlorometaxylene	86.5%

FORM I

0037

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: MON-C-R1
DILUTION

Lab Sample ID: NJ20E
LIMS ID: 08-19151
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 22:58
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.3 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 50.0
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	240	4,200 E
72-54-8	4,4'-DDD	240	1,100 P
50-29-3	4,4'-DDT	240	< 240 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	96.6%
Tetrachlorometaxylene	145%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: MON-C-R1
DILUTION2

Lab Sample ID: NJ20E
LIMS ID: 08-19151
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/04/08 05:49
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.3 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 100
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	480	4,300
72-54-8	4,4'-DDD	480	1,200
50-29-3	4,4'-DDT	480	< 480 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	D
Tetrachlorometaxylene	D

FORM I

0039

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A **Sample ID: MON-C-R2**
Page 1 of 1 **SAMPLE**

Lab Sample ID: NJ20F
LIMS ID: 08-19152
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 08/29/08 01:50
Instrument/Analyst: ECD3/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.8 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	4.6	76 E
72-54-8	4,4'-DDD	4.6	< 4.6 U
50-29-3	4,4'-DDT	4.6	< 4.6 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	91.8%
Tetrachlorometaxylene	75.0%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: MON-C-R2
DILUTION

Lab Sample ID: NJ20F
LIMS ID: 08-19152
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 23:18
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.8 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 5.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	23	120
72-54-8	4,4'-DDD	23	< 23 U
50-29-3	4,4'-DDT	23	< 23 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	106%
Tetrachlorometaxylene	91.0%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: MON-C-R3
SAMPLE

Lab Sample ID: NJ20G
LIMS ID: 08-19153
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 08/29/08 02:11
Instrument/Analyst: ECD3/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.0 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	5.0	500 E
72-54-8	4,4'-DDD	5.0	80
50-29-3	4,4'-DDT	5.0	< 5.0 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	96.8%
Tetrachlorometaxylene	72.2%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: MON-C-R3
DILUTION

Lab Sample ID: NJ20G
LIMS ID: 08-19153
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 23:39
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.0 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 20.0
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	**4,4'-DDE**	**100**	**470**
72-54-8	4,4'-DDD	100	< 100 U
50-29-3	4,4'-DDT	100	< 100 U

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	103%
Tetrachlorometaxylene	116%

FORM I

0043

ANALYTICAL RESOURCES INCORPORATED

SW8081 PESTICIDE TISSUE SURROGATE RECOVERY SUMMARY

Matrix: Tissue

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014

Client ID	DCBP	TCMX	TOT OUT
H-97-B-R1	91.2%	88.5%	0
H-97-B-R1 DL	99.0%	137%	0
H-97-B-R2	93.5%	84.5%	0
H-97-B-R2 DL	107%	172%*	1
H-97-B-R3	96.5%	83.5%	0
H-97-B-R3 DL	110%	102%	0
MB-082608	116%	73.8%	0
LCS-082608	106%	85.2%	0
MON-B-R1	79.2%	75.4%	0
MON-B-R1 MS	111%	88.4%	0
MON-B-R1 MSD	117%	96.8%	0
MON-B-R2	100%	90.5%	0
MON-B-R2 DL	117%	104%	0
MON-B-R3	95.2%	82.2%	0
MAL-B-R1	95.2%	81.0%	0
MAL-B-R1 DL	100%	104%	0
MAL-B-R1 DL	152%	105%	0
MAL-B-R2	96.0%	91.0%	0
MAL-B-R3	99.5%	83.0%	0
MAL-B-R3 DL	112%	117%	0

	LCS/MB LIMITS	QC LIMITS
(DCBP) = Decachlorobiphenyl	(30-160)	(30-160)
(TCMX) = Tetrachlorometaxylene	(30-160)	(30-160)

Prep Method: TISSM
Log Number Range: 08-18431 to 08-18439

FORM-II SW8081

ANALYTICAL RESOURCES INCORPORATED

SW8081 PESTICIDE TISSUE SURROGATE RECOVERY SUMMARY

Matrix: Tissue

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014

Client ID	DCBP	TCMX	TOT OUT
MB-082608	116%	73.8%	0
LCS-082608	106%	85.2%	0
H97-C-R1	94.0%	76.0%	0
H97-C-R1 DL	92.5%	48.4%	0
H97-C-R1 DL	D	D	0
H97-C-R2	83.8%	104%	0
H97-C-R2 DL	89.0%	89.2%	0
H97-C-R2 DL	D	D	0
H97-C-R3	89.8%	91.5%	0
H97-C-R3 DL	89.8%	92.9%	0
H97-C-R3 DL	D	D	0
H97-C-R4	69.2%	73.2%	0
H97-C-R4 DL	76.9%	140%	0
H97-C-R4 DL	D	D	0
MON-C-R1	91.5%	86.5%	0
MON-C-R1 DL	96.6%	145%	0
MON-C-R1 DL	D	D	0
MON-C-R2	91.8%	75.0%	0
MON-C-R2 DL	106%	91.0%	0
MON-C-R3	96.8%	72.2%	0
MON-C-R3 DL	103%	116%	0

	LCS/MB LIMITS	QC LIMITS
(DCBP) = Decachlorobiphenyl	(30-160)	(30-160)
(TCMX) = Tetrachlorometaxylene	(30-160)	(30-160)

Prep Method: TISSM
Log Number Range: 08-19147 to 08-19153

FORM-II SW8081

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: MON-B-R1
MS/MSD

Lab Sample ID: NI49D
LIMS ID: 08-18434
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/29/08
Date Received: 08/01/08

Date Extracted MS/MSD: 08/26/08

Date Analyzed MS: 09/01/08 17:55
MSD: 09/01/08 18:16
Instrument/Analyst MS: ECD4/AAR
MSD: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No

Sample Amount MS: 10.1 g-as-rec
MSD: 10.1 g-as-rec
Final Extract Volume MS: 5.0 mL
MSD: 5.0 mL
Dilution Factor MS: 5.00
MSD: 5.00
Silica Gel: No

Percent Moisture: NA

Analyte	Sample	MS	Spike Added-MS	MS Recovery	MSD	Spike Added-MSD	MSD Recovery	RPD
4,4'-DDE	230	224	19.8	NA	230	19.8	NA	2.6%
4,4'-DDD	< 24.1	44.4	19.8	224%	41.6	19.8	210%	6.5%
4,4'-DDT	< 24.1	28.5	19.8	144%	24.6	19.8	124%	14.7%

Reported in µg/kg (ppb)
RPD calculated using sample concentrations per SW846.

FORM III

0046

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: MON-B-R1
MATRIX SPIKE

Lab Sample ID: NI49D
LIMS ID: 08-18434
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/29/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 17:55
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.1 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 5.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	25	---
72-54-8	4,4'-DDD	25	---
50-29-3	4,4'-DDT	25	---

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	111%
Tetrachlorometaxylene	88.4%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: MON-B-R1
MATRIX SPIKE DUP

Lab Sample ID: NI49D
LIMS ID: 08-18434
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/29/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 18:16
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No
Acid Cleanup: No

Sample Amount: 10.1 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 5.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
72-55-9	4,4'-DDE	25	---
72-54-8	4,4'-DDD	25	---
50-29-3	4,4'-DDT	25	---

Reported in µg/kg (ppb)

Pest/PCB Surrogate Recovery	
Decachlorobiphenyl	117%
Tetrachlorometaxylene	96.8%

FORM I

0048

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Pesticides/PCB by GC/ECD Method SW8081A
Page 1 of 1

Sample ID: LCS-082608
LAB CONTROL

Lab Sample ID: LCS-082608
LIMS ID: 08-18434
Matrix: Tissue
Data Release Authorized:
Reported: 09/03/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/29/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/01/08 16:15
Instrument/Analyst: ECD4/AAR
GPC Cleanup: Yes
Sulfur Cleanup: No
Florisil Cleanup: No

Sample Amount: 10.0 g-as-rec
Final Extract Volume: 5.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

Analyte	Lab Control	Spike Added	Recovery
4,4'-DDE	20.0	20.0	100%
4,4'-DDD	19.0	20.0	95.0%
4,4'-DDT	18.6	20.0	93.0%

Pest/PCB Surrogate Recovery

Decachlorobiphenyl	106%
Tetrachlorometaxylene	85.2%

Reported in µg/kg (ppb)

FORM 4
PESTICIDE METHOD BLANK SUMMARY

SAMPLE NO.

NI49MBT

Lab Name: ANALYTICAL RESOURCES, INC Client: PARAMETRIX, INCORPORATED

ARI Job No.: NI49 Project: WELLS DAM RELICENSING

Lab Sample ID: NI49MBT Lab File ID: 0901A007

Matrix (soil/water) SOLID Extraction:(SepF/Cont/Sonc) TISSM

Sulfur Cleanup (Y/N) Y Date Extracted: 08/26/08

Date Analyzed (1): 09/01/08 Date Analyzed (2): 09/01/08

Time Analyzed (1): 1554 Time Analyzed (2): 1554

Instrument ID (1): ECD4 Instrument ID (2): ECD4

GC Column (1): STX-CLP1 ID: 0.53(mm) GC Column (2): STX-CLP2 ID: 0.53(mm)

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS and MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED 1	DATE ANALYZED 2
01	NI49LCST	NI49LCST	09/01/08	09/01/08
02	H-97-B-R1	NI49A	09/01/08	09/01/08
03	H-97-B-R2	NI49B	09/01/08	09/01/08
04	H-97-B-R3	NI49C	09/01/08	09/01/08
05	MON-B-R1	NI49D	09/01/08	09/01/08
06	MON-B-R1 MS	NI49DMS	09/01/08	09/01/08
07	MON-B-R1 MSD	NI49DMSD	09/01/08	09/01/08
08	MON-B-R2	NI49E	09/01/08	09/01/08
09	MON-B-R3	NI49F	09/01/08	09/01/08
10	MAL-B-R1	NI49G	09/01/08	09/01/08
11	MAL-B-R2	NI49H	09/01/08	09/01/08
12	MAL-B-R3	NI49I	09/01/08	09/01/08
13	H97-C-R1	NJ20A	09/01/08	09/01/08
14	H97-C-R2	NJ20B	09/01/08	09/01/08
15	H97-C-R3	NJ20C	09/01/08	09/01/08
16	H97-C-R4	NJ20D	09/01/08	09/01/08
17	MON-C-R1	NJ20E	09/01/08	09/01/08
18	MON-C-R2	NJ20F	09/01/08	09/01/08
19	MON-C-R3	NJ20G	09/01/08	09/01/08
20	MAL-B-R1	NI49G	09/03/08	09/03/08
21	H97-C-R1	NJ20A	09/03/08	09/03/08
22	H97-C-R2	NJ20B	09/03/08	09/03/08
23	H97-C-R3	NJ20C	09/03/08	09/03/08
24	H97-C-R4	NJ20D	09/03/08	09/03/08
25	MAL-B-R1	NI49G	09/03/08	09/03/08
26	H97-C-R4	NJ20D	09/03/08	09/03/08
27	MON-C-R1	NJ20E	09/04/08	09/04/08

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: MB-082608
METHOD BLANK

Lab Sample ID: MB-082608
LIMS ID: 08-18437
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: NA
Date Received: NA

Date Extracted: 08/26/08
Date Analyzed: 09/02/08 21:35
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.0 g
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	4.0	< 4.0 U
53469-21-9	Aroclor 1242	4.0	< 4.0 U
12672-29-6	Aroclor 1248	4.0	< 4.0 U
11097-69-1	Aroclor 1254	4.0	< 4.0 U
11096-82-5	Aroclor 1260	4.0	< 4.0 U
11104-28-2	Aroclor 1221	4.0	< 4.0 U
11141-16-5	Aroclor 1232	4.0	< 4.0 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	101%
Tetrachlorometaxylene	69.2%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082
Page 1 of 1

Sample ID: H-97-B-R1
SAMPLE

Lab Sample ID: NI49A
LIMS ID: 08-18431
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/18/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/02/08 22:11
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.1 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	4.0	< 4.0 U
53469-21-9	Aroclor 1242	4.0	< 4.0 U
12672-29-6	Aroclor 1248	4.0	< 4.0 U
11097-69-1	**Aroclor 1254**	**4.0**	**20**
11096-82-5	**Aroclor 1260**	**4.0**	**9.4**
11104-28-2	Aroclor 1221	4.0	< 4.0 U
11141-16-5	Aroclor 1232	4.0	< 4.0 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	86.0%
Tetrachlorometaxylene	86.8%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082
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Sample ID: H-97-B-R2
SAMPLE

Lab Sample ID: NI49B
LIMS ID: 08-18432
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/18/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/02/08 22:29
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.2 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	4.0	< 4.0 U
53469-21-9	Aroclor 1242	4.0	< 4.0 U
12672-29-6	Aroclor 1248	9.9	< 9.9 Y
11097-69-1	**Aroclor 1254**	**4.0**	**36**
11096-82-5	Aroclor 1260	7.9	< 7.9 Y
11104-28-2	Aroclor 1221	4.0	< 4.0 U
11141-16-5	Aroclor 1232	4.0	< 4.0 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	94.2%
Tetrachlorometaxylene	89.0%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: H-97-B-R3
SAMPLE

Lab Sample ID: NI49C
LIMS ID: 08-18433
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/18/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/02/08 22:47
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 15.1 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	6.6	< 6.6 U
53469-21-9	Aroclor 1242	6.6	< 6.6 U
12672-29-6	Aroclor 1248	6.6	< 6.6 U
11097-69-1	**Aroclor 1254**	**6.6**	**58**
11096-82-5	**Aroclor 1260**	**6.6**	**21**
11104-28-2	Aroclor 1221	6.6	< 6.6 U
11141-16-5	Aroclor 1232	6.6	< 6.6 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	75.5%
Tetrachlorometaxylene	78.5%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: MON-B-R1
SAMPLE

Lab Sample ID: NI49D
LIMS ID: 08-18434
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/29/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/02/08 23:04
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.7 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	3.9	< 3.9 U
53469-21-9	Aroclor 1242	3.9	< 3.9 U
12672-29-6	Aroclor 1248	3.9	< 3.9 U
11097-69-1	**Aroclor 1254**	**3.9**	**20**
11096-82-5	**Aroclor 1260**	**3.9**	**18**
11104-28-2	Aroclor 1221	3.9	< 3.9 U
11141-16-5	Aroclor 1232	3.9	< 3.9 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	101%
Tetrachlorometaxylene	86.8%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082
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Sample ID: MON-B-R2
SAMPLE

Lab Sample ID: NI49E
LIMS ID: 08-18435
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/29/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/02/08 23:22
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.5 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	3.9	< 3.9 U
53469-21-9	Aroclor 1242	3.9	< 3.9 U
12672-29-6	Aroclor 1248	3.9	< 3.9 U
11097-69-1	**Aroclor 1254**	**3.9**	**10**
11096-82-5	**Aroclor 1260**	**3.9**	**4.6**
11104-28-2	Aroclor 1221	3.9	< 3.9 U
11141-16-5	Aroclor 1232	3.9	< 3.9 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	96.5%
Tetrachlorometaxylene	87.0%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: MON-B-R3
SAMPLE

Lab Sample ID: NI49F
LIMS ID: 08-18436
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/29/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/02/08 23:40
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.0 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	4.0	< 4.0 U
53469-21-9	Aroclor 1242	4.0	< 4.0 U
12672-29-6	Aroclor 1248	4.0	< 4.0 U
11097-69-1	Aroclor 1254	4.0	< 4.0 U
11096-82-5	Aroclor 1260	4.0	< 4.0 U
11104-28-2	Aroclor 1221	4.0	< 4.0 U
11141-16-5	Aroclor 1232	4.0	< 4.0 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	85.0%
Tetrachlorometaxylene	78.8%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: MAL-B-R1
SAMPLE

Lab Sample ID: NI49G
LIMS ID: 08-18437
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/31/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/02/08 23:58
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.3 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	4.0	< 4.0 U
53469-21-9	Aroclor 1242	4.0	< 4.0 U
12672-29-6	Aroclor 1248	4.0	< 4.0 U
11097-69-1	Aroclor 1254	30	< 30 Y
11096-82-5	**Aroclor 1260**	**4.0**	**8.9**
11104-28-2	Aroclor 1221	4.0	< 4.0 U
11141-16-5	Aroclor 1232	4.0	< 4.0 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	84.5%
Tetrachlorometaxylene	83.0%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: MAL-B-R2
SAMPLE

Lab Sample ID: NI49H
LIMS ID: 08-18438
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/31/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 01:28
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.1 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	4.0	< 4.0 U
53469-21-9	Aroclor 1242	4.0	< 4.0 U
12672-29-6	Aroclor 1248	4.0	< 4.0 U
11097-69-1	Aroclor 1254	10	< 10 Y
11096-82-5	**Aroclor 1260**	**4.0**	**4.2**
11104-28-2	Aroclor 1221	4.0	< 4.0 U
11141-16-5	Aroclor 1232	4.0	< 4.0 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	93.5%
Tetrachlorometaxylene	80.5%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: MAL-B-R3
SAMPLE

Lab Sample ID: NI49I
LIMS ID: 08-18439
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/31/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 01:45
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.4 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	3.9	< 3.9 U
53469-21-9	Aroclor 1242	3.9	< 3.9 U
12672-29-6	Aroclor 1248	3.9	< 3.9 U
11097-69-1	Aroclor 1254	9.8	< 9.8 Y
11096-82-5	**Aroclor 1260**	**3.9**	**4.1**
11104-28-2	Aroclor 1221	3.9	< 3.9 U
11141-16-5	Aroclor 1232	3.9	< 3.9 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	96.8%
Tetrachlorometaxylene	87.2%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082
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Sample ID: H97-C-R1
SAMPLE

Lab Sample ID: NJ20A
LIMS ID: 08-19147
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 02:03
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.5 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	3.9	< 3.9 U
53469-21-9	Aroclor 1242	3.9	< 3.9 U
12672-29-6	Aroclor 1248	3.9	< 3.9 U
11097-69-1	Aroclor 1254	55	< 55 Y
11096-82-5	**Aroclor 1260**	**3.9**	**24**
11104-28-2	Aroclor 1221	3.9	< 3.9 U
11141-16-5	Aroclor 1232	3.9	< 3.9 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	82.0%
Tetrachlorometaxylene	74.8%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082
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Sample ID: H97-C-R2
SAMPLE

Lab Sample ID: NJ20B
LIMS ID: 08-19148
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 02:21
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.2 g-as-rec
Final Extract Volume: 3.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	12	< 12 U
53469-21-9	Aroclor 1242	12	< 12 U
12672-29-6	Aroclor 1248	12	< 12 U
11097-69-1	Aroclor 1254	120	< 120 Y
11096-82-5	Aroclor 1260	60	< 60 Y
11104-28-2	Aroclor 1221	12	< 12 U
11141-16-5	Aroclor 1232	12	< 12 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	123%
Tetrachlorometaxylene	84.8%

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ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082
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Sample ID: H97-C-R3
SAMPLE

Lab Sample ID: NJ20C
LIMS ID: 08-19149
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 02:39
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.7 g-as-rec
Final Extract Volume: 3.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	12	< 12 U
53469-21-9	Aroclor 1242	12	< 12 U
12672-29-6	Aroclor 1248	12	< 12 U
11097-69-1	Aroclor 1254	93	< 93 Y
11096-82-5	**Aroclor 1260**	**12**	**43 P**
11104-28-2	Aroclor 1221	12	< 12 U
11141-16-5	Aroclor 1232	12	< 12 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	114%
Tetrachlorometaxylene	79.5%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082
Page 1 of 1

Sample ID: H97-C-R4
SAMPLE

Lab Sample ID: NJ20D
LIMS ID: 08-19150
Matrix: Tissue
Data Release Authorized:
Reported: 09/10/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 02:57
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.6 g-as-rec
Final Extract Volume: 4.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	16	< 16 U
53469-21-9	Aroclor 1242	16	< 16 U
12672-29-6	Aroclor 1248	16	< 16 U
11097-69-1	**Aroclor 1254**	**16**	**150**
11096-82-5	**Aroclor 1260**	**16**	**96**
11104-28-2	Aroclor 1221	16	< 16 U
11141-16-5	Aroclor 1232	16	< 16 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	121%
Tetrachlorometaxylene	97.1%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: MON-C-R1
SAMPLE

Lab Sample ID: NJ20E
LIMS ID: 08-19151
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 03:15
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.4 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	3.9	< 3.9 U
53469-21-9	Aroclor 1242	3.9	< 3.9 U
12672-29-6	Aroclor 1248	3.9	< 3.9 U
11097-69-1	Aroclor 1254	30	< 30 Y
11096-82-5	**Aroclor 1260**	**3.9**	**20**
11104-28-2	Aroclor 1221	3.9	< 3.9 U
11141-16-5	Aroclor 1232	3.9	< 3.9 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	82.5%
Tetrachlorometaxylene	66.0%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: MON-C-R2
SAMPLE

Lab Sample ID: NJ20F
LIMS ID: 08-19152
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 03:33
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.2 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	4.0	< 4.0 U
53469-21-9	Aroclor 1242	4.0	< 4.0 U
12672-29-6	Aroclor 1248	4.0	< 4.0 U
11097-69-1	Aroclor 1254	16	< 16 Y
11096-82-5	**Aroclor 1260**	**4.0**	**17**
11104-28-2	Aroclor 1221	4.0	< 4.0 U
11141-16-5	Aroclor 1232	4.0	< 4.0 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	105%
Tetrachlorometaxylene	81.8%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: MON-C-R3
SAMPLE

Lab Sample ID: NJ20G
LIMS ID: 08-19153
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014
Date Sampled: 08/04/08
Date Received: 08/05/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 03:51
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.4 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	3.9	< 3.9 U
53469-21-9	Aroclor 1242	3.9	< 3.9 U
12672-29-6	Aroclor 1248	3.9	< 3.9 U
11097-69-1	Aroclor 1254	14	< 14 Y
11096-82-5	**Aroclor 1260**	**3.9**	**8.8**
11104-28-2	Aroclor 1221	3.9	< 3.9 U
11141-16-5	Aroclor 1232	3.9	< 3.9 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	130%
Tetrachlorometaxylene	104%

ANALYTICAL RESOURCES INCORPORATED

SW8082/PCB TISSUE SURROGATE RECOVERY SUMMARY

Matrix: Tissue

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014

Client ID	DCBP	TCMX	TOT OUT
H-97-B-R1	86.0%	86.8%	0
H-97-B-R2	94.2%	89.0%	0
H-97-B-R3	75.5%	78.5%	0
MON-B-R1	101%	86.8%	0
MON-B-R2	96.5%	87.0%	0
MON-B-R3	85.0%	78.8%	0
MB-082608	101%	69.2%	0
LCS-082608	109%	64.2%	0
MAL-B-R1	84.5%	83.0%	0
MAL-B-R1 MS	104%	98.8%	0
MAL-B-R1 MSD	87.2%	91.8%	0
MAL-B-R2	93.5%	80.5%	0
MAL-B-R3	96.8%	87.2%	0

	LCS/MB LIMITS	QC LIMITS
(DCBP) = Decachlorobiphenyl	(36-130)	(33-149)
(TCMX) = Tetrachlorometaxylene	(30-119)	(32-121)

Prep Method: TissM
Log Number Range: 08-18431 to 08-18439

ANALYTICAL RESOURCES INCORPORATED

SW8082/PCB TISSUE SURROGATE RECOVERY SUMMARY

Matrix: Tissue

QC Report No: NJ20-Parametrix, Incorporated
Project: Wells Dam Re-Liciensing
553-1541-014

Client ID	DCBP	TCMX	TOT OUT
H97-C-R1	82.0%	74.8%	0
H97-C-R2	123%	84.8%	0
H97-C-R3	114%	79.5%	0
H97-C-R4	121%	97.1%	0
MON-C-R1	82.5%	66.0%	0
MON-C-R2	105%	81.8%	0
MON-C-R3	130%	104%	0

	LCS/MB LIMITS	QC LIMITS
(DCBP) = Decachlorobiphenyl	(36-130)	(33-149)
(TCMX) = Tetrachlorometaxylene	(30-119)	(32-121)

Prep Method: TissM
Log Number Range: 08-19147 to 08-19153

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: MAL-B-R1
MS/MSD

Lab Sample ID: NI49G
LIMS ID: 08-18437
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/31/08
Date Received: 08/01/08

Date Extracted MS/MSD: 08/26/08

Date Analyzed MS: 09/03/08 00:52
MSD: 09/03/08 01:10
Instrument/Analyst MS: ECD5/PK
MSD: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount MS: 25.1 g-as-rec
MSD: 25.3 g-as-rec
Final Extract Volume MS: 1.0 mL
MSD: 1.0 mL
Dilution Factor MS: 1.00
MSD: 1.00
Silica Gel: No

Percent Moisture: NA

Analyte	Sample	MS	Spike Added-MS	MS Recovery	MSD	Spike Added-MSD	MSD Recovery	RPD
Aroclor 1016	< 4.0 U	21.0	19.9	106%	16.9	19.7	85.8%	21.6%
Aroclor 1260	8.9	30.1	19.9	107%	24.1	19.7	77.2%	22.1%

Results reported in µg/kg (ppb)
RPD calculated using sample concentrations per SW846.

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: MAL-B-R1
MATRIX SPIKE

Lab Sample ID: NI49G
LIMS ID: 08-18437
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/31/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 00:52
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.1 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	4.0	---
53469-21-9	Aroclor 1242	4.0	< 4.0 U
12672-29-6	Aroclor 1248	4.0	< 4.0 U
11097-69-1	Aroclor 1254	30	< 30 Y
11096-82-5	Aroclor 1260	4.0	---
11104-28-2	Aroclor 1221	4.0	< 4.0 U
11141-16-5	Aroclor 1232	4.0	< 4.0 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	104%
Tetrachlorometaxylene	98.8%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082

Sample ID: MAL-B-R1
MATRIX SPIKE DUP

Lab Sample ID: NI49G
LIMS ID: 08-18437
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: 07/31/08
Date Received: 08/01/08

Date Extracted: 08/26/08
Date Analyzed: 09/03/08 01:10
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.3 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

CAS Number	Analyte	RL	Result
12674-11-2	Aroclor 1016	4.0	---
53469-21-9	Aroclor 1242	4.0	< 4.0 U
12672-29-6	Aroclor 1248	4.0	< 4.0 U
11097-69-1	Aroclor 1254	30	< 30 Y
11096-82-5	Aroclor 1260	4.0	---
11104-28-2	Aroclor 1221	4.0	< 4.0 U
11141-16-5	Aroclor 1232	4.0	< 4.0 U

Reported in µg/kg (ppb)

PCB Surrogate Recovery	
Decachlorobiphenyl	87.2%
Tetrachlorometaxylene	91.8%

ANALYTICAL RESOURCES INCORPORATED

ORGANICS ANALYSIS DATA SHEET
PCB by GC/ECD Method SW8082
Page 1 of 1

Sample ID: LCS-082608
LAB CONTROL

Lab Sample ID: LCS-082608
LIMS ID: 08-18437
Matrix: Tissue
Data Release Authorized:
Reported: 09/04/08

QC Report No: NI49-Parametrix, Incorporated
Project: Wells Dam Relicensing
553-1541-014
Date Sampled: NA
Date Received: NA

Date Extracted: 08/26/08
Date Analyzed: 09/02/08 21:53
Instrument/Analyst: ECD5/PK
GPC Cleanup: Yes
Sulfur Cleanup: Yes
Acid Cleanup: Yes
Florisil Cleanup: No

Sample Amount: 25.0 g-as-rec
Final Extract Volume: 1.0 mL
Dilution Factor: 1.00
Silica Gel: No

Percent Moisture: NA

Analyte	Lab Control	Spike Added	Recovery
Aroclor 1016	15.9	20.0	79.5%
Aroclor 1260	20.8	20.0	104%

PCB Surrogate Recovery

Decachlorobiphenyl	109%
Tetrachlorometaxylene	64.2%

Results reported in µg/kg (ppb)

FORM III

0074

4

PCB METHOD BLANK SUMMARY

BLANK NO.: NI49MBS1

Lab Name: ANALYTICAL RESOURCES, INC — Client: PMX

ARI Job No.: NI49 — Project: WELLS DAM RELICENSIN

Lab Sample ID: NI49MB1 — Lab File ID: 0902B027

Date Extracted: 08/26/08 — Matrix: SOLID

Date Analyzed: 09/02/08 — Instrument ID: ECD5

Time Analyzed: 2135 — GC Columns: ZB5/ZB35

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS and MSD:

	CLIENT SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED
01	NI49LCSS1	NI49LCS1	09/02/08
02	H-97-B-R1	NI49A	09/02/08
03	H-97-B-R2	NI49B	09/02/08
04	H-97-B-R3	NI49C	09/02/08
05	MON-B-R1	NI49D	09/02/08
06	MON-B-R2	NI49E	09/02/08
07	MON-B-R3	NI49F	09/02/08
08	MAL-B-R1	NI49G	09/02/08
09	MAL-B-R1 MS	NI49GMS	09/03/08
10	MAL-B-R1 MSD	NI49GMSD	09/03/08
11	MAL-B-R2	NI49H	09/03/08
12	MAL-B-R3	NI49I	09/03/08
13	H97-C-R1	NJ20A	09/03/08
14	H97-C-R2	NJ20B	09/03/08
15	H97-C-R3	NJ20C	09/03/08
16	H97-C-R4	NJ20D	09/03/08
17	MON-C-R1	NJ20E	09/03/08
18	MON-C-R2	NJ20F	09/03/08
19	MON-C-R3	NJ20G	09/03/08

ALL RUNS ARE DUAL COLUMN

Appendix C

Technical Memorandum: Data Review of 2008 Wells Dam Sediment and Fish Tissue Data

411 108TH AVENUE NE, SUITE 1800
BELLEVUE, WA 98004-5571
T. 425.458.6200 F. 425.458.6363
www.parametrix.com

TECHNICAL MEMORANDUM

Date:	September 10, 2008
To:	Project File
From:	Stuart Currie
Subject:	Data review of 2008 Wells Dam sediment and fish tissue data
cc:	Jim Good
Project Number:	553-1541-014 (01/03)
Project Name:	Wells Dam Relicensing

INTRODUCTION

As part of the Wells Hydroelectric Project relicensing process, Douglas County PUD is required to obtain a water quality certificate pertinent to section 401 of the Clean Water Act. In support of these efforts, bulk sediment and fish tissue analyses were conducted to provide more information with regards to DDT and PCB levels in the lower Okanogan River within the Wells Hydroelectric Project boundary and their potential impacts on recreational activities.

This technical memorandum summarizes the results of an internal quality assurance/quality control (QA/QC) review of analytical results for sediment and fish tissue samples collected in July and August 2008. Five (5) sediment and 16 tissue samples were analyzed for organochlorine pesticides (specifically 4,4'-DDT and its analogs, 4,4'-DDE and 4,4'-DDD), polychlorinated biphenyl (PCB) arochlors, particle size distribution (sediments), total organic carbon (sediments), and percent lipids (tissues). Analytical Resources, Inc. (ARI) in Tukwila, WA conducted all analyses.

Final laboratory data were submitted to Parametrix via two hardcopy Tier IV data reports (ARI Job No. NE61 on August 1, 2008 and ARI Job Nos. NI49/NJ20 on September 10, 2008). All data and analytical QC elements were reviewed against laboratory and method QC criteria, and qualifiers were applied where judged appropriate.

DATA REVIEW SUMMARY

Sediments

All samples collected were prepared and analyzed using standard methods and all method holding times were met. The data packet submitted by the laboratory was complete; however, the report cover letter contains the wrong date for when the samples were submitted to ARI (January 23, 2008, rather than the correct date of July 9, 2008). No other errors or omissions were noted.

No target analytes were detected in any of the respective method blanks. Laboratory Control Sample (LCS), matrix spike (MS), and matrix spike duplicate (MSD) recoveries for the target analytes were in control, indicating good analytical accuracy. Sample and spike replicate relative percent differences (RPD) or relative standard deviations (RSDs), as appropriate, were also in control indicating good analytical precision. Surrogate compound recoveries for the pesticide and PCB analyses were also acceptable. No sediment data were qualified based on this review.

Tissues

All samples collected were prepared and analyzed using standard methods and all method holding times were met. The data packet submitted by the laboratory was complete except for a missing case narrative report. No other errors or omissions were noted.

For the pesticide analyses, 13 of the 16 sample extracts required dilution and re-analysis due to levels of DDE and/or DDD that exceeded the calibration range of the analytical instrument. Over-range results were qualified “E” or “ES” by the laboratory, and should be replaced by the non-qualified, in-range results generated by the corresponding dilution analyses.

The laboratory also qualified several DDD and DDT results with a "P" indicating there was a high RPD between the two analytical columns. In these cases, the retention times for the analytes were correct on both columns, with no evidence of interference (e.g., skewed peaks, shoulders, etc.), indicating that the analytes were confirmed as being present but with some variability between the two columns with regards to the actual concentration. These values should be considered estimates, with the “P” qualifier replaced with a “J” (see table 1 below).

Table 1. Qualified Tissue Pesticide Data

Sample ID	Analyte	Result	Old Qualifier	New Qualifier	Units
H-97-B-R1	4,4'-DDD	140	JP	J	ug/kg
MAL-B-R1	4,4'-DDD	460	P	J	ug/kg
MAL-B-R2	4,4'-DDD	15	P	J	ug/kg
H-97-C-R1	4,4'-DDT	26	P	J	ug/kg
H-97-C-R1	4,4'-DDD	7,700	P	J	ug/kg
H-97-C-R2	4,4'-DDD	6,800	P	J	ug/kg
H-97-C-R3	4,4'-DDD	7,400	P	J	ug/kg
H-97-C-R4	4,4'-DDT	28	P	J	ug/kg
MON-C-R1	4,4'-DDD	1,100	P	J	ug/kg

For the PCB analyses, reporting limits for several analytes/samples were raised due to either matrix interference or interference from the high levels of pesticide analytes. These occurrences were flagged by the laboratory with a "Y" qualifier and the results should be considered non-detects at the elevated reporting limit.

No target analytes were detected in any of the respective method blanks. Laboratory Control Sample (LCS), matrix spike (MS), and matrix spike duplicate (MSD) recoveries for the target analytes were acceptable, indicating good analytical accuracy. Sample and spike replicate relative percent differences (RPD) or relative standard deviations (RSDs), as appropriate, were also in control indicating good analytical precision. Surrogate compound recoveries for the pesticide and PCB analyses were also acceptable.

CONCLUSION

All samples were analyzed within the required holding times and the appropriate methods were used. Analytical accuracy and precision were determined to be acceptable based on this review. Data should be considered valid as qualified and acceptable for further use.