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720 Third Avenue, Suite 1700
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March 6, 2013

Greg Weigel, On-Scene Coordinator
United States Environmental Protection Agency
950 West Bannock Street, Suite 900, Mail Stop IOO
Boise, Idaho 85702

Re: Contract Number: EP-S7-06-02, Technical Direction Document Number: 12-02-0005
Clearwater River – Orofino Oil Seep Site Investigation

Dear Mr. Weigel:

Enclosed please find the site investigation report for the Clearwater River – Orofino Oil Seep, which is located in Orofino, Idaho. If you have any question regarding this submittal, please call me at (206) 920-1739 or Renee Nordeen at (206) 624-9537.

Sincerely,

ECOLOGY AND ENVIRONMENT, INC.

Steven G. Hall
START-3 Project Leader

cc: Renee Nordeen, Project Manager, E & E, Seattle, Washington

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Clearwater River – Orofino Oil Seep

Orofino, Idaho

Technical Direction Document Number: 12-02-0005

March 2013

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
950 West Bannock Street, Suite 900, Mail Stop IOO
Boise, Idaho 85702

Prepared by:

ECOLOGY AND ENVIRONMENT, INC.
720 Third Avenue, Suite 1700
Seattle, Washington 98104

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List of Abbreviations and Acronyms

Acronym	Definition
AST	above-ground storage tank
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
CASSE	Coeur d'Alene Service Station Equipment
CWA	Clean Water Act
E & E	Ecology and Environment, Inc.
EPA	United States Environmental Protection Agency
FID	flame ionization detector
GC	gas chromatography
HCID	hydrocarbon identification
IDEQ	Idaho Department of Environmental Quality
IDTL	Initial Default Target Level
LNAPL	light non-aqueous phase liquid
MCL	Maximum Contaminant Level
MSL	Marine Safety Lab
NFA	No Further Action
PAH	polynuclear aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PIANO	paraffin, isoparaffin, aromatic, naphthene, and olfin
PID	photoionization detector
ppm	parts per million
PRP	potentially responsible party
PSTF	Petroleum Storage Tank Fund
QA/QC	quality assurance/quality control
RAL	Removal Action Level
RCBA	Risk Based Corrective Action
RSL	Regional Screening Level
SI	site investigation
SOW	Statement of Work
START	Superfund Technical Assessment and Response Team
SVOCs	semivolatile organic compounds
TPH	total petroleum hydrocarbons
UCM	unresolved complex mixture
USCG	United States Coast Guard
USGS	United States Geological Survey
UST	underground storage tank
VOCs	volatile organic compounds

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EXECUTIVE SUMMARY

Ecology and Environment, Inc. (E & E) was tasked by the United States Environmental Protection Agency (EPA) to provide technical support for completion of a site investigation (SI) at the Clearwater River – Orofino Oil Seep, which is located in Orofino, Idaho. E & E completed SI activities under Technical Direction Document Number 12-02-0005, issued under EPA, Region 10, Superfund Technical Assessment and Response Team (START)-3 Contract Number EP-S7-06-02.

The Clearwater River – Orofino Oil Seep is located on the northeast bank of the Clearwater River in Orofino, Idaho, within the boundaries of the Nez Perce Reservation approximately 640 feet north of the Michigan Street Bridge. On Friday, December 30, 2011, petroleum sheen was observed on surface water in the Clearwater River. The sheen was observed as blooms or bubbles emanating in the river several feet out from the water's edge. It is unknown when the release first began to occur. Absorbent booms were placed in the river around the sheen. A card-lock fueling facility (Hunt Oil) was located approximately 150 feet northeast of the seep, and diesel and gasoline were stored at this location in above-ground storage tanks (ASTs). This facility was temporarily closed pending further investigation as a potential source of the seep. At this time, the EPA issued a notice of federal interest to the Hunt Oil facility owners.

In addition to the Hunt Oil facility, the Nez Perce Tribe Water Resources Division conducted a review of area underground storage tank (UST) files and discovered numerous additional facilities in the area where USTs are or had been utilized.

Since the first noted observation of the sheen on the groundwater seep to the Clearwater River, various entities, including the EPA, Nez Perce Tribe, Clearwater County, the Petroleum Storage Tank Fund, and Atkinson Distributing (the owners of the Hunt Oil facility) have been conducting investigations at the seep location and adjacent areas in an attempt to ascertain the source of the petroleum contamination in the seep. The investigations have included the installation of six monitoring wells around the Hunt Oil facility; the collection and analyses of numerous samples, including soil, groundwater, sediment, surface water, and product; and monitoring of groundwater levels and thickness of LNAPL encountered in several wells at the Hunt Oil facility and downgradient from the facility. Samples have been analyzed for various constituents including volatile organic compounds, semivolatile organic compounds, and hydrocarbon forensics.

E & E evaluated the existing analytical data and site geology and hydrogeology and developed a conceptual site model. This model was utilized to assist in determining the likely source of the petroleum contamination in the seep.

The results of the investigations have confirmed a release of gasoline from the Hunt Oil facility and the weight of evidence indicates that the facility is the source of petroleum hydrocarbons observed in the Clearwater River seep. Of the nearby facilities that have formerly or currently

store fuel in USTs or ASTs, the Hunt Oil facility is the only facility documented to have released gasoline-range hydrocarbons to subsurface soil upgradient of the seep location. Additionally, the results of forensic hydrocarbon analyses link gasoline stored at the Hunt Oil facility to the petroleum contamination in the subsurface and groundwater hydraulically downgradient of the facility, and the groundwater gradient for most of the year is generally towards the Clearwater River. Based on the confirmed release at the Hunt Oil facility, EPA issued a Unilateral Administrative Order requiring the cleanup of contamination from the fuel release, and Atkinson Distribution conducted this contaminated soil removal in December 2012.

1 INTRODUCTION

Ecology and Environment, Inc. (E & E) was tasked by the United States Environmental Protection Agency (EPA) to provide technical support for completion of a site investigation (SI) at the Clearwater River – Orofino Oil Seep, which is located in Orofino, Idaho. E & E completed SI activities under Technical Direction Document Number 12-02-0005, issued under EPA, Region 10, Superfund Technical Assessment and Response Team (START)-3 Contract Number EP-S7-06-02.

The specific goals for this investigation, as identified by the EPA, are:

- Identify the source or sources for the contamination at the seep;
- Characterize the nature and extent of the seep and its potential source(s); and
- Develop a conceptual site model for the seep and its potential source(s).

Completion of the investigation included reviewing existing site information, reviewing documents produced by the consultant for the Idaho Petroleum Storage Tank Fund (PSTF), executing a sampling plan (including collection of samples), and conducting oversight of the contaminated soil removal action, creating a conceptual site model, and producing this report.

The report is organized as follows:

- Section 1, Introduction – authority for performance of this work, goals for the project, and summary of the report contents;
- Section 2, Background – site description, initial release history, and a discussion of potential sources;
- Section 3, Seep Related Investigations – discussion of Nez Perce Tribe-led investigations, PSTF-led investigations, the contaminated soil removal action, and a discussion of work conducted by EPA;
- Section 4, Conceptual Site Model – discussion of the nature and extent of the contamination associated with the seep, release mechanism, a forensic evaluation, and migration pathways and transport mechanism;
- Section 5, Summary and Conclusions – A summary of the findings of this report; and
- Section 6, References – Alphabetical listing of references used in the preparation of this report.

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2 SITE BACKGROUND

This section describes the background of the site including a description of the location and previous investigations.

2.1 Site Location

Site Name:	Clearwater River – Orofino Oil Seep
Latitude:	46º 28’ 49.21” North
Longitude:	-116º 15’ 32.8” West
Legal Description:	Section 7, Township 36 North, Range 2 East
County:	Clearwater
CERCLIS ID Number:	Not applicable
Federal Project Number:	E12006

2.2 Site Description

The Clearwater River – Orofino Oil Seep is located on the northeast bank of the Clearwater River, approximately 640 feet north of the Michigan Street Bridge, in Orofino, Idaho, within the boundaries of the Nez Perce Reservation (Figure 2-1). Primary land use surrounding the seep site is light industry and recreation including a former card-lock fueling facility (Hunt Oil), county maintenance shed, and the Clearwater Crossing RV Park (Figure 2-1). The Clearwater River is a navigable water of the United States and is a tributary to the Snake River, into which it flows near Lewiston, Idaho, approximately 40 miles to the west.

The City of Orofino receives its drinking water from a shallow surface water intake on the Clearwater River. This intake is located upstream (i.e., to the southeast) of the seep. The Dworshak National Fish Hatchery is located approximately 4 miles downstream of the seep. The Clearwater River in the vicinity of the seep is a popular place for fishing and recreational activities such as river tubing.

2.3 Initial Release History

On Friday, December 30, 2011, petroleum sheen was observed on surface water in the Clearwater River. The sheen was observed as blooms or bubbles emanating in the river several feet out from the water's edge. It is unknown when the release first began to occur. Absorbent booms were placed in the river around the sheen. A card-lock fueling facility was located approximately 150 feet northeast of the seep, and diesel and gasoline were stored at this location in above-ground storage tanks (ASTs). This facility was unmanned during hours of operation. Operations at the facility were temporarily ceased pending further investigation as a potential source of the contamination at the seep. On December 31, 2011, an excavator was deployed by Atkinson Distributing to excavate a trench adjacent to the card-lock facility to determine if this was the source of the contamination at the seep. An excavation trench was advanced to

approximately 15 feet below ground surface (bgs). A strong odor but no free product was encountered in the excavation; however, the excavation was not completed to groundwater.

2.4 Area Facilities with Current or Historic Underground Storage Tanks

The Nez Perce Tribe Water Resources Division conducted a review of area underground storage tank (UST) files and discovered the following potential industrial and commercial facilities with current or historical USTs. This report will only discuss those facilities located within ¼ mile of the Clearwater River seep. A brief discussion and consideration of these facilities is provided in the following subsections.

2.4.1 Clearwater County Road Maintenance Department

This facility is located approximately 114 feet southeast of the seep. Currently, there are two 2,000-gallon heating oil tanks associated with this property. There is no indication that there is currently or has recently been a release from these tanks. Historical information indicates that three USTs were removed in June 1993, and a "No Further Action" (NFA) was issued in October 1997. (Goodson 2012)

2.4.2 Clearwater County Sherriff Department

The exact location of this facility is not known, but it is believed to be in the vicinity of the current Hunt Oil facility. The facility is listed as being located in the Camas Prairie Railroad Ground, which is currently owned by the Bountiful Grain and Craig Mountain Railroad. Three USTs are reported to have been removed sometime in 1986 or 1989, although the exact locations of the former USTs are unknown. There is no NFA on file for these tank removals. (Goodson 2012)

2.4.3 Hunt Oil

This facility is located approximately 150 feet northeast of the Clearwater River seep. The Hunt Oil facility is owned by Atkinson Distributing, and the ASTs at the facility are filled by the owners' delivery truck and then fuel is dispensed to vehicles via a card-lock system (Goodson 2012). Additional information regarding sampling and associated investigations is provided in Section 3. This is the only facility that has a current confirmed release.

2.4.4 Edward Jones Company

This facility is located approximately 790 feet southeast of the Clearwater River seep and is the location of a former Phillips 66 gasoline station. The current property owner indicated that two tanks were removed the year in which he purchased the property (1975). There is no indication that USTs are currently located on the property. (Goodson 2012)

2.4.5 Becky's Burgers

This facility is located approximately 830 feet southeast of the Clearwater River seep. Historical information indicates that the USTs present at this site were closed in 1989. No further information could be determined for this location. (Goodson 2012)

2.4.6 Sunset Mart #3

This facility is located approximately 1,000 feet southeast of the Clearwater River seep. On August 27, 1990, between 1,000 and 1,500 gallons of unleaded gasoline were released.

Following the release, approximately 150 cubic yards of contaminated soil were removed and sample results from monitoring wells indicated the presence of benzene, toluene, ethylbenzene, and xylene (BTEX). The leaking UST event was closed in December 2002. The most recent inspection (July 2012) did not indicate any violations. Leak detection was conducted at the facility on January 23, 2012, and included alarm history and liquid status. All systems were reported as normal. (Goodson 2012)

2.4.7 Clearwater Land Title

This facility is located approximately 1,186 feet southeast of the Clearwater River seep and is the former location of the PJ Ford automobile dealership. The current owner indicated that two USTs were closed in place with gravel, and the tanks were located under the current landscaping. No additional information was available. (Goodson 2012)

2.4.8 Rick C. Lundgren Optometry

This facility is located approximately 1,065 feet southeast of the Clearwater River seep. It is the former location of Orofino Chevron. In 1993, four USTs were removed from the site. In October 1994, contamination in two downgradient monitoring wells indicated weathered petroleum migrating from the upgradient Ford facility (Section 2.4.7). An NFA was issued for the site in 1996. The current structure was erected in 2007. (Goodson 2012)

ecology and environment, inc.
Global Specialists in the Environment
Seattle, Washington

CLEARWATER RIVER – OROFINO OIL SEEP
Orofino, Idaho

Figure 2-1
SITE VICINITY

0 300 600
Approximate Scale in Feet

Date: 11/14/12

Drawn by: AES

10:START-3\12020005\fig 2-1

3 SEEP RELATED INVESTIGATIONS

Since the first noted occurrence of the petroleum sheen at the seep on the Clearwater River, various entities, including the EPA, the Nez Perce Tribe Water Resources Division, Clearwater County, consultants for PSTF, and consultants for Atkinson Distributing have been conducting investigations to ascertain the source of the contamination at the seep and to delineate and characterize the release from the Hunt Oil facility. The following is a discussion of those investigations in chronological order.

3.1 Initial investigations

On December 31, 2011, after the discovery of the sheen and as a result of the close proximity of the facility to the seep, Atkinson Distributing voluntarily excavated a trench adjacent to their Hunt Oil facility. The trench was 40-foot long by 12-foot deep and parallel to the Clearwater River and immediately adjacent to the concrete pump dispenser island. Three soil samples (Hunt # 1, Hunt #2, and Hunt #3) were collected from the trench approximately 10 feet apart. The samples were collected by Atkinson Distributing and relinquished to the Nez Perce Tribe Water Resources Division representatives. The samples were submitted for off-site fixed laboratory analysis of Risk Based Corrective Action (RCBA) contaminants of concern for gasoline by EPA Method 8260B. The sample results are presented in Table 3-1 and were compared to EPA Removal Action Levels (RALs) for residential soil and worker soil, EPA Regional Screening Levels (RSLs) for residential soil and industrial soil, and Idaho Initial Default Target Levels (IDTLs). Sample results indicate the presence of benzene, m,p-xylene, toluene, and total xylene at concentrations that exceeded at least one screening criteria in all three soil samples and ethylbenzene and naphthalene at concentrations that exceeded at least one screening criteria in two of the three samples.

On January 5, 2012, the Nez Perce Tribe Water Resources Division was notified by Atkinson Distributing that a heavy sheen was present on the Clearwater River bank in the vicinity of the seep. As a result, on January 6, 2012, Nez Perce Tribe Water Resources Division representatives collected one surface water sample and one sediment sample from the Clearwater River. The exact location of these samples is not known. The samples were submitted for off-site fixed laboratory analysis of hydrocarbon identification (HCID; Method WATPH-HCID), polychlorinated biphenyls (PCBs; sediment sample only by EPA Method 8082), semivolatile organic compounds (SVOCs; EPA Method 8270C), and total petroleum hydrocarbons (TPH; EPA Method 8015B modified). The sediment sample results are presented in Table 3-1 and were compared to EPA RALs, EPA RSLs, and IDTLs. The results for the sediment sample indicate the presence of 2-methylnaphthalene, anthracene, and naphthalene at concentrations that exceeded the IDTL screening criteria. Further, no PCBs were detected in the sample above the instrument detection limit. Finally, there were concentrations of TPH above the instrument detection limits in the samples; however, there are no criteria with which to compare these results. The hydrocarbon scan indicated the presence of diesel (1,000 parts per million [ppm]) and gasoline (12,000 ppm) and a minor amount of lube oil (100 ppm). The surface water sample results are provided in Table 3-2. The sample results were compared to National Recommended

Water Quality Criteria as determined by the Clean Water Act (CWA), Human Health Criteria – Organisms only (EPA 2012) and Idaho Risk Evaluation Manual for Petroleum Releases - Surface Water Toxics Criteria for Petroleum Chemicals of Interest – Organisms only (IDEQ 2012). The results for the surface water sample indicate the benzene concentration exceeded both criteria and toluene exceeded the CWA screening criteria.

On January 23, 2012, Nez Perce Tribe Water Resources Division representatives collected one surface water sample from the Clearwater River. The exact location of this sample is not known. The sample was submitted for off-site fixed laboratory analysis of RCBA contaminants of concern for gasoline using EPA Method 8260B. Sample results are presented in Table 3-2 and were compared to CWA and Idaho surface water screening levels. Sample results indicated that benzene was detected at a concentration that exceeded the screening criteria.

On March 14, 2012, a Nez Perce Tribe Water Resources Division representative conducted a visit to the Clearwater River site to walk along the shoreline to determine if sheen was present on the bank. During this visit, it was noted that petroleum sheen would "squeeze" into the water from the riverbank sediments along an approximately 40 to 50 feet length of river bank (Brackney 2012). As a result, on March 15, 2012, the Nez Perce Tribe Water Resources Division representatives collected ten surface water samples from shallow shovel pits along the bank of the Clearwater River. The samples locations were selected based on readings from a photoionization detector (PID). A total of six samples (1E, 3E, 5E, 7E, 9E, and 11E) were collected upstream of the seep location and four samples (1W, 5W, 3W, and 1W) were collected downstream of the seep. The numerical portion of the sample number indicates the upstream or downstream (east and west) distance from a transformer that was located on the river bank near the seep location, and which the Nez Perce Tribe Water Resources Division used as a reference point for the samples. The samples were submitted for off-site fixed laboratory analysis for volatile organic compounds (VOCs) using EPA Method 8260B. The sample results are presented in Table 3-2. Sample results were compared CWA and Idaho surface water screening levels. Sample results indicate the presence of benzene at concentrations which exceeded both criteria in all 10 samples and toluene at concentrations which exceeded the CWA criteria in seven of the ten samples.

Additionally, one surface water sample (labeled at the laboratory as 12-125-1 and 12-125-2) was submitted to the United States Coast Guard (USCG) Marine Safety Laboratory (MSL) which is located in New London, Connecticut, for gas chromatograph analysis. The sample was co-located with surface water sample 5E. The USCG MSL laboratory's conclusion of the sample results indicated they were representative of spilled oil and the samples contained gasoline that appeared to be only slightly weathered. A small amount of non-petroleum contamination was present in each of the samples. The MSL data reports are provided in Appendix A.

3.2 Interim Site Investigation

On April 9, 2012, Brown and Caldwell on behalf of the PSTF submitted an Interim Site Investigation report for the Hunt Oil site (Brown and Caldwell 2012a). The report documents the preliminary investigation to assess if the sheen observed on the Clearwater River was due to a release from the Hunt Oil facility. Activities completed as a part of this investigation included:

- A site visit;
- A review of product line tightness testing;
- A review of Hunt Oil fuel inventory data;

- A geophysical survey at the Hunt Oil facility;
- Collection of soil and surface water samples;
- Installation of monitoring wells at the Hunt Oil facility; and
- A review of Clearwater County public information records.

Five ASTs were identified as part of the Hunt Oil facility including:

- Two ASTs (20,000 and 10,000 gallons) containing clear diesel;
- One AST (20,000 gallons) containing dyed diesel;
- One AST (12,000 gallons) containing regular gasoline; and
- One AST (2,000 gallons) which was taken out of service in 2010 but had contained premium gasoline.

The ASTS are located within a secondary containment that consists of concrete floors and walls. Underground fuel lines connect the ASTs to the pump dispensing island. A map depicting Hunt Oil features is provided in Figure 3-1.

Based on information available at the time of production of the Interim Site Investigation report, Brown and Caldwell recommended that a subsequent Initial Site Characterization report be completed and further groundwater sampling and monitoring be collected from recently installed monitoring wells.

The results of sample collection activities were not discussed in the Interim Site Investigation report. The sampling activities and analytical results were provided in the subsequent Initial Site Characterization report and, therefore, will be discussed further in the following section.

3.3 Initial Site Investigation

On May 17, 2012, Brown and Caldwell (on behalf of the PSTF) submitted an Initial Site Characterization Report which discussed in detail activities associated with investigations at the Hunt Oil facility from January 2012 through April 2012 (Brown and Caldwell 2012b). The report included a description of the Hunt Oil facility, a discussion of the release scenario, discussion of surrounding soils and regional geology, a discussion of area drilling logs, detailed information on site investigations, quality assurance/quality control (QA/QC), analytical results, and a summary.

Product line testing was conducted on January 6, 2012, and February 7, 2012, by Coeur D'Alene Service Station Equipment, Inc. (CASSE). In the January 6 test, four lines (non-winter clear diesel, winter clear diesel, regular unleaded, and dyed diesel) were tested and all four lines passed. The description of the lines is as follows: non-winter clear diesel – 35-foot steel, winter clear diesel – 35-foot steel, regular unleaded – 25-foot steel, and the dyed diesel – 25-foot steel. The ASTs were not pressure tested because they reside inside appropriate secondary containment. In the February 7 test, one line (abandoned fuel line) was tested and it also passed the test.

Brown and Caldwell also reviewed the Hunt Oil fuel inventory records for a two-year span from January 2010 to January 2012. Based on their review, Brown and Caldwell indicated that "fluctuations in fuel levels are more likely due to measurement variability and recordkeeping practices than a release."

On January 10, 2012, Brown and Caldwell collected surface water samples and soil samples. Surface water sample "River" was collected from flowing water in the Clearwater River and sample "Water-2" was collected from a low area along the bank from pooled water. Surface soil samples (Soil-1, Soil-2, and Soil-3) were collected along the bank of the Clearwater River. The samples were submitted to on off-site fixed laboratory for analysis of gasoline range contaminants of concern (EPA Method 8260 or 8260B), PCBs, (EPA Method 8082), 1,2-dibromomethane (EPA method 8011); and polynuclear aromatic hydrocarbons (PAHs; EPA Method 8270). Surface soil sample results are presented in Table 3-1 and surface water sample results are presented in Table 3-2. The sample locations along with other features associated with the Hunt Oil Facility and nearby features are depicted on Figure 3-1. The soil samples were compared to EPA RALs, EPA RSLs, and IDTLs. Soil sample results indicate the presence of benzene, naphthalene, and toluene at concentrations that exceeded at least one of the screening levels in all three of the samples and the ethylbenzene concentration exceeded the IDTL in one sample. PCBs were not detected above the instrument detection limit in any of the soil samples. Surface water sample results were compared to CWA and Idaho surface water screening levels. Surface water sample results indicate the presence of ethylbenzene and toluene at concentrations that exceed the CWA screening criteria and benzene at a concentration that exceeds both screening criteria in the "Water-2" sample. The "River" sample did not exceed any of the screening criteria for any analytes for which it was analyzed.

On February 9, 2012, Geophysical Survey conducted a geophysical site investigation at the Hunt Oil property for Brown and Caldwell. The objectives of the investigation were to detect and delineate subsurface features including USTs. Two anomalies on the river side of the Clearwater County Road Maintenance Department building that were interpreted as USTs were noted. The size was estimated to be from 300 to 500 gallons each.

On February 9, 2012, Brown and Caldwell installed three monitoring wells (MW-1 through MW-3) on the Hunt Oil Property. The locations of the wells are depicted on Figure 3-1. Monitoring well MW-1 was installed in an area suspected of being hydrologically upgradient of the Hunt Oil facility. Monitoring well MW-2 was installed on the northwest corner of the property and MW-3 was installed on the northwest corner of AST secondary containment. The total depth of well MW-1 was 23 feet bgs, MW-2 was 18 feet bgs, and MW-3 was 18.5 feet bgs. Field headspace analysis was conducted at 2.5 foot bgs increments to the total depth of the monitoring well. Soil samples which exhibited the highest field screening values were submitted for off-site fixed laboratory analysis of gasoline range contaminants of concern (EPA Method 8260B) and PAHs (EPA Method 8270). Soil sample results are presented in Table 3-1. The monitoring wells were developed on February 10, 2012, and groundwater samples were collected for off-site fixed laboratory analysis for the same analyses as the soil samples. The soil samples were compared to EPA RALs, EPA RSLs, and IDTLs. None of the analytes exceeded any of the screening criteria for any of the analytes for which they were analyzed, with the exception of naphthalene, which exceeded the IDTL in the soil sample from MW-3. The groundwater sample results were compared to EPA Maximum Contaminant Levels (MCLs) and IDTLs. Sample results indicate that benzene, ethylbenzene, naphthalene, toluene, and xylenes were detected at concentrations which exceeded at least one screening level in MW-2, and benzene and naphthalene also exceeded screening levels in MW-3. No other analytes were detected above screening levels in any of the samples.

Quarterly groundwater monitoring began following well installation and development. The first round of groundwater samples were collected on April 12, 2012. In addition to the collection of a sample for laboratory analysis, the depth to groundwater and the amount of light nonaqueous phase liquid (LNAPL) in any monitoring well, if present, was measured. In monitoring wells MW-2 and MW-3, approximately 0.9 feet of LNAPL was observed in each, so no groundwater samples were collected from these wells. One groundwater sample from monitoring well MW-1 was collected and submitted to an off-site fixed laboratory for analysis of gasoline range contaminants of concern (EPA Method 8260B) and PAHs (EPA Method 8270). Groundwater sample results are presented in Table 3-3. No analytes were detected above the instrument detection limit in this sample. In addition, LNAPL samples were collected from monitoring wells MW-2 and MW-3 for analysis and forensic characterization, and samples of product were also collected from the fuel distribution system for comparative purposes. The samples were submitted to an off-site fixed laboratory for hydrocarbon fuel scan and paraffin, isoparaffin, aromatic, naphthene, and olfin (PIANO). The results of these samples are discussed in more detail in Section 5.

Based on depth to groundwater measurements collected during both sampling events, Brown and Caldwell developed a groundwater flow map. Data from the February sampling event indicated groundwater flow direction of west/northwest while depth to groundwater data collected from the April 2012 sampling event indicated groundwater flow direction to the south/southwest. Brown and Caldwell asserted that flow direction in February could have been impacted by the drilling method employed and the difference in the April flow direction could have been impacted by an increase in groundwater elevations due to increased flow in the Clearwater River.

Finally, weekly visits were made to the Hunt Oil facility to collect depth to groundwater and depth to product measurements, and Brown and Caldwell removed any product observed in the monitoring wells. It was estimated that 0.65 gallon of product had been removed from MW-2 and MW-3 from February 9, 2012 to April 27, 2012.

3.4 Clearwater County Excavation

As a result of information regarding former USTs at the Clearwater County Road Maintenance site, on April 12, 2012, two excavations were completed on the county maintenance property by Clearwater County employees to determine if petroleum contamination was present in the vicinity of three previously removed USTs; these locations were identified by a former Clearwater County Road Development employee. A western pit was excavated to 15 feet bgs, and during excavation activities, pit run fill was encountered. It was surmised that the fill indicated the previous presence of one of the two former 5,000-gallon USTs. No staining, odor, or other evidence of petroleum contamination was noted during the western excavation. An eastern excavation pit was completed to a depth of 10 feet bgs. No odor, staining, or other evidence of petroleum contamination was noted in the eastern excavation. At the completion of the excavation, the locations of the excavation pits were plotted on a map and it was determined that the eastern excavation may not have been properly placed. The Nez Perce Tribe Water Resources Division representative indicated that because the west pit was “clean” and, based on groundwater contours previously provided by Brown and Caldwell that indicated groundwater flow direction paralleled the Clearwater River, it was unlikely that any contamination from the east pit, if present, could result in contamination in the Clearwater River without first contaminating the location of the west pit. (Brackney 2012)

3.5 Initial EPA Sampling

On May 1, 2012, START mobilized to the seep location and Hunt Oil facility to collect groundwater, product, and surface water samples. The facility had been reopened since the closure upon finding the contamination at the seep; however, the date the facility was re-opened is not known. Samples were collected in accordance with an approved Site-Specific Sampling Plan (E & E 2012). A total of five samples (AS01PR, AS02PR, AS03PR, AS04PR, and MWPR02) were collected. Samples of product were planned to be collected from each of the Hunt Oil wells in which LNAPL was discovered. One product sample (MWPR02) was collected from monitoring well MW-2. Prior to sample collection, an oil-water interface probe was used to measure the depth from the top of the casing to groundwater. The sample was collected utilizing low flow volume sampling techniques with a peristaltic pump and dedicated Teflon-lined tubing. Water quality measurements using a Horiba U-10 water quality meter were collected every 3 minutes until the water quality parameters stabilized. The sample was then collected directly into the pre-cleaned sample containers. Each sample consisted of two jars due to shipping restrictions of product. Additionally, one sample each was collected from the following Hunt Oil product lines directly into pre-cleaned sample containers:

- AS01PR – Pump 1 Unleaded Gasoline;
- AS02PR – Pump 3 Dyed Diesel;
- AS03PR – Pump 4 Diesel; and
- AS04PR – Pump 5 Diesel.

A sample was not collected from MW-1 because no LNAPL was encountered. No sample was collected from MW-3 although LNAPL (less than 0.1 foot) was encountered, as there was not enough product volume to collect a sample. A sample was planned to be collected at the seep if there was evidence of material flowing into the river. The seep could not be located because of vegetation on the bank of the Clearwater River at the time of the sampling.

The samples were stored on ice and maintained under chain-of-custody. A copy of the laboratory sample check-in log is provided in Appendix B. All samples were submitted to the USCG MSL which is located in New London, Connecticut, for gas chromatography comparison to previously collected and submitted samples (those submitted by the Nez Perce Tribe Water Resources Division in March 2012) as well as product samples collected from the Hunt Oil facility. The samples were renumbered at the laboratory as follows (each jar was given a separate sample identifier):

- AS01PR – 12-141-1 and 12-141-6
- AS02PR – 12-141-2 and 12-141-7
- AS03PR – 12-141-3 and 12-141-8
- AS04PR – 12-141-4 and 12-141-9
- MWPR02 – 12-141-5 and 12-141-10.

According to the USCG MSL, the sample results indicate that sample MWPR02 contains very slightly weathered gasoline and is similar to the samples previously submitted. Sample AS01PR contains gasoline with characteristics similar to sample MWPR02. Samples AS02PR, AS03PR, and AS04PR contain light fuel oil with overall characteristics completely different from sample MWPR02 and the differences are not attributable to weathering. The USCG MSL concluded that sample AS01PR and sample MWPR02 are derived from a common source of petroleum, while samples AS02PR, AS03PR, and AS04PR are derived from a different source than MWPR02. The laboratory reports are provided in Appendix C.

3.6 Nez Perce Tribe Water Resources Division Additional Sampling

On July 23, 2012, a report of an oily sheen and red staining on the banks of the Clearwater River was received by the Nez Perce Tribe Water Resources Division. Representatives visited the site and determined that the sheen had a distinct characteristic of biota rather than petroleum; however, upon further inspection with shallow (6 to 12 inches bgs) shovel pits and monitoring with a PID, high VOC concentrations were noted. As a result, an additional five surface water samples were collected from the shovel pits, and the sample locations were chosen based on the highest PID readings. A total of three surface water samples (+30W, +20W, and +10W) were collected downstream of the seep and one surface water sample (-5E) was collected upstream of the seep. The same sample nomenclature was employed as those from the March 14th sampling event. The samples were submitted to an off-site fixed laboratory for analysis of VOCs using EPA Method 8260B and one sample (+30W, where a black oil was observed) was submitted for analysis for SVOCs using EPA Method 8270. Sample results are presented in Table 3-2 and were compared to CWA and Idaho surface water screening levels. The results indicate benzene at concentrations that exceed both screening criteria in all four of the surface water samples. Toluene was also detected at concentrations that exceeded the CWA threshold in all four samples, and ethylbenzene was detected at concentrations that exceeded the CWA screening criteria in one sample and both criteria in one sample. (Brackney 2012)

On July 24, 2012, an additional two surface water samples (River Trans +0 and River Trans +30W) were collected by the Nez Perce Tribe Water Resources Division representatives from the Clearwater River. Both samples were submitted to an off-site fixed laboratory for VOCs using EPA Method 8260B. The sample results are presented in Table 3-2 and were compared to CWA and Idaho surface water screening levels. The results indicate the presence of benzene at concentrations that exceed both screening criteria. (Brackney 2012)

3.7 Line Tightness Testing

On July 24 and 25, 2012, a line tightness test was conducted by CASSE. During this test, four lines (on-road diesel, and two off-road diesel [off-road #4 and off-road diesel], and north unleaded) passed the tightness test; however, two lines (south unleaded #5 and north unleaded #4) were not able to pass the tightness test on either July 24 or 25, 2012. The description of the lines is as follows: on-road diesel – 35-foot steel, off-road diesel # 4 – 35-foot steel, off-road diesel – 25-foot steel, north unleaded – 45-foot steel, south unleaded – 45-foot steel, and north unleaded – 45-foot steel. (CASSE 2012)

Following the failure of the line tightness test, the Hunt Oil facility was closed and the lines were excavated. A break in the line was discovered and that piece of pipe was removed and transported to Boise, Idaho. Additionally, at the time of the excavation of the leaking gasoline pipe, one of the diesel lines was noted to be wet by a representative of the Nez Perce Tribe Water Resources Division. It is not known if this wet line is a result of a diesel leak or from the unleaded fuel lines leak (Brackney 2012), and a release from this diesel line has not yet been confirmed; however, the presence of saturated soil around the diesel line may be indicative of previous diesel releases.

3.8 Additional Site Characterization

On September 12, 2012, Brown and Caldwell submitted an Additional Site Characterization Report (Brown and Caldwell 2012c). The report included a brief background description of the Hunt Oil Facility, a discussion of the installation and sampling of additional monitoring wells, the detection and removal of LNAPL from the monitoring wells, QA/QC, and a summary of the analytical results of samples collected from the monitoring wells.

On July 30 and 31, 2012, an additional three monitoring wells (MW-4 through MW-6) were installed in order to characterize groundwater quality downgradient of the facility and better determine groundwater flow direction. The wells were located between the Hunt Oil facility and the Clearwater River; the locations are depicted on Figure 3-1. The wells were installed in the access road between the Hunt Oil Facility and the Clearwater Count Road Maintenance shop. Monitoring wells MW-4 and MW-5 were installed on the east side of the sewer line that runs approximately in the center of the road and MW-6 was installed on the west side of the sewer. The total depth of wells MW-4 and MW-5 was 15.3 feet bgs and MW-6 was 15 feet. During the installation of the monitoring wells, field headspace analysis was conducted at 2.5 foot bgs increments to the total depth of the monitoring well. Soil samples which exhibited the highest field screening values were submitted for off-site fixed laboratory analysis of gasoline range contaminants of concern (EPA Method 8260B) and PAHs (EPA Method 8270). Soil sample results are presented in Table 3-1. Soil samples were compared to EPA RALs, EPA RSLs, and IDTLs. Sample results indicate the presence of benzene and total xylene at concentrations that exceeded at least one of the screening criteria in all three of the samples and ethylbenzene, naphthalene, and toluene at concentrations that exceeded at least one of the screening criteria in the sample collected from MW-4. Additionally, benzo(a)pyrene and dibenz(a,h) anthracene were detected above at least one screening level in the sample from MW-6. All three of the monitoring wells were developed on July 31, 2012. Groundwater samples were subsequently collected from all monitoring wells (MW-1 through MW-6) on August 3, 2012. The samples were submitted to an off-site fixed laboratory for gasoline range contaminants of concern (EPA Method 8260B), PAHs (EPA Method 8270) and ethylene dibromide (EPA Method 8011). Groundwater sample results are presented in Table 3-3. Sample results were compared to EPA MCLs and IDTLs. Sample results indicate the presence of benzene and naphthalene at concentrations that exceed both screening criteria in five of the six samples and ethylbenzene, toluene, and total xylenes at concentrations that exceed both screening criteria in four of the six samples. No other analytes were detected at concentrations that exceeded screening criteria in any of the samples. Only sample MW-1, which was collected from the designated background monitoring well, did not have any detections above the instrument detection limit.

Weekly monitoring of depth to groundwater and depth to product was conducted from April 2012 through May 18, 2012, and from June 29, 2012, through the publication of the additional characterization report. Product thickness in monitoring well MW-2 ranged from 0.01 feet on May 8, 2012 to 1.56 feet on April 19, 2012. Product thickness in monitoring well MW-3 ranged from 0.02 feet on May 11, 2012 to 0.95 feet on July 27, 2012. Product thickness in monitoring well MW-4 ranged from 0.12 feet on August 31, 2012 to 0.28 feet on September 7, 2012. Product was not encountered on any date from MW-1, MW-5, or MW-6. If encountered, LNAPL was removed from the well by hand bailing. Brown and Caldwell estimated that as of September 7, 2012, approximately 1 gallon of LNAPL had been removed from MW-2 and approximately 1.1 gallons had been removed from MW-3. Additionally, on August 31, 2012, 0.12 feet of LNAPL was encountered in the recently installed MW-4. No

LNAPL had been encountered in MW-1, MW-5, or MW-6. Finally, recharge tests were conducted for MW-2 and MW-3 in April 2012 and July 2012. Brown and Caldwell summarized that product thickness measurements had not shown any long-term trend since monitoring began, and the thickness of the product fluctuates generally from 0.1 to 0.2 feet and as much as 0.6 to 0.8 feet.

Brown and Caldwell concluded that the presence of product in MW-4 indicates that a contamination plume has migrated from the Hunt Oil facility; however, they contend that the data also indicates this contaminant plume has not reached the Clearwater River, and they conclude that the release of product from the Hunt Oil facility is not the source of the contamination at the seep.

3.9 Additional EPA Groundwater Sampling

On August 16, 2012, START again mobilized to the Hunt Oil facility. Samples were collected in accordance with the Sample Plan Alteration Form to the SSSP (E & E 2012). Samples were collected from all six of the monitoring wells at the Hunt Oil Facility (MW01GW through MW06GW). Prior to sample collection, an oil-water interface probe was used to measure the depth from the top of the casing to groundwater. The probe was also able to measure LNAPL levels. No measureable LNAPL was encountered in MW-1, MW-4, MW-5, or MW-6. Approximately 3 inches of LNAPL was encountered in MW-2 and approximately 1 inch of LNAPL was encountered in MW-3.

Groundwater samples were collected utilizing low-flow volume sampling techniques, using a peristaltic pump with dedicated Teflon-lined tubing. Water quality measurements using a Horiba U-10 water quality meter were collected every 3 minutes until the water quality parameters stabilized. The samples were collected from the dedicated tubing directly into pre-preserved pre-cleaned sample containers. The samples were placed on ice and stored in coolers under chain-of-custody. Chain-of-custody documentation is provided in Appendix B. The samples were submitted to an off-site fixed laboratory analysis of VOCs using EPA Method SW-846 8260. Additionally, one product sample was collected from MW-3 for submission to the USCG MSL for comparison to previously collected samples. The sample submitted to the USCG MSL was relabeled at the laboratory as 12-235-1 and 12-235-2.

Sample results from the USCG MSL indicate that the sample contains traces of petroleum hydrocarbons; however, the quantity was insufficient to identify the type of petroleum product for comparative analysis.

Sample results from the monitoring well samples are presented in Table 3-3. The sample results were compared to MCLs and IDTLs. Sample results indicate the presence of benzene at concentrations that exceed both screening criteria in all downgradient wells, 1,2,4-trimethylbenzene, ethylbenzene, naphthalene, toluene, and xylenes at concentrations that exceeded screening criteria in four of the six wells, and 1,3,5-trimethylbenzene at a concentrations that exceeded the screening criteria in three of the samples. Only sample MW01GW, which was collected from the designated background monitoring well, did not have any detections above the instrument detection limit.

3.10 EPA Unilateral Order

On November 19, 2012, EPA issued a Unilateral Administrative Order under provisions in the Resource Conservation and Recovery Act to Atkinson Distributing. Under this order, Atkinson Distributing was required to cleanup contamination associated with the release of fuel at the site. A statement of work (SOW) was included in the order which was based on a proposal of work presented by Brown and Caldwell on behalf of the PSTF. A modification to the SOW was prepared on December 5, 2012. The contaminated soil removal action was conducted as a result of this order under EPA oversight.

3.11 Contaminated Soil Removal

From December 12 through 21, 2012, Atkinson Distributing performed a cleanup action of contaminated soil associated with the release of petroleum hydrocarbons from the fuel line leak at the Hunt Oil facility as a result of the EPA Unilateral Order.

Prior to the removal action, monitoring wells MW-2, MW-3, and MW-4 were abandoned as they were in the footprint of the proposed excavation.

During the removal, approximately 2,280 cubic yards of contaminated soil was removed and transported off-site for disposal or land farming. The extent of the excavation is presented on Figure 3-2. Soil was removed using an excavator and buckets were screened using a PID. Soil was removed to the land farm if PID readings were greater than 50 ppm. Soil with PID readings less than 50 ppm were stockpiled on-site for use as backfill in the excavation prior to confirmation sampling to ensure contamination was not present in the soil. The extent of the excavation on the northeast wall was to “clean” soil as measured using the PID (i.e., less than 50 ppm). The extent of the excavation on the southeast wall was confined by the AST secondary containment pad. PID readings along this wall ranged from 39.0 to 250 ppm. The extent of the removal along the southwest wall was confined by the presence of the Clearwater County sewer pipe, for which Clearwater County required a 10-foot offset during excavation. At this southwest extent of excavation towards the sewer pipe (and the river), PID readings along this wall ranged from 31.0 to 2,900 ppm, with the highest readings encountered to the west end of the excavation wall (Figure 3-2). Additional excavation along this wall was also impacted by the presence of the sewer line as it gradually followed a northerly turn. Although the results along the northwest wall indicated that the extent of contaminated soil at that location had been reached, the extent of contamination to the east and west was not delineated because of physical barriers. Specifically, to the east, the extent of contamination was not delineated because of the presence of the tank farm and associated concrete containment walls. To the west and toward the river, the extent of contamination was not able to be determined because of the county sewer line.

Groundwater was encountered and infiltrated the excavation. Although no visible product was observed in the excavation, sheen was noted and sorbent pads were placed in the excavation at night while there was no site activity. The pads were removed each morning prior to work, and a strong odor was noted; however, it did not appear there was product on the pads. (Amec 2013)

Upon completion of excavation, soil samples were collected from approximately 20-foot intervals from the sidewalls near the base of the excavation. Samples were submitted to an off-site fixed laboratory for analysis of BTEX, methyl tert butyl ether, 1.2-dibromoethane, and 1.2-dichloroethane (EPA Method 8260B) and gasoline range organics (method NWTPH-Gx).

Sample results for BTEX and naphthalene and sample locations are presented in Figure 3-2. A total of 12 samples were collected. Sample results were compared to Idaho Department of Environmental Quality (IDEQ) Risk Evaluation Manual for Petroleum Releases, and the results indicate the presence of BTEX and naphthalene at concentrations that exceed screening criteria. These locations are notated on the figure with highlighted boxes. No other analytes were detected at concentrations that exceeded the screening criteria. (Amec 2013)

During backfill of the excavation, a chemical oxidation product was applied to the backfill material and groundwater. Material was mixed in the bucket of the excavator, spread over the backfill area, and aerated with water. The excavation was filled in lifts of approximately 48 feet long by 12 feet long by 2 feet deep using 2 inch rock. Approximately 400 gallons of water per lift was applied. On the final day of chemical oxidation application, the fire hose utilized in aeration had frozen and the excavator bucket was utilized to spread water that was present in the excavation over the product. (Amec 2013)

3.12 Post-Soil Removal Monitoring

Additional monitoring and sampling of the remaining monitoring wells (MW-1, MW-5, and MW-6) was conducted on February 7, 2013. Samples were submitted to an off-site fixed laboratory for analysis of gasoline range organics (Method NWTPH-Gx); BTEX and naphthalene (Method EPA 8260B); ion chromatography (Method EPA300.0/9056A); total iron (Method EPA 6010C); and total organic carbon, orthophosphate phosphorous and ammonia (method conventional chemistry parameters). Sample results are presented in Table 3-3, and the results indicate the presence of benzene, ethylbenzene, naphthalene, and toluene at concentrations that exceed screening criteria in both groundwater samples collected from the downgradient wells (MW-5 and MW-6). The results for benzene, naphthalene, and toluene appear consistent with previous sampling results; however, the results for ethylbenzene and total xylenes are slightly higher than previous sampling results.

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Table 3-1 Soil Samples Analytical Results Summary

Sample Location ID	RALs (µg/kg)		RSLs (µg/kg)			Hunt #1	Hunt #2	Hunt #3	Hunt Oil River	Soil-1	Soil-2	Soil-3	MW-1	MW-2	MW-3	MW-4 5-10	MW5 5-10	MW-6 5-10'
Sample Date	Residential		Residential	Industrial	IDTL	12/31/2012 µg/kg			1/6/2012	1/10/2012			17.5-20'	12.5-15' µg/kg 2/9/2012	10-12.5'	7/30/2012		
Sample Source	Soil	Worker Soil	Soil	Soil	(µg/kg)	Nez Perce Tribe				Brown and Caldwell								
Volatile Organic Compounds																		
Benzene	113000	626000	1100	5400	17.785284	**4470**	**5460**	**250**	NA	**40300**	**8570**	**1180**	ND	ND	ND	**6180**	**122**	**441**
Ethylbenzene	574000	3180000	5400	27000	10200	**46500**	**38400**	**1780**	NA	**123000**	**36600**	**1420**	ND	**71.6**	**131**	**24100**	**1650**	**858**
m,p-Xylene	1840000	8570000	630000	2700000	1665.700819	**255000**	**196000**	**6280**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	389000	2180000	3600	18000	1144	**8520**	**6780**	**900**	NA	**95900**	**24300**	**2980**	ND	**543**	**3500**	**3370**	**916**	**567**
o-Xylene	16300000	76100000	690000	3000000	1665.700819	**92200**	**71200**	**1830**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	35400000	155000000	5000000	45000000	4885.155634	**154000**	**141000**	**5520**	NA	**483000**	**129000**	**15300**	ND	**55.9**	ND	**90000**	**2480**	**2290**
Xylene (Total)	1840000	8570000	630000	2700000	1665.700819	NA	NA	NA	NA	**949000**	**323000**	**46800**	ND	**583**	**626**	**171000**	**11500**	**6810**
Semivolatile Organic Compounds																		
1-Methylnaphthalene	2200000	11000000	16000	53000		NA	NA	NA	**42200**	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	12500000	41000000	1200000	12000000	818.983494	NA	NA	NA	**2840**	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	3290000	13600000	230000	2200000	3310	NA	NA	NA	**80200**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	34900000	110000000	340000	33000000	52264.31779	NA	NA	NA	**970**	**913**	**719**	**228**	ND	ND	ND	ND	**57.1**	ND
Acenaphthylene	--	--	--	--	78017	NA	NA	NA	ND	**350**	**321**	ND	ND	ND	**113**	ND	**20.5**	**14.5**
Anthracene	175000000	550000000	17000000	170000000	1040118.81	NA	NA	NA	**350**	**737**	**440**	ND	ND	ND	**77.1**	ND	**35.1**	**19.5**
Benzo(a)anthracene	8980	143000	150	2100	421.68974	NA	NA	NA	**250**	**309**	**366**	ND	ND	ND	ND	ND	ND	**25.4**
Benzo(a)pyrene	1480	23400	15	210	42	NA	NA	NA	ND	**178**	**210**	ND	ND	ND	ND	ND	ND	**106**
Benzo(b)fluoranthene	8980	143000	150	2100	422	NA	NA	NA	ND	**284**	**445**	ND	ND	ND	ND	ND	ND	**61.7**
Benzo(g,h,i)perylene	--	--	--	--	1178	NA	NA	NA	**260**	**321**	**351**	ND	ND	ND	ND	ND	ND	**130**
Benzo(k)fluoranthene	8980	143000	1500	21000	4218	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	**32.6**
Bis(2-ethylhexyl)phthalate	3470000	13700000	35000	120000	11835.70888	NA	NA	NA	**1730**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	89800	1430000	15000	210000	33366.10739	NA	NA	NA	**280**	NA	NA	NA	NA	NA	NA	NA	NA	**34.8**
Dibenz(a,h)anthracene	2630	41700	15	210	42	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	**37.4**
Fluoranthene	23300000	73300000	2300000	22000000	363511.7258	NA	NA	NA	**640**	**924**	**1020**	**243**	ND	ND	**16.4**	ND	ND	**36.0**
Fluorene	23300000	73300000	2300000	22000000	54836.07871	NA	NA	NA	**1130**	**3450**	**2670**	**556**	ND	ND	**351**	**15.7**	**147**	**22.1**
Indeno(1,2,3-cd)pyrene	8980	143000	150	2100	422	NA	NA	NA	ND	ND	**178**	ND	ND	ND	ND	ND	ND	**91.9**
Naphthalene	389000	2180000	3600	18000	1144.003936	NA	NA	NA	**68900**	**64000**	**27200**	**1480**	ND	**51.5**	**2120**	**663**	**648**	**149**
Phenanthrene	--	--	--	--	79042.03191	NA	NA	NA	**3110**	**6620**	**5050**	**795**	ND	**13.6**	**1130**	**28.1**	**274**	**59.2**
Pyrene	17500000	55000000	1700000	17000000	4885.155634	NA	NA	NA	**820**	**1540**	**1390**	**376**	ND	ND	**35.2**	ND	**12.9**	**49.4**
Total Petroleum Hydrocarbons																		
Diesel	--	--	--	--	--	NA	NA	NA	**1040000**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil	--	--	--	--	--	NA	NA	NA	**113000**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hydrocarbon Identification																		
Diesel	--	--	--	--	--	NA	NA	NA	**1000000**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline	--	--	--	--	--	NA	NA	NA	**12000000**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lube Oil	--	--	--	--	--	NA	NA	NA	**100000**	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: Bold type indicates the sample result is above the instrument detection limit.
Highlight type indicates the sample result is above at least one of the screening value criteria.
Only those analytes and analysis in which there were detections above the instrument detection limit are included in this table.

Key:
-- = Not applicable.
µg/kg = micrograms per kilogram.
IDTL = Idaho Default Target Level.
mg/kg = milligrams per kilogram.
NA = Not analyzed.
ND = Not detected.
RAL = Removal Action Level.
RSL = Removal Screening Level.

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Table 3-2 Surface Water Samples Analytical Results Summary

Sample Location ID			Bubble	Hunt Oil	7W	5W	3W	1W	1E	3E	5E	7E	9E	11E	+30W	+20W	+10W	+5E	River Trans +0	River Trans +30W	River	Water-2
Sample Date			1/5/12	1/23/12	3/15/12										7/23/12				7/24/12		1/10/12	
Sample Source	CWA[1]	IDEQ[2]	Nez Perce Tribe																		Brown and Caldwell	
Volatile Organic Compounds (µg/L)																						
1,2,4-Trichlorobenzene				NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**2510**	ND	ND	NA	NA
1,2,4-Trimethylbenzene	--	--	**1620**	NA	**4900**	**2090**	**2660**	**9820**	**2790**	**7930**	**5570**	**2680**	**808**	**342**	ND	**5270**	**20200**	ND	**56.3**	**29.4**	NA	NA
1,3,5-Trimethylbenzene	--	--	**434**	NA	**1640**	**827**	**978**	**3830**	**1150**	**2850**	**2240**	**951**	**346**	**201**	ND	**1870**	**7170**	**840**	**18.4**	**7.83**	NA	NA
Benzene	51	51	**20200**	**174**	**9430**	**15100**	**20800**	**11200**	**11000**	**7190**	**2790**	**7360**	**2250**	**1470**	**12800**	**16300**	**10300**	**14000**	**263**	**185**	ND	**19400**
Ethylbenzene	2100	2100	**1970**	**22.7**	**1170**	**1100**	**1660**	**2710**	**1200**	**3190**	**1850**	**1540**	**320**	**72.9**	**ND**	**2890**	**5320**	**2090**	**61.7**	**46.8**	ND	**2700**
Isopropylbenzene	--	--	ND	NA	**190**	ND	**123**	**795**	**135**	ND	ND	**175**	ND	**12.1**	ND	ND	ND	ND	ND	ND	NA	NA
m,p-Xylene	--	--	**9800**	**152**	**15500**	**12600**	**14400**	**19700**	**12100**	**17600**	**11000**	**14100**	**3830**	**783**	**9670**	**19200**	**32000**	**12600**	**407**	**296**		NA
Methyl ethyl ketone	--	--	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**8.88**	NA	NA
n-Propylbenzene	--	--	**152**		ND	ND	ND	ND	ND	**750**	ND	ND	**30.6**	ND	ND	ND	ND	ND	ND	ND	NA	NA
Naphthalene	--	--	**407**	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**3.16**	**3.95**	ND	**574**
o-Xylene	--	--	**4040**	**69.8**	**7360**	**5910**	**6400**	**8270**	**5950**	**7570**	**4500**	**6260**	**1920**	**361**	**4070**	**7780**	**11300**	**5470**	**173**	**133**		NA
tert-Butylbenzene	--	--	ND	NA	ND	ND	ND	**2270**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Toluene	15000	15000	**33800**	**438**	**22800**	**27500**	**38600**	**24000**	**26900**	**25300**	**9400**	**29200**	**5550**	**1650**	**20700**	**24500**	**35400**	**40300**	**863**	**762**	ND	**42600**
Xylene (total)	--	--	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	ND	**18900**

Source: Brackney 2012

Note: Bold type indicates the sample result is above the instrument detection limit.
Highlighted type indicates the sample result exceeds at least one of the screening criteria.
Only those analytes and analysis in which there were detections above the instrument detection limit are included in this table.

1 National Recommended Water Quality Criteria as determined by the Clean Water Act, Human Health Criteria – Organisms only.

2 Idaho Risk Evaluation Manual for Petroleum Releases - Surface Water Toxics Criteria for Petroleum Chemicals of Interest – Organisms only.

Key:
µg/L = micrograms per liter.
CWA = Clean Water Act.
IDEQ = Idaho Department of Environmental Quality.
NA = Not applicable.
ND = Not detected.

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Table 3-3 Groundwater Samples Analytical Results Summary

Sample Number																					
Location ID	MCL	IDTL	MW-1	MW-2	MW-3	MW-1	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	12072001 MW01GW	12072002 MW02GW	12072003 MW03GW	12072004 MW04GW	12072005 MW05GW	12072006 MW06GW	MW-1	MW-5	MW-6
Sample Date			2/10/2012			4/12/2012	8/3/2012						8/16/2012						2/7/2013		
Sample Source			Brown and Caldwell										EPA						Amec		
Volatile Organic Compounds (µg/L)																					
1,2,4-Trimethylbenzene	--	439	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	**1500**	10 U	**1100**	**1600**	**1600**	NA	NA	NA
1,3,5-Trimethylbenzene	--	304	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	**410**	10 U	**300**	**380**	**400**	NA	NA	NA
4-Isopropyltoluene	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	200 U	**11**	200 U	200 U	200 U	NA	NA	NA
Benzene	5	5	**3.9**	**22800**	**338**	ND	ND	**11400**	**1400**	**25500**	**13800**	**15800**	0.5 U	**18000**	**1500**	**35000**	**25000**	**21000**	ND	**17900**	**25400**
Ethylbenzene	700	700	**8.4**	**2380**	**94.1**	ND	ND	**1910**	**130**	**2510**	**1730**	**2280**	0.5 U	**2500**	**150**	**2100**	**2400**	**2800**	ND	**2290**	**2280**
Isopropylbenzene	--	1042.857143	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	200 U	**36**	200 U	200 U	200 U	NA	NA	NA
m,p-Xylenes	10000	4340	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	**11000**	**550**	**10000**	**10000**	**12000**	NA	NA	NA
Naphthalene	--	209	**5.9**	**452**	**278**	ND	ND	**594**	**269**	**214**	**271**	**345**	2 U	**210**	**270**	200 U	**330**	**250**	ND	**215**	**209**
n-Butylbenzene	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	200 U	**13**	200 U	200 U	200 U	NA	NA	NA
n-Propylbenzene	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	200 U	**70**	200 U	200 U	200 U	NA	NA	NA
o-Xylene	10000	4340	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	**4600**	**10**	**4200**	**4300**	**5000**	NA	NA	NA
sec-Butylbenzene	--	104.2857143	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	200 U	**14**	200 U	200 U	200 U	NA	NA	NA
Toluene	1000	1000	ND	**29300**	**17.7**	ND	ND	**35300**	**153**	**45900**	**20100**	**26400**	0.5 U	**41000**	**220**	**50000**	**41000**	**41000**	ND	**39100**	**38000**
Xylene (Total)	10000	4340	ND	**12900**	**289**	ND	ND	**12200**	**466**	**17800**	**11000**	**15700**	NR	NR	NR	NR	NR	NR	ND	**12800**	**14000**
Polynuclear Aromatic Hydrocarbons (µg/L)																					
Acenaphthene	--	626	**0.23**	**0.63 J**	**4.2**	ND	ND	**0.057**	**3.6**	**0.17**	**1.1**	**0.32**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	--	626	**0.046**	ND	**0.79**	ND	ND	ND	**0.74**	ND	**0.21**	**0.071**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	--	3128	ND	ND	**0.29**	ND	ND	ND	ND	**0.06**	**0.087**	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	--	417	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	--	417	**0.32**	ND	**6.5**	ND	ND	**0.11**	**5.9**	**0.34**	**1.9**	**0.57**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	209	**3.8**	**228 J**	**173**	ND	ND	**92.6**	**166**	**162**	**175**	**159**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	--	313	**0.22**	**0.54 J**	**3.6**	ND	ND	**0.10**	**4.3**	**0.35**	**1.2**	**0.43**	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	--	313	ND	ND	**0.060**	ND	ND	ND	ND	**0.046**	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gasoline Range Hydrocarbons (mg/L)																					
Gasoline Range Organics	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	**166**	**187**
Anions (mg/L)																					
Nitrate-Nitrogen	--	10000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**7.21**	ND	ND
Sulfate	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**25.1**	**175**	**228**
Total Metals (mg/L)																					
Iron	300	3128	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	**11.2**	**31.5**
Conventional Chemistry Parameters (mg/L)																					
Total Organic Carbon	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	**20.9**	**92.7**
Orthophosphate Phosphorous	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**9.60**	**0.061**
Ammonia as N	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.342**	**0.336**

Note: Bold type indicates the sample result is above the instrument detection limit.
Highlight type indicates the sample result is above at least one of the screening value criteria.
Only those analytes and analysis in which there were detections above the instrument detection limit are included in this table.

Key:

-- = Not applicable.
µg/L = micrograms per liter.
ID = Identificaiton
IDTL = Idaho Default Target Value.
MCL = Maximum Contaminant Level.
NA = Not Analyzed.
ND = Not detected.
U = The analyte was analyzed for but was not detected above the reported sample quantitation limit.

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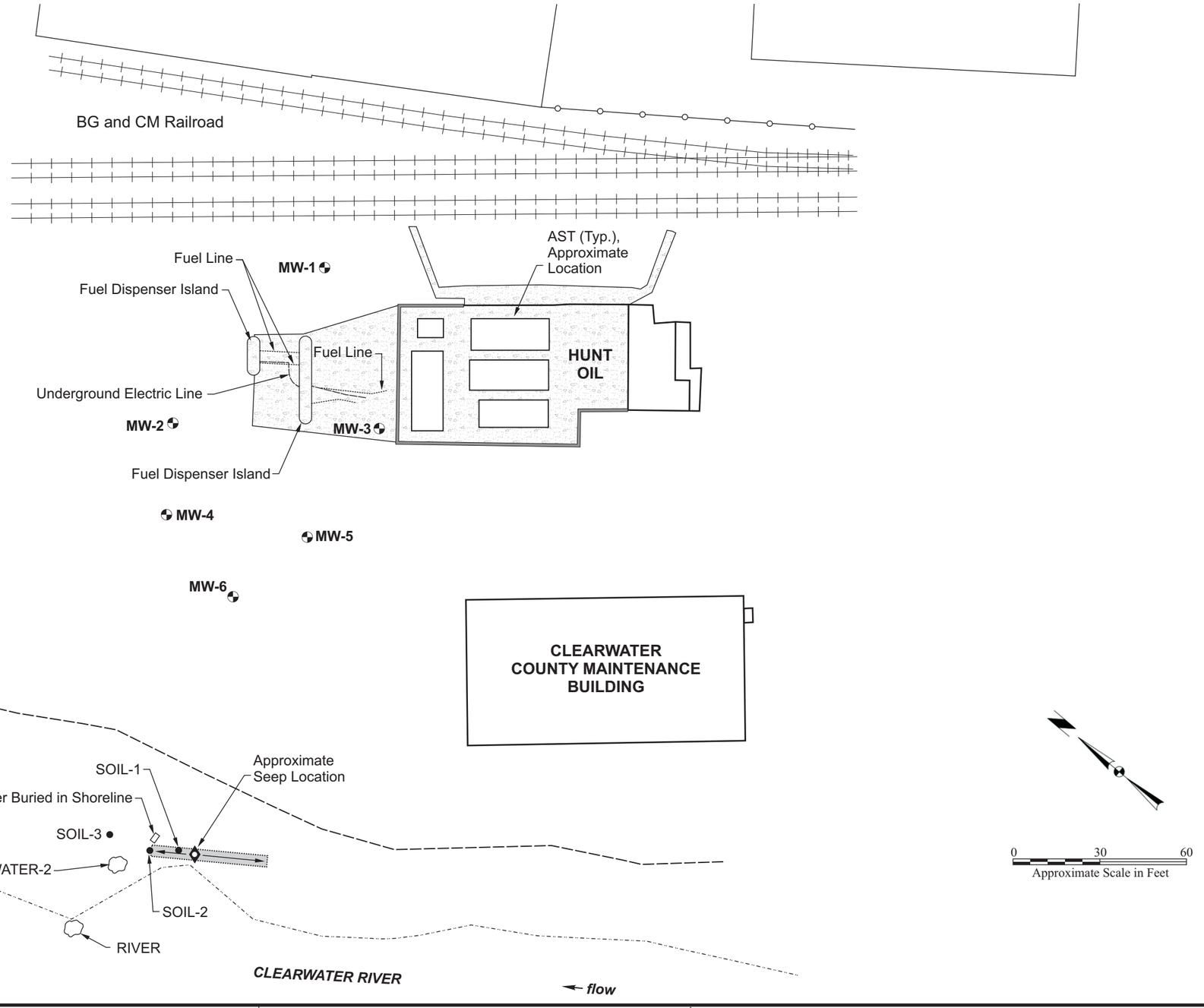
LEGEND

- MW ◔ Monitoring Well
- ● or ⬠ GPS Sampling Points or Areas
- ▭ Concrete



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Seattle, Washington

Source: Brown and Caldwell, 2012a and 2012b.

CLEARWATER RIVER – OROFINO OIL SEEP
Orofino, Idaho

Figure 3-1
BROWN AND CALDWELL SAMPLE LOCATIONS

Date:	Drawn by:	
3/1/13	AES	10:START-3\12020005\fig 3-1

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LEGEND:

- NORTH-2 ● SAMPLE LOCATION
- MW-2 ⊗ MONITORING WELL
- EXCAVATION LIMIT
- ASPHALT
- CONCRETE
- E — ELECTRIC (OVERHEAD)
- S — SEWER
- W — WATER
- GRAVEL
- PROPERTY LINE
- RAILROAD TRACK
- RETAINING WALL
- STRUCTURE
- UTILITY POLE

0' 10' 20' 30'

1" = 20'

BG & CM RAILROAD

MW-1

NORTH-3					
DEPTH (FT.)	B	T	E	X	N
17	**0.438**	**1.83**	**0.370**	**2.41**	**0.134**
head space = 2265 ppm					

NORTH-3

NORTH-4					
DEPTH (FT.)	B	T	E	X	N
18	**0.707 J**	**1.34 J**	**0.114 J**	**0.570 J**	<0.155
head space = 11.7 ppm					

NORTH-4

NORTH-2					
DEPTH (FT.)	B	T	E	X	N
17	**0.0715**	**0.251**	<0.0400	**0.192**	<0.160
head space = 2035 ppm					

NORTH-2

EAST-2					
DEPTH (FT.)	B	T	E	X	N
17	<0.00846	<0.0338	<0.0169	<0.0507	<0.0677
head space = 250 ppm					

EAST-2

FORMER DISPENSER ISLANDS

ABOVEGROUND STORAGE TANKS

OFFICE

NORTH-1

NORTH-1					
DEPTH (FT.)	B	T	E	X	N
17	**0.0357**	**0.0953**	<0.0331	<0.0331	<0.132
head space = 36.0 ppm					

MW-2 (ABANDONED)

MW-3 (ABANDONED)

EAST-1					
DEPTH (FT.)	B	T	E	X	N
16	**0.0587**	**1.65**	**0.859**	**5.28**	**0.494 J**
head space = 39.0 ppm					

EAST-1

WEST-1					
DEPTH (FT.)	B	T	E	X	N
16	**3.91**	**115**	**80.1**	**543**	**15.0**
head space = 1700 ppm					

WEST-1

FORMER BACKFILLED TRENCH

SOUTH-1

SOUTH-5					
DEPTH (FT.)	B	T	E	X	N
17	**9.09**	**123**	**25.8**	**191**	**3.09**
head space = 2900 ppm					

SOUTH-5

RIVERFRONT ROAD

SOUTH-4

SOUTH-3

SOUTH-2

MW-4 (ABANDONED)

MW-5

MW-6

SOUTH-1					
DEPTH (FT.)	B	T	E	X	N
17	**0.0322**	<0.0670	<0.0335	<0.0335	<0.134
head space = 31.0 ppm					

SOUTH-2					
DEPTH (FT.)	B	T	E	X	N
17	**2.20**	**36.9**	**18.3**	**134**	**7.58**
head space = 1678 ppm					

SOUTH-4					
DEPTH (FT.)	B	T	E	X	N
17	**4.02**	**31.5**	**4.42**	**22.1**	**0.611**
head space = 450 ppm					

SOUTH-3					
DEPTH (FT.)	B	T	E	X	N
17	**0.132**	**2.22**	**0.390**	**2.62**	<0.120
head space = 1853 ppm					

CLEARWATER COUNTY BUILDING

NOTE: BASE MAP OBTAINED FROM BROWN & CALDWELL, L12-001_Bmap.dwg, 01/25/2012.
ADDITIONAL FEATURES OBTAINED FROM BROWN & CALDWELL, Site_Map.dwg, 09/12/2012.

B = BENZENE
T = TOLUENE
E = ETHYLBENZENE
X = XYLENE
N = NAPTHALENE
= EXCEEDS SCREENING LEVEL, TABLE 2, IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY, RISK EVALUATION, MANUAL FOR PETROLEUM RELEASES, AUGUST 2012, PROTECTION TO GROUNDWATER.
BOLD = ANALYTE IS DETECTED ABOVE METHOD REPORTING LIMIT.
ALL RESULTS ARE IN MICROGRAMS PER KILOGRAM.

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Seattle, Washington

Source: AMEC, 2013.

CLEARWATER RIVER – OROFINO OIL SEEP
Orofino, Idaho

Figure 3-2
CONTAMINATED SOIL REMOVAL AREA, SAMPLE LOCATIONS, AND SAMPLE RESULTS

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4 CONCEPTUAL SITE MODEL

This section presents a conceptual site model for the seep and its potential sources.

Information on the nature and extent of the site contamination, impacted media, and potential sources of the contamination at the seep is presented in Sections 2 through 4. This section provides further discussion of the data presented above and presents additional information gathered and evaluated for the purpose of attempting to identify the source and migration of the contamination at the seep.

Information on the physical characteristics of the site and surrounding area, including geology, ground surface conditions, locations of buildings/structures, and locations of underground utilities, and approximate locations of ASTs and USTs, is provided by Brown and Caldwell (2012a, 2012b).

4.1 Nature and Extent of Seep Contamination

The petroleum seep comprises petroleum-contaminated groundwater and LNAPL emerging from subsurface soil along the bank of the Clearwater River. The approximate extent of the contamination at the site has been delineated by soil/sediment and water sampling and air vapor field screening performed by EPA, Nez Perce Tribe Water Resources Division, and Brown and Caldwell personnel (summarized in Sections 3 and 4). Collectively, the sample and field screening results indicate that a continuous zone up to greater than 65 feet wide exhibited gross contamination and/or elevated concentrations of gasoline constituents, including BTEX and naphthalene. Other constituents also are present.

Observations of sheen at the seep have been reported on the following dates (Brackney 2012, 2013):

12/30/2011
12/31/2011
1/5/2012
1/6/2012
1/23/2012
3/14/2012
3/15/2012
7/23/2012
7/24/2012
8/16/2012
8/29/2012
9/5/2012
9/18/2012
9/21/2012
9/26/2012
9/27/2012

10/26/2012
12/17/12
12/28/12
2/14/13
2/21/13
2/26/13

These dates generally occurred during periods of relatively low Clearwater River gage elevation. An attempt by the START to locate the seep on May 1, 2012, was not successful. Groundwater flow is discussed further below.

4.2 Potential Sources

Possible point sources of gasoline and other petroleum contamination to the subsurface were investigated, as discussed in Section 2.4. Of these potential sources identified, only the Hunt Oil site has been documented to have a recent release of gasoline range hydrocarbons to subsurface soil. No other potential sources identified to date appear likely to be the source of a recent gasoline release.

4.3 Release Mechanism

Gasoline was released to the subsurface as a result of failed underground fuel lines at the Hunt Oil facility (see Section 3.7). Other releases of gasoline, diesel, or other petroleum hydrocarbons may have occurred at the Hunt Oil facility or near the river bank seep location, which may explain the presence of other petroleum hydrocarbons beyond the confirmed gasoline release (see Section 4.4).

On behalf of Atkinson Distributing, Brown and Caldwell (2012b) had previously reported that the active product lines had passed tightness testing in January 2012 and the inactive gasoline line had passed tightness testing in February 2012. Based on the information presented in the January tightness test, it does not appear that any 45-foot steel lines were tested. It is not known if these 45-foot lines were leaking in January as it does not appear they were tested.

4.4 Forensic Evaluation

Selected samples of various media have been submitted for a variety of laboratory analyses for the purpose of identifying the type of hydrocarbon material present and/or evaluating whether hydrocarbon materials in different samples could be related. Results are summarized below.

4.4.1 Nez Perce Tribe Water Resources Division Investigations

On January 5, 2012, a sediment sample was collected from the Clearwater River near the seep location. The sample was submitted for Method WATPH-HCID analysis. Results indicated the presence of gasoline (12,000 mg/kg), diesel (1,000 mg/kg), and lube oil (100 mg/kg; Brackney 2012).

On March 15, 2012, one sample of surface water with sheen from five feet east of the seep (jars were labeled as 12-125-1 and 12-125-2 at the USCG MSL) were collected and submitted to USCG MSL for gas chromatography analysis. The results were reported to indicate that the two samples contained gasoline and a small amount of non-petroleum contamination. The gasoline appeared to be “only slightly weathered” (see report in Appendix A).

4.4.2 Hunt Oil Investigations

On April 12, 2012, samples of LNAPL from wells MW-2 and MW-3 and product samples of gasoline, clear diesel, and dyed diesel were collected by Brown and Caldwell and submitted to Friedman and Bruya, Inc. for specific gravity and forensic evaluation using a gas chromatography (GC) / flame ionization detector (FID). Results are presented in a report by Friedman and Bruya, Inc. (May 3, 2012). The samples also were analyzed for the PIANO analytes. Results are presented in a separate report by Friedman and Bruya, Inc. (May 22, 2012). Results are presented below.

4.4.2.1 Sample MW-2

The Friedman and Bruya, Inc. (May 3, 2012) report states:

> "The GC trace using the flame ionization detector (FID) showed the presence of low boiling compounds. The patterns displayed by these peaks are indicative of gasoline."
>
> "The low boiling compounds appear as a ragged pattern of peaks eluting from n-C7 to n-C13 showing a maximum near n-C8. This correlates with a temperature range of approximately 100°C to 240°C with a maximum near 130°C."
>
> "Within this range, the GC/FID trace showed the presence of peaks, at varying levels, that are indicative of toluene, ethylbenzene, the xylenes, C3-benzenes, and methylnaphthalenes. These compounds are characteristic of the constituents commonly found in gasoline. The relative abundance of the volatile and semivolatile constituents present indicates that substantial degradation has not occurred to the fuel."

4.4.2.2 Sample MW-3

The Friedman and Bruya, Inc. (May 3, 2012) report states:

> "The GC trace using the flame ionization detector (FID) showed the presence of low and medium boiling compounds. The majority of material present in this sample is indicative of a middle distillate such as diesel fuel No. 2 or heating oil."
>
> "The medium boiling compounds appear as an irregular pattern of peaks on top of a broad hump or unresolved complex mixture (UCM). This material elutes from n-C8 to n-C24 showing a maximum near n-C15. This correlates with a temperature range of approximately 130°C to 390°C with a maximum near 270°C. Within this range, the dominant peaks present are indicative of isoprenoids including norpristane, pristane, and phytane. A discernible pattern of peaks characteristic of the normal alkanes was not present. The abundance of isoprenoids in conjunction with the apparent absence of normal alkanes indicates that the fuel present has undergone substantial biological degradation."
>
> "It should be noted that peaks are present eluting before n-C8 on the GC/FID trace. The presence of these peaks indicates that a low boiling material may also be present in this sample."

Friedman and Bruya, Inc. (June 5, 2012) provided a report summarizing the comparison of material from the MW-2 sample and the Unleaded sample submitted previously. Analysis consisted of analyzing for PIANO constituents using a GC/FID.

> "In order to provide a comparison of the gasoline present in these samples, the ratios of various compounds were evaluated in each of the samples using the PIANO data. These ratios can be used to distinguish different gasolines. Although evaluation of some of these ratios, such as 1,3,5 -trimethylbenzene to 1,2,4-trimethylbenzene, and 1- methyl-3 ethylbenzene to (1-methyl 3-ethylbenzene + 1,2,4-trimethylbenzene) showed some similarities, comparison of the ratio of isooctane to methylcyclohexane shows that this ratio was 1.6 for the sample MW-2 and 3.5 for the sample Unleaded. Based on the level of weathering seen in these samples, the difference in this ratio is not likely due solely to weathering. This comparison indicates that the gasoline present in the sample MW-2 is not impacted solely by the batch of fuel present in the reference sample Unleaded."

4.4.3 EPA Investigations

On May 1, 2012, START collected a sample of LNAPL from monitoring well MW-2 (MWPR02) and product samples of product from Hunt Oil dispensers:

- AS01PR – Pump 1 Unleaded Gasoline;
- AS02PR – Pump 3 Dyed Diesel;
- AS03PR – Pump 4 Diesel; and
- AS04PR – Pump 5 Diesel.

Samples were submitted to the USCG MSL for gas chromatography analysis and gas chromatography/mass spectrometry analysis. In addition, the results were compared to surface water sample 12-125-1/12-125-2 previously collected by the Nez Perce Tribe Water Resources Division on March 15, 2012.

The MSL concluded that the sample from the gasoline tank matched the LNAPL present in MW-2. It was concluded that LNAPL sample MWPR02 contained "very slightly weathered gasoline." When compared to dispenser sample AS01PR, the results indicated that product sample AS01PR "contains gasoline with characteristics similar" to LNAPL sample MWPR02, and that minor differences between the samples are attributable to weathering. These data reports are presented in Appendix C.

Results of the comparison of sample MWPR02 and surface water with sheen sample 12-125-1/12-125-2 indicate that sample 12-125-1/12-125-2 "appear similar" to sample MWPR02. It was noted that not all differences between product sample 12-125-1/12-125-2 and LNAPL sample MWPR02 are conclusively attributable to weathering based on the analysis conducted.

These results indicate that the contamination in the seep, while impacted by the release from the Hunt Oil facility, may have also been impacted by other hydrocarbon sources (i.e., perhaps other gasoline or diesel releases from the nearby Hunt Oil facility and/or other nearby sources).

Samples AS02PR, AS03PR, and AS04PR were reported to contain light fuel oil with overall characteristics completely different from sample MWPR02. The differences were reported to not be attributable to weathering.

On August 16, 2012, one LNAPL sample (labeled at the laboratory as jars 12-235-1 and 12-235-2) was collected from well MW-3 for submission to the USCG MSL for gas chromatography analysis for the purpose of comparison to previously collected samples. There was not enough material in the sample to conduct a forensic analysis. However, the groundwater sample collected from this well contained concentrations of petroleum constituents.

Results were reported to indicate that MW03 LNAPL sample 12-235-1/12-235-2 contain traces of petroleum hydrocarbons; however, the quantity of material was insufficient to identify the type of petroleum product or to compare it to sample 12-125-1/12-125-2.

4.5 Migration Pathways and Transport Mechanisms

Available groundwater chemistry and elevation data were evaluated in order to assess possible migration of petroleum hydrocarbons released from the Hunt Oil facility and/or other possible sources contamination at the seep.

Groundwater occurs in the vicinity of the seep and the Hunt Oil facility as an unconfined aquifer. Petroleum released to the subsurface at the Hunt Oil facility has migrated to groundwater. LNAPL has been observed in several monitoring wells installed by Brown and Caldwell at and near the Hunt Oil facility. LNAPL has been reported in monitoring wells MW-2, MW-3, and MW-4. Petroleum hydrocarbon constituents, including gasoline constituents, have been detected in groundwater samples collected from these monitoring wells. Although LNAPL has not been reported in downgradient wells MW-5 and MW-6, concentrations of BTEX and naphthalene in groundwater samples from these wells are similar to those in samples collected from monitoring wells MW-2, MW-3, and MW-4, in which LNAPL has been reported, which are likely near saturation for gasoline compounds. Detailed information on sampling and analysis of these samples is summarized in Sections 3 and 4. Information on forensic evaluation of the petroleum materials is summarized below.

Groundwater elevation and LNAPL data were provided by Brown and Caldwell (2012b, 2012c). Groundwater depths measured to date at the Hunt Oil facility range from approximately 5 to 15 feet bgs. Measured thickness of LNAPL in monitoring wells has ranged up to greater than 1.5 feet in well MW-2. Measured depth information and calculated groundwater elevation data and LNAPL thickness data are summarized in Table 4-1. Apparent groundwater flow directions and gradient in the area of monitoring wells MW-1, MW-2, and MW-3, located in the immediate vicinity of the Hunt Oil facility product dispensers, were calculated for each monitoring event using a mathematical three-point problem solver. Calculated apparent groundwater flow directions and gradients are presented in Table 4-2. Groundwater elevations for each monitoring event are presented graphically in Figure 4-1. Measured LNAPL thickness observed during the monitoring events are presented graphically in Figure 4-2.

Apparent groundwater flow direction and gradient in the vicinity of the Hunt Oil facility have exhibited considerable variation over the period of monitoring conducted to date. For most of the monitoring dates on which well monitoring is reported, the apparent groundwater flow direction is generally westward toward the Clearwater River and the seep location at a gradient of

approximately 0.008 to 0.009 feet per feet in the vicinity of monitoring wells MW-1, MW-2, and MW-3. Based on available data, such generally westward flow is prevalent during periods of comparatively low water table elevations. During periods of comparatively higher water table elevations, apparent groundwater flow direction varies from general southward to north-northeastward, and calculated groundwater gradients in the vicinity of monitoring wells MW-1, MW-2, and MW-3 range widely from 0.002 to 0.045 feet per feet (Table 4-2 and Figures 4-1 and 4-2). Apparent groundwater flow direction was north-northwestward on May 1, May 18, and July 6, 2012, and north-northeastward on July 18, 2012. Based on the non-detects of petroleum constituents in samples collected from monitoring well MW-1 on August 3, 2012, by Brown and Caldwell (2012c) and on August 16, 2012, by START, it does not appear likely that groundwater flow was toward the north-northeast for a significant period of time, if at all.

The reason(s) for such variation in apparent groundwater flow direction and gradient are not obvious. Possible explanations for variability of apparent groundwater flow direction may include one or more of the following:

1) Change in Clearwater River elevation near the seep:
   To assess possible effects of Clearwater River elevation on groundwater elevations in the vicinity of the seep and Hunt Oil facility, Clearwater River gage height data was obtained for the United States Geological Survey (USGS) stream gaging station 13340000 – Clearwater River at Orofino, Idaho, which is located approximately 56 feet upstream of the Michigan Avenue bridge and approximately 700 feet upstream of the seep. Published hourly gage height data were obtained online (USGS 2012) and provisional data was obtained via personal communication (Dickinson 2012). Average daily gage height values were calculated and plotted (Figure 4-3). River elevation data in the immediate vicinity of the seep is limited. The average elevation of the Clearwater River in the vicinity of the seep was surveyed on February 10, 2012, by TD&H Engineering under contract to Brown and Caldwell. The average elevation of the river was reported to be 976.23 feet at the time of the survey. The vertical datum for the elevation survey is not specified (Brown and Caldwell 2012b). On February 10, 2012, the gage height at USGS gaging station 13340000 was 994.11 feet above National Geodetic Vertical Datum 1929. The difference between these elevation values is 17.88 feet. In an attempt to approximate the Clearwater River elevation in the vicinity of the seep over the period of interest, the Clearwater River USGS gaging station data were “normalized” by subtracting 17.88 feet from the daily average gage height values. It should be noted that resulting estimated river elevation values are only approximate because the river channel morphology at the seep is different from that at the gaging station. Nonetheless, the resulting approximate river elevation values for the seep area are considered useful for assessing possible effects of changing river elevation on groundwater elevation. Based on historical satellite images viewed on Google Earth dated 8/19/2009, 9/11/2006, 9/26/2004, 7/24/2003, 6/29/1998, 9/2/1993, and 5/24/1992, the width of the Clearwater River at the seep location is wider than at the gaging station location. As such, it is likely that increases in river elevation for a given increase in discharge rate are somewhat less at the seep location than at the gaging station location.

   Approximate Clearwater River elevation and groundwater elevation data are illustrated in Figure 4-4. For most of the period evaluated, the approximate Clearwater River elevation is well below the groundwater elevations observed in monitoring wells installed at the Hunt Oil facility. This is consistent with a generally westward (i.e., toward the

Clearwater River and the seep location) groundwater flow direction observed in the monitoring wells. The Clearwater River gage height peaks for several days on several occasions during the period of relatively high groundwater elevation measurements. On two such occasions, on April 27 and May 18, 2012, the approximate river elevation near the site approaches the groundwater elevations in the monitoring wells for one or two days (Figure 4-4). However, the measured groundwater elevations on those dates are nonetheless below the estimated river elevation in the vicinity of the seep. Furthermore, on April 27, 2012, the apparent groundwater flow direction is toward the south-southwest, generally toward the river. Based on these observations, the apparent groundwater flow direction on April 27 and May 18, 2012, does not appear to indicate a reversal of groundwater flow direction in the vicinity of the monitoring wells due to increases in the Clearwater River elevation.

These observations, in conjunction with the generally northward apparent groundwater flow direction observed on July 6 and July 18, 2012, during which time the groundwater elevation is well above the nearby river elevation, suggests that other factors may be responsible for the apparent variability in groundwater flow direction in the area of the monitoring wells. Two such possible factors are discussed below.

2) Variations in LNAPL thickness:
Reported thickness of LNAPL in monitoring wells exhibited significant variability over the period of monitoring (Table 4-1 and Figure 4-2). The reasons for such variation are not known, but could include a combination of irregular influx of product or migration of LNAPL away from the monitoring wells. Such irregularities could cause irregular mounding of LNAPL and irregularities in calculated LNAPL-adjusted groundwater elevations.

3) Effects of possible preferential groundwater flow pathways:
A sewer line trends generally southeastward across the area between the Hunt Oil monitoring wells and the seep. The surveyed invert elevation at a location near monitoring well MW-5 is 983.14 feet. This elevation is well below the groundwater elevation in this area for part of the period of monitoring (Figure 4-4). The sewer line and other possible utility corridors could result in preferential flow pathways of groundwater and LNAPL during periods when the corridor is submerged below the water table. Further, it is possible that the sewer line and other utility corridors could be a source of water via exfiltration. Such potential impacts could affect measured groundwater depths and LNAPL thicknesses, and possibly explain variations in groundwater flow direction and LNAPL thickness.

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Table 4-1 Monitoring Well Groundwater and LNAPL Information

Monitoring Well	TOC Elevation (feet)	Measurement Date	Measured Depth to Water (feet below TOC)	LNAPL Observed in Well	Measured Depth to LNAPL (feet below TOC)	Measured LNAPL Thickness (feet)	LNAPL Water Adjustment (feet)[b]	LNAPL-Adjusted Water Depth (feet below TOC)[b]	LNAPL-Adjusted Water Elevation (feet below TOC)[b]	Water Elevation (feet below TOC)
MW-1	997.10	2/10/12	14.84	--	--	--	--	--	--	982.26
		4/12/12	10.33	--	--	--	--	--	--	986.77
		4/19/12	10.28	--	--	--	--	--	--	986.82
		4/27/12	8.77	--	--	--	--	--	--	988.33
		5/1/12	9.35	--	--	--	--	--	--	987.75
		5/11/12	10.13	--	--	--	--	--	--	986.97
		5/18/12	9.86	--	--	--	--	--	--	987.24
		6/29/12	11.34	--	--	--	--	--	--	985.76
		7/6/12	11.73	--	--	--	--	--	--	985.37
		7/13/12	12.42	--	--	--	--	--	--	984.68
		7/18/12	12.24	--	--	--	--	--	--	984.86
		7/27/12	13.19	--	--	--	--	--	--	983.91
		8/3/12	13.66	--	--	--	--	--	--	983.44
		8/10/12	14.03	--	--	--	--	--	--	983.07
		8/17/12	14.33	--	--	--	--	--	--	982.77
		8/24/12	14.76	--	--	--	--	--	--	982.34
		8/31/12	14.92	--	--	--	--	--	--	982.18
		9/7/12	15.25	--	--	--	--	--	--	981.85
MW-2	992.76	2/10/12	11.04	--	--	--	--	--	--	981.72
		4/12/12	6.45	X	5.75	0.70	0.49	5.96	986.80	--
		4/19/12	7.18	X	5.62	1.56	1.10	6.08	986.68	--
		4/27/12	5.03	X	4.56	0.47	0.33	4.70	988.06	--
		5/1/12	5.80	X	5.65	0.15	0.11	5.69	987.07	--
		5/11/12	6.54	X	5.75	0.79	0.56	5.98	986.78	--
		5/18/12	7.43	X	7.41	0.01	0.01	7.42	985.34	--
		6/29/12	7.40	X	7.32	0.08	0.06	7.34	985.42	--
		7/6/12	7.50	X	7.40	0.10	0.07	7.43	985.33	--
		7/13/12	8.73	X	8.35	0.38	0.27	8.46	984.30	--
		7/18/12	7.71	X	7.65	0.06	0.04	7.67	985.09	--
		7/27/12	9.50	X	9.21	0.29	0.21	9.29	983.47	--
		8/3/12	10.05	X	9.85	0.20	0.14	9.91	982.85	--
		8/10/12	10.48	X	10.27	0.21	0.15	10.33	982.43	--
		8/17/12	10.78	X	10.60	0.18	0.13	10.65	982.11	--
		8/24/12	11.21	X	10.98	0.23	0.16	11.05	981.71	--
		8/31/12	11.50	X	11.08	0.42	0.30	11.20	981.56	--
		9/7/12	11.86	X	11.32	0.54	0.38	11.48	981.28	--
MW-3	994.30	2/10/12	12.10	--	--	--	--	--	--	982.20
		4/12/12	8.50	X	7.61	0.89	0.76	7.74	986.56	--
		4/19/12	7.98	X	7.53	0.45	0.38	7.60	986.70	--
		4/27/12	6.51	--	--	--	--	--	--	987.79
		5/1/12	6.00	--	--	--	--	--	--	988.30
		5/11/12	7.42	X	7.40	0.02	0.02	7.40	986.90	--
		5/18/12	5.85	X	5.79	0.06	0.05	5.80	988.50	--
		6/29/12	9.38	X	8.70	0.68	0.58	8.80	985.50	--
		7/6/12	9.25	X	8.75	0.50	0.43	8.83	985.48	--
		7/13/12	10.33	X	9.77	0.66	0.56	9.77	984.53	--
		7/18/12	9.31	X	8.59	0.72	0.61	8.70	985.60	--
		7/27/12	11.32	X	10.37	0.95	0.81	10.51	983.79	--
		8/3/12	11.40	X	11.11	0.29	0.25	11.15	983.15	--
		8/10/12	11.81	X	11.51	0.30	0.26	11.56	982.75	--
		8/17/12	11.91	X	11.84	0.07	0.06	11.85	982.45	--
		8/24/12	12.35	X	12.25	0.10	0.09	12.27	982.04	--
		8/31/12	12.45	X	12.40	0.05	0.04	12.41	981.89	--
		9/7/12	12.76	X	12.69	0.07	0.06	12.70	981.60	--
MW-4	992.77	8/3/12	10.43	--	--	--	--	--	--	982.34
		8/10/12	10.97	--	--	--	--	--	--	981.80
		8/17/12	11.46	--	--	--	--	--	--	981.31
		8/24/12	11.89	--	--	--	--	--	--	980.88
		8/31/12	12.16	X	12.04	0.12	0.08	12.08	980.69	--
		9/7/12	12.54	X	12.26	0.28	0.20	12.34	980.43	--
MW-5	993.15	8/3/12	10.31	--	--	--	--	--	--	982.84
		8/10/12	11.09	--	--	--	--	--	--	982.06
		8/17/12	11.54	--	--	--	--	--	--	981.61
		8/24/12	11.95	--	--	--	--	--	--	981.20
		8/31/12	12.18	--	--	--	--	--	--	980.97
		9/7/12	12.47	--	--	--	--	--	--	980.68
MW-6	992.05	8/3/12	10.08	--	--	--	--	--	--	981.97
		8/10/12	10.65	--	--	--	--	--	--	981.40
		8/17/12	11.11	--	--	--	--	--	--	980.94
		8/24/12	11.43	--	--	--	--	--	--	980.62
		8/31/12	11.60	--	--	--	--	--	--	980.45
		9/7/12	11.84	--	--	--	--	--	--	980.21

Notes:

[a] Source of information: Brown and Caldwell (2012c)

[b] Following Brown and Caldwell (2012b, 2012c), measured thickness of LNAPL and measured specific gravity of LNAPL samples collected by Brown and Caldwell were used to adjust water depth and elevation. For LNAPL in wells MW-2 and MW-4, specific gravity of 0.707 was used. For LNAPL in well MW-3, specific gravity of 0.850 was used.

Key:

TOC = Top of casing.

LNAPL = Light non-aqueous phase liquid

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Table 4-2 Calculated Groundwater Flow Direction and Gradient

Date	Water Elevation (feet)[a]			Azimuth of Groundwater Flow Direction (Degrees)[b]	General Groundwater Flow Direction	Groundwater Gradient[b]
	MW-1	MW-2	MW-3			
2/10/12	982.26	981.72	982.20	293	WNW	0.008
4/12/12	986.77	986.80	986.56	177	S	0.004
4/19/12	986.82	986.68	986.70	238	WSW	0.002
4/27/12	988.33	988.06	987.79	207	SSW	0.009
5/1/12	987.75	987.07	988.30	333	NNW	0.018
5/11/12	986.97	986.78	986.90	274	W	0.003
5/18/12	987.24	985.34	988.50	330	NNW	0.045
6/29/12	985.76	985.42	985.50	245	WSW	0.005
7/6/12	985.37	985.33	985.48	349	N	0.002
7/13/12	984.68	984.30	984.53	273	W	0.005
7/18/12	984.86	985.09	985.60	18	NNE	0.013
7/27/12	983.91	983.47	983.79	281	W	0.006
8/3/12	983.44	982.85	983.15	264	W	0.008
8/10/12	983.07	982.43	982.75	263	W	0.009
8/17/12	982.77	982.11	982.45	264	W	0.009
8/24/12	982.34	981.71	982.04	264	W	0.009
8/31/12	982.18	981.56	981.89	265	W	0.008
9/7/12	981.85	981.28	981.60	268	W	0.008

Notes:

[a] Source of water elevation information: Brown and Caldwell (2012c)

[b] Groundwater flow direction estimated using mathematical three-point problem solver (http://www.usouthal.edu/geography/allison/GY403/ThreePoint.xls). Location input data for three-point problem solver, consisting of distances and bearings between monitoring wells MW-1 through MW-3, were estimated from Figure 3 of Brown and Caldwell (2012c Water table information input data for three-point problem solver consists of water elevation values and LNAPL-adjusted water elevation values for MW-1, MW-2, and MW-3.

Key:

N = North.
NNE = North-northeast.
NNW = North-northwest.
S = South.
SSW = South-southwest.
W = West.
WNW = West-northwest.
WSW = West-southwest.

Figure 4-1
Groundwater Elevation
Clearwater River - Orofino Oil Seep
Orofino, Idaho

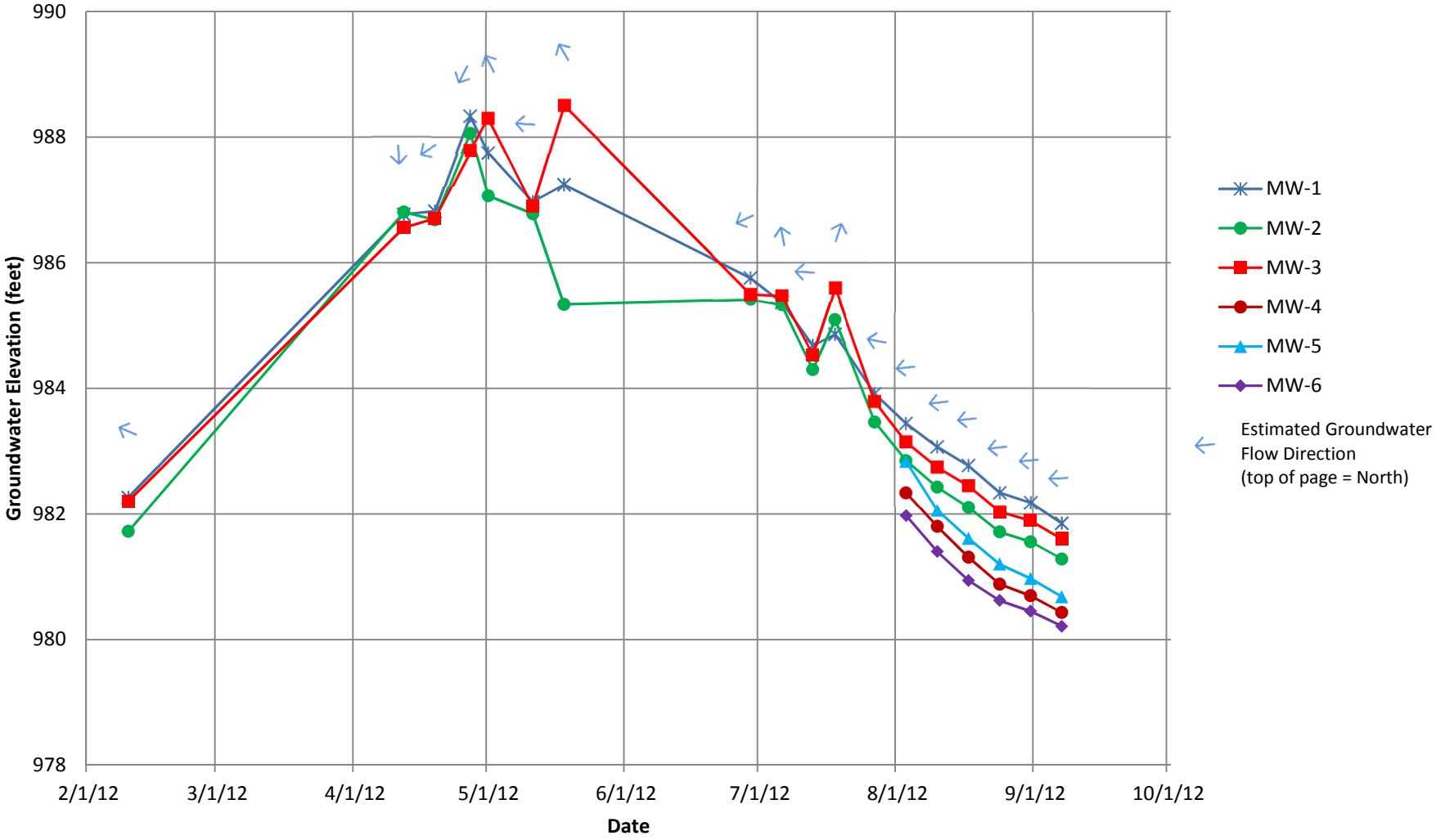


Figure 4-2
Groundwater Elevation and LNAPL Thickness
Clearwater River - Orofino Oil Seep
Orofino, Idaho

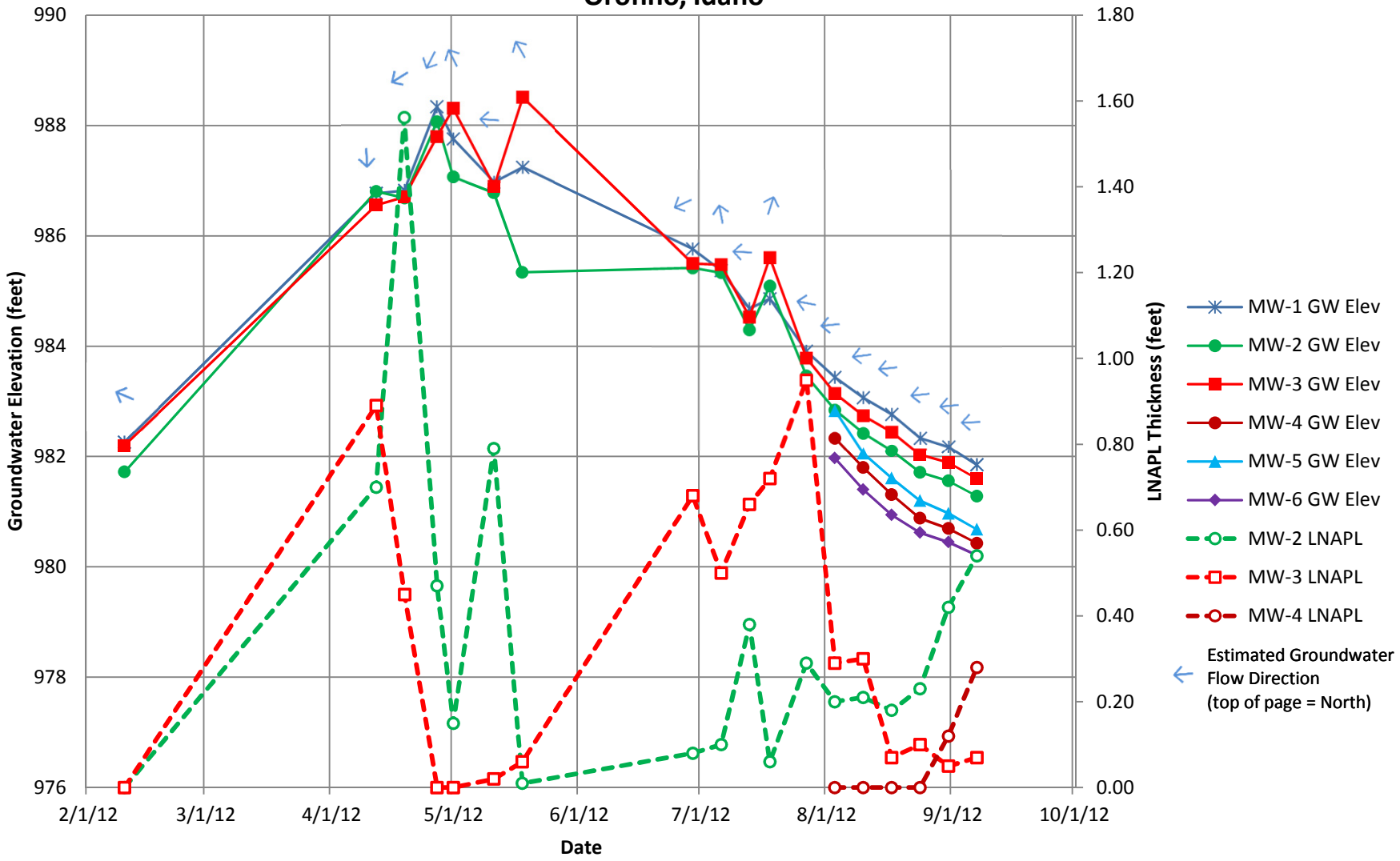


Figure 4-3
Clearwater River Elevation
USGS Gaging Station 13340000, Clearwater River at Orofino, Idaho
Clearwater River - Orofino Oil Seep
Orofino, Idaho

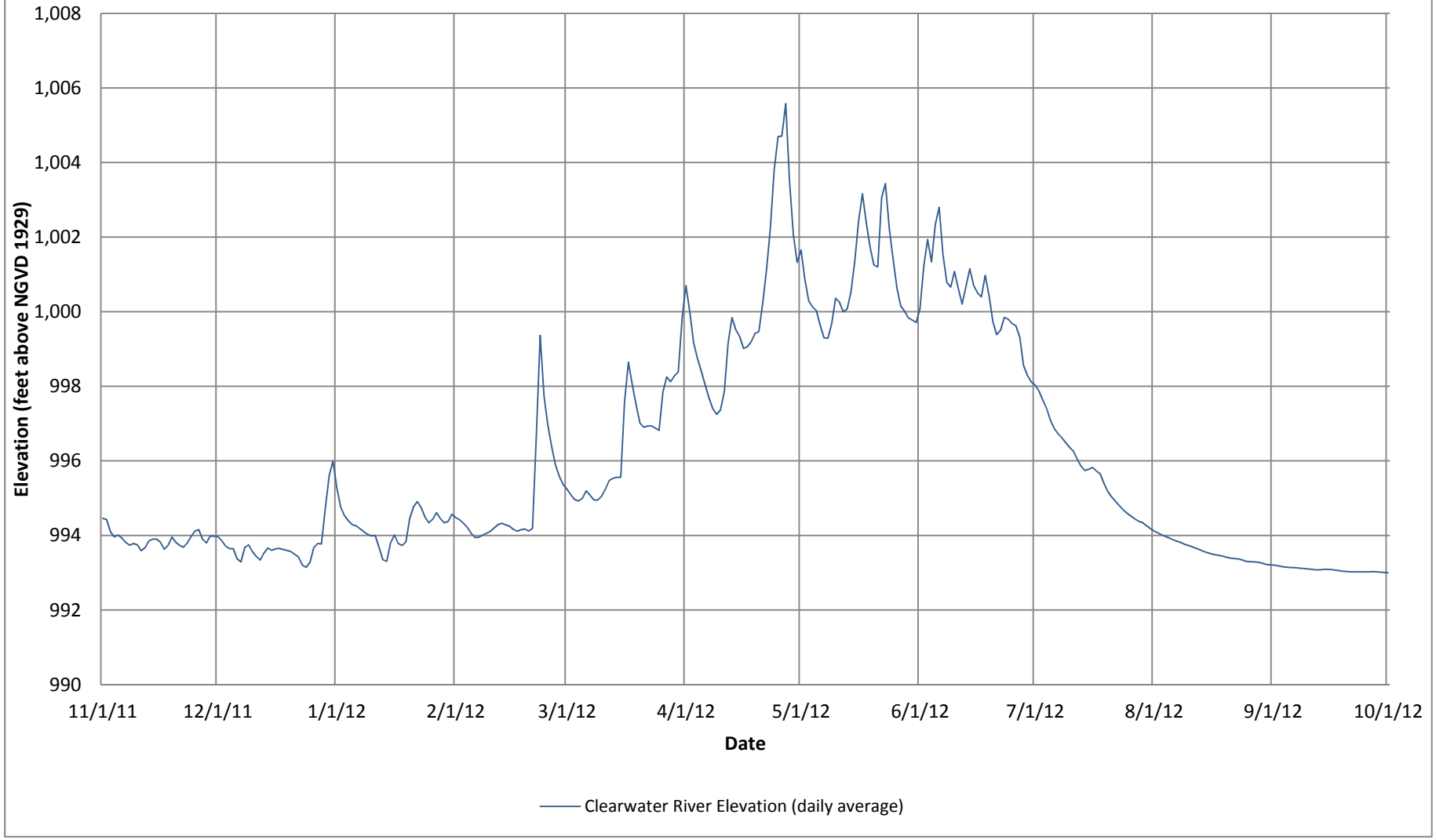
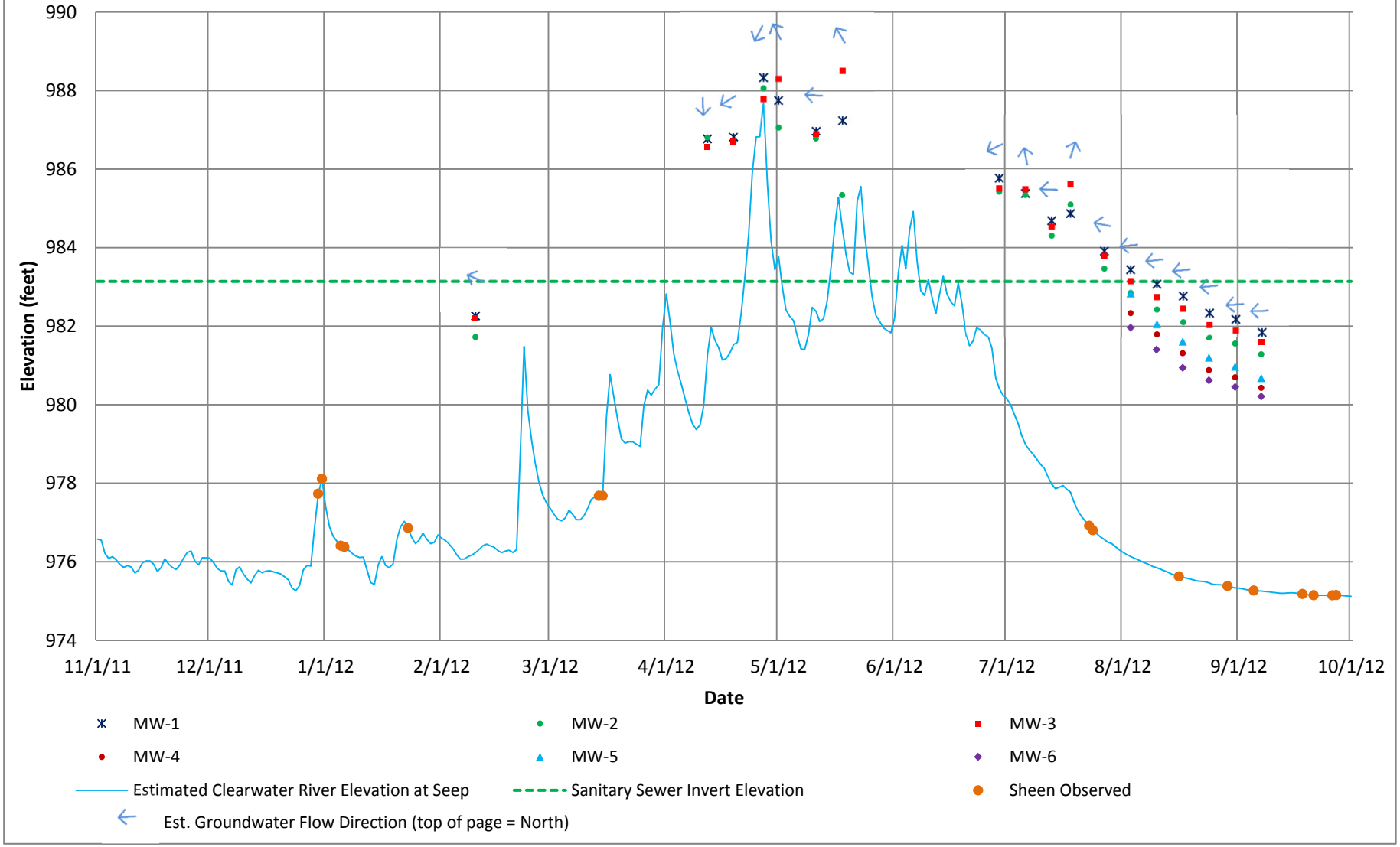


Figure 4-4
Groundwater Elevation and Approximate Clearwater River Elevation Near Seep
Clearwater River - Orofino Oil Seep
Orofino, Idaho



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5 SUMMARY AND CONCLUSIONS

A seep containing petroleum hydrocarbons was discovered on the Clearwater River in Orofino, Idaho, on December 31, 2011. Since that time, the seep and resulting petroleum sheen on surface water has been observed at the same location on multiple occasions since the contaminated soil removal as late as February 26, 2013 (the last reported sighting before the preparation of this report).

At the time the contamination at the seep was first noticed, the Hunt Oil facility was an unmanned active card-lock fueling station with several ASTs containing gasoline and diesel fuel, located approximately 150 feet generally upgradient of the seep location. Since the failure of the line tightness test in July 2012, the facility has ceased operations and all the ASTs have been emptied. Additional former and active UST facilities are also located in the area near the seep. However, Hunt Oil is the only facility in the vicinity with a confirmed recent release.

There have been several rounds of investigative field work to characterize the contamination associated with the seep and to attempt to identify a source or sources of the released petroleum hydrocarbons. These investigations, performed separately by EPA, the Nez Perce Tribe, PSTF, and Atkinson Distributing included the installation of six monitoring wells around the Hunt Oil facility; the collection and analyses of numerous samples, including soil, groundwater, sediment, surface water, and product; and monitoring of groundwater levels and thickness of LNAPL encountered in several wells at the Hunt Oil facility. After the leaking gasoline line was discovered a cleanup was conducted at the facility per a Unilateral Order issued by EPA.

As a result of these investigations, a release of gasoline from the Hunt Oil facility has been confirmed. The groundwater gradient was determined to be generally westward toward the Clearwater River in the area of the Hunt Oil facility for most of the year. LNAPL (consisting of very slightly weathered gasoline and weathered diesel) and groundwater containing high concentrations of gasoline constituents (e.g., BTEX and naphthalene) have been observed in downgradient groundwater monitoring wells. Additionally, LNAPL has not been observed in the upgradient monitoring well MW-1, and most groundwater samples from this well have been non-detect for gasoline constituents. Based upon their forensic analyses, the USCG MSL confirmed that a product sample collected from one downgradient monitoring well was very slightly weathered gasoline that matched a sample of gasoline from one of the Hunt Oil facility's ASTs. Additionally, the facility's two gasoline lines failed a tightness test, and further investigation revealed the location of the break in one of the gasoline lines and the release point of at least some of the gasoline. In addition to this documented release of gasoline, soil surrounding the diesel line was also observed to be wet, indicating the potential of past releases from the diesel line.

The results of analyses performed on samples from the seep location (i.e., surface water containing sheen and sediments) also indicate the presence of gasoline-range hydrocarbons and gasoline constituents (e.g., BTEX and naphthalene). Several compounds (benzene, ethylbenzene,

and toluene) were detected at concentrations above state and federal surface water screening levels. The results of forensic analysis indicate that a sample of the spill material at the seep location was a "slightly weathered gasoline" that was similar to the LNAPL observed in the monitoring well downgradient from the Hunt Oil facility. While the forensic analysis indicated that there were some differences between these two samples that were not attributable to weathering alone, it is possible that these differences may be attributable to additional past releases at the facility.

The weight of evidence presented in this report supports the conclusion that the Hunt Oil Facility is the source of petroleum contamination in the seep. The primary evidence that supports this conclusion includes:

- The slightly weathered gasoline in the seep is similar to gasoline stored at, and known to be released from, the Hunt Oil facility;
- Analytical results of LNAPL “match” the product stored and distributed at the facility;
- The Hunt Oil facility is located hydrologically upgradient of the seep location for most of the year;
- Sheen has been observed during the time that gasoline is known to have been released from the Hunt Oil facility; and
- Confirmation sampling results of the December 2012 soil excavation at the Hunt Oil facility show that the western extent of petroleum-contaminated soil was not reached (because of the off-set requirements for excavation around the sewer line). Significant petroleum contamination on the river-side of the sewer line is evidenced by high concentrations of BTEX and gasoline range hydrocarbons in downgradient monitoring wells MW-5 and MW-6.

The results of the investigations indicate that there may be other small and de minimus contributors of petroleum hydrocarbons in the seep in addition to the recent gasoline release from the Hunt Oil facility. Although the results of the forensic analysis at the USCG MSL indicated that the seep material was similar to the gasoline stored at the Hunt Oil facility, this analysis also noted differences that are not entirely attributable to weathering (i.e., petroleum hydrocarbons from different sources may have commingled). The results of forensic analyses (including PIANO analyses) performed by Friedman & Bruya also indicate that the gasoline product recovered from the downgradient monitoring well may have been influenced by other releases beyond the then-current batch of gasoline from the Hunt Oil facility. LNAPL consisting of weathered diesel was identified in monitoring well MW-3 at the Hunt Oil facility, indicating a release of diesel in this area. It is also possible that differences between the petroleum that are not attributable to weathering could be attributable to differences in the product material released (e.g., previous batches of gasoline at the Hunt Oil facility) or to the presence of another potential source, such as the facilities identified in Section 2.4 or perhaps from surface spills. However, based on the available data, there is insufficient evidence to identify another potential source or sources.

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A UNITED STATES COAST GUARD MARINE SAFETY LABORATORY REPORTS

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Oil Sample Analysis Report

U. S. EPA Region 10
Case Number E12006

Marine Safety Laboratory
Case Number 12-125

U.S. Department of
Homeland Security

**United States
Coast Guard**

Manager
U.S. Coast Guard
Marine Safety Laboratory

1 Chelsea Street
New London, CT 06320
Phone: (860) 271-2704
Fax: (860) 271-2641

16450
28 Mar 2012

Attn: On-Scene Coordinator
1435 N. Orchard St.
Boise, Idaho 83706

Dear On-Scene Coordinator:

The laboratory analysis of this case has been completed and our report is forwarded. The technical data supporting the report (spectrograms and chromatograms) have been archived at our facility and are available upon request. We will maintain the oil samples in refrigerated storage pending final case disposition.

Questions concerning this report or the analytical methods used should be directed to the Supervisor of Analysis, Kristy Juaire.

K. JUAIRE
By direction

Encl: (1) MSL Report 12-125

United States Coast Guard
Marine Safety Laboratory
Oil Spill Identification Report
12-125

Requestor: U. S. EPA Region 10
Unit Case/Activity Number: E12006
Received: 23-Mar-12 **Via:** UPS 1Z844X451380145169

Number Of Samples: 2
Lab NO. of Spills: 1 and 2
Lab NO. of Suspects: n/a
Lab NO. of Background: n/a

Analysis Methods:

- [x] GAS CHROMATOGRAPHY (GC)
- [ ] GAS CHROMATOGRAPHY-MASS SPECTROMETRY (GC-MS)
- [ ] INFRARED SPECTROSCOPY (IR)

Laboratory's Conclusion (as explained below): ID ONLY

RESULTS:

1. Samples 12-125-1 and 2 were specified to be representative of spilled oil. Analysis indicates these samples contain gasoline and appear to be only slightly weathered. A small amount of non-petroleum contamination is present in each sample.

CONCLUSIONS:

1. Samples 12-125-1 and 2 contain gasoline.

SUPERVISOR OF ANALYSIS K. JUAIRE _____ **DATE** 28-Mar-12

United States Coast Guard
Marine Safety Laboratory

Oil Spill Identification Analysis
Cost Recovery Documentation

Laboratory Case Number:	12-125
Requestor:	U. S. EPA Region 10
Unit Case Number:	E12006
Number of Samples:	4
Cost Per Sample Prepared:	$20.00
Total Costs of Sample Preparation:	$80.00
Number of Analyses:	5
Cost Per Sample Analyzed:	$86.00
Total Costs for Analysis:	$430.00
TOTAL COSTS:	$510.00

This documentation is provided for purposes of Phase IV - Documentation and Cost Recovery under the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300)

Signature: Kristy Juare **Date:** 28 Mar 2012

United States Coast Guard
Marine Safety Laboratory Sample
Check-In Log

MSL Case/Activity Number: 12-125

Requestor: U. S. EPA Region 10 **Unit Case Number** E12006

Federal Project Number: E12006 **Delivery Method:** UPS

Received Date: 23 Mar 12 **Delivery Number:** 1Z844X451380145169

Priority: No **Rush:** No **Comparison** No

Lab Number 12-125	Sample Descriptions from Sample Jars	Spill	Source
1	1 - OF - 2 (COLLECTED 3/15/12; HAS BEEN IN COLD STORAGE EVEN IN TRANSPORT)	☑	☐
2	2 - OF 2 (COLLECTED 3/15/12; HAS BEEN IN COLD STORAGE EVEN IN TRANSPORT)	☑	☐
3		☐	☐
4		☐	☐
5		☐	☐
6		☐	☐
7		☐	☐
8		☐	☐
9		☐	☐
10		☐	☐

Remarks: I.D. ONLY. Sample descriptions and 'Spill' designations taken from CoC.

Samples checked in by: MST2 TADD MARTIN **Date:** 23 Mar 12

Sample Custodian: MST3 MICHELLE KOSMO Michelle R Kosmo **Date:** 03APR12

Supervisor of Analysis: K. JUAIRE Kristy Juaire **Date:** 04Apr 12

Oil Sample Analysis Report

U. S. EPA Region 10
Case Number E12006

Marine Safety Laboratory
Case Number 12-141

U.S. Department of
Homeland Security

**United States
Coast Guard**

Manager
U.S. Coast Guard
Marine Safety Laboratory

1 Chelsea Street
New London, CT 06320
Phone: (860) 271-2704
Fax: (860) 271-2641

16450
04 May 2012

Attn: On-Scene Coordinator
1435 N. Orchard St.
Boise, Idaho 83706

Dear On-Scene Coordinator:

The laboratory analysis of this case has been completed and our report is forwarded. The technical data supporting the report (spectrograms and chromatograms) have been archived at our facility and are available upon request. We will maintain the oil samples in refrigerated storage pending final case disposition.

Questions concerning this report or the analytical methods used should be directed to the Supervisor of Analysis, Kristy Juaire.

Kristy Juaire

K. JUAIRE
By direction

Encl: (1) MSL Report 12-141

United States Coast Guard
Marine Safety Laboratory
Oil Spill Identification Report
12-141

Requestor: U. S. EPA Region 10
Unit Case/Activity Number: E12006
Received: 02-May-12 **Via:** Federal Express 870485054112

Number Of Samples: 10

Lab NO. of Spills: 5

Lab NO. of Suspects: 1, 2, 3 and 4

Lab NO. of Background: n/a

Analysis Methods:

- [x] GAS CHROMATOGRAPHY (GC)
- [x] GAS CHROMATOGRAPHY-MASS SPECTROMETRY (GC-MS)
- [ ] INFRARED SPECTROSCOPY (IR)

Laboratory's Conclusion (as explained below): MATCH

SPECIAL INSTRUCTIONS: Compare samples 12-141-1 through 5 with samples from MSL Case 12-125. Prepare samples 12-141-6 through 10 for future analyses. Samples 12-125-1 and 2 were reanalyzed for comparison purposes.

RESULTS:

1. Sample 12-141-5 was specified to be representative of spilled oil. Analysis indicates this sample contains very slightly weathered gasoline.

2. Spill samples 12-125-1 and 2 are similar to each other and contain slightly weathered gasoline. These samples appear similar to sample 12-141-5. However, not all differences are conclusively attributable to weathering based on the analysis conducted.

3. Suspected source sample 12-141-1 contains gasoline with characteristics similar to those of spill sample 12-141-5. Minor differences are attributable to weathering.

4. Suspected source samples 12-141-2, 3 and 4 contain light fuel oil with overall characteristics completely different from those of spill sample 12-141-5. Differences are not attributable to weathering.

CONCLUSIONS:

1. Suspected source sample 12-141-1 and spill sample 12-141-5 are derived from a common source of petroleum oil.

2. Comparison of samples 12-125-1 and 2 to spill sample 12-141-5 is inconclusive for reasons stated above.

3. Suspected source samples 12-141-2, 3 and 4 and spill sample 12-141-5 are not derived from a common source.

SUPERVISOR OF ANALYSIS K. JUAIRE **DATE** 04-May-12

United States Coast Guard
Marine Safety Laboratory

Oil Spill Identification Analysis
Cost Recovery Documentation

Laboratory Case Number:	12-141
Requestor:	U. S. EPA Region 10
Unit Case Number:	E12006
Number of Samples:	11
Cost Per Sample Prepared:	$20.00
Total Costs of Sample Preparation:	$220.00
Number of Analyses:	18
Cost Per Sample Analyzed:	$86.00
Total Costs for Analysis:	$1,548.00
TOTAL COSTS:	$1,768.00

This documentation is provided for purposes of Phase IV - Documentation and Cost Recovery under the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300)

Signature: Kristy Juare **Date:** 04 May 2012

United States Coast Guard
Marine Safety Laboratory Sample
Check-In Log

MSL Case/Activity Number: 12-141

Requestor: U. S. EPA Region 10 **Unit Case Number** E12006

Federal Project Number: E12006 **Delivery Method:** Federal Express

Received Date: 02 May 12 **Delivery Number:** 870485054112

Priority: Yes **Rush:** No **Comparison** Yes

Lab Number 12-141	Sample Descriptions from Sample Jars	Spill	Source
1	12050001 AS01PR 5/1/2012 08:40	☐	☑
2	12050002 AS02PR 5/1/2012 08:44	☐	☑
3	12050003 AS03PR 5/1/2012 08:47	☐	☑
4	12050004 AS04PR 5/1/2012 08:50	☐	☑
5	12050006 MWPR02 5/1/2012 08:30	☑	☐
6	12050001 AS01PR 5/1/2012 08:40	☐	☑
7	12050002 AS02PR 5/1/2012 08:44	☐	☑
8	12050003 AS03PR 5/1/2012 08:47	☐	☑
9	12050004 AS04PR 5/1/2012 08:50	☐	☑
10	12050006 MWPR02 5/1/2012 08:30	☑	☐

Remarks: Compare samples 1-5 to MSL Case 12-125; hold samples 6-10 for future comparisons. Spill/source designations taken from COC.

Samples checked in by: KRISTY JUAIRE Kristy Juaire **Date:** 02 May 12

Sample Custodian: MST3 MICHELLE KOSMO Michelle Kosmo **Date:** 03May12

Supervisor of Analysis: K. JUAIRE Kristy Juaire **Date:** 04May12

Oil Sample Analysis Report

U. S. EPA Region 10
Case Number E12006

Marine Safety Laboratory
Case Number 12-235

U.S. Department of
Homeland Security

**United States
Coast Guard**

Manager
U.S. Coast Guard
Marine Safety Laboratory

1 Chelsea Street
New London, CT 06320
Phone: (860) 271-2704
Fax: (860) 271-2641

16450
14 Sep 2012

Attn: On-Scene Coordinator
1435 N. Orchard St.
Boise, Idaho 83706

Dear On-Scene Coordinator:

The laboratory analysis of this case has been completed and our report is forwarded. The technical data supporting the report (spectrograms and chromatograms) have been archived at our facility and are available upon request. We will maintain the oil samples in refrigerated storage pending final case disposition.

Questions concerning this report or the analytical methods used should be directed to the Supervisor of Analysis, Kristy Juaire.

K. JUAIRE
By direction

Encl: (1) MSL Report 12-235

United States Coast Guard
Marine Safety Laboratory
Oil Spill Identification Report
12-235

Requestor: U. S. EPA Region 10
Unit Case/Activity Number: E12006
Received: 12-Sep-12 **Via:** Federal Express 8623 0310 6557

Number Of Samples: 2
Lab NO. of Spills: n/a
Lab NO. of Suspects: 1 and 2
Lab NO. of Background: n/a

Analysis Methods:

- [x] GAS CHROMATOGRAPHY (GC)
- [ ] GAS CHROMATOGRAPHY-MASS SPECTROMETRY (GC-MS)
- [ ] INFRARED SPECTROSCOPY (IR)

Laboratory's Conclusion (as explained below): OTHER

SPECIAL INSTRUCTIONS: Compare to samples from MSL Case 12-125.

RESULTS:

1. Samples 12-125-1 and 2 were specified to be representative of spilled oil. Analysis indicates these samples contain gasoline.

2. Suspected source samples 12-235-1 and 2 appear to contain traces of petroleum hydrocarbons. The quantity is not sufficient to identity the type of petroleum product present or to compare the samples to samples 12-125-1 and 2 based on the analysis conducted..

CONCLUSIONS:

1. Suspected source samples 12-235-1 and 2 do not contain a quantity of petroleum oil sufficient for comparison purposes.

SUPERVISOR OF ANALYSIS K. JUAIRE **DATE** 14-Sep-12

United States Coast Guard
Marine Safety Laboratory

Oil Spill Identification Analysis
Cost Recovery Documentation

Laboratory Case Number:	12-235
Requestor:	U. S. EPA Region 10
Unit Case Number:	E12006
Number of Samples:	4
Cost Per Sample Prepared:	$20.00
Total Costs of Sample Preparation:	$80.00
Number of Analyses:	7
Cost Per Sample Analyzed:	$86.00
Total Costs for Analysis:	$602.00
TOTAL COSTS:	$682.00

This documentation is provided for purposes of Phase IV - Documentation and Cost Recovery under the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300)

Signature: _____ **Date:** 14 Sep 2012

United States Coast Guard
Marine Safety Laboratory Sample
Check-In Log

MSL Case/Activity Number: 12-235

Requestor: U. S. Environmental Protection Agency **Unit Case Number** E12006

Federal Project Number: E12006 **Delivery Method:** Federal Express

Received Date: 12 Sep 12 **Delivery Number:** 8623 0310 6557

Priority: No **Rush:** No **Comparison** Yes

Lab Number 12-235	Sample Descriptions from Sample Jars	Spill	Source
1	12072009 [SAMPLE COLLECTED: 8/16/2012, SAMPLER : A. JENSEN, SOURCE MW03] 8/16/12 0950	☐	☑
2	12072009 [SAMPLE COLLECTED: 8/16/2012, SAMPLER : A. JENSEN, SOURCE MW03] 8/16/12 0950	☐	☑
3		☐	☐
4		☐	☐
5		☐	☐
6		☐	☐
7		☐	☐
8		☐	☐
9		☐	☐
10		☐	☐

Remarks: Compare to 12-125. Sample descriptions in brackets [ ] and 'Source' designations taken from the CoC.

Samples checked in by: MST1 JOSHUA OROURKE **Date:** 12 Sep 12

Sample Custodian: MST3 MICHELLE KOSMO **Date:** 14SEP12

Supervisor of Analysis: K. JUAIRE **Date:** 14 Sep 12

United States Coast Guard
Marine Safety Laboratory Sample
Check-In Log

MSL Case/Activity Number: 12-125

Requestor: U. S. EPA Region 10 **Unit Case Number** E12006

Federal Project Number: E12006 **Delivery Method:** UPS

Received Date: 23 Mar 12 **Delivery Number:** 1Z844X451380145169

Priority: No **Rush:** No **Comparison** No

Lab Number 12-125	Sample Descriptions from Sample Jars	Spill	Source
1	1 - OF - 2 (COLLECTED 3/15/12; HAS BEEN IN COLD STORAGE EVEN IN TRANSPORT)	☑	☐
2	2 - OF 2 (COLLECTED 3/15/12; HAS BEEN IN COLD STORAGE EVEN IN TRANSPORT)	☑	☐
3		☐	☐
4		☐	☐
5		☐	☐
6		☐	☐
7		☐	☐
8		☐	☐
9		☐	☐
10		☐	☐

Remarks: I.D. ONLY. Sample descriptions and 'Spill' designations taken from CoC.

Samples checked in by: MST2 TADD MARTIN **Date:** 23 Mar 12

Sample Custodian: MST3 MICHELLE KOSMO Michelle R Kosmo **Date:** 03APR12

Supervisor of Analysis: K. JUAIRE Kristy Juaire **Date:** 04Apr 12

B CHAIN-OF-CUSTODY DOCUMENTATION

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United States Coast Guard
Marine Safety Laboratory Sample
Check-In Log

MSL Case/Activity Number: 12-141

Requestor: U. S. EPA Region 10 **Unit Case Number** E12006

Federal Project Number: E12006 **Delivery Method:** Federal Express

Received Date: 02 May 12 **Delivery Number:** 870485054112

Priority: Yes **Rush:** No **Comparison** Yes

Lab Number 12-141	Sample Descriptions from Sample Jars	Spill	Source
1	12050001 AS01PR 5/1/2012 08:40	☐	☑
2	12050002 AS02PR 5/1/2012 08:44	☐	☑
3	12050003 AS03PR 5/1/2012 08:47	☐	☑
4	12050004 AS04PR 5/1/2012 08:50	☐	☑
5	12050006 MWPR02 5/1/2012 08:30	☑	☐
6	12050001 AS01PR 5/1/2012 08:40	☐	☑
7	12050002 AS02PR 5/1/2012 08:44	☐	☑
8	12050003 AS03PR 5/1/2012 08:47	☐	☑
9	12050004 AS04PR 5/1/2012 08:50	☐	☑
10	12050006 MWPR02 5/1/2012 08:30	☑	☐

Remarks: Compare samples 1-5 to MSL Case 12-125; hold samples 6-10 for future comparisons. Spill/source designations taken from COC.

Samples checked in by: KRISTY JUAIRE Kristy Juaire **Date:** 02 May 12

Sample Custodian: MST3 MICHELLE KOSMO Michelle Kosmo **Date:** 03May12

Supervisor of Analysis: K. JUAIRE Kristy Juaire **Date:** 04May12

USEPA CLP Generic COC (LAB COPY)
DateShipped: 8/16/2012
CarrierName: FedEx
AirbillNo: 8623 0310 6535

CHAIN OF CUSTODY RECORD
Site #: ZOD6
Project Code:
Cooler #:

No: 10-081512-140138-0001
Lab: ALS Environmental
Lab Contact: Ed Wallace
Lab Phone: 360-577-7222

Sample #	Matrix/Sampler	Coll. Method	Analysis/Turnaround	Tag/Preservative/Bottles	Station Location	Collected	For Lab Use Only
12072001	Ground Water/ Alan Jensen	Grab	VOAs(21)	A (HCl) (9)	MW01GW	08/16/2012 0845	
12072002	Ground Water/ Alan Jensen	Grab	VOAs(21)	A (HCl) (3)	MW02GW	08/16/2012 0904	
12072003	Ground Water/ Alan Jensen	Grab	VOAs(21)	A (HCl) (3)	MW03GW	08/16/2012 0955	
12072004	Ground Water/ Alan Jensen	Grab	VOAs(21)	A (HCl) (3)	MW04GW	08/16/2012 1013	
12072005	Ground Water/ Alan Jensen	Grab	VOAs(21)	A (HCl) (3)	MW05GW	08/16/2012 1100	
12072006	Ground Water/ Alan Jensen	Grab	VOAs(21)	A (HCl) (3)	MW06GW	08/16/2012 1039	
12072007	Ground Water/ Alan Jensen	Grab	VOAs(21)	A (HCl) (3)	MW02GW	08/16/2012 0906	
12072008	Water/ Alan Jensen	Grab	VOAs(21)	A (HCl) (3)	TB01WT	08/16/2012 1055	

Sample(s) to be used for Lab QC: 12072001
Please

Shipment for Case Complete? N
Samples Transferred From Chain of Custody #

Analysis Key: VOAs=Volatiles (VOAs)

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished By	Date	Received by	Date	Time
	RNolan	8/16/12 1230	Fred Illi	8/17/12	0915						

C DATA VALIDATION MEMORANDA

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ecology and environment, inc.
Global Environmental Specialists
720 Third Avenue, Suite 1700
Seattle, Washington 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: September 14, 2012

TO: Renee Nordeen, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-3 Chemist, E & E, Seattle, Washington MW

SUBJ: **Organic Data Quality Assurance Review, Clearwater River – Orofino Oil Seep Site, Orofino, Idaho**

REF: TDD: 12-02-0005 PAN: 002233.0769.01SF

The data quality assurance review of 8 water samples collected from the Clearwater River – Orofino Oil Seep site in Orofino, Idaho, has been completed. Volatile Organic Compound (VOC) analysis (EPA Method 8260C) was performed by Columbia Analytical Services (part of the ALS Group), Kelso, Washington. All sample analyses were evaluated following EPA's Stage 2 Data Validation Manual Process (S2VM).

The samples were numbered:

12072001	12072002	12072003	12072004	12072005	12072006
12072007	12072008				

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were maintained and received within the QC limits of < 6°C. The samples were collected on August 16, 2012, and were analyzed by August 28, 2012, therefore meeting QC criteria of less than 14 days between collection and analysis for preserved water samples.

2. Tuning: Acceptable.

Tuning was performed at the beginning of each 12-hour analysis sequence. All results were within QC limits.

3. Initial Calibration: Acceptable.

All average Relative Response Factors (RRFs) were greater than the lower QC limit. All Relative Standard Deviations (RSDs) were within the QC limits.

4. Continuing Calibration: Satisfactory.

All RRFs were greater than the lower QC limit. All % differences were within the QC limits except the surrogate toluene-d8; no actions were taken based on the surrogate calibration outlier.

5. Blanks: Acceptable.

A method blank was analyzed for each 20 sample batch per matrix. There were no detections in any method blank.

6. System Monitoring Compounds (SMCs): Acceptable.

All SMC recoveries were within QC limits.

7. Matrix Spike (MS)/MS Duplicate (MSD)/Blanks Spike (BS) Analysis: Acceptable.

Spike analyses were performed per SDG or per matrix per concentration level. All recoveries were within QC limits.

8. Duplicate Analysis: Acceptable.

Laboratory spike duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All spike duplicate results were within QC limits.

9. Internal Standards: Acceptable.

All internal standards were within $\pm$ 30 seconds of the continuing calibration internal standard retention times. All area counts were within 50 % to 200 % of the continuing calibration area counts.

10. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

11. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

12. Overall Assessment of Data for Use

Positive sample results greater than the method detection limit (MDL) and less than the method reporting limit (MRL) were qualified as estimated quantities (JQ).

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical method, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

COLUMBIA ANALYTICAL SERVICES, INC.
Now part of the ALS Group
Analytical Results

Client: Ecology And Environment, Incorporated
Project: ZOD6
Sample Matrix: Water

Service Request: K1208178
Date Collected: 08/16/2012
Date Received: 08/17/2012

Volatile Organic Compounds

Sample Name: 12072001
Lab Code: K1208178-001

Extraction Method: EPA 5030B
Analysis Method: 8260C

Units: ug/L
Basis: NA
Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Chloromethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Vinyl Chloride	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Bromomethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Chloroethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Trichlorofluoromethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
1,1-Dichloroethene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Acetone	ND	U	20	1	08/27/12	08/27/12	KWG1209767	
Carbon Disulfide	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Methylene Chloride	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
trans-1,2-Dichloroethene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
1,1-Dichloroethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
2,2-Dichloropropane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
cis-1,2-Dichloroethene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
2-Butanone (MEK)	ND	U	20	1	08/27/12	08/27/12	KWG1209767	
Bromochloromethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Chloroform	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
1,1,1-Trichloroethane (TCA)	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Carbon Tetrachloride	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
1,1-Dichloropropene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Benzene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
1,2-Dichloroethane (EDC)	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Trichloroethene (TCE)	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
1,2-Dichloropropane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Dibromomethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Bromodichloromethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
cis-1,3-Dichloropropene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
4-Methyl-2-pentanone (MIBK)	ND	U	20	1	08/27/12	08/27/12	KWG1209767	
Toluene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
trans-1,3-Dichloropropene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
1,1,2-Trichloroethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Tetrachloroethene (PCE)	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
2-Hexanone	ND	U	20	1	08/27/12	08/27/12	KWG1209767	

Comments:

Client: Ecology And Environment, Incorporated
Project: ZOD6
Sample Matrix: Water

Service Request: K1208178
Date Collected: 08/16/2012
Date Received: 08/17/2012

Volatile Organic Compounds

Sample Name: 12072001
Lab Code: K1208178-001

Extraction Method: EPA 5030B
Analysis Method: 8260C

Units: ug/L
Basis: NA
Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
1,3-Dichloropropane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Dibromochloromethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
1,2-Dibromoethane (EDB)	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
Chlorobenzene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Ethylbenzene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
1,1,1,2-Tetrachloroethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
m,p-Xylenes	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
o-Xylene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Styrene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Bromoform	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Isopropylbenzene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
1,1,2,2-Tetrachloroethane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
Bromobenzene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
n-Propylbenzene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
1,2,3-Trichloropropane	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
2-Chlorotoluene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
1,3,5-Trimethylbenzene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
4-Chlorotoluene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
tert-Butylbenzene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
1,2,4-Trimethylbenzene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
sec-Butylbenzene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
4-Isopropyltoluene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
1,3-Dichlorobenzene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
1,4-Dichlorobenzene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
n-Butylbenzene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
1,2-Dichlorobenzene	ND	U	0.50	1	08/27/12	08/27/12	KWG1209767	
1,2-Dibromo-3-chloropropane	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
1,2,4-Trichlorobenzene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
Hexachlorobutadiene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
Naphthalene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	
1,2,3-Trichlorobenzene	ND	U	2.0	1	08/27/12	08/27/12	KWG1209767	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072001	**Units:**	ug/L
Lab Code:	K1208178-001	**Basis:**	NA

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	114	73-122	08/27/12	Acceptable
Toluene-d8	121	65-144	08/27/12	Acceptable
4-Bromofluorobenzene	113	68-117	08/27/12	Acceptable

Comments:

COLUMBIA ANALYTICAL SERVICES, INC.
Now part of the ALS Group
Analytical Results

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072002	**Units:**	ug/L
Lab Code:	K1208178-002	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	SCVM
Chloromethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Vinyl Chloride	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Bromomethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Chloroethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Trichlorofluoromethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,1-Dichloroethene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Acetone	ND	U	2000	100	08/27/12	08/27/12	KWG1209767	
Carbon Disulfide	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Methylene Chloride	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
trans-1,2-Dichloroethene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,1-Dichloroethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
2,2-Dichloropropane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
cis-1,2-Dichloroethene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
2-Butanone (MEK)	ND	U	2000	100	08/27/12	08/27/12	KWG1209767	
Bromochloromethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Chloroform	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,1,1-Trichloroethane (TCA)	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Carbon Tetrachloride	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,1-Dichloropropene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Benzene	18000	D	1000	2000	08/27/12	08/27/12	KWG1209767	
1,2-Dichloroethane (EDC)	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Trichloroethene (TCE)	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,2-Dichloropropane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Dibromomethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Bromodichloromethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
cis-1,3-Dichloropropene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
4-Methyl-2-pentanone (MIBK)	ND	U	2000	100	08/27/12	08/27/12	KWG1209767	
Toluene	41000	D	1000	2000	08/27/12	08/27/12	KWG1209767	
trans-1,3-Dichloropropene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,1,2-Trichloroethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Tetrachloroethene (PCE)	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
2-Hexanone	ND	U	2000	100	08/27/12	08/27/12	KWG1209767	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072002	**Units:**	ug/L
Lab Code:	K1208178-002	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
1,3-Dichloropropane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Dibromochloromethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,2-Dibromoethane (EDB)	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
Chlorobenzene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Ethylbenzene	2500	D	50	100	08/27/12	08/27/12	KWG1209767	
1,1,1,2-Tetrachloroethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
m,p-Xylenes	11000	D	50	100	08/27/12	08/27/12	KWG1209767	
o-Xylene	4600	D	50	100	08/27/12	08/27/12	KWG1209767	
Styrene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Bromoform	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Isopropylbenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,1,2,2-Tetrachloroethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Bromobenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
n-Propylbenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,2,3-Trichloropropane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
2-Chlorotoluene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,3,5-Trimethylbenzene	410	D	200	100	08/27/12	08/27/12	KWG1209767	
4-Chlorotoluene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
tert-Butylbenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,2,4-Trimethylbenzene	1500	D	200	100	08/27/12	08/27/12	KWG1209767	
sec-Butylbenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
4-Isopropyltoluene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,3-Dichlorobenzene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,4-Dichlorobenzene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
n-Butylbenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,2-Dichlorobenzene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,2-Dibromo-3-chloropropane	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,2,4-Trichlorobenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
Hexachlorobutadiene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
Naphthalene	210	D	200	100	08/27/12	08/27/12	KWG1209767	
1,2,3-Trichlorobenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072002	**Units:**	ug/L
Lab Code:	K1208178-002	**Basis:**	NA

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	112	73-122	08/27/12	Acceptable
Toluene-d8	121	65-144	08/27/12	Acceptable
4-Bromofluorobenzene	110	68-117	08/27/12	Acceptable

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072003	**Units:**	ug/L
Lab Code:	K1208178-003	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Chloromethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Vinyl Chloride	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Bromomethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Chloroethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Trichlorofluoromethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
1,1-Dichloroethene	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Acetone	ND	U	100	5	08/28/12	08/28/12	KWG1209826	
Carbon Disulfide	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Methylene Chloride	ND	U	10	5	08/28/12	08/28/12	KWG1209826	
trans-1,2-Dichloroethene	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
1,1-Dichloroethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
2,2-Dichloropropane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
cis-1,2-Dichloroethene	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
2-Butanone (MEK)	ND	U	100	5	08/28/12	08/28/12	KWG1209826	
Bromochloromethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Chloroform	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
1,1,1-Trichloroethane (TCA)	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Carbon Tetrachloride	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
1,1-Dichloropropene	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Benzene	1500	D	50	100	08/28/12	08/28/12	KWG1209826	
1,2-Dichloroethane (EDC)	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Trichloroethene (TCE)	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
1,2-Dichloropropane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Dibromomethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Bromodichloromethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
cis-1,3-Dichloropropene	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
4-Methyl-2-pentanone (MIBK)	ND	U	100	5	08/28/12	08/28/12	KWG1209826	
Toluene	220	D	2.5	5	08/28/12	08/28/12	KWG1209826	
trans-1,3-Dichloropropene	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
1,1,2-Trichloroethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Tetrachloroethene (PCE)	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
2-Hexanone	ND	U	100	5	08/28/12	08/28/12	KWG1209826	

Comments:

COLUMBIA ANALYTICAL SERVICES, INC.
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Analytical Results

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072003	**Units:**	ug/L
Lab Code:	K1208178-003	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
1,3-Dichloropropane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Dibromochloromethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
1,2-Dibromoethane (EDB)	ND	U	10	5	08/28/12	08/28/12	KWG1209826	
Chlorobenzene	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Ethylbenzene	150	D	2.5	5	08/28/12	08/28/12	KWG1209826	
1,1,1,2-Tetrachloroethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
m,p-Xylenes	550	D	2.5	5	08/28/12	08/28/12	KWG1209826	
o-Xylene	10	D	2.5	5	08/28/12	08/28/12	KWG1209826	
Styrene	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Bromoform	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Isopropylbenzene	36	D	10	5	08/28/12	08/28/12	KWG1209826	
1,1,2,2-Tetrachloroethane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
Bromobenzene	ND	U	10	5	08/28/12	08/28/12	KWG1209826	
n-Propylbenzene	70	D	10	5	08/28/12	08/28/12	KWG1209826	
1,2,3-Trichloropropane	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
2-Chlorotoluene	ND	U	10	5	08/28/12	08/28/12	KWG1209826	
1,3,5-Trimethylbenzene	ND	U	10	5	08/28/12	08/28/12	KWG1209826	
4-Chlorotoluene	ND	U	10	5	08/28/12	08/28/12	KWG1209826	
tert-Butylbenzene	ND	U	10	5	08/28/12	08/28/12	KWG1209826	
1,2,4-Trimethylbenzene	ND	U	10	5	08/28/12	08/28/12	KWG1209826	
sec-Butylbenzene	14	D	10	5	08/28/12	08/28/12	KWG1209826	
4-Isopropyltoluene	11	D	10	5	08/28/12	08/28/12	KWG1209826	
1,3-Dichlorobenzene	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
1,4-Dichlorobenzene	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
n-Butylbenzene	13	D	10	5	08/28/12	08/28/12	KWG1209826	
1,2-Dichlorobenzene	ND	U	2.5	5	08/28/12	08/28/12	KWG1209826	
1,2-Dibromo-3-chloropropane	ND	U	10	5	08/28/12	08/28/12	KWG1209826	
1,2,4-Trichlorobenzene	ND	U	10	5	08/28/12	08/28/12	KWG1209826	
Hexachlorobutadiene	ND	U	10	5	08/28/12	08/28/12	KWG1209826	
Naphthalene	270	D	200	100	08/28/12	08/28/12	KWG1209826	
1,2,3-Trichlorobenzene	ND	U	10	5	08/28/12	08/28/12	KWG1209826	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072003	**Units:**	ug/L
Lab Code:	K1208178-003	**Basis:**	NA

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	112	73-122	08/28/12	Acceptable
Toluene-d8	119	65-144	08/28/12	Acceptable
4-Bromofluorobenzene	109	68-117	08/28/12	Acceptable

Comments:

COLUMBIA ANALYTICAL SERVICES, INC.
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Analytical Results

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072004	**Units:**	ug/L
Lab Code:	K1208178-004	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Chloromethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Vinyl Chloride	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Bromomethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Chloroethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Trichlorofluoromethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,1-Dichloroethene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Acetone	ND	U	2000	100	08/27/12	08/27/12	KWG1209767	
Carbon Disulfide	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Methylene Chloride	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
trans-1,2-Dichloroethene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,1-Dichloroethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
2,2-Dichloropropane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
cis-1,2-Dichloroethene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
2-Butanone (MEK)	ND	U	2000	100	08/27/12	08/27/12	KWG1209767	
Bromochloromethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Chloroform	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,1,1-Trichloroethane (TCA)	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Carbon Tetrachloride	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,1-Dichloropropene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Benzene	35000	D	1000	2000	08/27/12	08/27/12	KWG1209767	
1,2-Dichloroethane (EDC)	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Trichloroethene (TCE)	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,2-Dichloropropane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Dibromomethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Bromodichloromethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
cis-1,3-Dichloropropene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
4-Methyl-2-pentanone (MIBK)	ND	U	2000	100	08/27/12	08/27/12	KWG1209767	
Toluene	50000	D	1000	2000	08/27/12	08/27/12	KWG1209767	
trans-1,3-Dichloropropene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,1,2-Trichloroethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Tetrachloroethene (PCE)	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
2-Hexanone	ND	U	2000	100	08/27/12	08/27/12	KWG1209767	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072004	**Units:**	ug/L
Lab Code:	K1208178-004	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
1,3-Dichloropropane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Dibromochloromethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,2-Dibromoethane (EDB)	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
Chlorobenzene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Ethylbenzene	2100	D	50	100	08/27/12	08/27/12	KWG1209767	
1,1,1,2-Tetrachloroethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
m,p-Xylenes	10000	D	50	100	08/27/12	08/27/12	KWG1209767	
o-Xylene	4200	D	50	100	08/27/12	08/27/12	KWG1209767	
Styrene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Bromoform	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Isopropylbenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,1,2,2-Tetrachloroethane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
Bromobenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
n-Propylbenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,2,3-Trichloropropane	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
2-Chlorotoluene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,3,5-Trimethylbenzene	300	D	200	100	08/27/12	08/27/12	KWG1209767	
4-Chlorotoluene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
tert-Butylbenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,2,4-Trimethylbenzene	1100	D	200	100	08/27/12	08/27/12	KWG1209767	
sec-Butylbenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
4-Isopropyltoluene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,3-Dichlorobenzene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,4-Dichlorobenzene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
n-Butylbenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,2-Dichlorobenzene	ND	U	50	100	08/27/12	08/27/12	KWG1209767	
1,2-Dibromo-3-chloropropane	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,2,4-Trichlorobenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
Hexachlorobutadiene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
Naphthalene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	
1,2,3-Trichlorobenzene	ND	U	200	100	08/27/12	08/27/12	KWG1209767	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072004	**Units:**	ug/L
Lab Code:	K1208178-004	**Basis:**	NA

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	112	73-122	08/27/12	Acceptable
Toluene-d8	117	65-144	08/27/12	Acceptable
4-Bromofluorobenzene	113	68-117	08/27/12	Acceptable

Comments:

COLUMBIA ANALYTICAL SERVICES, INC.
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Analytical Results

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072005	**Units:**	ug/L
Lab Code:	K1208178-005	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Chloromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Vinyl Chloride	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Bromomethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Chloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Trichlorofluoromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1-Dichloroethene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Acetone	ND	U	2000	100	08/28/12	08/28/12	KWG1209826	
Carbon Disulfide	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Methylene Chloride	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
trans-1,2-Dichloroethene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1-Dichloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
2,2-Dichloropropane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
cis-1,2-Dichloroethene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
2-Butanone (MEK)	ND	U	2000	100	08/28/12	08/28/12	KWG1209826	
Bromochloromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Chloroform	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1,1-Trichloroethane (TCA)	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Carbon Tetrachloride	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1-Dichloropropene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Benzene	25000	D	1000	2000	08/28/12	08/28/12	KWG1209826	
1,2-Dichloroethane (EDC)	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Trichloroethene (TCE)	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,2-Dichloropropane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Dibromomethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Bromodichloromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
cis-1,3-Dichloropropene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
4-Methyl-2-pentanone (MIBK)	ND	U	2000	100	08/28/12	08/28/12	KWG1209826	
Toluene	41000	D	1000	2000	08/28/12	08/28/12	KWG1209826	
trans-1,3-Dichloropropene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1,2-Trichloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Tetrachloroethene (PCE)	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
2-Hexanone	ND	U	2000	100	08/28/12	08/28/12	KWG1209826	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072005	**Units:**	ug/L
Lab Code:	K1208178-005	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
1,3-Dichloropropane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Dibromochloromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,2-Dibromoethane (EDB)	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
Chlorobenzene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Ethylbenzene	2400	D	50	100	08/28/12	08/28/12	KWG1209826	
1,1,1,2-Tetrachloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
m,p-Xylenes	10000	D	50	100	08/28/12	08/28/12	KWG1209826	
o-Xylene	4300	D	50	100	08/28/12	08/28/12	KWG1209826	
Styrene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Bromoform	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Isopropylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,1,2,2-Tetrachloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Bromobenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
n-Propylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,2,3-Trichloropropane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
2-Chlorotoluene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,3,5-Trimethylbenzene	380	D	200	100	08/28/12	08/28/12	KWG1209826	
4-Chlorotoluene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
tert-Butylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,2,4-Trimethylbenzene	1600	D	200	100	08/28/12	08/28/12	KWG1209826	
sec-Butylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
4-Isopropyltoluene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,3-Dichlorobenzene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,4-Dichlorobenzene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
n-Butylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,2-Dichlorobenzene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,2-Dibromo-3-chloropropane	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,2,4-Trichlorobenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
Hexachlorobutadiene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
Naphthalene	330	D	200	100	08/28/12	08/28/12	KWG1209826	
1,2,3-Trichlorobenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072005	**Units:**	ug/L
Lab Code:	K1208178-005	**Basis:**	NA

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	112	73-122	08/28/12	Acceptable
Toluene-d8	118	65-144	08/28/12	Acceptable
4-Bromofluorobenzene	112	68-117	08/28/12	Acceptable

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072006	**Units:**	ug/L
Lab Code:	K1208178-006	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	S2
Chloromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Vinyl Chloride	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Bromomethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Chloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Trichlorofluoromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1-Dichloroethene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Acetone	ND	U	2000	100	08/28/12	08/28/12	KWG1209826	
Carbon Disulfide	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Methylene Chloride	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
trans-1,2-Dichloroethene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1-Dichloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
2,2-Dichloropropane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
cis-1,2-Dichloroethene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
2-Butanone (MEK)	ND	U	2000	100	08/28/12	08/28/12	KWG1209826	
Bromochloromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Chloroform	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1,1-Trichloroethane (TCA)	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Carbon Tetrachloride	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1-Dichloropropene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Benzene	21000	D	500	1000	08/28/12	08/28/12	KWG1209826	
1,2-Dichloroethane (EDC)	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Trichloroethene (TCE)	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,2-Dichloropropane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Dibromomethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Bromodichloromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
cis-1,3-Dichloropropene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
4-Methyl-2-pentanone (MIBK)	ND	U	2000	100	08/28/12	08/28/12	KWG1209826	
Toluene	41000	D	500	1000	08/28/12	08/28/12	KWG1209826	
trans-1,3-Dichloropropene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1,2-Trichloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Tetrachloroethene (PCE)	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
2-Hexanone	ND	U	2000	100	08/28/12	08/28/12	KWG1209826	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072006	**Units:**	ug/L
Lab Code:	K1208178-006	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
1,3-Dichloropropane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Dibromochloromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,2-Dibromoethane (EDB)	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
Chlorobenzene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Ethylbenzene	2800	D	50	100	08/28/12	08/28/12	KWG1209826	
1,1,1,2-Tetrachloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
m,p-Xylenes	12000	D	500	1000	08/28/12	08/28/12	KWG1209826	
o-Xylene	5000	D	50	100	08/28/12	08/28/12	KWG1209826	
Styrene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Bromoform	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Isopropylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,1,2,2-Tetrachloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Bromobenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
n-Propylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,2,3-Trichloropropane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
2-Chlorotoluene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,3,5-Trimethylbenzene	400	D	200	100	08/28/12	08/28/12	KWG1209826	
4-Chlorotoluene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
tert-Butylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,2,4-Trimethylbenzene	1600	D	200	100	08/28/12	08/28/12	KWG1209826	
sec-Butylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
4-Isopropyltoluene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,3-Dichlorobenzene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,4-Dichlorobenzene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
n-Butylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,2-Dichlorobenzene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,2-Dibromo-3-chloropropane	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,2,4-Trichlorobenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
Hexachlorobutadiene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
Naphthalene	250	D	200	100	08/28/12	08/28/12	KWG1209826	
1,2,3-Trichlorobenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072006	**Units:**	ug/L
Lab Code:	K1208178-006	**Basis:**	NA

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	110	73-122	08/28/12	Acceptable
Toluene-d8	119	65-144	08/28/12	Acceptable
4-Bromofluorobenzene	113	68-117	08/28/12	Acceptable

Comments:

MW 9-4-12

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072007	**Units:**	ug/L
Lab Code:	K1208178-007	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Chloromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Vinyl Chloride	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Bromomethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Chloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Trichlorofluoromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1-Dichloroethene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Acetone	ND	U	2000	100	08/28/12	08/28/12	KWG1209826	
Carbon Disulfide	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Methylene Chloride	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
trans-1,2-Dichloroethene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1-Dichloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
2,2-Dichloropropane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
cis-1,2-Dichloroethene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
2-Butanone (MEK)	ND	U	2000	100	08/28/12	08/28/12	KWG1209826	
Bromochloromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Chloroform	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1,1-Trichloroethane (TCA)	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Carbon Tetrachloride	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1-Dichloropropene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Benzene	19000	D	500	1000	08/28/12	08/28/12	KWG1209826	
1,2-Dichloroethane (EDC)	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Trichloroethene (TCE)	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,2-Dichloropropane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Dibromomethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Bromodichloromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
cis-1,3-Dichloropropene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
4-Methyl-2-pentanone (MIBK)	ND	U	2000	100	08/28/12	08/28/12	KWG1209826	
Toluene	42000	D	500	1000	08/28/12	08/28/12	KWG1209826	
trans-1,3-Dichloropropene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,1,2-Trichloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Tetrachloroethene (PCE)	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
2-Hexanone	ND	U	2000	100	08/28/12	08/28/12	KWG1209826	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072007	**Units:**	ug/L
Lab Code:	K1208178-007	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
1,3-Dichloropropane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Dibromochloromethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,2-Dibromoethane (EDB)	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
Chlorobenzene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Ethylbenzene	2500	D	50	100	08/28/12	08/28/12	KWG1209826	
1,1,1,2-Tetrachloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
m,p-Xylenes	11000	D	50	100	08/28/12	08/28/12	KWG1209826	
o-Xylene	4600	D	50	100	08/28/12	08/28/12	KWG1209826	
Styrene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Bromoform	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Isopropylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,1,2,2-Tetrachloroethane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
Bromobenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
n-Propylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,2,3-Trichloropropane	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
2-Chlorotoluene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,3,5-Trimethylbenzene	410	D	200	100	08/28/12	08/28/12	KWG1209826	
4-Chlorotoluene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
tert-Butylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,2,4-Trimethylbenzene	1500	D	200	100	08/28/12	08/28/12	KWG1209826	
sec-Butylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
4-Isopropyltoluene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,3-Dichlorobenzene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,4-Dichlorobenzene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
n-Butylbenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,2-Dichlorobenzene	ND	U	50	100	08/28/12	08/28/12	KWG1209826	
1,2-Dibromo-3-chloropropane	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
1,2,4-Trichlorobenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
Hexachlorobutadiene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	
Naphthalene	220	D	200	100	08/28/12	08/28/12	KWG1209826	
1,2,3-Trichlorobenzene	ND	U	200	100	08/28/12	08/28/12	KWG1209826	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072007	**Units:**	ug/L
Lab Code:	K1208178-007	**Basis:**	NA

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	111	73-122	08/28/12	Acceptable
Toluene-d8	119	65-144	08/28/12	Acceptable
4-Bromofluorobenzene	113	68-117	08/28/12	Acceptable

Comments:

9/14/12

COLUMBIA ANALYTICAL SERVICES, INC.
Now part of the ALS Group
Analytical Results

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072008	**Units:**	ug/L
Lab Code:	K1208178-008	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Chloromethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Vinyl Chloride	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Bromomethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Chloroethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Trichlorofluoromethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
1,1-Dichloroethene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Acetone	ND	U	20	1	08/28/12	08/28/12	KWG1209826	
Carbon Disulfide	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Methylene Chloride	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
trans-1,2-Dichloroethene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
1,1-Dichloroethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
2,2-Dichloropropane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
cis-1,2-Dichloroethene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
2-Butanone (MEK)	ND	U	20	1	08/28/12	08/28/12	KWG1209826	
Bromochloromethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Chloroform	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
1,1,1-Trichloroethane (TCA)	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Carbon Tetrachloride	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
1,1-Dichloropropene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Benzene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
1,2-Dichloroethane (EDC)	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Trichloroethene (TCE)	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
1,2-Dichloropropane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Dibromomethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Bromodichloromethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
cis-1,3-Dichloropropene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
4-Methyl-2-pentanone (MIBK)	ND	U	20	1	08/28/12	08/28/12	KWG1209826	
Toluene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
trans-1,3-Dichloropropene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
1,1,2-Trichloroethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Tetrachloroethene (PCE)	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
2-Hexanone	ND	U	20	1	08/28/12	08/28/12	KWG1209826	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072008	**Units:**	ug/L
Lab Code:	K1208178-008	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260C		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
1,3-Dichloropropane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Dibromochloromethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
1,2-Dibromoethane (EDB)	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
Chlorobenzene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Ethylbenzene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
1,1,1,2-Tetrachloroethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
m,p-Xylenes	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
o-Xylene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Styrene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Bromoform	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Isopropylbenzene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
1,1,2,2-Tetrachloroethane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
Bromobenzene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
n-Propylbenzene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
1,2,3-Trichloropropane	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
2-Chlorotoluene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
1,3,5-Trimethylbenzene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
4-Chlorotoluene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
tert-Butylbenzene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
1,2,4-Trimethylbenzene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
sec-Butylbenzene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
4-Isopropyltoluene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
1,3-Dichlorobenzene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
1,4-Dichlorobenzene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
n-Butylbenzene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
1,2-Dichlorobenzene	ND	U	0.50	1	08/28/12	08/28/12	KWG1209826	
1,2-Dibromo-3-chloropropane	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
1,2,4-Trichlorobenzene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
Hexachlorobutadiene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
Naphthalene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	
1,2,3-Trichlorobenzene	ND	U	2.0	1	08/28/12	08/28/12	KWG1209826	

Comments:

Client:	Ecology And Environment, Incorporated	**Service Request:**	K1208178
Project:	ZOD6	**Date Collected:**	08/16/2012
Sample Matrix:	Water	**Date Received:**	08/17/2012

Volatile Organic Compounds

Sample Name:	12072008	**Units:**	ug/L
Lab Code:	K1208178-008	**Basis:**	NA

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	112	73-122	08/28/12	Acceptable
Toluene-d8	121	65-144	08/28/12	Acceptable
4-Bromofluorobenzene	110	68-117	08/28/12	Acceptable

Comments:

MW 9-14-12