START 3

Superfund Technical Assessment and Response Team 3 - Region 8

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Expanded Site Investigation – Analytical Results Report

PAVILLION AREA GROUNDWATER INVESTIGATION
Pavillion, Fremont County, Wyoming

TDD No. 0901-01

August 30, 2010

URS
OPERATING SERVICES, INC.

In association with:
Garry Struthers Associates, Inc.
LT Environmental, Inc.
TechLaw, Inc.
Tetra Tech EMI
TN & Associates, Inc.

EXPANDED SITE INVESTIGATION
ANALYTICAL RESULTS REPORT

PAVILLION AREA GW INVESTIGATION
Pavillion, Fremont County, Wyoming

CERCLIS ID # WYN000802735

EPA Contract No. EP-W-05-050
TDD No. 0910-01

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EXPANDED SITE INSPECTION – ANALYTICAL RESULTS REPORT

PAVILLION AREA GROUNDWATER INVESTIGATION
Pavillion, Fremont County, Wyoming

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1.0 INTRODUCTION

This Analytical Results Report (ARR) for the Expanded Site Inspection (ESI) at the Pavillion Area Groundwater (GW) Investigation site (Comprehensive Environmental Response, Compensation, and Liability Information System [CERCLIS] ID# WYN000802735) in Fremont County, Wyoming, has been prepared to satisfy the requirements of Technical Direction Document (TDD) No. 0901-01 issued to URS Operating Services, Inc. (UOS) under the U.S. Environmental Protection Agency (EPA) Region 8 Superfund Technical Assessment and Response Team 3 (START 3) Contract No. EP-W-05-050. This report has been prepared in accordance with the EPA "Guidance for Performing Site Inspections under CERCLA," Interim Final, September 1992, and the "Region 8 Supplement to Guidance for Performing Site Inspections under CERCLA" (EPA 1992; EPA 1993). Field activities were conducted from January 18 to January 22, 2010, in Pavillion, Wyoming. Field activities followed the Site Inspection (SI) format during the ESI, applicable UOS Technical Standard Operating Procedures (TSOPs), and the Generic Quality Assurance Project Plan (QAPP) (UOS 2005b; UOS 2005a). This ARR is intended to be used in conjunction with the Field Sampling Plan (FSP) (UOS 2010).

Contamination from chemicals of concern in the Pavillion area was originally alleged by local residents when visual and odor parameters for several domestic wells changed. Visual changes included yellow color, increased turbidity, oil sheen, and inclusion of small gas bubbles. A hydrocarbon odor was also reported. Prior screening, sampling, and analyses conducted previous to EPA's investigation indicated chemicals of concern in domestic wells with unknown risks to health and unknown sources. A previous SI performed by EPA narrowed the area of concern to an area in and around 11 wells that possessed detections of methane; volatile petroleum hydrocarbons (VPH), tentatively identified semivolatile organic compounds (SVOCs) and volatile organic compounds (VOCs); nitrate; arsenic; phthalates; and caprolactam. These wells are located in Sections 2, 10, 11, 12, 13, 15, 17, 21, and 27 of T. 3N., R. 2 E. and Section 7 of T. 3 N., R. 3 E. See Section 3.3.2 for a summary of previous work.

2.0 OBJECTIVES

The primary purpose of this ESI is to gather information for the evaluation of this site with regard to the following objectives:

- Quantify levels of chemicals of concern in wells, in order to determine risk(s), to the extent practicable; and
- Identify source(s) of chemicals of concern, to the extent practicable.

The primary purpose of this report is to present the data obtained from EPA's January 2010 sampling event. EPA has not currently reached any conclusions regarding the source of compounds of concern in domestic wells. EPA will continue to collect data and plans to prepare a report to identify the source(s) of chemicals of concern, to the extent practicable.

3.0 BACKGROUND INFORMATION

3.1 SITE LOCATION AND DESCRIPTION

The Pavillion Area Groundwater Investigation site is located near Pavillion, Wyoming, in Fremont County (Figure 1). The site is a rural community situated east of Pavillion in the Wind River Basin, and is centered approximately where several complaints of foul odor and taste in domestic water wells have been levied by residents. The site is centered in the southwest quarter of Section 2, T. 3 N., R. 2 E. The latitude is 43° 15' 37.533" north and the longitude is 108° 36' 59.698" west. Land use surrounding the site is rural, with some residential properties located among fields used for agriculture and natural gas production.

3.2 SITE CHARACTERISTICS

3.2.1 Physical Geography

The Pavillion Area Groundwater Investigation site is located in the Wind River Valley, which is the major regional topographic expression. The valley is located in central Wyoming, and is approximately 200 miles long by 100 miles wide, covering an area of approximately 11,700 square miles (Fox and Dolton 1995). The site is at an elevation of approximately 5,463 feet above mean sea level, and the terrain at the site slopes gently to the south (U.S. Geological Survey [USGS] 1959). The site is located in a sparsely populated rural area. The predominant vegetation in the area is a mixture of dryland grasses and shrubs (UOS 2008).

3.2.2 Geology and Hydrogeology

Wind-River Basin

The site is located in the north-central portion of the the Wind River Basin, a structurally controlled sedimentary basin in central Wyoming. The basin is bounded by the Owl Creek and Bighorn Mountains to the north, the Wind River Range to the west, the

Granite Mountains to the south, and the Casper Arch to the east (McGreevy 1969; Mason 2005).

The Wind River basin consists of a thick sequence of sedimentary rocks derived from the nearby mountain ranges (Appendix C – Figure 1). These sedimentary rocks are laterally and vertically variable in composition. Because of the variation, groundwater occurrence in the area is complex and varies with location, elevation, and geologic unit. USGS reports more than 30 water-bearing formations in the Wind River Basin. These units can be separated into two main groups: an underlying bedrock aquifer consisting of Tertiarty-aged rock units and an overlying sequence of young, unconsolidated alluvium and eolian deposits. (Zelt *et al.* 1999). The Wind River Basin has a complicated structure created by uplifting, folding, and faulting. The Wind River aquifer is the principal source of domestic and stock water at the site.

In the Wind River Basin, the major stratigraphic units exposed at the surface are Cretaceous, Tertiary, and Quaternary in age. The Cretaceous units include the Cody Shale, a dull gray shale with gray siltstones and fine-grained sandstones, and the Mesaverde Formation, a light colored massive to bedded sandstone with gray sandy shale and coal beds present.

Tertiary aged units include the Wind River, Fort Union, and Indian Meadows Formations. The Wind River Formation is the dominant outcrop present in the Wind River Basin and is exposed over most of the central portion of the basin. This formation is described as a red and white claystone and siltstone unit containing a lenticular coal unit in the center of the formation, and mostly nontuffaceous except near the top (Love and Christiansen 1985). The thickness of the Wind River formation varies from a few meters at the basin margin to several thousand meters thick in the northern part of the area (Seeland 1978). The Indian Meadows Formation is described as a red claystone to sandstone with limestone present; the unit also contains Paleozoic boulders and Mesozoic rocks, probably resulting from glaciations (Love and Christiansen 1985). The Indian Meadow is absent along the southwestern side of the basin, and may be thousands of meters thick or more in the subsurface along the north side of the basin (Seeland 1978). The Fort Union Formation, the least abundant unit present in the basin, is described as a brown to gray sandstone with gray to black shale and thin coal bed. Along the northern

edge of the basin the Fort Union is 2,500 meters thick; along the west and south sides of the basin the formation ranges in thickness from 50 to 350 meters (Seeland 1978).

Along with the previously mentioned formations, the basin contains various Quaternary deposits including river alluvium, gravel pediment, and fan deposits, and Pleistocene glacial deposits (Love and Christiansen 1985).

Pavillion Area Geology

This section was provided by EPA.

Erosion of the nearby mountains ranges uplifted during Late Cretaceous and early Tertiary formed the sequence of sedimentary rocks of the Wind River Basin. Channel fill and thin layers comprise the majority of the basin sediments depending on depth and surface location. The accumulation of sediments in the basin stopped in the late tertiary and erosion began to expose the more resistant layers of the Wind River formation in the Pavillion area. (Morris 1959)

The Wind River formation in the Pavillion area is essentially horizontal with a slight dip toward the center of the basin to the northeast. (Appendix C – Figures 2 and 3) Generally the Wind River formation consists of poorly consolidated sandstone, siltstone, and shale. The more resistant layers of the Wind River formation in the Pavillion area have formed Muddy Ridge to the north of the project area and Indian Ridge which is located near the southern end of the project area. (Morris 1959)

The Wind River formation consists of a complex series of interbedded lenticular sand stone, siltstone, shale, claystone, conglomerate tuff, and fresh-water limestone. It has been differentiated from the Fort Union formation below by a slight discordance or unconformity on lignite beds of the Fort Union formation. Sandstone deposits were deposited generally as lenticular lenses or as channel deposits which are sometimes crossbedded. The cemented lenses are irregular, elongate masses up to 3 feet thick which resist erosion and form ledges or ridges. (Morris, 1959) This geologic unit is exposed from the west-central part to the northeast and south-central parts of the county and is composed of "variegated claystone and sandstone; lenticular conglomerate" (Plafcan, M., et al,. 1995).

Alluvial deposits along Five Mile Creek can range up to 1 mile wide but are generally found to be a quarter of a mile to three quarters of a mile wide and the average thickness is 40 feet. (Morris 1959)

Pavillion Area Hydrogeology

This section was provided by EPA.

"Ground-water movement is controlled by the location of recharge and discharge areas and by the thickness and permeability of the geologic unit. Primary permeability is a function of the grain size, sorting, and cementation between grains. Secondary permeability created by fracturing and dissolution also is an important factor controlling ground-water movement. Fractures along anticlines can provide important conduits for vertical and horizontal ground-water flow." (Plafcan, M., et al,. 1995).

Geologic units in Fremont County are recharged by one or a combination of the following sources: (1) precipitation that infiltrates the geologic unit in its outcrop area, (2) infiltration of surface water, (3) infiltration of irrigation water, and (4) leakage from another geologic unit, either above or below. Ground-water movement is controlled by the location of recharge and discharge areas and by the thickness and permeability of the geologic unit.

Shallow wells in the weathered Wind River formation are typically completed in the unconfined aquifer but wells in the Wind River formation obtaining water from deeper lenticular sandstone beds can be semi-confined. (Morris 1959) (Appendix C – Figure 4).

Regarding shallow unconfined groundwater, both quality and water levels in the Pavillion area are most likely indicative of flood irrigation volume and quality. Crops such as alfalfa are irrigated and cut up to three times per year. The consumptive irrigation requirement for alfalfa in the Riverton area is 24.37 inches. The irrigation season begins in April and ends in October (Trelease, F.J., et al., 1970).

The colluvial-alluvial, alluvial and possibly terrace deposits in the Pavillion area together make up the shallow unconfined groundwater. Due to increased recharge to this zone during the irrigation season, the water table increases in elevation. Groundwater flow directions follow the land contours in surficial deposits. In the project area near Indian

Ridge, groundwater flow would be expected to flow along the slope of land until it reaches alluvial deposits which are hydraulically connected to Five Mile Creek. Groundwater flow in the alluvial deposits primarily moves down valley or discharges to Five Mile Creek. It is expected that Five Mile Creek flow is largely dependent on the amount of irrigation that is applied during the summer months recharging shallow groundwater which ultimately provides base flow conditions through out the winter months with some additional snow melt in the spring (Morris 1959).

In the lower reaches of Five Mile Creek where the creek cuts into the Wind River formation shallow confined groundwater discharges to the creek from the Wind River formation. Pieziometric surfaces in confined or semi-confined aquifers in the Wind River Formation are mostly influenced by nearby pumping wells.

The Wind River Formation is the most areally extensive water-bearing unit that occurs at the surface. Forty-eight percent of the wells evaluated in the 1995 Water Resources of Fremont County report were completed in the Wind River Formation. Pump tests of confined aquifers performed on Wind River formation wells in the Riverton area have shown that sandstone layers are interconnected hydraulically. Transmissibility is 10,000 gallons per day (gpd) per feet or a transmissivity of 1,000 ft^2 per day and storage coefficient for the Wind River formation are between 0.00012 and 0.00021. Although aquifers in the Wind River formation do not yield large quantities, it is the best source of water for domestic use. The largest yield is 200gpm but larger yields could be obtained by drilling deeper into the formation (Morris 1959) Richter reported a maximum yield of 3,000 gal/min from a well completed in the Wind River Formation (Richter 1981).

Economic Geology

As previously stated, the Wind River Basin has a complicated structure created by the uplifting, folding, and faulting of the Laramide Orogeny. Various thrust faults run the length of the basin along the north and northeast boundaries. A large amount of faulting is also present in the north-central to northeastern part of the basin, including in the Pavillion Area, and in the south part of the basin near the Granite Mountains (Love and Christiansen 1985). The complex geologic structure and rock formations have resulted in many structural and stratigraphic traps for hydrocarbons; consequently, drilling for natural gas and oil is common in the area (Fox and Dolton 1995).

In addition to the hydrocarbon production in the basin, uranium deposits occur along the south and southeast basin margins (Seeland 1978, Soister 1968). Many of the lower Eocene-aged strata are radioactive in the southeastern part of the basin; however, they contain uranium minerals only in a few localities (Keefer 1965).

Water-yielding, Tertiary-aged formations in the basin include the White River, a highly permeable and productive unit, yielding between 1 and 1,100 liters per minute, with a maximum reported at 3,200 liters per minute; Tepee Trail, which yields small amounts of water and is a confining layer; the Wagon Bed, which yields small amounts of water, but is not considered an aquifer; the Wasatch, for which water yield is unknown; and the Wind River, which represents a major aquifer in the basin and yields water between 4 and 11,000 liters per minute. These formations contain local artesian zones, are the principal source of domestic and stock water on the Wind River Reservation, and are the major source of industrial water in the southern part of the basin. The Willwood and Fort Union Formations yield small amounts of water, although the Fort Union is not currently used for domestic use (Zelt et al., 1999). The Aycross and Indian Meadows Formations represent confining layers within the Tertiary units. A majority of the groundwater used in the region comes from the younger aquifers, mostly because of the depth of the aquifers (Zelt *et al.* 1999).

3.2.3 Surface Water Hydrology

Surface water and runoff generally flow from the site to Five-Mile Creek, then eastward to the Boysen Reservoir. The annual mean flow of the Five-Mile Creek for the year of 2007 was 120 cubic feet per second (cfs) and the highest flow recorded was 253 cfs in 1999 (USGS 2008).

The principal streams of the area flow southeastward parallel to the axis of the Wind River Basin. Five Mile Creek flow is more than likely sustained by surface runoff during precipitation events. However return flows during irrigation and groundwater flow to Five Mile Creek provides most of the flow for the entire year. The first irrigation canal for the Riverton Irrigation project was completed in 1907.

3.2.4 Meteorology

The climate of Wind River Valley is characterized as semiarid continental, with an annual mean precipitation of approximately 11.5 inches and an annual net precipitation of slightly more than 1 inch (University of Delaware 1986). The 2-year, 24-hour rainfall event for the area is approximately 1.5 inches (Dunne and Leopold 1978).

3.3 SITE HISTORY AND BACKGROUND RESEARCH

3.3.1 Site History

Domestic well owners in the Pavillion area have filed complaints with the Wyoming Department of Environmental Quality and EPA Region 8, and have reported a foul odor and taste in their groundwater. Some domestic well owners suspect the foul odor and taste originate from natural gas well activity in the area.

3.3.2 Previous Work

Previous EPA field activities at the site include a site inspection conducted by UOS in 2009. This site inspection consisted of collecting 37 residential well and 2 municipal well water samples in Pavillion, Wyoming. Field activities were conducted from March 2 through March 6, 2009, and May 14 and May 15, 2009. Samples were analyzed for some or all of the following parameters: Target Compound List (TCL) Volatile Organic Compounds, Semi-volatile Organic Compounds, Target Analyte List (TAL) total metals, pesticides, polychlorinated biphenyls (PCB), microbacteriological parameters, anions, and petroleum hydrocarbons including Volatile Petroleum Hydrocarbons (VPH), and Extractable Petroleum Hydrocarbons (EPH). Through the EPA Contract Laboratory Program (CLP), 40 samples were analyzed for VOCs, 39 samples were analyzed for SVOCs, 40 samples were analyzed for TAL total metals, 39 samples were analyzed for pesticides, and 39 samples were analyzed for PCBs. Through the EPA Region 8 Laboratory, 14 samples were analyzed for SVOC Tentatively Identified Compounds (TIC), 40 samples were analyzed for anions/ alkalinity, and 15 samples were analyzed for dissolved methane. Through a commercial laboratory, 14 samples were analyzed for VPH, 12 samples were analyzed for EPH and 6 samples were analyzed for bacteriological parameters (UOS 2009).

SVOC TICs including adamantanes, tris(2-butoxyethyl) phosphate also known as 2-butoxyethanol phosphate (2-BEP), 2,4-bis(1-phenyl)-phenol, bisphenol-A, terpineol, 5-hydroxymethyldihydrofuran, and limonene were detected in groundwater samples. Bacterial testing was conducted for five wells. Of those five wells, two contained iron-reducing bacteria and one contained iron- and sulfate-reducing bacteria. Heterotrophic plate count testing (a measure of bacterial activity) revealed bacteria at levels between 2 and 130 MPN/mL (Most Probable Number of bacterial colonies per milliliter).

Arsenic was detected in sample PGDW25 at 31 micrograms per liter (µg/L), which exceeds the Maximum Contaminant Level (MCL) of 10 µg/L.

VPHs were detected in the petroleum analyses for samples PGDW05 and PGDW30 at 26 µg/L and 25 µg/L, respectively.

Dissolved methane was detected in eight domestic wells above the non-detect value.

Nitrate was detected in sample PGDW22 at 43.6 milligrams per liter (mg/L), which exceeds the MCL of 10 mg/L.

Many of the detections (arsenic, methane, adamantanes, tris (2-butoxyethyl) phosphate, phthalates, caprolactam, and VPH) occured in a small number of wells. These wells and the surrounding area are the focus of this ESI (Figure 2).

4.0 PRELIMINARY PATHWAY ANALYSIS

4.1 SOURCE CHARACTERIZATION

For the purpose of this report the site is considered an area of impacted groundwater in and around the 11 wells identified in the previous Site Inspection.

Potential sources of contamination considered for this analysis include:

- Natural gas production activities, such as abandoned pits, improperly plugged and abandoned wells, improper well construction, improper well completion techniques, well stimulation, and workover activities;
- Agricultural activities, such as improper application or disposal of pesticides or rodenticides;

- Industrial chemicals from local businesses that may include but not limited to: machinery shops, repair shops, auto body work shops, and painting facilities;
- Landowner/well owner management of wells, and well components;
- Landowner's septic systems, fuel storage and small scale dumps; and
- Naturally occurring contaminants.

Potential source pathways include:

- Downward infiltration of chemicals of concern from the surface;
- Lateral emplacement of chemicals of concern from offset wells;
- Upward migration of chemicals of concern from underlying sources;
- Direct placement of chemicals of concern in domestic water wells; and
- Infiltration from surface water bodies (i.e., Five Mile Creek).

4.2 GROUNDWATER PATHWAY

Groundwater is the primary pathway being considered in this investigation. The surrounding residents obtain drinking water from private domestic wells. The Wyoming State Engineer's Office has records of approximately 83 private domestic wells within the 4-mile radius of the site area center. The average number of persons per household in Fremont County, Wyoming, is 2.3 (U.S. Department of the Interior, Bureau of the Census [U.S. Census Bureau] 2000). Assuming that each domestic well serves one household, the total number of residents using groundwater within the 4-mile radius of the site is approximately 191 people. The data from the Wyoming State Engineer's Office website does not provide information on the current status of each well within the 4-mile radius (Wyoming State Engineer's Office 2008).

The town of Pavillion, Wyoming, located approximately 5 miles west of the study area center area, has five municipal wells that supply water to 165 residents in 89 homes (UOS 2009). Four of the municipal wells were running during the sampling time frame. All four of the wells were considered purged and two were subsequently sampled. The sampled municipal wells were the same two wells that were sampled during the 2009 Site Inspection.

Within the 2-mile radius of the site there are eight stock wells used for ranching purposes.

TABLE 2
Domestic Wells within a 4-Mile Radius

Radius (miles)	Number of Wells	Estimated Number of Persons Served by Domestic Wells
0 – 0.25	0	0
0.25 – 0.50	2	5
0.50 – 1.0	7	16
1.0 – 2.0	15	35
2.0 – 3.0	21	48
3.0 – 4.0	38	87
Total	**83**	**191**

4.3 SURFACE WATER PATHWAY

Topography of the site slopes to the south and east. The surface water overland drainage flows off the site mainly in the southeasterly direction 975 feet to Five-Mile Creek. The annual flow rate of Five-Mile Creek is 120 cfs, and the creek is considered a fishery.

Four miles of the 15-mile target distance limit considered under the Hazard Ranking System along Five-Mile Creek consists of wetlands (Figure 3). The wetlands start approximately 0.25 mile downstream of the site with Palustrine Scrub Shrub, and the remainder of the wetlands consists of Palustrine Emergent land with a scattering of Palustrine Scrub Shrub (U.S. Fish and Wildlife Service [USFWS] 1998). No drinking water intakes are documented along the 15-mile target distance limit. No electronic floodplain information could be located at the time of the preparation of this report.

Five-Mile Creek is used for recreational fishing. The species of fish that can be found in Five-Mile Creek include: Burbot, Flathead Chubs, Lake Chubs, White Suckers, and Long-nose Dace. The Burbot is a game fish eaten by local residents (Wyoming Game and Fish Department [WGFD] 2009). This creek is classified as a fishery by the State of Wyoming.

Five locations along Five-Mile Creek were sampled to characterize background (upstream) and downstream water quality.

4.4 SOIL EXPOSURE

The contaminated groundwater is more than 2 feet below ground surface and, therefore, not relevant to the soil exposure pathway. There are approximately 200 natural gas wells located in the Pavillion natural gas field. Thirty wells in the field are listed as plugged and abandoned (WOGCC 2008). The natural gas wells are situated on graveled pads and are unsecured. Access is not restricted to the graveled pads. Workers associated with natural gas production frequently visit the production wells. Approximately 59 residents live within the 1-mile radius of the site area center (U.S. Census Bureau 2000).

There are no terrestrial sensitive environments identified within 200 feet of the center of the study area (UOS 2008).

4.5 AIR PATHWAY

The site is located in a rural area on the Wind River Basin in north central Fremont County. There are 9 residents within the 0.25-mile radius of the site center (UOS 2009), and a total of 161 people within the 4-mile radius. The potential contamination source at the site is a plume that is more than 2 feet below ground surface and, therefore, not relevant to the air pathway. There are 357 natural gas wells in the study area. The natural gas wells are situated on graveled pads and are unsecured. Since the site includes a residential area, access is not restricted and easily accessible to the public.

An average of 2.3 people occupies each residence in Fremont County (U.S. Census Bureau 2000).

There are sensitive terrestrial environments identified within the 4-mile radius of the site. There is a State Wildlife Management Area within the 1- to 2-mile radius of the site, and another State Wildlife Management Area is located within the 3- to 4-mile radius of the site (WGFD 2008).

There are 1,212 acres of wetlands located within the 4-mile radius of the site. More than 1,000 acres of wetlands are part of the Ocean Lake, which is also designated as a State Wildlife Management Area (USFWS 1998).

TABLE 3
Population and Wetlands Within 4 Miles of the Site

Distance from Site	Estimated Population (# of persons)	Wetlands (acres)
On Site	0	0
0 – 0.25 Mile	0	0
>0.25 – 0.5 Mile	5	0
>0.5 – 1 Mile	16	0
>1 – 2 Miles	35	111
>2 – 3 Miles	48	45
>3 – 4 Miles	87	1,056
Total Within 4 Miles	**191**	1,212

Source: National Wetlands Inventory (USFWS 1998).

See the table below for a State of Wyoming Game and Fish list of endangered and threatened species found in Fremont County (WGFD 2008).

TABLE 4
Threatened and Endangered Species in Fremont County

Species	Scientific Name	Status
Brown Pelican	*Pelecanus occidentalis*	Endangered
Wood Stork	*Mycteria americana*	Endangered
Bald Eagle	*Haliaeetus leucocephalus*	Threatened
Whooping Crane	*Grus americana*	Endangered
Piping Plover	*Charadrius melodus*	Endangered
Least Tern	*Sterna antillarum*	Endangered
Passenger Pigeon	*Ectopistes migartorius*	Extinct
Gray Wolf	*Canis lupus*	Threatened
Grizzly Bear	*Ursus arctos*	Threatened
Black-footed Ferret	*Mustela nigripes*	Endangered
Canada Lynx	*Lynx canadensis*	Threatened

5.0 DATA QUALITY OBJECTIVES PROCESS

The EPA Data Quality Objectives (DQO) Process is a seven-step systematic planning approach to develop acceptance or performance criteria for EPA-funded projects. The seven steps of the DQO process are:

Step 1 The Problem Statement;

Step 2 Identifying the Decision;

Step 3 Identifying the Decision Inputs;

Step 4 Defining the Investigation Boundaries;

Step 5 Developing a Decision Rule;

Step 6 Defining Tolerance Limits on Decision Errors; and

Step 7 Optimizing the Sample Design.

These DQOs were developed by UOS and EPA based on research documented in the Preliminary Assessment (UOS 2008) and sampling results from the Site Inspection. (UOS 2009)

The project team identified groundwater as the pathway of potential concern at the site. The possible pathways of concern are presented in the Conceptual Site Model in Figure 4.

Project Objectives

- Quantify levels of chemicals of concern in wells, in order to determine risk(s) to the extent practicable; and
- Identify source(s) of chemicals of concern, to the extent practicable.

Step 1: Problem Statement

Domestic well contamination in the Pavillion area was originally alleged by local residents when visual and odor parameters for domestic wells changed. Visual changes included color, turbidity, sheen, and inclusion of small bubbles/gas. A hydrocarbon odor was also reported.

The 2009 Site Inspection has narrowed the focus of the area of concern to an area in and around the 11 wells with methane, Total Purgeable Hydrocarbons (TPH), and SVOCs found in the dissolved aqueous

phase above analytical detection limits, as well as the TICs listed in Section 3.3.2. These wells are located in Sections 2, 10, 11, 12, 13, 15, 17, 21, and 27 of T. 3 N., R. 2 E., and Section 7 of T. 3 N., R. 3 E (see section 3.3.2).

Potential health risks identified in the 2009 Site Investigation include the following:

- Arsenic above the MCL in one well;
- Detections of the SVOCs caprolactam, dimethylphthalate, bis(2-ethylhexyl)phthalate, and the TICs listed in Section 3.3.2;
- Detections of dissolved methane as methane buildup, which could lead to a explosivity hazard; and
- Total TPH detected above 20 parts per billion (ppb) in two wells.

Conceptual Site Model (Figure 4)

- The total depths of the domestic wells within the area range between 50 and 800 feet below ground surface.
- The principal industries in the area of concern are natural gas production and agriculture.
- Domestic wells show chemicals of concern.
- Potential sources include oil and natural gas production activities, agricultural sources, industrial chemicals, landowner/well owner management of wells, and well components.
- Potential source pathways at the site include:
  - Downward infiltration of chemicals of concern from the surface;
  - Lateral emplacement of chemicals of concern from offset wells;
  - Upward migration of chemicals of concern from underlying sources;
  - Direct placement of chemicals of concern in domestic water wells; and
  - Infiltration from surface water bodies (i.e., Five Mile Creek).
- The universe of materials/compounds used within the site area is not completely known.

- The hydrogeology (depth of freshwater zones used for drinking water, vertical and lateral permeability characterization, water chemistry changes with depth) is not fully known.

Step 2: Identifying the Decision

The principal investigation questions that must be addressed are:

- What are the levels of chemicals of concern in wells?
- What are the sources of chemicals of concern found in well water?

Step 3: Identifying the Inputs to the Decision

Information was gathered to assist in defining the following:

- The site conceptual model (see above discussion);
- The pathway(s) for chemicals of concern; and
- Chemicals of concern (identify and quantify).

Various sources of information that were consulted included:

- Material Safety Data Sheets (MSDS) provided by oil and gas companies operating in the area, EPA studies on oil and gas extraction-related chemicals, and the TEDX list of public MSDSs collected from oil and gas extraction-related activities (specifically chemicals that are persistent, toxic, and can be analyzed by conventional methodologies);
- Information from local agricultural businesses regarding pesticide applications;
- State regulatory agencies (WOGCC, WDEQ);
- State and local assistance agencies (Fremont County Health, Agricultural Extension Agencies);
- Interviews to determine chemical management practices by individuals at or near domestic wells;
- Federal regulatory agencies (EPA, Bureau of Land Management [BLM], Bureau of Indian Affairs [BIA]); and
- Historical sampling and analysis reports including the data from the initial sampling event (2009 Site Investigation).

Define the decision values for determining if additional action may be required:

- Maximum Contaminant Levels (MCLs);
- Integrated Risk Information System (IRIS);
- Health risk benchmarks from EPA Regional Screening Levels (RSLs); and
- Health Consultation by the Agency for Toxic Substances and Disease Registry (ATSDR).

Define the evidence to assist with determining the source of chemicals of concern:

- Chemicals of concern exist in source and well/aquifer; and
- Chemicals of concern pathway(s) have been identified.

Samples Collected (Tables 6 and 8):

Site activities involved collecting the following:

- Twenty-one domestic well water samples,
- Two municipal well samples,
- Five gas product samples from natural gas wells,
- Four liquid phase samples from natural gas wells,
- Three soil samples using GeoProbe at pit remediation locations,
- Three groundwater samples from monitoring wells at pit remediation locations,
- Five surface water samples from Five-Mile Creek,
- Five sediment samples, co-located with the surface water samples on Five-Mile Creek,
- One filter media sample,
- Four duplicate samples (one for each matrix); and
- Quality assurance/quality control (QA/QC) blanks: two field blanks (one water and one gas) and one VOC trip blank per cooler.

Test Methods (Table 7):

The list of volatile and semi-volatile analytes (Table 7) included compounds from the MSDSs provided by local oil and gas companies (Appendix F), the list of chemicals used in oil and gas production provided by TEDX (Appendix D), and the EPA study list of compounds used in oil and gas production (Appendix E). This data was analyzed for toxicity and persistence and compared to the available methods for analysis to determine the most appropriate analyses for samples collected under this study. The TCL of VOCs and SVOCs were analyzed for by a CLP laboratory, ALS Laboratory Group, using EPA Statement of Work (SOW) SOM01.2.

Additional low level volatiles and semi-volatiles were analyzed at the EPA Region 8 Laboratory using EPA methods SW846 8260 and 8270 respectively. The TICs from the 2009 Site Inspection, which included adamantane, 2-BEP, and 1,3-dimethyl adamantane were also included in the EPA Region 8 Laboratory analysis. They were included in the calibration to get a quantification of the analytes. The previous analyses were in essence a qualitative assessment of the TICs. Other analyses performed by the EPA Region 8 Laboratory included: fixed light gases, such as methane, ethane, propane and butane by EPA method 524.2; anions, ammonia, chloride, fluoride, nitrate, nitrite, phosphorous, and sulfate by EPA method 300.0; alkalinity by EPA method 310.1; and Time of Flight (TOF) mass spectrometry.

The TCL of Pesticides and PCBs were analyzed by a CLP laboratory, ALS Laboratory Group, using EPA SOW SOM01.2. The TAL metals were analyzed by a CLP laboratory, A4 Scientific, Incorporated, using EPA SOW ILM05.4. These analyses were performed in order to determine if any pesticides, PCBs, or metals were causing issues in domestic well water.

Petroleum hydrocarbon ranges in the form of Gasoline Range Organics (GRO), Total Purgeable Hydrocarbons (TPH), Diesel Range Organics (DRO), and Total Extractable Hydrocarbons (TEH) were analyzed by a commercial laboratory, Energy Laboratories, Incorporated, using method SW846 8015B. These analyses were performed in order to determine if additional hydrocarbons, not specifically calibrated for in the volatile and semivolatile analyses, were present. The GRO and DRO were also analyzed at the EPA Region 8 Laboratory with a lower reporting limit.

Iron-related and sulfate-reducing bacterial testing as well as heterotrophic plate counts on all domestic wells and three monitoring wells were included to determine if bacteria was causing issues in domestic well water. The bacterialogical samples were analyzed by a commercial laboratory, Energy Laboratories,

Incorporated. The methodologies used were method IRB-BART for the iron-related and sulfate-reducing bacterial testing and method A9215E for the heterotrophic plate counts.

Another commercial laboratory, Zymax Forensics, performed fingerprinting analyses on the production gases, dissolved gases, and liquid product. The production gas was analyzed for dissolved methane isotopic analysis and light fixed gas analysis, the carbon range of C1 to C5, for a subset of wells to determine if methane present in the sample was biogenic or thermogenic in nature. The dissolved gases were analyzed for the carbon ranges of C3 to C10 and C10 to C40. The liquid product was analyzed for the carbon range of C3 to C44.

Stable Isotope Analyses, to document release from specific source, was performed by Zymax Forensics. This analysis included δD/H and $\delta^{13}C$ on nine domestic wells and 5 production wells.

Step 4: Defining the Investigation Boundaries

The study area is defined as a 4-mile radius loosely centered on the domestic wells that had detections of chemicals of concern in the Site Inspection, and includes a 15-mile section of Five-Mile Creek (Figure 1). The target population is primarily residents within the study area who use water from domestic wells.

Step 5: Developing a Decision Rule

Values for determining if additional action may be required include:

- Maximum Contaminant Levels (MCLs);
- Integrated Risk Information System (IRIS);
- Health risk benchmarks from EPA Regional Screening Levels (RSLs); and
- Health Consultation by the Agency for Toxic Substances and Disease Registry (ATSDR).

Step 6: Defining Tolerance Limits on Decision Errors

Because sampling locations were limited to existing wells and shallow Geoprobe® samples, judgmental sampling was used for this project. Judgmentally based samples cannot be analyzed by statistical means. Therefore, error in the data will be controlled by:

- Adhering to the project FSP, TSOPs, and the START QAPP (UOS 2005a);
- Validating data, especially data addressing human health issues; and

- Achieving data quality goals as stated in section 8.0 of the FSP.

Step 7: Optimizing the Sample Design

The following deviations occurred from the Field Sampling Plan in regard to the number of samples collected:

- Sample PGDW35 could not be collected, as that well had been abandoned since the initial sampling event. Instead, a sample was collected from an alternate well on the property that was being used for domestic water; this well location was designated as PGDW48.

- At the request of a landowner, sample location PGDW49 (a shallow stock well) was added to the sampling event.

- Winter conditions at the site made the collection of surface water and sediment samples difficult. The number of sample locations was reduced from seven to five in order to reduce risk to field personnel and meet schedule constraints caused by short daylight hours.

- At location PGDW41, START contractor sampled the deeper well for analysis. EnCana was able to take split samples of this deeper domestic well. EPA relinquished all samples taken from the shallow well to an EnCana field representative.

6.0 FIELD ACTIVITIES

START team members mobilized from Denver, Colorado to Riverton, Wyoming on January 17, 2010 in order to be on site Monday January 18, 2010. START team members mobilized to the temporary field office, the Pavillion Recreation Center, at 7 a.m. to set up for sampling activities. The START Project Manager Mark McDaniel and EPA personnel Luke Chavez, Rob Parker, Nathan Wiser, and Greg Oberley met with an EnCana Oil & Gas (USA) (EnCana) representative to outline sampling plans as samples from EnCana operating gas wells were scheduled to be taken.

Site activities involved collecting the following:

- Twenty-one domestic well water samples,
- Two municipal well samples,
- Five gas product samples from natural gas wells,
- Four liquid phase samples from natural gas wells,
- Three soil samples using GeoProbe at pit remediation locations,
- Three groundwater samples from monitoring wells at pit remediation locations,
- Five surface water samples from Five-Mile Creek,
- Five sediment samples, co-located with the surface water samples on Five-Mile Creek,
- One filter media sample,
- Four duplicate samples (one for each matrix); and
- Quality assurance/quality control (QA/QC) blanks: two field blanks (one water and one gas) and one VOC trip blank per cooler.

START members were divided into teams to collect the various samples. All sample points were located with a global positioning system (GPS) device after sample collection. All samples were photographed and documented in accordance with the procedures outlined in UOS TSOP 4.5, "Sample Location Documentation" (UOS 2005b). All groundwater samples were collected from existing wells. EnCana representatives accompanied each START team and collected co-located samples at locations where EnCana also had access to collect samples and on EnCana-owned properties. Figure 2 summarizes sample locations.

Two START teams collected the domestic water well samples from January 18 to January 22, 2010. The standard procedures for water sampling included notifying the property owner of the approximate time START members would be on-site to collect samples, and requesting the property owner to begin purging water 1 to 2 hours prior to the scheduled sampling time. All domestic wells were in continuous use by the homeowners; therefore, one volume of water in the casing was flowed before parameter measurements were taken. Additionally, purging exceeded the volume of any storage device located in the waterline between the well and the sample. After one volume of the casing had been purged, water parameters including pH, conductivity, and temperature were then monitored until all three parameters stabilized

such that three successive measurements were within 10 percent of each other 1 minute apart. After satisfying all of these requirements, team members collected a sample as close to the well as possible.

Sample locations PGDW40 and PGDW41 were both non-functioning domestic wells on parcels of land that Pavillion Land Development had purchased. The electrical connections for both wells had been disconnected at the time of the field-sampling event, and an EnCana representative stated that the wells had additional problems such as inoperable pumps or no electricity to the property. START hired a local well service company to refurbish the non-functioning domestic water wells at locations PGDW40 and PGDW41. The well service company installed temporary pumps and well casings on January 21 and January 22, 2010, so that water could be purged and sampled from the wells.

Two START team members met with a Town of Pavillion representative to collect the municipal well samples on January 21, 2010. Since these wells were not flowing at the time of sampling, three times the volume in the casing was purged prior to monitoring the water parameters. After three volumes of the casing had been purged, water parameters including pH, conductivity, and temperature were then monitored until all three parameters stabilized such that three successive measurements were within 10 percent of each other 1 minute apart. After satisfying all of these requirements, team members sampled the wells.

Two START team members met with representatives from EnCana to collect samples from monitoring wells at three waste pits that are included in the WDEQ Voluntary Remediation Program (VRP). The monitoring wells were located near three EnCana natural gas well pads. Three times the volume in the casing was purged prior to monitoring the water parameters. After three volumes of the casing had been purged, water parameters including pH, conductivity, and temperature were then monitored until all three parameters stabilized such that three successive measurements were within 10 percent of each other one minute apart. After satisfying all of these requirements, team members sampled the wells. Due to the slow recharge rates of the monitoring wells, there was not enough water sampled to perform the bacterial analysis for these three samples.

START members Henry Schmelzer and Nathan Williams used a Geoprobe® truck-mounted direct-push drill rig to profile soils at three waste pits that are included in the WDEQ VRP. The remediation pits were located on three EnCana natural gas well pads. START members were required to attend an EnCana contractor orientation meeting on the evening of January 18, 2010, during which an EnCana representative provided the START team with approximate locations of the VRPs. The START

Geoprobe® team met with a contracted utility locator to clear locations prior to any coring. Sampling procedures were performed in accordance with UOS TSOP 4.16, "Surface and Shallow Depth Soil Sampling" and UOS TSOP 4.27 "Basic Geoprobe Operations." The Macro-Core® open-tube soil core was used to core starting at ground surface and terminating immediately below the extent of contamination. Stained soil with strong hydrocarbon odor was identified above the groundwater table at each location, and a sample was collected.

Surface water and sediment samples were collected at five locations along Five-Mile Creek by multiple START teams. Surface water sampling was conducted by chipping a hole through the ice and immersing the sample bottles directly into the sample media. UOS measured field parameters, including pH, temperature, and electrical conductivity of each sample collected, as described in TSOP 4.14 "Water Sample Field Measurements." Sediment samples were generally collected from the bank at the capillary fringe zone of the water body.

Field parameters including pH, conductivity, and temperature were collected for each aqueous sample. Each sample collected, its sample matrix, and which analyses were performed are detailed in Table 6. Figure 2 identifies the sample locations.

START members Mark McDaniel and Chuck Baker collected five product samples from natural gas wells. Samples PGPP01 and PPPG02 were gas phase only (no liquid phase product present at the time of sampling). Samples PGPP04, PGPP05, and PGPP06 contained both gas and liquid phase product. EnCana collected split samples at all natural gas well locations. Gas and liquid phase samples were collected by Precision Analytics Inc. for both START and EnCana. Gas sample cylinders were attached to the natural gas sales meter run and purged between 11 and 15 times (according to line pressure) before sampling. Line pressure and temperature were recorded at each sample location. A field blank, designated as PGPP03, for the gas samples was prepared by purging and then filling a sample cylinder with nitrogen before mobilizing to the field. Since the liquid phase samples contained both hydrocarbon and water phases, water parameters such as temperature, conductivity, and pH were not collected.

One opportunity sample was collected, PGFM20. This sample was a media filter collected from the reverse osmosis system in the home. Sample PGDW20 was collected from the same home and was taken at the well head.

QA/QC samples followed the requirements of the "Region 8 Supplement to Guidance for Performing Site Inspections under CERCLA" (EPA 1993), and included a VOC trip blank per cooler to monitor for

volatile contamination during transport, one field blank for methods that report tentatively identified compounds, one gas-phase field blank, and one field duplicate with matrix spike and matrix spike duplicate sample per matrix to measure the precision of field collection techniques and laboratory methods.

6.1 FIELD OBSERVATIONS

Sample PGDW35 could not be collected, as that well had been abandoned since the initial sampling event. Instead, a sample was collected from an alternate well on the property that was being used for domestic water; this well location was designated as PGDW48.

At the request of a landowner, sample location PGDW49 (a shallow stock well) was added to the sampling event.

Two wells were present at Pavillion Land Development owned property at 179 Indian Ridge Road (sample location PGDW41): one shallow well (approximately 70 feet deep) and one deep well (approximately 265 feet deep). Based on information from the Wyoming State Engineer's Office, EPA was aware of only one domestic well on the property. The well to be sampled, which was identified on the access form dated January 18, 2010, signed by EnCana and Pavillion Land Development, LLC, was the shallow well. EPA contacted the EnCana point of contact to request permission and voluntary access to sample the additional (deep) well as an opportunity sample. Because of poor cell phone coverage at the sampling location, EPA representatives Luke Chavez and Nathan Wiser had to travel to another location to conduct this conversation with the EnCana point of contact. Before he left the site, Mr. Chavez instructed START to sample the shallow well, which was the well designated on the signed access form. This action was taken to make prudent use of the START contractor's time.

During the off-site conversation, the EnCana point of contact allowed EPA to sample only one well, which was the deeper, 265-foot well, designated as PGDW41. By the time EPA returned to the sample location, the START contractor had already finished sampling the shallow well. It was noted that the shallow well sample had a visible sheen on the surface and that the water "tasted bad," according to a driller from the local well service company. Upon receiving access from EnCana, the START contractor did sample the deeper (PGDW41) well and retained that sample for analysis. EnCana was able to take split samples of this deeper domestic well. EPA relinquished all samples taken from the shallow well to an EnCana representative.

Winter conditions at the site made the collection of surface water and sediment samples difficult. The number of sample locations was reduced from seven to five in order to reduce risk to field personnel and meet schedule constraints due to fewer daylight hours.

Several domestic wells and all three monitoring wells had a sheen or odor at the time of sampling.

Other than the instances detailed above, all samples were collected as designed in the FSP.

7.0 LABORATORY DATA ANALYSIS

Sample names and sample locations are listed in Table 6 and presented in Figure 2. Samples were sent to five laboratories for different analyses.

A4 Scientific, Inc. is part of the EPA CLP and provided TAL metals and mercury analysis of 40 samples, including QA/QC. The samples were shipped via FedEx to:

A4 Scientific, Inc.
1544 Sawdust Road, Suite 505
The Woodlands, TX 77380

ALS Laboratory Group is part of the EPA CLP and provided VOC, SVOC, pesticide, and PCB analysis of 41 samples, including QA/QC. The samples were shipped via FedEx to:

ALS Laboratory Group
960 West LeVoy Drive
Salt Lake City, UT 84123

Energy Laboratories, Inc. is a commercial laboratory and provided bacteriological testing of 27 samples, including QA/QC. The test included Heterotrophic Plate Counts (HPC), Iron Reducing Bacteria (IRB), and Sulphur Reducing Bacteria (SRB). The samples were shipped via FedEx to:

Energy Laboratories, Inc.
1120 South 27th Street
Billings, MT 59107-0916

EPA Region 8 Laboratory provided Time of Flight Mass Spectroscopy (TOF/MS) specific analyte testing, low-level VOC and SVOC, anions and alkalinity, and light gases VOC analytic testing. The samples were shipped via FedEx to:

EPA Region 8 Laboratory
16194 West 45th Drive
Golden, CO 80403

Zymax Forensics Laboratory provided geochemistry fingerprinting analyses, including isotope, hydrocarbon, and fixed gas analyses. The samples were shipped via FedEx to:

Zymax Forensics Laboratory
600 S. Andreasen Drive, Suite B
Escondido, CA 92029

All five laboratories indicated that the samples were received intact with no issues. The analytic tests and the respective laboratories performing the tests are listed in Table 5.

8.0 ANALYTICAL RESULTS

Detections for compounds of interest in groundwater varied widely; for example m,p-xylene ranged from non-detect at 0.1 µg/L to 46,000,000 µg/L. Due to the volume of detected analytes, they will not be individually discussed here. See Appendix A for laboratory data; data summaries are located in the following tables:

Table 9 SVOA, TPH/DRO, Pesticide, and PCB Results

Table 10 VOA and TPH/GRO Results

Table 11 Wet Chemistry and Bacteriological Results

Table 12 Metals Data

Table 13 Fixed and Light Gases in Natural Gas from Production Wells and Domestic Water Wells

Table 14 Isotopic Analyses

Table 15 Gas Analysis by Chromatography

Table 16 Additional Gas Analyses

Table 17 C3 – C10 Gasoline Range Compounds in Production and Drinking Water Wells

Element Geochemistry, Bacterial Analysis, and Isotopic groundwater analysis were also investigated in the scope of this ARR and the results are presented below.

8.1 GROUNDWATER CHEMISTRY

This Section was provided by EPA.

Groundwater samples were analyzed for a range of major, minor, and trace chemicals. Major element geochemistry of groundwater can be used to classify compositional types and to evaluate overall water quality.

Groundwater chemistry at Pavillion is dominated by Na_2SO_4-type (sodium-sulfate) compositions. Maximum concentrations of sodium (Na^+) and sulfate (SO_4^{-2}) in groundwater samples are <1200 mg/L and <4000 mg/L, respectively. These two major solutes typically comprise the primary component of the total dissolved solid (TDS) load of groundwater. TDS values in groundwater range from about 500 to 5300 mg/L. The pH of groundwater shows significant variability, ranging from about 7 (near-neutral) to values as high as 10.5 (moderately alkaline). Typically, the pH is lower in groundwater with elevated TDS values; whereas, the highest pH values coincide with low TDS (<1000 mg/L). Of the major element components in groundwater, sulfate concentrations and pH, in many samples, fall outside of desirable water quality limits.

Groundwater collected from depths less than 100 feet below ground surface are typically more varied in composition. Rather than being dominated by Na_2SO_4-type compositions, shallow groundwater tends to be $Ca(HCO_3)_2$ (calcium bicarbonate), $CaSO_4$ (calcium-sulfate), or $Na(HCO_3)$ -type (sodium bicarbonate). TDS values for shallow groundwater ranges from about 600 to 2500 mg/L. There appears to be no obvious geographical controls on the major element chemistry of groundwater, other than deep groundwater being dominantly Na-SO4-type and shallow groundwater being more varied, typically with calcium as the dominant cationic component.

A Piper diagram is shown in Appendix C -Figure 5 for samples collected during the Phase 2 water sampling investigation. This diagram shows the relative distribution of major dissolved anions (chloride, sulfate, and bicarbonate; lower right triangle) and major dissolved cations (calcium, magnesium, sodium, and potassium; lower left triangle). The data trends show that Pavillion groundwater is dominated by sulfate and bicarbonate (chloride-poor) and by sodium, with a trend toward calcium and magnesium compositions. Deep groundwater tends to cluster at the sulfate apex of the lower right triangle on the Piper diagram, with a trend toward more bicarbonate-rich compositions coinciding with shallower depths. Similarly, deep groundwater

clusters near the sodium plus potassium apex of the lower left triangle with a trend toward calcium plus magnesium compositions at shallower depths.

8.2 BACTERIAL ANALYSIS

This Section was provided by EPA.

Microbiological samples were collected from two public drinking water wells, three monitoring wells and all domestic water wells. These samples were analyzed for nonpathogenic bacteria that are naturally occurring in the subsurface. These bacteria will have increased populations in areas where substrates (food sources) such as compounds containing carbon, iron, nitrogen and sulfate are abundant.

Organic compounds can act as a growth substrate and typically lead to increases in microbial populations. When this microbial activity increases, biodegradation or transformation of the substrate occurs through a pathway that results in the oxidation of the parent compound. The growth rate of the microbial population will be dependant on multiple factors related to nutrient supply and environmental conditions, including but not limited to the concentration of substrate, pH, and oxidation-reduction potential.

During the ESI sampling event, samples were analyzed for three types of bacteria: heterotrophs, iron reducers, and sulfate reducers. These samples were analyzed using the following methods:

- A9215 E method- heterotrophic bacteria
- IRB-BART-iron related bacteria
- Indicator- sulfate reducing bacteria

Heterotrophic bacteria tolerate a wide range of environmental conditions: temperature, pH, salinity, etc. They can be either gram-positive or gram-negative and strictly aerobic or facultative anaerobes (they can survive in both the presence and absence of oxygen).

Iron reducing bacteria are naturally found in the environment in many areas. They are typically found in the transition zone where water flows between anaerobic and aerobic conditions. These microbes have specialized enzymes capable of reducing insoluble ferric oxide into soluble ferrous hydroxide. When this de-oxygenated water reaches a source of oxygen, iron bacteria use that

oxygen to convert the soluble ferrous iron back into an insoluble reddish precipitate of ferric iron. Iron bacteria often produce unpleasant tastes and odors.

Sulfate reducing bacteria reduce elemental sulfates to sulfides, particularly hydrogen sulfide. Hydrogen sulfide is toxic and tends to have a rotten egg odor.

8.3 ISOTOPIC ANALYSIS

This Section was provided by EPA.

Isotope analysis of methane was performed for eight wells which included 12C, 13C, 1H, and 2H (deuterium). The results are expressed in δ D per mil for the isotopes of hydrogen and δ 13C per mil for carbon. One additional well did not have a high enough concentration of methane to perform the isotope analysis. Methane carbon and hydrogen isotope analysis was performed to assist in determining the origin of methane in groundwater generated by microbial activity in shallow groundwater or as thermogenic gas from deep gas producing reservoirs. Seven of the eight wells on which isotope analysis were performed showed methane origin as either oxidized thermogenic source or showed a mixture of thermogenic and microbially generated methane (Coleman, et al., 1995) (Appendix C – Figure 6).

9.0 DATA VALIDATION AND INTERPRETATION

9.1 DATA QUALITY ASSESSMENT

Definitions of Data Qualifiers (Flags) Used in this Dataset:

U – The analyte was analyzed for but not detected. The value preceding the U is the Contract Required Quantitation Limit (CRQL).

J – The identification of the analyte is acceptable, but quality assurance criteria indicate that the quantitative values may be outside the normal expected range of precision; i.e., the quantitative value is considered estimated.

R – Data is considered to be rejected and shall not be used. This flag denotes the failure of quality control criteria such that it cannot be determined if the analyte is present or absent from

the sample. Resampling and analysis are necessary to confirm or deny the presence of the analyte.

UJ – This is a combination of the U and J flags. The analyte is not present. The reported value is considered to be an estimated CRQL.

While the overall quality of the data is good, some anomalies and exceptions occur in any dataset of significant size. These instances and their impact on the usability of the data are summarized below.

CLP Laboratory Program

Inorganics:

- Samples PGDW03, PGDW04, PGDW05D, PGDW20, PGDW22, PGDW 23, PGDW25, PGDW32, PGDW39, PGDW42, PGDW43, PGDW44, PGDW45, PGDW47, PGDW48, and PGSW01 were flagged as "J" or "UJ" for copper due to laboratory duplicate criteria not being met, bias is unknown.

- Antimony in samples PGDW05, PGDW43, PGDW46, PGDW47, PGDW49, PGSW02, PGSW03, PGSW05, PGMW02, and PGMW03 were flagged as "U" at the CRQL due to laboratory blank contamination.

- Samples PGDW05D, PGDW40, PGPW01, PGPW02, PGSW01, PGSW02D, PGSW03, PGSW04, PGSW05, PGMW01, and PGMW02 were qualified as non-detect or "U" for copper due to laboratory blank contamination.

- Samples PGDW30, PGDW40, PGDW41, PGDW43, PGDW46, PGDW49, PGSW01, PGSW02, PGSW02D, PGSW03, PGSW05, PGMW01, PGMW01D, PGMW02, PGMW03, PGPW01, and PGPW02 were flagged as "J" or "UJ" for silver due to a low matrix spike recovery resulting in a low bias.

- Several samples required a "J" flag added to the calcium result after serial dilution check failed criteria. Since calcium will not drive decisions at the site, the specific samples will not be discussed.

Organics:

- Carbon disulfide in all samples analyzed by the CLP laboratory was flagged as "U," removing detections between the method detection limit and CRQL due to laboratory method blank contamination.

- Trichlorofluoromethane in all samples analyzed by the CLP laboratory was flagged as "U," removing detections between the method detection limit and CRQL due to laboratory holding blank contamination (contamination acquired from the sample storage refrigerator).

- Bis(2-ethylhexyl)phthalate in soil and sediment samples was flagged as "U" due to laboratory blank contamination.

- The field blank PGFB01 was extracted outside of hold time, and the results were flagged as "J" or "UJ" (results potentially biased low).

- Other minor exceedances of surrogates and continuing calibrations were flagged as "J" or "UJ" where appropriate and are acceptable with the attached qualifiers.

Energy Laboratories, Inc.

Data from Energy Laboratories were acceptable as is with no additional qualifiers attached.

EPA Region 8 Laboratory

- TPH/DRO results for samples PGDW48 and PGFB01 were extracted outside of hold time and have been flagged as "J"; these sample results are potentially biased low.

- TPH/DRO in sample PGSW02D was flagged "J" due to laboratory contamination of phthalates; these results may be biased high.

- The matrix spike recovery for PGMW01 TPH/DRO and TPH/GRO was high and the results have been flagged as "J", these results may be biased high.

- The TPH/GRO surrogate recovery for PGFM20 was below acceptable limits and the result was flagged as "J." This sample consisted of filter media from a reverse osmosis

water filtration system which is designed to absorb organics and metals; the data is likely biased low.

- Samples PGDW05, PGDW05D, PGDW10, PGDW22, PGDW23, PGDW44, and PGDW45 were flagged as "J" due to exceedance of hold time for GC/FID light gases and are potentially biased low.

- All detected compounds in samples PGDW05, PGDW05D, PGDW10, PGDW20, PGDW22, PGDW23, PGDW30, PGDW39, PGDW40, PGDW41PGDW45,PGDW47, PGSW01, PGPP04, PGPP05, PPPG06 and PGFB01 were flagged as "J" due to exceedance of hold time for 8270 semi-volatile organics and are potentially biased low.

- All detected compounds in samples PGPP01, PGPP04, PGPP05, PGPP06, PGDW05, PGDW05D, PGDW23, PGDW30, PGDW32, PGMW01, PGMW01D, and PGMW02 were flagged as "J" due to exceedance of hold time for 8260 volatile organics and are potentially biased low.

- For 8260, 8270, TPH GRO/DRO, and light gases analyses, several Continuing Calibration Verification (CCV) checks, Initial Calibration Verifications (ICV), method blanks, and laboratory control spikes had compounds that exceeded the upper or lower control limits; these compounds have been flagged as "J." There was no direct connection in the case narrative to assign specific failures to associated sample.

- There was method blank contamination associated with bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, and di-n-octyl phthalate for the Region 8 lab. In accordance with the CLP National Functional Guidelines, EPA personnel compared each of the sample concentrations with their associated method blank concentrations. Detections have been changed to non-detect if the concentration in the sample is below 5x the concentration in the blank.

- Additionally, there was field blank contamination associated with bis(2-ethylhexyl)phthalate, diethylphthalate, and phenol. In accordance with Risk Assessment Guidance for Superfund, EPA personnel compared each of the sample concentrations with the field blank concentration. Detections were changed to non-detect if the concentration in the sample was either 5x below the concentration in the blank for

phenol, or 10x below the concentration in the blank for the phthalate esters, as they are deemed "common lab contaminants."

- The field blank had a detection for DRO in the EPH analysis that the Region 8 laboratory attributed to a large peak of 2,4-bis(1,1-dimethylethyl) phenol that was detected in the 8270 analysis and comprised 43 percent of the DRO response. This compound was not detected in any other samples. Analysis by EPA Region 8 Laboratory personnel illustrated no overlap between the chromatogram for the field blank, which shows a detection of predominately one peak, and the chromatograms of any of the other samples. Additionally, none of the instrument blanks had detections over the laboratory reporting limit. Due to the fact that the field blank peak was not detected in any of the other samples, none of the data qualifiers for this data will be adjusted.

Zymax Forensics Laboratory

Data from Zymax Laboratories met acceptance criteria and require no additional qualifiers.

Field Analytical Data

Temperature, conductivity, and pH measurements were taken in the field using an Oakton Instruments® model PCS Testr35. The pH and conductivity were calibrated at the beginning of the day, and all samples were collected within 3 hours of calibration. Logbooks were reviewed and field analytical data for all samples were found to be complete.

9.2 DATA QUALITY INDICATORS

9.2.1 Bias

Calibrations, serial dilutions, interference check samples, matrix spikes, and blanks were reviewed as possible indicators of bias in the data. Negative blank contamination and positive blank contamination (blank has detections for target analytes above the method detection limit) was present in the laboratory data for some data points. Negative blank contamination creates a potential low bias, while positive blank contamination creates a high bias. Additionally, some samples were analyzed or extracted beyond hold times; this creates a negative bias as well. See section 9.1 for results that may have a potential bias.

9.2.2 Sensitivity

Some reporting limits were raised by the data reviewer due to blank problems (as discussed above in section 9.1). The elevated detection limits do not impact the end use of the data because, with the exception of phthalates, these detections were below the reporting limits.

9.2.3 Precision

Precision is monitored by instrument calibration and spike samples. All precision criteria were met, with the exception of the several data points flagged as "J" in the Region 8 Laboratory data as discussed in section 9.1. These data are acceptable for their intended use with the attached qualifiers.

9.2.4 Accuracy

All laboratory duplicates met criteria. The field duplicates had some relative percent differences (RPD) that were greater than the 20 percent criteria set by the National Functional Guidelines for Data Review (NFG). However, since most values associated with high RPDs were within five times the CRDL, they are considered non-significant, per NFG specifications. This variability is due to increasing error as values approach the CRDL. Overall RPD from field sample duplicates and replicates was 18 percent for domestic water samples, 16.5 percent for surface waters, 13 percent for sediment and soil samples, and 44 percent for groundwater monitoring wells. The goals set in the NFG and site DQOs were 20 percent RPD for water and 35 percent RPD for soils and sediment. The higher RPD from the monitoring well PGMW01 is likely due to the extremely low flow and recharge rate, as well as high levels of contaminants present. These two factors may have created a non-homogeneous duplicate sample. Furthermore the difference between PGMW01 and PGMW01D was demonstrated at both the EPA Region 8 Laboratory and the CLP Laboratory.

9.2.5 Representativeness

All samples were collected within a 5-day period using the same methodology. There were no deviations from the FSP, TSOPs, or analytical methods employed to collect the

data. While chain of custody (COC) and preservation requirements for the samples were met, hold-time exceedances in the samples may create a low bias in the resulting data.

9.2.6 Completeness

Percent completeness (number of valid measurements / total number of measurements planned) was 100 percent. Several samples were added to the study in the field. Sample PGDW35 was not collected as the pump was not functioning in that well; instead sample PGDW48 was collected from an alternate well at the property that is being used for drinking water. All data points are valid, with the validation qualifiers attached. The completeness is sufficient for the intended purpose.

9.2.7 Comparability

The data are homogeneous for several reasons:

- All samples were collected during a single sampling event, eliminating seasonal variation;
- All samples were collected as specified in the FSP and TSOP, except where noted in section 6.0; and
- The same method. was used for samples with similar matrices and analyses regardless of the lab that completed the analysis.

9.2.8 Data Usability Summary

All analytical data, including logbooks, COCs, and long form raw data packages, were reviewed by a UOS chemist or by a third party data reviewer against the TSOP or EPA method they were generated under, and found to be acceptable for their intended use with the attached qualifiers, with exceptions noted below:

- Results for samples that were analyzed or extracted beyond hold times should be considered as having a potential low bias.

- Results for samples that had a low surrogate recovery should be considered as having a potential low bias.

- Results for samples that had a high surrogate recovery should be considered as having a potential high bias.

- Results that exceeded the upper linear calibration range and were not rerun at a higher dilution should be considered as having a probable low bias.

- Results for samples that had low recoveries in the corresponding spike sample should be considered as having a potential low bias.

- Results for samples that had high recoveries in the corresponding spike sample should be considered as having a potential high bias.

- Results for samples that had initial calibration, continuing calibration or DMC recoveries low should be considered as having a potential low bias.

- Results for samples that had initial calibration, continuing calibration or DMC recoveries high should be considered as having a potential high bias.

10.0 SUMMARY AND CONCLUSIONS

Section 10.0, Summary and Conclusions, was provided by EPA.

10.1 BACKGROUND

EPA conducted an Expanded Site Inspection (ESI) in January 2010 in Pavillion, Wyoming. This sampling effort is a follow up to a first round of sampling that took place in March 2009. The focus of this investigation is to address potential groundwater contamination based on resident complaints about odors, tastes and adverse changes in water quality in their private wells. The objectives of this ESI are to:

- Quantify levels of chemicals of concern in wells, in order to determine risk(s), to the extent practicable; and,
- Identify source(s) of chemicals of concern, to the extent practicable.

EPA's investigation sampled 19 drinking water wells (17 private and 2 public) and 4 stock/irrigation wells in January 2010. EPA also sampled 3 shallow groundwater monitoring wells and soils associated with inactive pits, as well as production fluids from 4 gas production wells, and surface water and nearby sediment from 5 locations on Five Mile Creek.

10.2 SUMMARY OF RESULTS AND CONCLUSIONS

A number of nearby drinking water and stock wells have low level detections of organic compounds such as phenols, benzene, and naphthalene. Seventeen of 19 drinking water wells sampled show detections of Total Petroleum Hydrocarbons. Two drinking water wells sampled in January 2010 had constituents detected by EPA that exceeded a primary drinking water standard. One well, which was not being used for drinking water during the sampling event, exceeded the primary drinking water standards for lead and phthalate. The other drinking water well exceeded one standard for nitrates. This well owner also had the same exceedance during the Phase 1 sampling and was notified at each incident and was provided with assistance.

Four pesticides were detected in 4 private wells at very low concentrations, less than 10 parts per trillion.

EPA was able to confirm and quantify the concentrations of some of the Tentatively Identified Compounds (TICs) found during our March 2009 sampling event. Eleven wells were confirmed to have 2-butoxyethanol phosphate, or 2-BEP, at very low concentrations (less than 5 ppb). The compound 2- BEP is not a constituent typically found in drinking water wells. A USGS national groundwater study using similar detection limits detected 2-BEP in only 1 of around 200 wells sampled.

Methane identified in 7 drinking water wells was found to be of thermogenic origin, meaning it originated within the natural gas reservoir. One drinking water well showed methane resulting from microbial activity, known as biogenic methane.

Adamantane compounds were also confirmed in 4 drinking wells at low concentrations. Adamantane compounds are commonly associated with hydrocarbon production fluids, and can be found in other products.

EPA also performed analysis of the bacteria present in groundwater at some well locations. This information is indicative of the level of microbial activity in groundwater. The microbial organisms that were identified are not organisms that are harmful to health, but could lead to concerns with odor.

Sample results also indicated a number of inorganic constituents that EPA would expect to see given the historic groundwater quality in the area. Although these constituents, such as sulfates, iron and magnesium, are generally within the ranges seen in previous studies, they are in some cases present at elevated levels.

Our sampling confirmed that shallow ground water located near inactive pits being addressed under Wyoming DEQ's voluntary clean-up program still contain significant levels of organic compounds including benzene, naphthalene, phenol and hydrocarbons.

Two Town of Pavillion water supply wells were sampled as part of this ESI. EPA's Public Water Supply Program requires routine sampling and analysis of the system's blended and treated water that supplies drinking water to residents of the town of Pavillion. Because sampling for this project was to assess the condition of groundwater in the vicinity and not to assess the finished water that is in the Pavillion distribution system, the samples for this project were collected at the well prior to treatment so as to represent the characteristics of the aquifer. Consequently, these sample results are not indicative of the water provided by the Pavillion public water supply system to its customers. Compounds detected in the untreated and unblended water included caprolactam, butyl benzyl phthalate, and DRO at low levels.

These ESI sampling results show that groundwater in Pavillion contains a number of organic compounds that were detected in monitoring wells, drinking water wells and stock wells.

The shallow groundwater is hydrologically connected to the aquifers that are being used for drinking water in the area. Without more information on flow direction and contaminant movement, significant uncertainty exists regarding future impacts to drinking water wells. These sample results reflect a single snapshot in time and we are unable to determine any trends or changes in condition.

EPA continues to further investigate and will be collecting data from two new monitoring wells and a soil gas survey in the Pavillion field. EPA has not reached any conclusions about how constituents of concern are occurring in domestic wells with this ARR. The additional investigation results will help determine where the constituents are coming from. Even with the additional information, EPA may not be able to definitively pinpoint a specific source or sources.

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Figure 1 Site Location Map

Figure 2 Sample Locations Map

Figure 3 Area of Influence and Well locations

Figure 4 – Conceptual Site Model

Table 5
Laboratories and Test Methods

Laboratory	Test	Analysis Category	Purpose	Number of Samples
Zymax Forensic Geochemistry Lab	Hydrocarbon composition in water	Fingerprint Source	Needed to interpret Isotope work	15
Zymax Forensic Geochemistry Lab	Carbon and hydrogen isotope ratios of methane	Fingerprint Source	Determine methane source (coal, bacteria, natural gas)	15
Zymax Forensic Geochemistry Lab	C1-C5 hydrocarbons and fixed gas, production gases	Fingerprint Source	Fingerprint of production gas	15
Zymax Forensic Geochemistry Lab	C3-C10 hydrocarbon composition by GC/MS	Fingerprint Source	Fingerprint of dissolved gases	15
Zymax Forensic Geochemistry Lab	C10-C40 alkane analysis by GC/FID	Fingerprint Source	Fingerprint of dissolved gases	15
Zymax Forensic Geochemistry Lab	C3-C44 hydrocarbon composition,	Fingerprint Source/ Human Health	Fingerprint of liquid product	15
Energy Labs	8015 GRO/DRO	Fingerprint Source/ Human Health	Hydrocarbon analysis with lower reporting limits	43
Energy Labs	Bacteriological Testing - Heterotrophic Plate Counts (HPC), Iron Reducing Bacteria (IRB), and Sulphur Reducing Bacteria (SRB)	Bacterial	Iron and sulfur reducing bacteria presence	27
EPA Region 8 Lab	TOF specific analyte Testing	Fingerprint Source/ Human Health	Test for polar compounds	39
EPA Region 8 Lab	8260 Low-level VOC	Fingerprint Source/ Human Health	Non-polar compounds (low level)	41
EPA Region 8 Lab	8270 Low-level SVOC	Fingerprint Source/ Human Health	Non-polar compounds (low level)	39
EPA Region 8 Lab	RSK-175 Light Gases P, M, E, B	Fingerprint Source/ Human Health	Methane source (coal, bacteria, natural gas) all wells	34
EPA Region 8 Lab	Anions + Alkalinity	Aquifer Chemistry	Determine how wells and aquifers are interrelated	34
ALS Laboratory Group - EPA CLP Laboratory	CLP Volatiles	Standard Drinking Water Testing	Standard drinking water testing	41
ALS Laboratory Group - EPA CLP Laboratory	CLP Semi-Volatiles	Standard Drinking Water Testing	Standard drinking water testing	41
A4 Scientific - EPA CLP Laboratory	CLP Metals	Standard Drinking Water Testing	Standard drinking water testing	40
ALS Laboratory Group - EPA CLP Laboratory	CLP PCBs + Pesticides	Standard Drinking Water Testing	Standard drinking water testing	41

Table 6
Sample Locations and Analyses

Sample Location	Matrix	A4 Scientific CLP TAL Metals ICP-AES	A4 Scientific CLP TAL Total Metals/Hg ICP-MS and ICP/AES	A4 Scientific CLP TCL Semivolatiles and Pesticides/ PCBs	Datachem Laboratories CLP TCL Trace Volatiles	EPA Region 8 Lab SVOA/ MS-TOF / GRO/DRO	EPA Region 8 Lab VOCs	EPA Region 8 Lab VOC Light Gases	EPA Region 8 Alkalinity and Anions	Energy Labs Bacteria HPC/ IRB/ SRB	Energy Labs GRO/DRO	Zymax Geochemistry Forensics Testing
PGDW03	Water		X	X	X	X	X	X	X	X	X	
PGDW04	Water		X	X	X	X	X	X	X	X	X	X
PGDW05	Water		X	X	X	X	X	X	X	X	X	
PGDW05D	Water		X	X	X	X	X	X			X	X
PGDW10	Water		X	X	X	X	X	X	X	X	X	
PGDW20	Water		X	X	X	X	X	X	X	X	X	X
PGDW22	Water		X	X	X	X	X	X	X	X	X	
PGDW23	Water		X	X	X	X	X	X	X	X	X	X
PGDW25	Water		X	X	X	X	X	X	X	X	X	
PGDW30	Water		X	X	X	X	X	X	X	X	X	X
PGDW32	Water		X	X	X	X	X	X	X	X	X	
PGDW39	Water		X	X	X	X	X	X	X	X	X	
PGDW40	Water		X	X	X	X	X	X	X	X	X	X
PGDW41	Water		X	X	X	X	X	X	X	X	X	X
PGDW42	Water		X	X	X	X	X	X	X	X	X	
PGDW43	Water		X	X	X	X	X	X	X	X	X	X
PGDW44	Water		X	X	X	X	X	X	X	X	X	X
PGDW45	Water		X	X	X	X	X	X	X	X	X	
PGDW46	Water		X	X	X	X	X	X	X	X	X	
PGDW47	Water		X	X	X	X	X	X	X	X	X	
PGDW48	Water		X	X	X	X	X	X	X	X	X	
PGDW49	Water		X	X	X	X	X	X	X	X	X	
PGFB01	Water			X		X						
PGMW01	Water		X	X	X	X	X	X	X	X	X	
PGMW01D	Water		X	X	X	X	X	X	X	X	X	
PGMW02	Water		X	X	X	X	X	X	X	X	X	
PGMW03	Water		X	X	X	X	X	X	X	X	X	
PGPP01	Product					X	X					X
PGPP02	Product											X
PGPP03	Product											X
PGPP04	Product					X	X					X
PGPP05	Product					X	X					X
PGPP06	Product					X	X					X
PGPW01	Municipal Water		X	X	X	X	X	X	X	X	X	
PGPW02	Municipal Water		X	X	X	X	X	X	X	X	X	
PGSE01	Sediment	X		X	X	X					X	
PGSE02	Sediment	X		X	X	X					X	
PGSE02d	Sediment	X		X	X	X					X	
PGSE03	Sediment	X		X	X	X					X	
PGSE04	Sediment	X		X	X	X					X	
PGSE05	Sediment	X		X	X	X					X	
PGSO01	Soil Boring					X					X	
PGSO02	Soil Boring					X					X	
PGSO03	Soil Boring					X					X	
PGSW01	Surface Water		X	X	X	X	X	X	X		X	
PGSW02	Surface Water		X	X	X	X	X	X	X		X	
PGSW02D	Surface Water		X	X	X	X	X	X	X		X	
PGSW03	Surface Water		X	X	X	X	X	X	X		X	
PGSW04	Surface Water		X	X	X	X	X	X	X		X	
PGSW05	Surface Water		X	X	X	X	X	X	X		X	
PGTB01	Water				X	X						
PGFM20	Filter Sample					X	X					

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
ALUMINUM	7429-90-5	A4 SCIENTIFIC	200	µg/L	CLP Metals - 200.7 (ICP-AES)
IRON	7439-89-6	A4 SCIENTIFIC	100	µg/L	CLP Metals - 200.7 (ICP-AES)
LEAD	7439-92-1	A4 SCIENTIFIC	10	µg/L	CLP Metals - 200.7 (ICP-AES)
MAGNESIUM	7439-95-4	A4 SCIENTIFIC	5000	µg/L	CLP Metals - 200.7 (ICP-AES)
MANGANESE	7439-96-5	A4 SCIENTIFIC	15	µg/L	CLP Metals - 200.7 (ICP-AES)
NICKEL	7440-02-0	A4 SCIENTIFIC	40	µg/L	CLP Metals - 200.7 (ICP-AES)
POTASSIUM	7440-09-7	A4 SCIENTIFIC	5000	µg/L	CLP Metals - 200.7 (ICP-AES)
SILVER	7440-22-4	A4 SCIENTIFIC	10	µg/L	CLP Metals - 200.7 (ICP-AES)
SODIUM	7440-23-5	A4 SCIENTIFIC	5000	µg/L	CLP Metals - 200.7 (ICP-AES)
THALLIUM	7440-28-0	A4 SCIENTIFIC	25	µg/L	CLP Metals - 200.7 (ICP-AES)
ANTIMONY	7440-36-0	A4 SCIENTIFIC	60	µg/L	CLP Metals - 200.7 (ICP-AES)
ARSENIC	7440-38-2	A4 SCIENTIFIC	10	µg/L	CLP Metals - 200.7 (ICP-AES)
BARIUM	7440-39-3	A4 SCIENTIFIC	200	µg/L	CLP Metals - 200.7 (ICP-AES)
BERYLLIUM	7440-41-7	A4 SCIENTIFIC	5	µg/L	CLP Metals - 200.7 (ICP-AES)
CADMIUM	7440-43-9	A4 SCIENTIFIC	5	µg/L	CLP Metals - 200.7 (ICP-AES)
CHROMIUM	7440-47-3	A4 SCIENTIFIC	10	µg/L	CLP Metals - 200.7 (ICP-AES)
COBALT	7440-48-4	A4 SCIENTIFIC	50	µg/L	CLP Metals - 200.7 (ICP-AES)
COPPER	7440-50-8	A4 SCIENTIFIC	25	µg/L	CLP Metals - 200.7 (ICP-AES)
VANADIUM	7440-62-2	A4 SCIENTIFIC	50	µg/L	CLP Metals - 200.7 (ICP-AES)
ZINC	7440-66-6	A4 SCIENTIFIC	60	µg/L	CLP Metals - 200.7 (ICP-AES)
CALCIUM	7440-70-2	A4 SCIENTIFIC	5000	µg/L	CLP Metals - 200.7 (ICP-AES)
SELENIUM	7782-49-2	A4 SCIENTIFIC	35	µg/L	CLP Metals - 200.7 (ICP-AES)
Aroclor-1260	11096-82-5	ALS	1	µg/L	CLP - Arochlors
Aroclor-1254	11097-69-1	ALS	1	µg/L	CLP - Arochlors
Aroclor-1268	11100-14-4	ALS	1	µg/L	CLP - Arochlors
Aroclor-1221	11104-28-2	ALS	1	µg/L	CLP - Arochlors
Aroclor-1232	11141-16-5	ALS	1	µg/L	CLP - Arochlors
Aroclor-1248	12672-29-6	ALS	1	µg/L	CLP - Arochlors
Aroclor-1016	12674-11-2	ALS	1	µg/L	CLP - Arochlors
Aroclor-1262	37324-23-5	ALS	1	µg/L	CLP - Arochlors
Aroclor-1242	53469-21-9	ALS	1	µg/L	CLP - Arochlors
Heptachlor epoxide	1024-57-3	ALS	0.05	µg/L	CLP - Pesticides
Endosulfan sulfate	1031-07-8	ALS	0.1	µg/L	CLP - Pesticides
Aldrin	309-00-2	ALS	0.05	µg/L	CLP - Pesticides
alpha-BHC	319-84-6	ALS	0.05	µg/L	CLP - Pesticides
beta-BHC	319-85-7	ALS	0.05	µg/L	CLP - Pesticides
delta-BHC	319-86-8	ALS	0.05	µg/L	CLP - Pesticides
Endosulfan II	33213-65-9	ALS	0.1	µg/L	CLP - Pesticides
4,4'-DDT	50-29-3	ALS	0.1	µg/L	CLP - Pesticides
alpha-Chlordane	5103-71-9	ALS	0.05	µg/L	CLP - Pesticides
gamma-Chlordane	5103-74-2	ALS	0.05	µg/L	CLP - Pesticides
Endrin ketone	53494-70-5	ALS	0.1	µg/L	CLP - Pesticides
gamma-BHC (Lindane)	58-89-9	ALS	0.05	µg/L	CLP - Pesticides
Dieldrin	60-57-1	ALS	0.1	µg/L	CLP - Pesticides

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
Endrin	72-20-8	ALS	0.1	µg/L	CLP - Pesticides
Methoxychlor	72-43-5	ALS	0.5	µg/L	CLP - Pesticides
4,4'-DDD	72-54-8	ALS	0.1	µg/L	CLP - Pesticides
4,4'-DDE	72-55-9	ALS	0.1	µg/L	CLP - Pesticides
Endrin aldehyde	7421-93-4	ALS	0.1	µg/L	CLP - Pesticides
Heptachlor	76-44-8	ALS	0.05	µg/L	CLP - Pesticides
Toxaphene	8001-35-2	ALS	5	µg/L	CLP - Pesticides
Endosulfan I	959-98-8	ALS	0.05	µg/L	CLP - Pesticides
4-Nitroaniline	100-01-6	ALS	10	µg/L	CLP - Semi-volatiles
4-Nitrophenol	100-02-7	ALS	10	µg/L	CLP - Semi-volatiles
Benzaldehyde	100-52-7	ALS	5	µg/L	CLP - Semi-volatiles
4-Bromophenyl-phenylether	101-55-3	ALS	5	µg/L	CLP - Semi-volatiles
Caprolactam	105-60-2	ALS	5	µg/L	CLP - Semi-volatiles
2,4-Dimethylphenol	105-67-9	ALS	5	µg/L	CLP - Semi-volatiles
4-Methylphenol	106-44-5	ALS	5	µg/L	CLP - Semi-volatiles
4-Chloroaniline	106-47-8	ALS	5	µg/L	CLP - Semi-volatiles
2,2'-Oxybis(1-chloropropane)	108-60-1	ALS	5	µg/L	CLP - Semi-volatiles
Phenol	108-95-2	ALS	5	µg/L	CLP - Semi-volatiles
Bis(2-chloroethyl)ether	111-44-4	ALS	5	µg/L	CLP - Semi-volatiles
Bis(2-chloroethoxy)methane	111-91-1	ALS	5	µg/L	CLP - Semi-volatiles
Bis(2-ethylhexyl)phthalate	117-81-7	ALS	5	µg/L	CLP - Semi-volatiles
Di-n-octylphthalate	117-84-0	ALS	5	µg/L	CLP - Semi-volatiles
Hexachlorobenzene	118-74-1	ALS	5	µg/L	CLP - Semi-volatiles
Anthracene	120-12-7	ALS	5	µg/L	CLP - Semi-volatiles
2,4-Dichlorophenol	120-83-2	ALS	5	µg/L	CLP - Semi-volatiles
2,4-Dinitrotoluene	121-14-2	ALS	5	µg/L	CLP - Semi-volatiles
Pyrene	129-00-0	ALS	5	µg/L	CLP - Semi-volatiles
Dimethylphthalate	131-11-3	ALS	5	µg/L	CLP - Semi-volatiles
Dibenzofuran	132-64-9	ALS	5	µg/L	CLP - Semi-volatiles
Atrazine	1912-24-9	ALS	5	µg/L	CLP - Semi-volatiles
Benzo(g,h,i)perylene	191-24-2	ALS	5	µg/L	CLP - Semi-volatiles
Indeno(1,2,3-cd)pyrene	193-39-5	ALS	5	µg/L	CLP - Semi-volatiles
Benzo(b)fluoranthene	205-99-2	ALS	5	µg/L	CLP - Semi-volatiles
Fluoranthene	206-44-0	ALS	5	µg/L	CLP - Semi-volatiles
Benzo(k)fluoranthene	207-08-9	ALS	5	µg/L	CLP - Semi-volatiles
Acenaphthylene	208-96-8	ALS	5	µg/L	CLP - Semi-volatiles
Chrysene	218-01-9	ALS	5	µg/L	CLP - Semi-volatiles
Benzo(a)pyrene	50-32-8	ALS	5	µg/L	CLP - Semi-volatiles
2,4-Dinitrophenol	51-28-5	ALS	10	µg/L	CLP - Semi-volatiles
4,6-Dinitro-2-methylphenol	534-52-1	ALS	10	µg/L	CLP - Semi-volatiles
Dibenzo(a,h)anthracene	53-70-3	ALS	5	µg/L	CLP - Semi-volatiles
Benzo(a)anthracene	56-55-3	ALS	5	µg/L	CLP - Semi-volatiles
2,3,4,6-Tetrachlorophenol	58-90-2	ALS	5	µg/L	CLP - Semi-volatiles
4-Chloro-3-methylphenol	59-50-7	ALS	5	µg/L	CLP - Semi-volatiles

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
2,6-Dinitrotoluene	606-20-2	ALS	5	µg/L	CLP - Semi-volatiles
N-Nitroso-di-n-propylamine	621-64-7	ALS	5	µg/L	CLP - Semi-volatiles
Hexachloroethane	67-72-1	ALS	5	µg/L	CLP - Semi-volatiles
4-Chlorophenyl-phenylether	7005-72-3	ALS	5	µg/L	CLP - Semi-volatiles
Hexachlorocyclopentadiene	77-47-4	ALS	5	µg/L	CLP - Semi-volatiles
Isophorone	78-59-1	ALS	5	µg/L	CLP - Semi-volatiles
Acenaphthene	83-32-9	ALS	5	µg/L	CLP - Semi-volatiles
Diethylphthalate	84-66-2	ALS	5	µg/L	CLP - Semi-volatiles
Di-n-butylphthalate	84-74-2	ALS	5	µg/L	CLP - Semi-volatiles
Phenanthrene	85-01-8	ALS	5	µg/L	CLP - Semi-volatiles
Butylbenzylphthalate	85-68-7	ALS	5	µg/L	CLP - Semi-volatiles
N-Nitrosodiphenylamine	86-30-6	ALS	5	µg/L	CLP - Semi-volatiles
Fluorene	86-73-7	ALS	5	µg/L	CLP - Semi-volatiles
Carbazole	86-74-8	ALS	5	µg/L	CLP - Semi-volatiles
Hexachlorobutadiene	87-68-3	ALS	5	µg/L	CLP - Semi-volatiles
Pentachlorophenol	87-86-5	ALS	10	µg/L	CLP - Semi-volatiles
2,4,6-Trichlorophenol	88-06-2	ALS	5	µg/L	CLP - Semi-volatiles
2-Nitroaniline	88-74-4	ALS	10	µg/L	CLP - Semi-volatiles
2-Nitrophenol	88-75-5	ALS	5	µg/L	CLP - Semi-volatiles
Naphthalene	91-20-3	ALS	5	µg/L	CLP - Semi-volatiles
2-Methylnaphthalene	91-57-6	ALS	5	µg/L	CLP - Semi-volatiles
2-Chloronaphthalene	91-58-7	ALS	5	µg/L	CLP - Semi-volatiles
3,3'-Dichlorobenzidine	91-94-1	ALS	5	µg/L	CLP - Semi-volatiles
1,1'-Biphenyl	92-52-4	ALS	5	µg/L	CLP - Semi-volatiles
2-Methylphenol	95-48-7	ALS	5	µg/L	CLP - Semi-volatiles
2-Chlorophenol	95-57-8	ALS	5	µg/L	CLP - Semi-volatiles
1,2,4,5-Tetrachlorobenzene	95-94-3	ALS	5	µg/L	CLP - Semi-volatiles
2,4,5-Trichlorophenol	95-95-4	ALS	5	µg/L	CLP - Semi-volatiles
Acetophenone	98-86-2	ALS	5	µg/L	CLP - Semi-volatiles
Nitrobenzene	98-95-3	ALS	5	µg/L	CLP - Semi-volatiles
3-Nitroaniline	99-09-2	ALS	10	µg/L	CLP - Semi-volatiles
MERCURY	7439-97-6	A4 SCIENTIFIC	0.2	µg/L	CLP - Mercury (Cold Vapor)
IRON	7439-89-6	A4 SCIENTIFIC	100	µg/L	CLP Metals - 200.8 (ICP-MS)
LEAD	7439-92-1	A4 SCIENTIFIC	1	µg/L	CLP Metals - 200.8 (ICP-MS)
MANGANESE	7439-96-5	A4 SCIENTIFIC	1	µg/L	CLP Metals - 200.8 (ICP-MS)
NICKEL	7440-02-0	A4 SCIENTIFIC	1	µg/L	CLP Metals - 200.8 (ICP-MS)
SILVER	7440-22-4	A4 SCIENTIFIC	1	µg/L	CLP Metals - 200.8 (ICP-MS)
THALLIUM	7440-28-0	A4 SCIENTIFIC	1	µg/L	CLP Metals - 200.8 (ICP-MS)
ANTIMONY	7440-36-0	A4 SCIENTIFIC	2	µg/L	CLP Metals - 200.8 (ICP-MS)
ARSENIC	7440-38-2	A4 SCIENTIFIC	1	µg/L	CLP Metals - 200.8 (ICP-MS)
BARIUM	7440-39-3	A4 SCIENTIFIC	10	µg/L	CLP Metals - 200.8 (ICP-MS)
BERYLLIUM	7440-41-7	A4 SCIENTIFIC	1	µg/L	CLP Metals - 200.8 (ICP-MS)
CADMIUM	7440-43-9	A4 SCIENTIFIC	1	µg/L	CLP Metals - 200.8 (ICP-MS)
CHROMIUM	7440-47-3	A4 SCIENTIFIC	2	µg/L	CLP Metals - 200.8 (ICP-MS)

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
COBALT	7440-48-4	A4 SCIENTIFIC	1	µg/L	CLP Metals - 200.8 (ICP-MS)
COPPER	7440-50-8	A4 SCIENTIFIC	2	µg/L	CLP Metals - 200.8 (ICP-MS)
VANADIUM	7440-62-2	A4 SCIENTIFIC	5	µg/L	CLP Metals - 200.8 (ICP-MS)
ZINC	7440-66-6	A4 SCIENTIFIC	2	µg/L	CLP Metals - 200.8 (ICP-MS)
SELENIUM	7782-49-2	A4 SCIENTIFIC	5	µg/L	CLP Metals - 200.8 (ICP-MS)
Ethylbenzene	100-41-4	ALS	0.5	µg/L	CLP - Volatiles
Styrene	100-42-5	ALS	0.5	µg/L	CLP - Volatiles
cis-1,3-Dichloropropene	10061-01-5	ALS	0.5	µg/L	CLP - Volatiles
trans-1,3-Dichloropropene	10061-02-6	ALS	0.5	µg/L	CLP - Volatiles
1,4-Dichlorobenzene	106-46-7	ALS	0.5	µg/L	CLP - Volatiles
1,2-Dibromoethane	106-93-4	ALS	0.5	µg/L	CLP - Volatiles
1,2-Dichloroethane	107-06-2	ALS	0.5	µg/L	CLP - Volatiles
4-Methyl-2-Pentanone	108-10-1	ALS	5	µg/L	CLP - Volatiles
Methylcyclohexane	108-87-2	ALS	0.5	µg/L	CLP - Volatiles
Toluene	108-88-3	ALS	0.5	µg/L	CLP - Volatiles
Chlorobenzene	108-90-7	ALS	0.5	µg/L	CLP - Volatiles
Cyclohexane	110-82-7	ALS	0.5	µg/L	CLP - Volatiles
1,2,4-Trichlorobenzene	120-82-1	ALS	0.5	µg/L	CLP - Volatiles
Dibromochloromethane	124-48-1	ALS	0.5	µg/L	CLP - Volatiles
Tetrachloroethene	127-18-4	ALS	0.5	µg/L	CLP - Volatiles
cis-1,2-Dichloroethene	156-59-2	ALS	0.5	µg/L	CLP - Volatiles
trans-1,2-Dichloroethene	156-60-5	ALS	0.5	µg/L	CLP - Volatiles
Methyl tert-butyl ether	1634-04-4	ALS	0.5	µg/L	CLP - Volatiles
m,p-Xylene	179601-23-1	ALS	0.5	µg/L	CLP - Volatiles
1,3-Dichlorobenzene	541-73-1	ALS	0.5	µg/L	CLP - Volatiles
Carbon tetrachloride	56-23-5	ALS	0.5	µg/L	CLP - Volatiles
2-Hexanone	591-78-6	ALS	5	µg/L	CLP - Volatiles
Acetone	67-64-1	ALS	5	µg/L	CLP - Volatiles
Chloroform	67-66-3	ALS	0.5	µg/L	CLP - Volatiles
Benzene	71-43-2	ALS	0.5	µg/L	CLP - Volatiles
1,1,1-Trichloroethane	71-55-6	ALS	0.5	µg/L	CLP - Volatiles
Bromomethane	74-83-9	ALS	0.5	µg/L	CLP - Volatiles
Chloromethane	74-87-3	ALS	0.5	µg/L	CLP - Volatiles
Bromochloromethane	74-97-5	ALS	0.5	µg/L	CLP - Volatiles
Chloroethane	75-00-3	ALS	0.5	µg/L	CLP - Volatiles
Vinyl chloride	75-01-4	ALS	0.5	µg/L	CLP - Volatiles
Methylene chloride	75-09-2	ALS	0.5	µg/L	CLP - Volatiles
Carbon disulfide	75-15-0	ALS	0.5	µg/L	CLP - Volatiles
Bromoform	75-25-2	ALS	0.5	µg/L	CLP - Volatiles
Bromodichloromethane	75-27-4	ALS	0.5	µg/L	CLP - Volatiles
1,1-Dichloroethane	75-34-3	ALS	0.5	µg/L	CLP - Volatiles
1,1-Dichloroethene	75-35-4	ALS	0.5	µg/L	CLP - Volatiles
Trichlorofluoromethane	75-69-4	ALS	0.5	µg/L	CLP - Volatiles
Dichlorodifluoromethane	75-71-8	ALS	0.5	µg/L	CLP - Volatiles

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ALS	0.5	µg/L	CLP - Volatiles
1,2-Dichloropropane	78-87-5	ALS	0.5	µg/L	CLP - Volatiles
2-Butanone	78-93-3	ALS	5	µg/L	CLP - Volatiles
1,1,2-Trichloroethane	79-00-5	ALS	0.5	µg/L	CLP - Volatiles
Trichloroethene	79-01-6	ALS	0.5	µg/L	CLP - Volatiles
Methyl acetate	79-20-9	ALS	0.5	µg/L	CLP - Volatiles
1,1,2,2-Tetrachloroethane	79-34-5	ALS	0.5	µg/L	CLP - Volatiles
1,2,3-Trichlorobenzene	87-61-6	ALS	0.5	µg/L	CLP - Volatiles
o-Xylene	95-47-6	ALS	0.5	µg/L	CLP - Volatiles
1,2-Dichlorobenzene	95-50-1	ALS	0.5	µg/L	CLP - Volatiles
1,2-Dibromo-3-chloropropane	96-12-8	ALS	0.5	µg/L	CLP - Volatiles
Isopropylbenzene	98-82-8	ALS	0.5	µg/L	CLP - Volatiles
Heterotrophic Plate count	NA	Energy Laboratories	2	MFN/mL	Microbiological - SM 9215
Iron Reducing Bacteria	NA	Energy Laboratories	100	CPU/mL	Microbiological - IRB BART
Sulfur Reducing Bacteria	NA	Energy Laboratories	Present/ Absen	CPU/mL	Microbiological - SRB BART
Total Purgeable Hydrocarbons	NA	Energy Laboratories	20	ug/L	SW-846 8015B
Total Extractable Hydrocarbons	NA	Energy Laboratories	0.31	mg/L	SW-846 8015B
1,2,4-Trichlorobenzene	120-82-1	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
1,2-Dichlorobenzene	95-50-1	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
1,3-Dichlorobenzene	541-73-1	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
1,4-Dichlorobenzene	106-46-7	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
2,4,5-Trichlorophenol	95-95-4	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
2,4,6-Trichlorophenol	88-06-2	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
2,4-Dichlorophenol	120-83-2	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
2,4-Dimethylphenol	105-67-9	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
2,4-Dinitrophenol	51-28-5	EPA R8 Laboratory	5	µg/L	EPA 8270D
2,4-Dinitrotoluene	121-14-2	EPA R8 Laboratory	5	µg/L	EPA 8270D
2,6-Dinitrotoluene	606-20-2	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
2-Chloronaphthalene	91-58-7	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
2-Chlorophenol	95-57-8	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
2-Methylnaphthalene	91-57-6	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
2-Methylphenol	95-48-7	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
2-Nitroaniline	88-74-4	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
2-Nitrophenol	88-75-5	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
3 & 4-Methylphenol	106-44-5	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
3-Nitroaniline	99-09-2	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
4,6-Dinitro-2-methylphenol	534-52-1	EPA R8 Laboratory	5	µg/L	EPA 8270D
4-Bromophenyl phenyl ether	101-55-3	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
4-Chloro-3-methylphenol	59-50-7	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
4-Chloroaniline	106-47-8	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
4-Chlorophenyl phenyl ether	7005-72-3	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
4-Nitroaniline	100-01-6	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
4-Nitrophenol	100-02-7	EPA R8 Laboratory	5	µg/L	EPA 8270D
Acenaphthene	83-32-9	EPA R8 Laboratory	0.5	µg/L	EPA 8270D

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
Acenaphthylene	208-96-8	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Anthracene	120-12-7	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Azobenzene	103-33-3	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Benzo (a) anthracene	56-55-3	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Benzo (a) pyrene	50-32-8	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Benzo (g,h,i) perylene	191-24-2	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Benzo (k) fluoranthene	207-08-9	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Benzo(b)fluoranthene	205-99-2	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Bis(2-chloroethoxy)methane	111-91-1	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Bis(2-chloroethyl)ether	111-44-4	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Bis(2-chloroisopropyl)ether	39638-32-9	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Bis(2-ethylhexyl)phthalate	117-81-7	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Butyl benzyl phthalate	85-68-7	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Carbazole	86-74-8	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Chrysene	218-01-9	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Dibenz (a,h) anthracene	53-70-3	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Dibenzofuran	132-64-9	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Diethyl phthalate	84-66-2	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Dimethyl phthalate	131-11-3	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Di-n-butyl phthalate	84-74-2	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Di-n-octyl phthalate	117-84-0	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Fluoranthene	206-44-0	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Fluorene	86-73-7	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Hexachlorobenzene	118-74-1	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Hexachlorobutadiene	87-68-3	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Hexachlorocyclopentadiene	77-47-4	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Hexachloroethane	67-72-1	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Indeno (1,2,3-cd) pyrene	193-39-5	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Isophorone	78-59-1	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Naphthalene	91-20-3	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Nitrobenzene	98-95-3	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
N-Nitrosodi-n-propylamine	621-64-7	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Pentachlorophenol	87-86-5	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Phenanthrene	85-01-8	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Phenol	108-95-2	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
Pyrene	129-00-0	EPA R8 Laboratory	0.5	µg/L	EPA 8270D
(R)-(+)-Limonene	5989-27-5	EPA R8 Laboratory	0.2	µg/L	EPA 8270D
1,3-Dimethyl adamantane	702-79-4	EPA R8 Laboratory	0.2	µg/L	EPA 8270D
2-Butoxyethanol	111-76-2	EPA R8 Laboratory	0.25	µg/L	EPA 8270D
Tris (2-butoxyethyl) phosphate	78-51-3	EPA R8 Laboratory	0.3	µg/L	EPA 8270D
Adamantane	281-23-2	EPA R8 Laboratory	0.2	µg/L	EPA 8270D
Terpiniol	8000-41-7	EPA R8 Laboratory	0.2	µg/L	EPA 8270D
Alkalinity	NA	EPA R8 Laboratory	5.0	µg/L	EPA 310.1
Chloride	16887-00-6	EPA R8 Laboratory	0.5	µg/L	EPA 300.0

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
Fluoride	16984-48-8	EPA R8 Laboratory	0.2	µg/L	EPA 300.0
Nitrate as N	NA	EPA R8 Laboratory	0.5	µg/L	EPA 300.0
Nitrite as N	NA	EPA R8 Laboratory	0.5	µg/L	EPA 300.0
Sulfate as SO4	148-08-798	EPA R8 Laboratory	5.0	µg/L	EPA 300.0
Ammonia	148-08-798	EPA R8 Laboratory	5.0	µg/L	EPA 300.0
Total Phosphorus	148-08-798	EPA R8 Laboratory	5.0	µg/L	EPA 300.0
Methane	74-82-8	EPA R8 Laboratory	5.0	µg/L	EPA 524.2
Pentane	74-82-8	EPA R8 Laboratory	5.0	µg/L	EPA 524.2
Butane	NA	EPA R8 Laboratory	5.0	µg/L	EPA 524.2
MS/TOF Scan	NA	EPA R8 Laboratory	TBD	µg/L	MS/ TOF
Isobutane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Isobutene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Butane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3-Methyl-1-butene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Isopentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1-Pentene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2-Methyl-1-butene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Pentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
trans-2-Pentene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
cis-2-Pentene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2-Methyl-2-butene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,2-Dimethylbutane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Cyclopentene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
4-Methyl-1-pentene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Cyclopentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,3-Dimethylbutane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2-Methylpentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3-Methylpentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Hexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
trans-2-Hexene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2-Methyl-2-pentene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3-Methylcyclopentene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3-Methyl-2-pentene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
cis-2-Hexene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,2-Dimethylpentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,2-Dichloroethane (EDC)	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Methylcyclopentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,4-Dimethylpentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1-Methylcyclopentene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Benzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
5-Methyl-1-hexene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
4,4-Dimethyl-2-pentene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3,3-Dimethylpentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Thiophene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
Cyclohexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2-Methylhexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,3-Dimethylpentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3-Methylhexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
trans-1,3-Dimethylcyclopentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
cis-1,3-Dimethylcyclopentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2-Methyl-1-hexene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,2-Dimethylcyclopentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,2,4-Trimethylpentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Heptane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
trans-2-Heptene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Methylcyclohexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,5-Dimethylhexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,4-Dimethylhexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,3,4-Trimethylpentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,3-Dimethylhexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,2-Dibromoethane (EDB)	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2-Methylheptane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
4-Methylheptane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Toluene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,3,3-Trimethylpentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3,4-Dimethylhexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2-Methylthiophene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3-Ethyl-3-methylpentane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3-Methylthiophene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3-Methylheptane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
trans-1,4-Dimethylcyclohexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2-Methyl-1-heptene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
trans-1,2-Dimethylcyclohexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1-Octene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Octane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,2-Dimethylheptane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,4,4-Trimethylhexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,4-Dimethylheptane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,6-Dimethylheptane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Ethylcyclohexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,5-Dimethylheptane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Ethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2-Ethylthiophene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
m,p-Xylenes	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3-Ethylheptane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3-Methyloctane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,3-Dimethylheptane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
4-Methyloctane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
1,2,4-Trimethylcyclohexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Styrene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2-Methyloctane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,1,2-Trimethylcyclohexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
o-Xylene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1-Nonene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Nonane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3,3,5-Trimethylheptane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Isopropylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Isopropylcyclohexane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2,2-Dimethyloctane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3-Methylnonane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3,3-Dimethyloctane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
n-Propylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1-Methyl-3-ethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1-Methyl-4-ethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,3,5-Trimethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
3,3,4-Trimethylheptane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1-Methyl-2-ethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,2,4-Trimethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1-Decene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1-Methyl-3-isopropylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Decane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
sec-Butylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,2,3-Trimethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Indane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Indene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,3-Diethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
n-Butylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,3-Dimethyl-5-ethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,4-Diethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1-Methyl-2-propylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,4-Dimethyl-2-ethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,3-Dimethyl-4-ethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,2-Dimethyl-4-ethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,3-Dimethyl-2-ethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Undecane	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,2,4,5-Tetramethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,2,3,5-Tetramethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1,2,3,4-Tetramethylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Naphthalene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
2-Methylnaphthalene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
1-Methylnaphthalene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
Benzothiophene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
n-Pentylbenzene	NA	Zymax Forensics	1.0	µg/L	C3-C10 Hydrocarbons by GC/MS
$\delta^{13}C$ Stable Carbon Isotopes - methane	NA	Zymax Forensics	0.32	1σ	Stable Isotope Analysis CH4
δD - Stable Hydrogen Isotopes - methane	NA	Zymax Forensics	0.52	1σ	Stable Isotope Analysis CH4
n-Pentane / n-Heptane	NA	Zymax Forensics	Ratio	NA	Evaporation
2-Methylpentane / 2-Methylheptane	NA	Zymax Forensics	Ratio	NA	Evaporation
Benzene / Cyclohexane	NA	Zymax Forensics	Ratio	NA	Waterwashing
Toluene / Methylcyclohexane	NA	Zymax Forensics	Ratio	NA	Waterwashing
Aromatics / Total Paraffins (n+iso+cyc)	NA	Zymax Forensics	Ratio	NA	Waterwashing
Aromatics / Naphthenes	NA	Zymax Forensics	Ratio	NA	Waterwashing
Olefins	NA	Zymax Forensics	Ratio	NA	Biodegredation
3-Methylhexane / n-Heptane	NA	Zymax Forensics	Ratio	NA	Biodegredation
Methylcyclohexane / n-Heptane	NA	Zymax Forensics	Ratio	NA	Biodegredation
Isoparaffins + Naphthenes / Paraffins	NA	Zymax Forensics	Ratio	NA	Biodegredation
Methylcyclohexane	NA	Zymax Forensics	Ratio	NA	Octane Rating
% Paraffinic	NA	Zymax Forensics	0.01	%	PIANO Relative Percentage
% Isoparaffinic	NA	Zymax Forensics	0.01	%	PIANO Relative Percentage
% Aromatic	NA	Zymax Forensics	0.01	%	PIANO Relative Percentage
% Naphthenic	NA	Zymax Forensics	0.01	%	PIANO Relative Percentage
% Olefinic	NA	Zymax Forensics	0.01	%	PIANO Relative Percentage
Propane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Isobutane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Isobutene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Butane/Methanol	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
trans-2-Butene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
cis-2-Butene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3-Methyl-1-butene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Isopentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1-Pentene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2-Methyl-1-butene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Pentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
trans-2-Pentene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
cis-2-Pentene/t-Butanol	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2-Methyl-2-butene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,2-Dimethylbutane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Cyclopentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,3-Dimethylbutane/MTBE	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2-Methylpentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3-Methylpentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Hexane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
trans-2-Hexene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3-Methylcyclopentene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3-Methyl-2-pentene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
cis-2-Hexene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3-Methyl-trans-2-pentene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
Methylcyclopentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,4-Dimethylpentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Benzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
5-Methyl-1-hexene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Cyclohexane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2-Methylhexane/TAME	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,3-Dimethylpentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3-Methylhexane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1-trans-3-Dimethylcyclopentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1-cis-3-Dimethylcyclopentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,2,4-Trimethylpentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
n-Heptane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Methylcyclohexane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,5-Dimethylhexane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,4-Dimethylhexane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,3,4-Trimethylpentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Toluene/2,3,3-Trimethylpentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,3,3-Trimethylpentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,3-Dimethylhexane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2-Methylheptane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
4-Methylheptane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3,4-Dimethylhexane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3-Ethyl-3-methylpentane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,4-Dimethylcyclohexane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3-Methylheptane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,2,5-Trimethylhexane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
n-Octane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,2-Dimethylheptane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,4-Dimethylheptane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Ethylcyclohexane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,6-Dimethylheptane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Ethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
m+p Xylenes	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
4-Methyloctane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2-Methyloctane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3-Ethylheptane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3-Methyloctane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
o-Xylene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1-Nonene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
n-Nonane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Isopropylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3,3,5-Trimethylheptane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2,4,5-Trimethylheptane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
n-Propylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
1-Methyl-3-ethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1-Methyl-4-ethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,3,5-Trimethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3,3,4-Trimethylheptane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1-Methyl-2-ethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
3-Methylnonane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,2,4-Trimethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Isobutylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
sec-Butylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
n-Decane	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,2,3-Trimethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Indan	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,3-Diethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,4-Diethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
n-Butylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,3-Dimethyl-5-ethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,4-Dimethyl-2-ethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,3-Dimethyl-4-ethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,2-Dimethyl-4-ethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Undecene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,2,4,5-Tetramethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,2,3,5-Tetramethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1,2,3,4-Tetramethylbenzene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Naphthalene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
2-Methyl-naphthalene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
1-Methyl-naphthalene	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Oxygen	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Nitrogen	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Carbon Disulfide	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Hydrogen Sulfide	NA	Zymax Forensics	0.01	%	C3-C44 Hydrocarbons by GC/MS
Methane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
Ethane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
Propane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
i-Butane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
n-Butane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
neo-Pentane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
i-Pentane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
n-Pentane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
2,2-Dimethylbutane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
2,3-Dimethylbutane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
2-Methylpentane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
3-Methylpentane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
n-Hexane	NA	Zymax Forensics	0.01	%	Gas Analysis ASTM D 1945/3588
Methane	NA	Zymax Forensics	0.05	ppm v/v	Gas Analysis EPA Method 18

Table 7
Pavillion Groundwater Plume Investigation ESI Analytes

Analyte	CAS Number	Laboratory Name	Reporting Limit	Reporting Limit Units	Method
Ethane	NA	Zymax Forensics	0.05	ppm v/v	Gas Analysis EPA Method 18
Propanes	NA	Zymax Forensics	0.05	ppm v/v	Gas Analysis EPA Method 18
Butanes	NA	Zymax Forensics	0.05	ppm v/v	Gas Analysis EPA Method 18
Pentanes	NA	Zymax Forensics	0.05	ppm v/v	Gas Analysis EPA Method 18
Hexanes	NA	Zymax Forensics	0.05	ppm v/v	Gas Analysis EPA Method 18
Heptanes	NA	Zymax Forensics	0.05	ppm v/v	Gas Analysis EPA Method 18
Octanes	NA	Zymax Forensics	0.05	ppm v/v	Gas Analysis EPA Method 18
Nonanes	NA	Zymax Forensics	0.05	ppm v/v	Gas Analysis EPA Method 18
Decanes	NA	Zymax Forensics	0.05	ppm v/v	Gas Analysis EPA Method 18

Sample ID	Sample Type	Latitude	Longitude
PGDW03	Drinking Water Sample	43.2271843	-108.658371
PGDW04	Drinking Water Sample	43.22790909	-108.6541901
PGDW05	Drinking Water Sample	43.25884628	-108.6126556
PGDW10	Drinking Water Sample	43.2358284	-108.6565018
PGDW20	Drinking Water Sample	43.25230026	-108.5915756
PGDW22	Drinking Water Sample	43.2444191	-108.598175
PGDW23	Drinking Water Sample	43.2486496	-108.6225891
PGDW25	Drinking Water Sample	43.24312592	-108.6672058
PGDW30	Drinking Water Sample	43.25754547	-108.6225662
PGDW32	Drinking Water Sample	43.24074936	-108.5941391
PGDW39	Drinking Water Sample	43.23750687	-108.5781708
PGDW40	Drinking Water Sample	43.26156616	-108.6198273
PGDW41	Drinking Water Sample	43.262146	-108.6378479
PGDW42	Drinking Water Sample	43.25574493	-108.647316
PGDW43	Drinking Water Sample	43.25749207	-108.64151
PGDW44	Drinking Water Sample	43.25086975	-108.6261292
PGDW45	Drinking Water Sample	43.25888062	-108.6130142
PGDW46	Drinking Water Sample	43.24651337	-108.6157684
PGDW47	Drinking Water Sample	43.24520493	-108.6319885
PGDW48	Drinking Water Sample	43.2299881	-108.6235733
PGDW49	Drinking Water Sample	43.25505829	-108.6178741
PGMW01	Monitoring Well	43.26122665	-108.6316147
PGMW02	Monitoring Well	43.24616241	-108.613205
PGMW03	Monitoring Well	43.25263977	-108.6020584
PGPP01	Gas/Product Sample	43.24578857	-108.6356735
PGPP02	Gas/Product Sample	43.2486496	-108.6274796
PGPP03	N2 Field Blank	43.2486496	-108.6274796
PGPP04	Gas/Product Sample	43.25984955	-108.6116409
PGPP05	Gas/Product Sample	43.2486496	-108.6274796
PGPP06	Gas/Product Sample	43.26016998	-108.6165009
PGPW01	Public Water Sample	43.24678802	-108.6879349
PGPW02	Public Water Sample	43.24697113	-108.6840515
PGSE01	Sediment Sample	43.29878235	-108.6962433
PGSE02	Sediment Sample	43.26332474	-108.6277313
PGSE03	Sediment Sample	43.25877762	-108.6137314
PGSE04	Sediment Sample	43.25296783	-108.5916977
PGSE05	Sediment Sample	43.2463913	-108.5588455
PGSO01	Soil Sample	43.26117325	-108.6316071
PGSO02	Soil Sample	43.24636841	-108.6135254
PGSO03	Soil Sample	43.2527504	-108.6022339
PGSW01	Surface Water Sample	43.29878235	-108.6962433
PGSW02	Surface Water Sample	43.26332474	-108.6277313
PGSW03	Surface Water Sample	43.25877762	-108.6137314
PGSW04	Surface Water Sample	43.25296783	-108.5916977
PGSW05	Surface Water Sample	43.2463913	-108.5588455

Table 9
SVOA, TPH/DRO, Pesticide, and PCB Results

Analyte	Laboratory Name	SCDM (Drinking Water)			PGDW03 µg/L	PGDW04 µg/L	PGDW05 µg/L	PGDW05D µg/L	PGDW10 µg/L	PGDW20 µg/L	PGDW22 µg/L	PGDW23 µg/L	PGDW25 µg/L	PGDW30 µg/L	PGDW32 µg/L	PGDW39 µg/L	PGDW40 µg/L	PGDW41 µg/L	PGDW42 µg/L	PGDW43 µg/L	PGDW44 µg/L	PGDW45 µg/L	PGDW46 µg/L	PGDW47 µg/L	PGDW48 µg/L	PGDW49 µg/L	PGPW01 µg/L	PGPW02 µg/L
Semi-Volatiles		MCL (µg/L)	RDSC (µg/L)	CRSC (µg/L)																								
1,1'-Biphenyl	CLP																											
2,4,5-Trichlorophenol	CLP									0.19 J																		
2,4,5-Trichlorophenol	U.S. EPA R8																											
2,4-Dimethylphenol	CLP		730																									
2,4-Dimethylphenol	U.S. EPA R8		730																									
2,6-Dinitrotoluene	CLP																											
2,6-Dinitrotoluene	U.S. EPA R8				0.12																							
Tris (2-butoxyethyl) phosphate	U.S. EPA R8				1.64 J [9]			0.56 J [1,9]	1.84 J [1,9]	0.63 J [1,9]						2.1 J [1,9]			0.55 J [1,9]		1.16 J [1,9]		1.83 J [9]	1.5 J [1,9]	0.65 J [9]	0.57 J [9]		
2-Chlorophenol	CLP																				0.34 J	0.61 J						
2-Chlorophenol	U.S. EPA R8																											
2-Methylnaphthalene	CLP																				0.31 J							
2-Methylnaphthalene	U.S. EPA R8																				0.37 J [1]							
2-Methylphenol	CLP																											
2-Methylphenol	U.S. EPA R8																											
3 & 4-Methylphenol	U.S. EPA R8		180																									
4-Chloro-3-methylphenol	CLP									0.19 J											0.27 J	0.42 J						
4-Chloro-3-methylphenol	U.S. EPA R8																											
4-Methylphenol	CLP		180																									
Acenaphthene	CLP		2,200																		0.43 J	0.24 J						
Acenaphthene	U.S. EPA R8		2,200																									
Acenaphthylene	CLP																			0.21 J								
Acenaphthylene	U.S. EPA R8																			0.21								
Acetophenone	CLP																											
Benzaldehyde	CLP																											
Bis(2-ethylhexyl)phthalate	CLP	6	730	6.1			U	U	U	U	U	U	U	U		U	U	11	U	U	U	U	U	U		U	U	U
Bis(2-ethylhexyl)phthalate	U.S. EPA R8	6	730	6.1	2	2	U	U	2	2	2	2	2	2	2	2	2	7.4 J [4,8]	U	2	2	2	2	2	2	2	2	2
Butyl benzyl phthalate	U.S. EPA R8		7,300									0.18 J [1,8]	0.15 J [8]	0.13 J [1,8]	0.14 J [8]	0.16 J [1,8]			0.19 J [1,8]		0.13 J [1,8]							
Butylbenzylphthalate	CLP		7,300																								0.23 J	0.23 J
Caprolactam	CLP							0.95 J			0.98 J	0.63 J	0.27 J		0.54 J	0.22 J			0.92 J		0.49 J		0.3 J				0.29 J	3.8 J
Diethyl phthalate	U.S. EPA R8		29,000																									
Diethylphthalate	CLP		29,000							U				U			U								U			
Di-n-butyl phthalate	U.S. EPA R8		3,700					2				2	2	2	2	2			2									
Di-n-butylphthalate	CLP		3,700								0.16 J			0.18 J		0.15 J								0.17 J				
Di-n-octyl phthalate	U.S. EPA R8		730		2		2		2							2		6 J [8]										
Di-n-octyl phthalate	CLP		730																									
Fluorene	CLP	0.1		1,500																	0.18 J							
Fluorene	U.S. EPA R8	0.1		1,500																	0.15 J [1]							
Naphthalene	CLP	0.1		1,500																0.25 J								
Naphthalene	U.S. EPA R8	0.1		1,500																0.3 J [1]								
Phenol	CLP			11,000																	0.3 J	0.55 J				0.68 J		
Phenol	U.S. EPA R8			11,000																U								
TEH, DRO																												
TPH as Diesel (DRO)	Energy																	850										
TPH as Diesel (DRO)	U.S. EPA R8						75.3	76.4		21.7	154		27.8	35		30	32.6	479	21.6	49.7	44.3	41.3	25.5	26.6		130		23.1
TPH Total Extractable Hydrocarbons	Energy																	1300								400		
Pesticides/Aroclor																												
4,4'-DDE	CLP			0.25																								
alpha-BHC	CLP			0.014																								
Aroclor-1016	CLP																				0.29 J							
beta-BHC	CLP			0.047																						0.00081 JP		
Dieldrin	CLP		1.8	0.0053																								
Endosulfan I	CLP		220							0.0015 J																		
gamma-BHC (Lindane)	CLP	0.2	11	0.066																								
gamma-Chlordane	CLP		18	0.24													0.0016 J											
Heptachlor	CLP	0.4	18	0.019																	0.0072 J							
Methoxychlor	CLP	40	180																									

1 - Exceeded holding time.
2 - Compound found in method blank; detection is above 10x method blank value.
3 - Low recovery of surrogate; potentially biased low.
4 - High recovery of surrogate; potentially biased high.
5 - Exceeded upper linear calibration range; biased low.
6 - High recoveries for the compound in the corresponding spike sample.
7 - Variability of samples outside QC limits for matrix spike.
8 - Recoveries below control limits for initial calibration verification or continuing calibration verification; potentially biased low.
9 - Recoveries above control limits for initial calibration verification or continuing calibration verification; potentially biased high.
10 - Low recovery for the compound in the corresponding spike sample.

The sample was not analyzed for this analyte.
(Blank Cell) Non Detect for this analyte.

J (J without footnotes) - Estimated as below Contract Required Quantitation Limit but above Method Detection Limit.
P - Greater than 10% difference for detected concentrations between the two GC columns.
U - Compound found in field blank; for phthalate compunds, concentration in the sample is below 10x the concentration in the field blank. For other compounds, concentration in the sample is below 5x the concentration in the field blank. Thus, these compounds are NOT used for Risk Assessment per Risk Assessment Guidance for Superfund (Chapter 5 - Data Evaluation); 10x is the multiplier because phthalate esters are considered a common lab contaminant.

Analyte	Laboratory Name	SCDM (Drinking Water)			PGFB01 µg/L	PGFM20 µg/L	PGMW01 µg/L	PGMW01D µg/L	PGMW02 µg/L	PGMW03 µg/L	PGPP01 µg/L	PGPP04P µg/L	PGPP05 µg/L	PGPP06 µg/L	PGSE01 µg/kg	PGSE02 µg/kg	PGSE02D µg/kg	PGSE03 µg/kg	PGSE04 µg/kg	PGSE05 µg/kg	PGSO01 µg/kg	PGSO02 µg/kg	PGSO03 µg/kg	PGSW01 µg/L	PGSW02 µg/L	PGSW02D µg/L	PGSW03 µg/L	PGSW04 µg/L	PGSW05 µg/L
Semi-Volatiles		MCL (µg/L)	RDSC (µg/L)	CRSC (µg/L)																									
1,1'-Biphenyl	CLP						0.86 J	1 J		0.76 J																			
2,4,5-Trichlorophenol	CLP																												
2,4,5-Trichlorophenol	U.S. EPA R8																												
2,4-Dimethylphenol	CLP		730				1.6 J	5.6 J	39 J	5 J																			
2,4-Dimethylphenol	U.S. EPA R8		730						12.7					5000 J [1]															
2,6-Dinitrotoluene	CLP																												
2,6-Dinitrotoluene	U.S. EPA R8																												
Tris (2-butoxyethyl) phosphate	U.S. EPA R8					10						10	10	10															
2-Chlorophenol	CLP																												
2-Chlorophenol	U.S. EPA R8																												
2-Methylnaphthalene	CLP						2.4 J	8.8	74	13																			
2-Methylnaphthalene	U.S. EPA R8						10.8	1	17.1	17		5400 J [1]	110000 J [1]																
2-Methylphenol	CLP								4.2 J	0.38 J																			
2-Methylphenol	U.S. EPA R8								4.8					7760 J [1]															
3 & 4-Methylphenol	U.S. EPA R8		180						12.8					6760 J [1, 8]															
4-Chloro-3-methylphenol	CLP																												
4-Chloro-3-methylphenol	U.S. EPA R8																												
4-Methylphenol	CLP		180				0.39 J		24 J	3.5 J																			
Acenaphthene	CLP		2,200																										
Acenaphthene	U.S. EPA R8		2,200																										
Acenaphthylene	CLP																												
Acenaphthylene	U.S. EPA R8																												
Acetophenone	CLP														41 J	73 J	34 J	64 J	66 J	54 J									
Benzaldehyde	CLP														18 J	44 J		23 J	30 J	22 J									
Bis(2-ethylhexyl)phthalate	CLP	6	730	6.1	0.64 J		U	U	U	U														U		U			U
Bis(2-ethylhexyl)phthalate	U.S. EPA R8	6	730	6.1	0.58 J [1,8]	500 J [1,8]	6.5 J [8]	7.46 J [8]	U	28.8 J [8]														2	2	2	10.3 J [8]	U	U
Butyl benzyl phthalate	U.S. EPA R8		7,300																					0.15 J [1,8]					0.16 J [8]
Butylbenzylphthalate	CLP		7,300																							0.21 J			
Caprolactam	CLP																							0.89 J		2.3 J			
Diethyl phthalate	U.S. EPA R8		29,000																										0.18
Diethylphthalate	CLP		29,000		0.36 J																						U	U	U
Di-n-butyl phthalate	U.S. EPA R8		3,700			220 J [1,8]																		0.15 J [1]					0.14 J
Di-n-butylphthalate	CLP		3,700																								0.22 J		
Di-n-octyl phthalate	U.S. EPA R8		730																										
Di-n-octyl phthalate	CLP		730			440 J [1,8]																						0.14 J [8]	
Fluorene	CLP	0.1		1,500																									
Fluorene	U.S. EPA R8	0.1		1,500																									
Naphthalene	CLP	0.1		1,500			7.1	14	170	61						10 J													
Naphthalene	U.S. EPA R8	0.1		1,500			2.2	2.15 J [5]	179 J [1]	57.5 J [5]	3430 J [1]	30000 J [1]	37800 J [1]	210 J [1]																
Phenol	CLP			11,000			12	15	41 J	2.3 J					17 J	36 J		23 J	29 J	24 J									
Phenol	U.S. EPA R8			11,000	0.13 J [1]		5.6	7.13 J [5]	22.5					6960 J [1]															
TEH, DRO																													
TPH as Diesel (DRO)	Energy						1200	600	39000	5200											1760000	841000	178000						
TPH as Diesel (DRO)	U.S. EPA R8				26.5 J [1, #]	752	638 J [2]	1230 J [4]	62100	4830 J [4]											1720	538	151	108	103	207 J [2]	102	90	86.6
TPH Total Extractable Hydrocarbons	Energy						1600	810	42000	5900						49000	53000			17000	2340000	1440000	243000						
Pesticides/Aroclor																													
4,4'-DDE	CLP			0.25											0.13 J	0.17 J			0.15 J	0.12 J									
alpha-BHC	CLP			0.014														0.016 J											
Aroclor-1016	CLP																												
beta-BHC	CLP			0.047			0.016 J	0.029 J	0.019 J	0.0065 J					0.065 J		0.14 J	0.17 J	0.41 J	0.4 J									
Dieldrin	CLP		1.8	0.0053					0.002 J																				
Endosulfan I	CLP		220																										
gamma-BHC (Lindane)	CLP	0.2	11	0.066						0.0056 J																			
gamma-Chlordane	CLP		18	0.24																									
Heptachlor	CLP	0.4	18	0.019															0.16 J										
Methoxychlor	CLP	40	180																	1.1 J									

Analyte	Laboratory Name	SCDM (Drinking Water)			PGDW03 µg/L	PGDW04 µg/L	PGDW05 µg/L	PGDW05D µg/L	PGDW10 µg/L	PGDW20 µg/L	PGDW22 µg/L	PGDW23 µg/L	PGDW25 µg/L	PGDW30 µg/L	PGDW32 µg/L	PGDW39 µg/L	PGDW40 µg/L	PGDW41 µg/L	PGDW42 µg/L	PGDW43 µg/L	PGDW44 µg/L	PGDW45 µg/L	PGDW46 µg/L	PGDW47 µg/L	PGDW48 µg/L
Volatile Organic Analysis		**MCL (µg/L)**	**RDSC (µg/L)**	**CRSC (µg/L)**																					
1,1,2-Trichloro-1,2,2-trifluoroethane	CLP																			0.38 J					
1,2,4-Trimethylbenzene	U.S. EPA R8																								
1,3,5-Trimethylbenzene	U.S. EPA R8																								
1,3-Dimethyl adamantane	U.S. EPA R8						1.74 J [1]	1.71 J [1]						1.81 J [1]			0.36 J [1]								
2-Butanone (MEK)	CLP		22,000																						
Acetone	CLP		33,000																						
Adamantane	U.S. EPA R8						0.21 J [1]	0.21 J [1]							0.3 J [1,4]										
Benzene	CLP	5	150	1.5																					
Benzene	U.S. EPA R8	5	150	1.5																0.54 J [1]					
Carbon disulfide	CLP		3,700																						
Carbon disulfide	U.S. EPA R8		3,700																						
Chloroform	CLP		360																						
Chloroform	U.S. EPA R8		360															0.24 J [1]							
Chloromethane	CLP																	0.27 J							
Chloromethane	U.S. EPA R8																								
Cyclohexane	CLP																								
Ethane	U.S. EPA R8									10.9															
Ethylbenzene	CLP	700	3,700																						
Ethylbenzene	U.S. EPA R8	700	3,700																						
Isopropylbenzene	CLP		3,700																						
Isopropylbenzene	U.S. EPA R8		3,700																						
m,p-Xylene	CLP	10,000	73,000																						
m,p-Xylene	U.S. EPA R8	10,000	73,000																						
Methane	U.S. EPA R8						5.44 J [1]	[1]	[1]	172	[1]	149 J [1]		808 J [1]	36.3		98.9		60		[1]	[1]			
Methylcyclohexane	CLP																								
Methylene chloride	CLP	5	2,200	11																					
Methylene chloride	U.S. EPA R8	5	2,200	11																					
n-Butyl Benzene	U.S. EPA R8																								
n-Propyl Benzene	U.S. EPA R8																								
o-Xylene	CLP	10,000	73,000																						
o-Xylene	U.S. EPA R8	10,000	73,000																						
p-Isopropyltoluene	U.S. EPA R8																								
Propane	U.S. EPA R8																								
sec-Butylbenzene	U.S. EPA R8																								
Styrene	CLP	100	7,300																						
Styrene	U.S. EPA R8	100	7,300														0.14 J [1]								
tert-Butylbenzene	U.S. EPA R8																								
Toluene	CLP	1,000	7,300															0.51							
Toluene	U.S. EPA R8	1,000	7,300																						
TPH, GRO																									
TPH as Gasoline (GRO)	Energy																								
TPH as Gasoline (GRO)	U.S. EPA R8						26.3	31.1							22.6										
TPH Total Purgeable Hydrocarbons	Energy						49	47						36											

1 - Exceeded holding time.
2 - Compound found in method blank; detection is above 10x method blank value.
3 - Low recovery of surrogate; potentially biased low.
4 - High recovery of surrogate; potentially biased high.
5 - Exceeded upper linear calibration range; biased low.
6 - High recoveries for the compound in the corresponding spike sample.
7 - Variability of samples outside QC limits for matrix spike.
8 - Recoveries below control limits for initial calibration verification or continuing calibration verification; potentially biased low.
9 - Recoveries above control limits for initial calibration verification or continuing calibration verification; potentially biased high.
10 - Low recovery for the compound in the corresponding spike sample.
The sample was not analyzed for this analyte.
(Blank Cell) Non Detect for this analyte.
D - Diluted.
J - Estimated as below Contract Required Quantitation Limit but above Method Detection Limit.

Analyte	Laboratory Name	SCDM (Drinking Water)			PGDW49 µg/L	PGPW01 µg/L	PGPW02 µg/L	PGFB01 µg/L	PGFM20 µg/L	PGMW01 µg/L	PGMW01D µg/L	PGMW02 µg/L	PGMW03 µg/L	PGPP01 µg/L	PGPP04P µg/L	PGPP05 µg/L	PGPP06 µg/L	PGSE01 µg/kg	PGSE02 µg/kg	PGSE02D µg/kg	PGSE03 µg/kg	PGSE04 µg/kg	PGSE05 µg/kg
Volatile Organic Analysis		**MCL (µg/L)**	**RDSC (µg/L)**	**CRSC (µg/L)**																			
1,1,2-Trichloro-1,2,2-trifluoroethane	CLP																						
1,2,4-Trimethylbenzene	U.S. EPA R8												14.1 J [1]	31600 J [1]	8730000 J [1]	1770 J [1]	765 J [1]						
1,3,5-Trimethylbenzene	U.S. EPA R8									2.6 J [1]	4.22 J [1]	12 J [1]	19.7 J [1]	18600 J [1]	6250000 J [1]	818 J [1]	414 J [1]						
1,3-Dimethyl adamantane	U.S. EPA R8								2960 J [1]	0.33 J [1]	0.33 J [1]	0.64 J [1]	0.29 J [1]	460 J [1]	9800 J [1]	8200 J [1]							
2-Butanone (MEK)	CLP		22,000																	11 J			
Acetone	CLP		33,000															13 J	16 J	38			
Adamantane	U.S. EPA R8								420 J [1]	2.1 J [1]	1.78 J [1]	3.86 J [1]	2.38 J [1]	520 J [1]	74000 J [1]	6400 J [1]							
Benzene	CLP	5	150	1.5						110 D	310 D	390 D	5.3 D										
Benzene	U.S. EPA R8	5	150	1.5						95 J [1]	91.6 J [1]	130 J [1]	3.06 J [1]	8020 J [1]	860000 J [1]	306 J [1]	3020 J [1]						
Carbon disulfide	CLP		3,700							1.6 JDB	6 JDB	8.2 JDB	1.6 JDB										
Carbon disulfide	U.S. EPA R8		3,700									0.33 J [1]											
Chloroform	CLP		360																				
Chloroform	U.S. EPA R8		360																				
Chloromethane	CLP																						
Chloromethane	U.S. EPA R8																						
Cyclohexane	CLP									110 D	140 D	68 D	100 D										
Ethane	U.S. EPA R8											299											
Ethylbenzene	CLP	700	3,700							15 D J [4]	39 D	93 D	44 D										
Ethylbenzene	U.S. EPA R8	700	3,700									1.6 J [1]	5.25 J [1]	26600 J [1]	4410000 J [1]	476 J [1]	542 J [1]						
Isopropylbenzene	CLP		3,700							8.3 J [4]	26 D	53 D	26 D										
Isopropylbenzene	U.S. EPA R8		3,700										1.14 J [1]	11400 J [1]	948000 J [1]	202 J [1]	58 J [1]						
m,p-Xylene	CLP	10,000	73,000							77 D	150 D	32 D	110 D								0.27 J		
m,p-Xylene	U.S. EPA R8	10,000	73,000							0.2 J [1]	0.1 J [1]	1.26 J [1]	51.1 J [1]	298000 J [1]	4.6E+07 J [1]	2180 J [1]	4760 J [1]						
Methane	U.S. EPA R8									474	708	361	528										
Methylcyclohexane	CLP									120 D	140 D	56 D	90 D										
Methylene chloride	CLP	5	2,200	11																			
Methylene chloride	U.S. EPA R8	5	2,200	11	0.33									510 J [1,2]									
n-Butyl Benzene	U.S. EPA R8													1060 J [1]	162000 J [1]	218 J [1]							
n-Propyl Benzene	U.S. EPA R8												0.14 J [1]	3640 J [1]	1290000 J [1]	198 J [1]	70 J [1]						
o-Xylene	CLP	10,000	73,000							1.4 JD [4]	2.2	0.62 J	1.3 JD [4]								0.36 J		
o-Xylene	U.S. EPA R8	10,000	73,000							1.24 J [1]	0.62 J [1]	0.78 J [1]	1.28 J [1]	73600 J [1]	9430000 J [1]	797 J [1]	1370 J [1]						
p-Isopropyltoluene	U.S. EPA R8											0.61 J [1]	1.52 J [1]	1640 J [1]	334000 J [1]	222 J [1]							
Propane	U.S. EPA R8											43.8											
sec-Butylbenzene	U.S. EPA R8													950 J [1]	270000 J [1]	243 J [1]							
Styrene	CLP	100	7,300																				
Styrene	U.S. EPA R8	100	7,300																				
tert-Butylbenzene	U.S. EPA R8									2.05 J [1]	1.6 J [1]	9.68 J [1]	5.79 J [1]	250 J [1]	86000 J [1]								
Toluene	CLP	1,000	7,300									0.61 J	0.16 J [4]										
Toluene	U.S. EPA R8	1,000	7,300									0.16 J [1]	0.1 J [1]	97500 J [1]	1.68E+07 J [1]	774 J [1]	9070 J [1]						
TPH, GRO																							
TPH as Gasoline (GRO)	Energy									1300	2720	2450	1420										
TPH as Gasoline (GRO)	U.S. EPA R8								[3]	389 J [7]	322	2210	1060										
TPH Total Purgeable Hydrocarbons	Energy									1700	3430	3790	1980										

Analyte	Laboratory Name	SCDM (Drinking Water)			PGSO01 µg/kg	PGSO02 µg/kg	PGSO03 µg/kg	PGSW01 µg/L	PGSW02 µg/L	PGSW02D µg/L	PGSW03 µg/L	PGSW04 µg/L	PGSW05 µg/L
Volatile Organic Analysis		**MCL (µg/L)**	**RDSC (µg/L)**	**CRSC (µg/L)**									
1,1,2-Trichloro-1,2,2-trifluoroethane	CLP												
1,2,4-Trimethylbenzene	U.S. EPA R8												
1,3,5-Trimethylbenzene	U.S. EPA R8												
1,3-Dimethyl adamantane	U.S. EPA R8												
2-Butanone (MEK)	CLP		22,000										
Acetone	CLP		33,000										
Adamantane	U.S. EPA R8												
Benzene	CLP	5	150	1.5									
Benzene	U.S. EPA R8	5	150	1.5									
Carbon disulfide	CLP		3,700										
Carbon disulfide	U.S. EPA R8		3,700										
Chloroform	CLP		360										
Chloroform	U.S. EPA R8		360										
Chloromethane	CLP												
Chloromethane	U.S. EPA R8												
Cyclohexane	CLP												
Ethane	U.S. EPA R8												
Ethylbenzene	CLP	700	3,700										
Ethylbenzene	U.S. EPA R8	700	3,700										
Isopropylbenzene	CLP		3,700										
Isopropylbenzene	U.S. EPA R8		3,700										
m,p-Xylene	CLP	10,000	73,000										
m,p-Xylene	U.S. EPA R8	10,000	73,000										
Methane	U.S. EPA R8												
Methylcyclohexane	CLP												
Methylene chloride	CLP	5	2,200	11									
Methylene chloride	U.S. EPA R8	5	2,200	11									
n-Butyl Benzene	U.S. EPA R8												
n-Propyl Benzene	U.S. EPA R8												
o-Xylene	CLP	10,000	73,000										
o-Xylene	U.S. EPA R8	10,000	73,000										
p-Isopropyltoluene	U.S. EPA R8												
Propane	U.S. EPA R8												
sec-Butylbenzene	U.S. EPA R8												
Styrene	CLP	100	7,300										
Styrene	U.S. EPA R8	100	7,300										
tert-Butylbenzene	U.S. EPA R8												
Toluene	CLP	1,000	7,300										
Toluene	U.S. EPA R8	1,000	7,300										
TPH, GRO													
TPH as Gasoline (GRO)	Energy				4600000	2490000	496000						
TPH as Gasoline (GRO)	U.S. EPA R8				5010000	888000	444000						
TPH Total Purgeable Hydrocarbons	Energy				6660000	3700000	940000						

Table 11
Wet Chemistry and Bacteriological Results

Analyte	Laboratory Name	PGDW03	PGDW04	PGDW05	PGDW05D	PGDW10	PGDW20	PGDW22	PGDW23	PGDW25	PGDW30	PGDW32	PGDW39	PGDW40
Bacteriological														
Bacteria, Heterotrophic (MPN/ml)	Energy	2		45		6		230	510				2	50
Bacteria, Iron Related	Energy	Present	Absent	Present		Present	Absent	Present	Present	Absent	Absent	Absent	Absent	Present
Bacteria, Approximate Iron Related Bacteria Population (CFU/ml)	Energy	500	Not Aggressive	9,000		9,000	Not Aggressive	9,000	2,300	Not aggressive	Not aggressive	Not Aggressive	Not Aggressive	9,000
Bacteria, Sulfate Reducing	Energy	Absent	Absent	Present		Absent	Absent	Absent	Absent	Absent	Present	Absent	Present	Present
Bacteria, Approximate Sulfate Reducing Bacteria Population (CFU/ml)	Energy	0	0	10 - 100		0	ec	0	0	c	10 - 100	0	10 - 100	10 - 100
Wet Chemistry (mg/L)														
Alkalinity (ppm)	U.S. EPA R8	28	38.3	88.4	89.1	147	67.9	337	54.2	295	94	31.5	129	86.3
Sulfate as SO4 (ppm)	U.S. EPA R8	570	532	287	287	293	1270	2780	368	441	333	368	3640	426
Fluoride (ppm)	U.S. EPA R8	0.8	0.9	0.9	1	0.9	0.8		1.5		0.9	2.4	0.3	
Chloride (ppm)	U.S. EPA R8	20.7	23.3	16.5	16.9	7.5	32.6	74.6	19.7	9.5	15.5	21.4	52.9	13.1
Nitrate as N (ppm)	U.S. EPA R8	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	40.7	<0.3	1.7	<0.3	<0.3	<0.3	<0.3
Nitrite as N (ppm)	U.S. EPA R8	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3

1 - Exceeded holding time.
2 - Compound found in method blank; detection is above 10x method blank value.
3 - Low recovery of surrogate; potentially biased low.
4 - High recovery of surrogate; potentially biased high.
5 - Exceeded upper linear calibration range; biased low.
6 - High recoveries for the compound in the corresponding spike sample.
7 - Variability of samples outside QC limits for matrix spike.
8 - Recoveries below control limits for initial calibration verification or continuing calibration verification; potentially biased low.
9 - Recoveries above control limits for initial calibration verification or continuing calibration verification; potentially biased high.
10 - Low recovery for the compound in the corresponding spike sample.

The sample was not analyzed for this analyte.
(Blank Cell) Non Detect for this analyte.

Table 11
Wet Chemistry and Bacteriological Results

Analyte	Laboratory Name	PGDW41	PGDW42	PGDW43	PGDW44	PGDW45	PGDW46	PGDW47	PGDW48	PGDW49	PGPW01	PGPW02	PGFB01	PGFM20	PGMW01
Bacteriological															
Bacteria, Heterotrophic (MPN/ml)	Energy	74	2	48	4					240					
Bacteria, Iron Related	Energy	Present	Present	Present	Present	Present	Present	Present	Absent	Present	Absent	Absent			Absent
Bacteria, Approximate Iron Related Bacteria Population (CFU/ml)	Energy	150	150	2,300	500	9,000	9,000	150	Not Aggressive	36,000	Not Aggressive	Not Aggressive			Not Aggressive
Bacteria, Sulfate Reducing	Energy	Present	Absent	Present	Present	Present	Absent	Present	Absent	Present	Absent	Absent			Present
Bacteria, Approximate Sulfate Reducing Bacteria Population (CFU/ml)	Energy	1 - 10	0	10 - 100	1 - 10	1 - 10	0	1 - 10	0	100,000 - 1,000,000	0	0			1 - 10
Wet Chemistry (mg/L)															
Alkalinity (ppm)	U.S. EPA R8	108	88.5	113	100	379	329	44.1	89.8	243	74.7	82.8			440
Sulfate as SO4 (ppm)	U.S. EPA R8	2670	311	2470	2880	213	126	330	1840	3160	300	847			1010
Fluoride (ppm)	U.S. EPA R8	0.5	1	0.4	0.3	1.9	0.5	1.5	0.3	0.4	1.2	0.5			0.4
Chloride (ppm)	U.S. EPA R8	31.4	13.2	38.4	39.5	14.5	8.4	21.6	24.1	64.3	15.3	8.5			3.5
Nitrate as N (ppm)	U.S. EPA R8	<0.3	<0.3	<0.3	<0.3	0.3	2.3	<0.3	<0.3	7.7	<0.3	<0.3			<0.3
Nitrite as N (ppm)	U.S. EPA R8	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			<0.3

Table 11
Wet Chemistry and Bacteriological Results

Analyte	Laboratory Name	PGMW01D	PGMW02	PGMW03	PGPP01	PGPP04P	PGPP05	PGPP06	PGSE01	PGSE02	PGSE02d	PGSE03	PGSE04	PGSE05
Bacteriological														
Bacteria, Heterotrophic (MPN/ml)	Energy	4	13,000	16,000										
Bacteria, Iron Related	Energy	Absent	Present	Present										
Bacteria, Approximate Iron Related Bacteria Population (CFU/ml)	Energy	25	140,000	140,000										
Bacteria, Sulfate Reducing	Energy	Present	Present	Present										
Bacteria, Approximate Sulfate Reducing Bacteria Population (CFU/ml)	Energy	1 - 10	1 - 10	1 - 10										
Wet Chemistry (mg/L)														
Alkalinity (ppm)	U.S. EPA R8	438	2750	536				653						
Sulfate as SO4 (ppm)	U.S. EPA R8	1040	108	28.4										
Fluoride (ppm)	U.S. EPA R8	0.6	0.2	1.4				3.2						
Chloride (ppm)	U.S. EPA R8	3.9	265	6.4				203						
Nitrate as N (ppm)	U.S. EPA R8	<0.3	1.9	<0.3				<300						
Nitrite as N (ppm)	U.S. EPA R8	<0.3	<0.3	<0.3				<300						

Analyte	CLP Limits - Water (µg/L)		SCDM (Drinking Water)			PGDW03 µg/L	PGDW04 µg/L	PGDW05 µg/L	PGDW05D µg/L	PGDW10 µg/L	PGDW20 µg/L	PGDW22 µg/L	PGDW23 µg/L	PGDW25 µg/L	PGDW30 µg/L	PGDW32 µg/L	PGDW39 µg/L	PGDW40 µg/L	PGDW41 µg/L	PGDW42 µg/L	PGDW43 µg/L
		MCLG (µg/L)	MCL (µg/L)	RDSC (µg/L)	CRSC (µg/L)																
ALUMINUM	200	0	0			200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	741	200 U	200 U
ANTIMONY	2	6	6	15		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2.1 U
ARSENIC	1	0	10	11	0.057	0.42 J	0.32 J	0.36 J	1 U	1 U	0.5 J	0.47 J	1 U	0.46 J	1 U	0.53 J	0.32 J	1 U	0.89 J	1 U	1.3
BARIUM	10	2,000	2,000	2,600		6.7 J	6 J	11.1	10.3	9.1 J	9.3 J	6.3 J	8.9 J	14	6.8 J	9.6 J	6.9 J	11.7	9.6 J	7.9 J	5.4 J
BERYLLIUM	1	4	4	73		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.29 J
CADMIUM	1	5	5	18		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.36 J
CALCIUM	5000					16300	15500	3330 J	3150 J	5760	71700	397000	5820	70100	4050 J	6890	389000	6570 J	270000 J	5060	208000 J
CHROMIUM	2	100	100	110		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	1.7 J	2 U	0.45 J
COBALT	1					1 U	1 U	1 U	1 U	1 U	1 U	0.33 J	1 U	1 U	1 U	1 U	0.42 J	1 U	0.51 J	1 U	0.57 J
COPPER	2	1,300	1,300			4.4 J	3.9 J	7.7 U	4.7 J	2.7 J	8.8 J	16.3 J	4.3 J	4.3 J	3.9 J	3 J	16.7 J	3.1 U	201 J	5.5 J	19.4 J
IRON	100					100 U	100 U	66.6 J	64.7 J	100 U	300	100 U	100 U	100 U	44.1 J	125	330	1260	1880	96.6 J	403
LEAD	1	0	15			1 U	1 U	0.42 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.91 J	38.3	1 U	0.81 J
MAGNESIUM	5000					5000 U	5000 U	5000 U	5000 U	5000 U	8140	130000	5000 U	9630	5000 U	5000 U	147000	5000 U	57500	5000 U	13700
MANGANESE	1			5,100		1.7	2.8	2.2	1.8	3.8	31.3	3	2.8	20.9	2.2	3.2	174	32.8	222	3	84.4
MERCURY	0.2	2	2	11		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	1			730		0.38 J	0.26 J	0.48 J	0.21 J	0.4 J	0.46 J	1.9	0.23 J	1 J	0.83 J	0.61 J	1.3	0.49 J	3.6	0.42 J	2.4
POTASSIUM	5000					5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5830	5000 U	5000 U	5000 U	5000 U	5280	5000 U	2680 J	5000 U	5000 U
SELENIUM	5	50	50	180		5 U	5 U	5 U	5 U	5 U	0.98 J	3.9 J	5 U	1.3 J	5 U	5 U	1.2 J	5 U	1.4 J	5 U	3.9 J
SILVER	1			180		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.3 J
SODIUM	5000					251000	265000	189000	181000	195000	550000	908000	194000	269000	195000	193000	1110000	244000	1030000	181000	911000
THALLIUM	1	0.5	2			1 U	1 U	0.23 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.76 J
VANADIUM	5			260		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2.7 J	5 U	1 J
ZINC	2			11,000		2.5	1.1 J	1.4 J	2 U	2	7.6	2.7	2 U	15.1	1.2 J	23.9	26.8	211	32.5	1.2 J	17.5

MCLG	Maximum Contaminant Level Goal. A non-enforceable health goal that is set at a level at which no known or anticipated adverse effect on the health of persons occurs and which allows an adequate margin of safety.
MCL	Maximum contaminant Level. The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLG as feasible using the best available analytical and treatment technologies and taking cost into consideration. MCLs are enforceable standards.
SCDM	Superfund Chemical Data Matrix
RDSC	Reference Dose Screening Concentration
CRSC	Cancer Risk Screening Concentration
CRDL	Contract Required Detection Limit
J	Estimated as below Contract Required Quantitation Limit but above Method Detection Limit.
U	Non-Detect

Analyte	CLP Limits - Water (µg/L)		SCDM (Drinking Water)			Sample ID														
		MCLG (µg/L)	MCL (µg/L)	RDSC (µg/L)	CRSC (µg/L)	PGDW44 µg/L	PGDW45 µg/L	PGDW46 µg/L	PGDW47 µg/L	PGDW48 µg/L	PGDW49 µg/L	PGPW01 µg/L	PGPW02 µg/L	PGMW01 µg/L	PGMW01D µg/L	PGMW02 µg/L	PGMW03 µg/L	PGSE01 µg/kg	PGSE02 µg/kg	PGSE02D µg/kg	PGSE03 µg/kg
ALUMINUM	200	0	0			200 U	200 U	200 U	200 U	200 U	81.8 J	200 U	200 U	200 U	200 U	565	200 U	6830	4680	5350	1740
ANTIMONY	2	6	6	15		2 U	2 U	0.43 J	2 U	2 U	0.34 J	2 U	2 U	2 U	2 U	0.43 J	0.34 J	7.1 U	8.5 U	8.2 U	6.6 U
ARSENIC	1	0	10	11	0.057	0.48 J	0.46 J	0.32 J	0.32 J	0.41 J	0.71 J	0.31 J	0.24 J	14.3	20.3	41.8	3.6	1.2 U	3	3.1	5
BARIUM	10	2,000	2,000	2,600		8 J	37	75.1	7.6 J	8.4 J	8.2 J	4.1 J	7.6 J	139	226	707	215	46	218	251	390
BERYLLIUM	1	4	4	73		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.39 J	0.28 J	0.31 J	0.21 J
CADMIUM	1	5	5	18		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.59 U	0.71 U	0.69 U	0.34 J
CALCIUM	5000					259000	138000	90300 J	6870	147000	486000 J	5700 J	34400 J	337000 J	336000 J	195000 J	150000 J	10000	28200	30000	41800
CHROMIUM	2	100	100	110		2 U	2 U	2 U	2 U	2 U	0.52 J	2 U	2 U	2 U	2 U	1.2 U	2 U	19.3	8.9	9.7	3.5
COBALT	1					1 U	1 U	1 U	1 U	1 U	0.5 J	1 U	1 U	0.84 J	0.64 J	0.79 J	1.9	7	4.1 J	4.3 J	3.2 J
COPPER	2	1,300	1,300			40 J	4.5 UJ	13.6 J	2.6 UJ	9.8 J	57.3 J	2 U	3.1 U	5.1 U	5.3 J	60.6 U	2 J	8.3 J	6.7 J	7 J	4.2 J
IRON	100					2070	100 U	100 U	100 U	49.1 J	11400	112	255	10400	10800	1220	3720	10500	8110	8760	9870
LEAD	1	0	15			1 U	0.21 J	1.3	1 U	1 U	2.2	1 U	1 U	1 U	0.22 J	0.58 J	0.44 J	6.2	7.5	7.9	6
MAGNESIUM	5000					28300	31200	9890	5000 U	4350 J	153000	5000 U	5000 U	61700	65500	91800	24700	5220	6080	6540	3600
MANGANESE	1			5,100		213	0.32 J	0.31 J	1.6	85.7	158	7.1	9.6	3350	3640	379	1170	133	289	287	603
MERCURY	0.2	2	2	11		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.053 J	0.14 U	0.13 U	0.11 U
NICKEL	1			730		0.2 J	1.3	1.3	0.42 J	1.2	3.5	0.22 J	0.4 J	2.2	1.9	2.4	2.3	15.9	9.3	9.9	6.4
POTASSIUM	5000					5000 U	2610 J	1810 J	5000 U	5000 U	11400	5000 U	5000 U	3710 J	4150 J	3860 J	2930 J	1860	1270	1420	347 J
SELENIUM	5	50	50	180		2.2 J	5.1	2.6 J	5 U	1 J	2.3 J	5 U	5 U	5 U	5 U	1.8 J	5 U	4.2 U	4.9 U	4.8 U	3.9 U
SILVER	1			180		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.2 U	1.4 U	1.4 U	1.1 U
SODIUM	5000					994000	59400	91100	183000	725000	1210000	173000	393000	128000	133000	1020000	26900	594 U	508 J	759	307 J
THALLIUM	1	0.5	2			1 U	1 U	1 U	1 U	1 U	0.24 J	1 U	1 U	1 U	1 U	1 U	1 U	3 U	3.5 U	3.4 U	2.8 U
VANADIUM	5			260		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	8.7	5 U	21.8	11.5	12.5	8.5
ZINC	2			11,000		6.3	4	32.7	2.2	2.3	18.7	2 U	2 U	2 U	2.3	1.4 J	1.5 J	36.5	30.1	32	22.2

Table 12
Metals Data

Analyte	CLP Limits - Water (µg/L)		SCDM (Drinking Water)										
		MCLG (µg/L)	MCL (µg/L)	RDSC (µg/L)	CRSC (µg/L)	PGSE04 µg/kg	PGSE05 µg/kg	PGSW01 µg/L	PGSW02 µg/L	PGSW02D µg/L	PGSW03 µg/L	PGSW04 µg/L	PGSW05 µg/L
ALUMINUM	200	0	0			1680	3290	200 U	93.6 J	200 U	90.2 J	99.9245 J	109 J
ANTIMONY	2	6	6	15		7.5 U	8.1 U	2 U	0.37 J	2 U	0.43 J	2 U	0.34 J
ARSENIC	1	0	10	11	0.057	3.9	2.5	0.44 J	0.48 J	0.46 J	0.53 J	0.39 J	0.59 J
BARIUM	10	2,000	2,000	2,600		356	162	36.4	33.1	32.3	33.8	30.7	31.7
BERYLLIUM	1	4	4	73		0.63 U	0.67 U	1 U	1 U	1 U	1 U	1 U	1 U
CADMIUM	1	5	5	18		0.63 U	0.67 U	1 U	1 U	1 U	1 U	1 U	1 U
CALCIUM	5000					40400	28100	316000	313000 J	316000 J	345000 J	295000 J	289000 J
CHROMIUM	2	100	100	110		4.5	7.3	2 U	2 U	2 U	2 U	2 U	2 U
COBALT	1					2.2 J	3.1 J	0.54 J	0.46 J	0.54 J	0.52 J	0.44 J	0.45 J
COPPER	2	1,300	1,300			2.6 J	3.7 J	2.7 UJ	2.7 U	2.4 U	2.3 U	2.2 U	2.6 U
IRON	100					6360	6290	68.1 J	81.8 J	72 J	79.3 J	114	114
LEAD	1	0	15			5.7	5.5	1 U	0.24 J	0.2 J	0.23 J	0.34 J	0.33 J
MAGNESIUM	5000					2500	3710	94600	91100	90100	99000	86100	83100
MANGANESE	1			5,100		367	252	246	147	145	155	129	126
MERCURY	0.2	2	2	11		0.13 U	0.07 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	1			730		4.2 J	6.3	2.4	3.2	2.9	2.9	2.9	2.6
POTASSIUM	5000					384 J	820	11800	10500	10200	11300	9160	8830
SELENIUM	5	50	50	180		4.4 U	4.7 U	5 U	2.1 J	2.1 J	2.4 J	2.7 J	3.2 J
SILVER	1			180		1.3 U	1.3 U	1 U	1 U	1 U	1 U	1 U	1 U
SODIUM	5000					293 J	396 J	184000	262000	258000	286000	251000	265000
THALLIUM	1	0.5	2			3.1 U	3.4 U	1 U	1 U	1 U	1 U	1 U	1 U
VANADIUM	5			260		6.5	9.4	5 U	5 U	5 U	5 U	5 U	5 U
ZINC	2			11,000		14.2	21.6	2 U	1.1 J	1.2 J	2 U	1.4 J	1.4 J

Table 13
Fixed and Light Gases in Natural Gas from
Production Wells and Domestic Water Wells

Analyte	Laboratory Name	PGDW03	PGDW04	PGDW05	PGDW05D	PGDW10	PGDW20	PGDW22	PGDW23	PGDW25	PGDW30
Methane	ZymaX		5.2		53		1300		820		6300
Ethane	ZymaX						52		1.7		1.8
Propanes	ZymaX						5.8				
Butanes	ZymaX				7.3		6.9		12		3.1
Pentanes	ZymaX				11		1.3		2.3		3.9
Hexanes	ZymaX				4.7				2.4		0.77
Heptanes	ZymaX				2.5				0.5		0.79
Octanes	ZymaX				4.1		1.9		2.4		2.9
Nonanes	ZymaX										
Decanes	ZymaX										
Total	ZymaX		5.2		82		1368		841		6313

The concentrations represent ppm of the gas hydrocarbons in the headspace created above the water in the 1 litre bottle.
These are not concentrations in the water of the analyte.

The sample was not analyzed for this analyte.
(Blank Cell) Non Detect for this analyte.

Table 13
Fixed and Light Gases in Natural Gas from
Production Wells and Domestic Water Wells

Analyte	Laboratory Name	PGDW32	PGDW39	PGDW40	PGDW41	PGDW42	PGDW43	PGDW44	PGDW45	PGDW46	PGDW47
Methane	ZymaX			270	12			5.4			
Ethane	ZymaX						1.4				
Propanes	ZymaX										
Butanes	ZymaX										
Pentanes	ZymaX				3.7			1.8			
Hexanes	ZymaX				0.75			0.54			
Heptanes	ZymaX				2.8			0.47			
Octanes	ZymaX							2.1			
Nonanes	ZymaX										
Decanes	ZymaX										
Total	ZymaX			270	19		1.4	10			

Table 13
Fixed and Light Gases in Natural Gas from
Production Wells and Domestic Water Wells

Analyte	Laboratory Name	PGDW48	PGDW49	PGPW01	PGPW02
Methane	ZymaX				
Ethane	ZymaX				
Propanes	ZymaX				
Butanes	ZymaX				
Pentanes	ZymaX				
Hexanes	ZymaX				
Heptanes	ZymaX				
Octanes	ZymaX				
Nonanes	ZymaX				
Decanes	ZymaX				
Total	ZymaX				

	$\delta^{13}C$	δD
	% VPDB	% VSMOW
	CH_4	CH_4
Sample ID		
PGDW04	-63.91	[a]-219.56
PGDW05D	-40.63	-179.79
PGDW20	-40.61	-182.61
PGDW23	-24.21	-178.65
PGDW30	-14.46	-168.16
PGDW40	-30.93	-175.39
PGDW41	-19.39	[a]-154.35
PGDW43		
PGDW44	-14.87	[a]-142.87
PGPP01	-28.54	-200.38
PGPP02	-28.99	-204.03
PGPP03		
PGPP04P	-28.39	-196.66
PGPP05	-27.49	-198.69
PGPP06	-28.43	-194.96

VPDB Vienna PeeDee Belemnite
VSMOW Vienna Standard Mean Ocean water

[a]Estimate results of δD at low concentrations.

The sample was not analyzed for this analyte.

(Blank Cell) Non Detect for this analyte.

Table 15-A
Gas Analysis by Chromatography – ASTMD 1945

Sample ID:	PGPP01			PGPP02			PGPP03			PGPP04P			PGPP05			PGPP06		
Analyte:	**Mole %**	**Weight %**	**G/MCF**	**Mole %**	**Weight %**	**G/MCF**	**Mole %**	**Weight %**	**G/MCF**	**Mole %**	**Weight %**	**G/MCF**	**Mole %**	**Weight %**	**G/MCF**	**Mole %**	**Weight %**	**G/MCF**
Oxygen	0.00	0.00		0.00	0.00		0.00	0.00		0.02	0.04		2.2	3.78		0.07	0.12	
Nitrogen	0.71	1.11		0.69	1.13		100	100.00		0.61	0.91		7.92	11.9		0.71	1.13	
Carbon Dioxide	0.04	0.1		0.49	1.27		0.00	0.00		0.12	0.28		0.59	1.4		0.06	0.14	
Hydrogen Sulfide																		
Methane	92.45	83.14		94.5	88.67		0.00	0.00		90	75.98		84.73	72.9		93.09	84.89	
Ethane	4.1	6.91	1.044	3.52	6.19	0.897	0.00	0.00	0.00	4.67	7.4	1.191	3.31	5.34	0.843	3.98	6.81	1.015
Propane	1.22	3.02	0.337	0.36	0.92	0.099	0.00	0.00	0.00	1.47	3.41	0.406	0.34	0.81	0.095	0.91	2.29	0.252
i-Butane	0.41	1.34	0.135	0.14	0.48	0.047	0.00	0.00	0.00	0.58	1.76	0.189	0.12	0.38	0.04	0.33	1.09	0.108
n-Butane	0.37	1.2	0.116	0.07	0.23	0.021	0.00	0.00	0.00	0.51	1.56	0.162	0.06	0.18	0.018	0.26	0.84	0.081
neo-Pentane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.06	0.006	0.00	0.00	0.00	0.00	0.00	0.00
i-Pentane	0.19	0.77	0.07	0.05	0.23	0.02	0.00	0.00	0.00	0.35	1.32	0.127	0.04	0.15	0.014	0.16	0.64	0.057
n-Pentane	0.12	0.47	0.042	0.02	0.09	0.008	0.00	0.00	0.00	0.22	0.84	0.08	0.01	0.05	0.004	0.09	0.39	0.034
2,2-Dimethylbutane	0.01	0.05	0.004	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.09	0.007	0.00	0.00	0.00	0.01	0.05	0.004
2,3-Dimethylbutane	0.06	0.3	0.023	0.03	0.14	0.01	0.00	0.00	0.00	0.21	0.94	0.075	0.00	0.00	0.00	0.06	0.31	0.023
2-Methylpentane	0.1	0.46	0.034	0.03	0.14	0.01	0.00	0.00	0.00	0.26	1.17	0.094	0.03	0.16	0.012	0.09	0.46	0.034
3-Methylpentane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n-Hexane	0.04	0.18	0.016	0.02	0.08	0.007	0.00	0.00	0.00	0.13	0.57	0.053	0.02	0.09	0.008	0.05	0.24	0.021
Hexanes Plus	0.2	0.95	0.082	0.08	0.42	0.035	0.00	0.00	0.00	0.81	3.66	0.339	0.62	2.86	0.26	0.12	0.58	0.05
Totals	100	100	1.903	100	100	1.152	0.00	100.00	0.00	100	100	2.728	100	100	1.295	100	100	1.679

The sample was not analyzed for this analyte.
G/MCF: Gallons/Thousand Cubic Feet

Table 15-B
Gas Analysis by Chromatography – ASTMD 3588

Sample ID:	PGPP01	PGPP02	PGPP03	PGPP04P	PGPP05	PGPP06
Specific Gravity, Calculated	0.6159	0.5903	0.9672	0.6561	0.6437	0.6074
Compressibility (Z) factor	0.9975	0.9978	0.9997	0.9971	0.9979	0.9976
Gross Calorific Value						
BTU/ft^3 dry	1093.7	1042.9	0.0	1155	962.7	1078.9
BTU/ft^3 wet	1074.7	1024.8	0.0	1134.9	946.0	1060.1
Net Calorific Value						
BTU/ft^3 dry	987.8	940.5	0.0	1045	868.8	974.0
BTU/ft^3 wet	970.6	924.1	0.0	1026.8	853.7	957.0
CHONS	**Weight %**	**Weight %**	**Weight %**	**Weight %**	**Weight %**	**Weight %**
Carbon	75.02	73.94	0.0	75.64	63.12	74.74
Hydrogen	23.8	24	0.0	23.21	20.18	23.9
Oxygen	0.07	0.93	0.0	0.25	4.8	0.23
Nitrogen	1.11	1.13	100.0	0.91	11.9	1.13
Sulfur	0.0	0.0	0.0	0.0	0.0	0.0
EPA 'F' Factor (60°F, 1ATM)	8513.2	8508	*	8516.1	8618.2	8509.1

* Out of range
BTU British Thermal Unit

Sample ID:	PGPP01	PGPP04P
Analyte:		
Evaporation		
n-Pentane/n-Heptane	0.12	0.16
2-Methylpentane/2-Methylheptane	0.39	0.49
Waterwashing		
Benzene/Cyclohexane	0	0
Toluene/Methylcyclohexane	0.3	0.2
Aromatics/Total Paraffins (n + iso + cyc)	0.49	0.29
Aromatics/Naphthenes	1.37	0.81
Biodegradation		
(C4-C8 Para + Isopara)/C4-C8 Olefins	9.72	7.66
3-Methylhexane/n-Heptane	0.33	0.37
Methylcyclohexane/n-Heptane	3.52	3.48
Isoparaffins + Naphthenes/Paraffins	2.18	2.41
Octane Rating		
2,2,4,-Trimethylpentane/Methylcyclohexane	0	0
Relative Percentages-Bulk hydrocarbon composition as PIANO		
% Paraffinic	20.38	21.47
% Isoparaffinic	21.34	25.51
% Aromatic	31.55	21.22
% Naphthenic	23.1	26.28
% Olefinic	3.63	5.51

Table 17
C3-C10 Gasoline Range Compounds from Production Wells and Domestic Wells
(ug/L)

Analyte	Laboratory Name	PGMWO1D	PGMW02	PGMW03	PGPP01	PGPP04W	PGPP05	PGPP06	PGSW01	PGSW02	PGSW02D	PGSW03	PGSW04	PGSW05	PGDW03	PGDW04	PGDW05	PGDW05D	PGDW10	PGDW20	PGDW22	PGDW23	PGDW25	PGDW30
Isobutane	ZymaX					1363.4	1808.6	723.0												2.6		8.9		
Isobutene	ZymaX					116.1																		
Butane	ZymaX					1379.9	1079.9	703.6																
3-Methyl-1-butene	ZymaX																							
Isopentane	ZymaX					1017.3	2685.2	422.6																
1-Pentene	ZymaX																							
2-Methyl-1-butene	ZymaX																							
Pentane	ZymaX					2483.9	1212.9	48778.4																
trans-2-Pentene	ZymaX					8.6																		
cis-2-Pentene	ZymaX																							
2-Methyl-2-butene	ZymaX					46.8																		
2,2-Dimethylbutane	ZymaX					42.6	646.9																	
Cyclopentene	ZymaX					6.1																		
4-Methyl-1-pentene	ZymaX																							
Cyclopentane	ZymaX					240.3	191.3	186.0																
2,3-Dimethylbutane	ZymaX					97.9	1389.2	70.8																
2-Methylpentane	ZymaX					256.7	2002.4	147.1																
3-Methylpentane	ZymaX					178	1322.5	97.9																
Hexane	ZymaX					301.4	1407.6	153.7																
trans-2-Hexene	ZymaX																							
2-Methyl-2-pentene	ZymaX					66.8																		
3-Methylcyclopentene	ZymaX																							
3-Methyl-2-pentene	ZymaX																							
cis-2-Hexene	ZymaX																							
2,2-Dimethylpentane	ZymaX																							
1,2-Dichloroethane (EDC)	ZymaX																							
Methylcyclopentane	ZymaX					720.5	1184.7	490.6																
2,4-Dimethylpentane	ZymaX						1070.6	81.4																
1-Methylcyclopentene	ZymaX					6.2																		
Benzene	ZymaX					2052.5	379.1	1953.0																
5-Methyl-1-hexene	ZymaX																							
4,4-Dimethyl-2-pentene	ZymaX																							
3,3-Dimethylpentane	ZymaX						161																	
Thiophene	ZymaX																							
Cyclohexane	ZymaX					1139	1527.9	728.6																
2-Methylhexane	ZymaX					72.2	2095.0	142.1																
2,3-Dimethylpentane	ZymaX					7.4	320.8																	
3-Methylhexane	ZymaX					92	2201.3	158.8																
trans-1,3-Dimethylcyclopentane	ZymaX					74.6	822.8	63.8																
cis-1,3-Dimethylcyclopentane	ZymaX					87.2	921.7	70.7																
2-Methyl-1-hexene	ZymaX																							
1,2-Dimethylcyclopentane	ZymaX					125.5	702.6	85.2																
2,2,4-Trimethylpentane	ZymaX						62.6																	
Heptane	ZymaX					227.9	2844.4																	
trans-2-Heptene	ZymaX																							
Methylcyclohexane	ZymaX					1799.9	5934.7	1089.0																
2,5-Dimethylhexane	ZymaX					14.8	1414.1	103.4																
2,4-Dimethylhexane	ZymaX					17.4	1478.7	112.3																
2,3,4-Trimethylpentane	ZymaX						76.3																	
2,3-Dimethylhexane	ZymaX					24	1898.5	135.9																
1,2-Dibromoethane (EDB)	ZymaX																							
2-Methylheptane	ZymaX						2390.8	204.4																
4-Methylheptane	ZymaX					54	1860.8	144.3																
Toluene	ZymaX					11329.2	1284.8	7288.4																
2,3,3-Trimethylpentane	ZymaX						111																	
3,4-Dimethylhexane	ZymaX						2167.4	189.2																
2-Methylthiophene	ZymaX																							
3-Ethyl-3-methylpentane	ZymaX						157.9																	
3-Methylthiophene	ZymaX																							
3-Methylheptane	ZymaX					85.5	3145.6	253.0																
trans-1,4-Dimethylcyclohexane	ZymaX					526.9	10460.3	928.2																
2-Methyl-1-heptene	ZymaX																							
trans-1,2-Dimethylcyclohexane	ZymaX					193.1	5670.5	421.0																
1-Octene	ZymaX																							
Octane	ZymaX					208.5	3030.2	267.2																

Table 17
C3-C10 Gasoline Range Compounds from Production Wells and Domestic Wells
(ug/L)

Analyte	Laboratory Name	PGMWO1D	PGMW02	PGMW03	PGPP01	PGPP04W	PGPP05	PGPP06	PGSW01	PGSW02	PGSW02D	PGSW03	PGSW04	PGSW05	PGDW03	PGDW04	PGDW05	PGDW05D	PGDW10	PGDW20	PGDW22	PGDW23	PGDW25	PGDW30
2,2-Dimethylheptane	ZymaX					8.7	1299.8	97.7																
2,4,4-Trimethylhexane	ZymaX					59.4	4870.1	425.8																
2,4-Dimethylheptane	ZymaX					10.7	1699.7	132.4																
2,6-Dimethylheptane	ZymaX					38.3	2787.2	239.2																
Ethylcyclohexane	ZymaX					184.2	5016.4	440.8																
2,5-Dimethylheptane	ZymaX					48.2	5706.2	512.0																
Ethylbenzene	ZymaX					631.6	579.2	262.0																
2-Ethylthiophene	ZymaX																							
m,p-Xylenes	ZymaX					11512.9	3684.8	4291.9																
3-Ethylheptane	ZymaX					16.6	2047.9	188.4																
3-Methyloctane	ZymaX					81.2	10753.8	828.1																
2,3-Dimethylheptane	ZymaX						449.7																	
4-Methyloctane	ZymaX					44.1	3917.7	316.4																
1,2,4-Trimethylcyclohexane	ZymaX						358.8																	
Styrene	ZymaX					22.1																		
2-Methyloctane	ZymaX					36.4	3219.3	300.2																
1,1,2-Trimethylcyclohexane	ZymaX					34.8	4720.3	387.6																
o-Xylene	ZymaX					2639.9	1306.9	1099.5																
1-Nonene	ZymaX																							
Nonane	ZymaX					142.6	3916.8	377.2																
3,3,5-Trimethylheptane	ZymaX						3729.6	294.7																
Isopropylbenzene	ZymaX					541.8	3427.3	336.5																
Isopropylcyclohexane	ZymaX					19.4	4876.7	434.9																
2,2-Dimethyloctane	ZymaX						105.3																	
3-Methylnonane	ZymaX					20.3	5908.1	637.9																
3,3-Dimethyloctane	ZymaX					39.7	1458.9	126.3																
n-Propylbenzene	ZymaX					129.5	802.7	110.2																
1-Methyl-3-ethylbenzene	ZymaX					579.7	1652	412.6																
1-Methyl-4-ethylbenzene	ZymaX					192.3	793.6	154.9																
1,3,5-Trimethylbenzene	ZymaX					464.5	1566	365.9																
3,3,4-Trimethylheptane	ZymaX						2139.6																	
1-Methyl-2-ethylbenzene	ZymaX					164	674.4	159.7																
1,2,4-Trimethylbenzene	ZymaX					694.7	2620.7	632.1																
1-Decene	ZymaX																							
1-Methyl-3-isopropylbenzene	ZymaX					44.7	1082.9	107.3																
Decane	ZymaX					73.7	4153.3	407.8																
sec-Butylbenzene	ZymaX					7	655.3	61.5																
1,2,3-Trimethylbenzene	ZymaX					155	903.7	170.3																
Indane	ZymaX					9.1	358.8																	
Indene	ZymaX						79.1																	
1,3-Diethylbenzene	ZymaX						626.3	63.6																
n-Butylbenzene	ZymaX						178.9																	
1,3-Dimethyl-5-ethylbenzene	ZymaX																							
1,4-Diethylbenzene	ZymaX						256.1																	
1-Methyl-2-propylbenzene	ZymaX						133.2																	
1,4-Dimethyl-2-ethylbenzene	ZymaX																							
1,3-Dimethyl-4-ethylbenzene	ZymaX							81.4																
1,2-Dimethyl-4-ethylbenzene	ZymaX																							
1,3-Dimethyl-2-ethylbenzene	ZymaX																							
Undecane	ZymaX						312.3	373.7																
1,2,4,5-Tetramethylbenzene	ZymaX																							
1,2,3,5-Tetramethylbenzene	ZymaX																							
1,2,3,4-Tetramethylbenzene	ZymaX																							
Naphthalene	ZymaX																							
2-Methylnaphthalene	ZymaX																							
1-Methylnaphthalene	ZymaX																							
Benzothiophene	ZymaX																							
n-Pentylbenzene	ZymaX																							

The sample was not analyzed for this analyte.
(Blank Cell) Non Detect for this analyte.

Table 17
C3-C10 Gasoline Range Compounds from Production Wells and Domestic Wells
(ug/L)

Analyte	Laboratory Name	PGDW32	PGDW39	PGDW40	PGDW41	PGDW42	PGDW43	PGDW44	PGDW45	PGDW46	PGDW47	PGDW48	PGDW49	PGPW01	PGPW02	PGFB01	PGFM20	PGMW01
Isobutane	ZymaX																	
Isobutene	ZymaX																	
Butane	ZymaX																	
3-Methyl-1-butene	ZymaX																	
Isopentane	ZymaX																	
1-Pentene	ZymaX																	
2-Methyl-1-butene	ZymaX																	
Pentane	ZymaX																	
trans-2-Pentene	ZymaX																	
cis-2-Pentene	ZymaX																	
2-Methyl-2-butene	ZymaX																	
2,2-Dimethylbutane	ZymaX																	
Cyclopentene	ZymaX																	
4-Methyl-1-pentene	ZymaX																	
Cyclopentane	ZymaX																	
2,3-Dimethylbutane	ZymaX																	
2-Methylpentane	ZymaX																	
3-Methylpentane	ZymaX																	
Hexane	ZymaX																	
trans-2-Hexene	ZymaX																	
2-Methyl-2-pentene	ZymaX																	
3-Methylcyclopentene	ZymaX																	
3-Methyl-2-pentene	ZymaX																	
cis-2-Hexene	ZymaX																	
2,2-Dimethylpentane	ZymaX																	
1,2-Dichloroethane (EDC)	ZymaX																	
Methylcyclopentane	ZymaX																	
2,4-Dimethylpentane	ZymaX																	
1-Methylcyclopentene	ZymaX																	
Benzene	ZymaX																	
5-Methyl-1-hexene	ZymaX																	
4,4-Dimethyl-2-pentene	ZymaX																	
3,3-Dimethylpentane	ZymaX																	
Thiophene	ZymaX																	
Cyclohexane	ZymaX																	
2-Methylhexane	ZymaX																	
2,3-Dimethylpentane	ZymaX																	
3-Methylhexane	ZymaX																	
trans-1,3-Dimethylcyclopentane	ZymaX																	
cis-1,3-Dimethylcyclopentane	ZymaX																	
2-Methyl-1-hexene	ZymaX																	
1,2-Dimethylcyclopentane	ZymaX																	
2,2,4-Trimethylpentane	ZymaX																	
Heptane	ZymaX																	
trans-2-Heptene	ZymaX																	
Methylcyclohexane	ZymaX																	
2,5-Dimethylhexane	ZymaX																	
2,4-Dimethylhexane	ZymaX																	
2,3,4-Trimethylpentane	ZymaX																	
2,3-Dimethylhexane	ZymaX																	
1,2-Dibromoethane (EDB)	ZymaX																	
2-Methylheptane	ZymaX																	
4-Methylheptane	ZymaX																	
Toluene	ZymaX																	
2,3,3-Trimethylpentane	ZymaX																	
3,4-Dimethylhexane	ZymaX																	
2-Methylthiophene	ZymaX																	
3-Ethyl-3-methylpentane	ZymaX																	
3-Methylthiophene	ZymaX																	
3-Methylheptane	ZymaX																	
trans-1,4-Dimethylcyclohexane	ZymaX																	
2-Methyl-1-heptene	ZymaX																	
trans-1,2-Dimethylcyclohexane	ZymaX																	
1-Octene	ZymaX																	
Octane	ZymaX																	

Table 17
C3-C10 Gasoline Range Compounds from Production Wells and Domestic Wells
(ug/L)

Analyte	Laboratory Name	PGDW32	PGDW39	PGDW40	PGDW41	PGDW42	PGDW43	PGDW44	PGDW45	PGDW46	PGDW47	PGDW48	PGDW49	PGPW01	PGPW02	PGFB01	PGFM20	PGMW01
2,2-Dimethylheptane	ZymaX																	
2,4,4-Trimethylhexane	ZymaX																	
2,4-Dimethylheptane	ZymaX																	
2,6-Dimethylheptane	ZymaX																	
Ethylcyclohexane	ZymaX																	
2,5-Dimethylheptane	ZymaX																	
Ethylbenzene	ZymaX																	
2-Ethylthiophene	ZymaX																	
m,p-Xylenes	ZymaX																	
3-Ethylheptane	ZymaX																	
3-Methyloctane	ZymaX																	
2,3-Dimethylheptane	ZymaX																	
4-Methyloctane	ZymaX																	
1,2,4-Trimethylcyclohexane	ZymaX																	
Styrene	ZymaX																	
2-Methyloctane	ZymaX																	
1,1,2-Trimethylcyclohexane	ZymaX																	
o-Xylene	ZymaX																	
1-Nonene	ZymaX																	
Nonane	ZymaX																	
3,3,5-Trimethylheptane	ZymaX																	
Isopropylbenzene	ZymaX																	
Isopropylcyclohexane	ZymaX																	
2,2-Dimethyloctane	ZymaX																	
3-Methylnonane	ZymaX																	
3,3-Dimethyloctane	ZymaX																	
n-Propylbenzene	ZymaX																	
1-Methyl-3-ethylbenzene	ZymaX																	
1-Methyl-4-ethylbenzene	ZymaX																	
1,3,5-Trimethylbenzene	ZymaX																	
3,3,4-Trimethylheptane	ZymaX																	
1-Methyl-2-ethylbenzene	ZymaX																	
1,2,4-Trimethylbenzene	ZymaX																	
1-Decene	ZymaX																	
1-Methyl-3-isopropylbenzene	ZymaX																	
Decane	ZymaX																	
sec-Butylbenzene	ZymaX																	
1,2,3-Trimethylbenzene	ZymaX																	
Indane	ZymaX																	
Indene	ZymaX																	
1,3-Diethylbenzene	ZymaX																	
n-Butylbenzene	ZymaX																	
1,3-Dimethyl-5-ethylbenzene	ZymaX																	
1,4-Diethylbenzene	ZymaX																	
1-Methyl-2-propylbenzene	ZymaX																	
1,4-Dimethyl-2-ethylbenzene	ZymaX																	
1,3-Dimethyl-4-ethylbenzene	ZymaX																	
1,2-Dimethyl-4-ethylbenzene	ZymaX																	
1,3-Dimethyl-2-ethylbenzene	ZymaX																	
Undecane	ZymaX																	
1,2,4,5-Tetramethylbenzene	ZymaX																	
1,2,3,5-Tetramethylbenzene	ZymaX																	
1,2,3,4-Tetramethylbenzene	ZymaX																	
Naphthalene	ZymaX																	
2-Methylnaphthalene	ZymaX																	
1-Methylnaphthalene	ZymaX																	
Benzothiophene	ZymaX																	
n-Pentylbenzene	ZymaX																	