DEPARTMENT OF ECOLOGY
State of Washington

Draft Cleanup Action Plan
Chevron Pipe Line Company Pasco Bulk Terminal
Facility Site ID 55763995
Cleanup Site 4867

Prepared by
Washington State Department of Ecology
Eastern Regional Office
Toxics Cleanup Program
Spokane, WA

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1.0 INTRODUCTION

This Draft Cleanup Action Plan (DCAP) sets cleanup standards and selects a cleanup action that meets cleanup standards for the Chevron Pipe Line Company (CPL) Pasco Bulk Terminal Site (Site). This facility is currently owned by CPL and Northwest Terminalling Company (NWTC), and is operated by CPL. The Site is a bulk fuel storage terminal supplied by pipeline and barge and is situated east of the city of Pasco, Franklin County, Washington. The Site is located at 2900 Sacajawea Park Road, which is southwest of the intersection of U.S. Highway 12 and Sacajawea Park Road (Figure 1). The cleanup action selected for the Site is based upon information contained in the Washington Department of Ecology's (Ecology) files, and the remedial investigation and feasibility study (RI/FS) completed by URS and CH2M HILL on behalf of CPL and Tidewater Terminal Company, Inc. (Tidewater). CPL and Tidewater are currently identified as potentially liable persons (PLPs) for the Site.

Ecology is responsible for the cleanup action selection and the completion of the DCAP. The selected cleanup action is intended to fulfill the requirements of the Model Toxics Control Act (MTCA) RCW 70.105D. The objectives of this document are to satisfy the MTCA requirements set forth in WAC 173-340-380(1) and will include the following:

- A brief Site history description;
- A description of the nature and extent of Site contamination summarized from the remedial investigation (RI);
- Establishment of cleanup standards for each contaminated medium protective of human health and the environment;
- Presentation of proposed remedial alternatives summarized from the feasibility study (FS); and
- Ecology's selected cleanup action.

1.1 APPLICABILITY

This DCAP is applicable only to the CPL Pasco Bulk Terminal Site in Pasco, Franklin County, Washington. The Facility Site Identification number is FSID 55763995. The remedial actions to be taken at this Site were developed to meet the threshold requirements and other requirements of WAC 173-340-360. Cleanup standards have been developed and cleanup actions selected as an overall remediation process being conducted under Ecology oversight using MTCA authority. Ecology's decisions regarding these matters should not be considered as setting precedent for other sites.

1.2 ADMINISTRATIVE DOCUMENTATION

Documents used to develop this DCAP and the decisions contained herein are contained in Ecology's files. The administrative record for this Site is on file and available for public review by appointment at Ecology's Eastern Regional Office, located at 4601 N. Monroe, Spokane, Washington 99205-1295. Documents made available for public comment are also available at the Mid-Columbia Library in Pasco, WA. The following documents were used to develop the proposed cleanup action:

- Briggs, Phillip R., 1992, Chevron U.S.A. Letter to Carl Nuechterlein, Washington Department of Ecology, April 16, 1992.
- CH2M HILL, 2000, Status Report #1: Status of Site Investigation and Proposed Interim Fuel Recovery Measures: Tidewater Pipeline Release – Pasco, WA, August 15, 2000.
- CH2M HILL, 2000, Status Report #2: Tidewater Pipeline Release – Pasco, WA, September 1, 2000.
- CH2M HILL, 2000, Tidewater Pipeline Release: Status Letter Report for Emergency Response Remedial Systems, October 11, 2000.
- CH2M HILL, 2000, Status Report #3: Tidewater Pipeline Release – Pasco, WA, October 30, 2000.
- CH2M HILL, 2001, Status Report #4: Tidewater Pipeline Release – Pasco, WA, January 30, 2001.
- CH2M HILL, 2001, Status Report #5 (August 2000 – February 2001): Tidewater Pipeline Release – Pasco, WA, April 26, 2001.
- CH2M HILL, 2001, Construction, System Start-up and Operations Report, September 2001.
- CH2M HILL, 2001, Tidewater Remedial Action – Groundwater Sampling and Analysis Report, October 2001.
- CH2M HILL, 2002, Remediation Progress Summary and November 2001 Groundwater Sampling Results - Tidewater Barge Lines, Pasco Fuel Release Site, February 2002.
- CH2M HILL, 2002, Remediation Progress Summary and July 2002 Groundwater Sampling Results - Tidewater Barge Lines, Pasco Fuel Release Site, October 2002.
- CH2M HILL, 2002, Remediation Progress Summary and November 2002 Groundwater Sampling Results - Tidewater Barge Lines, Pasco Fuel Release Site, January 2003.
- CH2M HILL, 2003, Remediation Progress Summary and February 2003 Groundwater Sampling Results - Tidewater Barge Lines, Pasco Fuel Release Site, May 2003.
- CH2M HILL, 2003, Ecology Status Meeting and Presentation titled "Pasco Fuel Release: Site Review, Cleanup Status and Path Forward", June 2003.
- CH2M HILL, 2003, June 2003 Groundwater Sampling Results - Tidewater Barge Lines, Pasco Fuel Release Site, July 2003.

- CH2M HILL, 2004, Rounds 3 and 4 Post-Remediation System Sampling Results, Tidewater Barge Lines, Pasco Fuel Release Site, February 2004.
- CH2M HILL, 2005, Tidewater Remediation System Decommissioning and Performance Monitoring Plan, Tidewater Barge Lines, Pasco Fuel Release Site, June 2005.
- CH2M HILL, 2005, Supplemental Groundwater Sampling, Tidewater Barge Lines, Pasco Fuel Release Site, May 16, 2006.
- GeoEngineers Inc., 1987, Report of Geotechnical Services , East Pasco Fuel Terminal, Pasco, Washington, for Chevron U.S.A., Inc., June 22, 1987.
- Maxim Technologies Inc., 2000a. Progress Toward Site Closure, Pasco Bulk Terminal, 3000 Sacajawea Road, Pasco, WA, July 10, 2000.
- Maxim Technologies Inc., 2000b. Progress Toward Site Closure, Pasco Bulk Terminal, 3000 Sacajawea Road, Pasco, WA, July 14, 2000.
- Maxim Technologies Inc., 2000c. Summary of Site Conditions and Petroleum Release History, Pasco Bulk Terminal, 3000 Sacajawea Road, Pasco, WA, October 10, 2000.
- Maxim Technologies Inc., 2000d. Groundwater Sampling, Pasco Bulk Terminal, 3000 Sacajawea Road, Pasco, WA, October 27, 2000.
- Maxim Technologies Inc., 2001. Groundwater Sampling, Pasco Bulk Terminal, 3000 Sacajawea Road, Pasco, WA, February 6, 2001.
- Rittenhouse-Zeman & Associates, Inc., 1988a. Free-Phase Petroleum Hydrocarbon Recovery Operations Status and Updated Recommendations, January 25, 1988.
- Rittenhouse-Zeman & Associates, Inc., 1988b. Status Report for May 10 to 31, 1988, June 1, 1988.
- Rittenhouse-Zeman & Associates, Inc., 1989a. Analytical Chemistry Results for Groundwater Discharge to Unlined Pond, February 17, 1989.
- Rittenhouse-Zeman & Associates, Inc., 1989c. Continued Subsurface Hydrocarbon Exploration and Free-Phase Petroleum Hydrocarbon Recovery System Installation, May 19, 1989.
- Rittenhouse-Zeman & Associates, Inc., 1989d. Bioventing System for Chevron U.S.A., Inc., November 29, 1989.
- Rittenhouse-Zeman & Associates, Inc., 1990a. Quarterly Status Report, April 30, 1990.
- Rittenhouse-Zeman & Associates, Inc., 1990b. Quarterly Status Report, September 17, 1990.
- Rittenhouse-Zeman & Associates, Inc., 1990c. Quarterly Status Report and Monitoring Well Sampling Results, December 6, 1990.
- Rittenhouse-Zeman & Associates, Inc., 1991a. Quarterly Status Report and Monitoring Well Sampling Results, March 7, 1991.
- Rittenhouse-Zeman & Associates, Inc., 1991b. Quarterly Status Report and Monitoring Well Sampling Results, June 7, 1991.
- Rittenhouse-Zeman & Associates, Inc., 1991c. Quarterly Status Report and Monitoring Well Sampling Results, September 9, 1991.

- Rittenhouse-Zeman & Associates, Inc., 1993a. Status Report, March 11, 1993.
- Rittenhouse-Zeman & Associates, Inc., 1993b. Quarterly Operations and Maintenance Report, May 20, 1993.
- TCM Northwest, Inc., 2000. Emergency Response Subsurface Site Investigation Report, December 20, 2000.
- URS Corporation, 2009. 2007-2008 Groundwater Monitoring Report, NWTC Pasco Terminal, June 3, 2009.
- URS Corporation and CH2M HILL, 2011. Remedial Investigation and Feasibility Study (RI/FS) for the NWTC Pasco Terminal, Pasco, WA, September 29, 2011.
- Washington Department of Ecology, 2001. Model Toxics Control Act, Chapter 173-340 WAC. Publication No. 94-06.
- Washington Department of Ecology, 2001. Cleanup Levels and Risk Calculations under the Model Toxics Control Act, Version 3.1. Publication No. 94-145.

1.3 CLEANUP PROCESS

Cleanup conducted under the MTCA process requires specific documents to be completed and submitted for Ecology review. The DCAP and Public Participation Plan are documents completed by Ecology. These documents are used by Ecology to obtain more detailed information and determine the remedial actions to be conducted, and the associated monitoring requirements, prior to and following a cleanup action. These procedural tasks and resulting documents, along with the MTCA section that requires their completion, are listed below with a brief description of each task.

- Remedial Investigation and Feasibility Study - WAC 173-340-350
- Draft Cleanup Action Plan - WAC 173-340-380
- Engineering Design Report - WAC 173-340-400
- Construction Plans and Specifications - WAC 173-340-400
- Operation and Maintenance Plan(s) - WAC 173-340-400
- Cleanup Action Report - WAC 173-340-400
- Compliance Monitoring Plan - WAC 173-340-410
- Public Participation Plan - WAC 173-340-600

The Remedial Investigation and Feasibility Study (RI/FS) process documents the investigations and the engineering evaluations conducted at the Site from the discovery phase to the final RI/FS. The investigations are designed to characterize the type and extent of contamination and the associated risks posed by the contamination to human health and the environment. The FS presents and evaluates different Site cleanup alternatives and proposes the preferred cleanup alternative. The RI/FS Report was reviewed and made available for public review and comment by Ecology, and then finalized. Ecology received three comments.

The DCAP sets the cleanup standards for the Site and selects the cleanup actions intended to achieve the cleanup standards. After public comment and any revisions made following public comment, the DCAP is finalized with an attached responsiveness summary and becomes the cleanup action plan (CAP).

The Engineering Design Report outlines the engineered system and design components of the CAP. Construction Plans and Specifications provide the technical drawings and specifications for design and implementation of the CAP.

The Operation and Maintenance (O&M) Plan(s) summarizes the requirements for inspection and maintenance as well as the regulatory and technical necessities to assure effective operations. The O&M Plan(s) outline the actions required to operate and maintain any equipment, structures, or other remedial facilities used in the cleanup action.

A Cleanup Action Report will be completed following implementation of the selected cleanup action. The report will detail the activities performed for the Site cleanup action and provide documentation of adherence to or variance from the CAP.

Compliance Monitoring Plans are designed to serve the following three purposes:

- Protection – Confirm human health and the environment are being protected during construction and O&M tasks for the cleanup action at the Site.
- Performance – Confirm the cleanup action has attained cleanup standards.
- Confirmational – Confirm the long-term effectiveness of the cleanup action after cleanup standards have been attained.

The Public Participation Plan is the framework to provide the public with information and give it the opportunity for participation in a site. This plan is tailored to meet the public's needs and coordinate its effort in the MTCA process.

An Engineering Design Report, Construction Plans and Specifications, O&M Plan, and Cleanup Action Report are not required for the selected remedy described in Sections 6.5.1 and 7.0. The information normally provided in these documents will be addressed in the Compliance Monitoring Plan.

2.0 SITE HISTORY

The following paragraphs provide a brief summary of ownership, operational, and regulatory history of the Site. The information provided herein was provided in RI reports completed by CH2M HILL, GeoEngineers, Maxim Technologies, Inc., Rittenhouse-Zeman & Associates, Inc., URS Corporation, and Ecology.

The CPL Pasco Terminal (Pasco Terminal) is used to store refined fuel products delivered by pipelines and barges. The Pasco Terminal has been in operation since 1950 and currently uses eighteen (18) aboveground storage tanks to store gasoline, diesel, jet fuel, and ethanol.

Tidewater owns and operates pipelines that transfer fuel products between barges, the Pasco Terminal, and the adjacent Tidewater Terminal. The Tidewater fuel transfer pipelines are located within an easement that crosses a portion of the Pasco Terminal. These pipelines allow CPL and Tidewater to transfer fuel products between the Pasco and Tidewater terminals.

During its operational history, the Pasco Terminal has documented and addressed releases from tanks, pipelines, and loading racks at the Site. The facility has documented 27 releases from 1972 to 2010. The releases vary in size from a few gallons to about 41,000 gallons.

The Site was placed on the Washington State Hazardous Sites List in August 2000. In addition, a site hazard assessment (SHA) was completed which resulted in a site ranking of 3. This site's ranking, on a scale of one to five with one being the highest, is relative to all other Washington State sites assessed at this time.

3.0 PHYSICAL SETTING

The property is located in Section 35, Township 9 North, Range 30 East, Willamette Meridian (Figure 1). Topographic map coverage of the Site and vicinity is provided by the Pasco Quadrangle, U.S. Geological Survey, 7.5-minute series dated 1992. The upland portion of the Site is about 420 feet above sea level using the National Geodetic Vertical Datum (NGVD) of 1929.

The 33-acre Site is situated along the north bank of the Snake River (Lake Wallula) and is bordered by unimproved land on three sides (Figure 2). Land use in the vicinity is limited with most of it being agricultural. The general land slope is relatively flat with a sharp decline from the tank storage area to the Snake River (Figure 1). The property is mostly compacted sand and gravel with a paved parking lot and entrance road.

The bulk storage terminal consists of eighteen (18) aboveground tanks that store gasoline, diesel, jet fuel, and ethanol. Pipelines transfer the products between the storage tanks, the barge facility on the river, and the adjacent Tidewater terminal. The remainder of the terminal is comprised of an office, pump station building, truck loading rack, warehouses, garages, storage rooms, welding shop, and workshops. A Site layout is presented in Figure 3.

3.1 REGIONAL AND SITE GEOLOGY

The Site is situated within the Pasco Basin. The basin is underlain by three major stratigraphic units, which are in ascending order: the Columbia River Basalt Group; the Ringold Formation; and the Hanford Formation. The thick sequence of flood basalts was deposited during the Miocene Era resulting in a total thickness of over 15,000 feet (Drost, et. al, 1997). The basalt formations found in the area include the Saddle Mountains Basalt that overlies the Wanapum Basalt which in turn overlies the Grande Ronde. Overlaying the basalt is the Ringold Formation. The Ringold, deposited during the Pliocene, consists of four units recognized by textural class and consist of the following soil types listed in ascending order:

- Basal units consisting of sand and gravel;
- Lower unit comprised of silt and clay;
- Middle unit composed of sand, gravel and silt; and
- Upper unit consisting of sand and silt.

Pleistocene glacial flood deposits sit atop the Ringold Formation. The Pleistocene age Hanford Formation is composed of two units: the lower Pasco Gravels; and the overlying Touchet Beds. The Pasco gravels are comprised of sand or sand and gravel while the Touchet Beds consist of silt and sand.

The Site geologic interpretation is made from logs of soil borings and monitoring wells installed on-site. A geologic cross section is presented as Figure 4. The upper soil profile consists of brown to gray, fine to coarse-grained sand with some gravel. The gravel amount appears to increase with depth. The gravel is dense, mostly fine to coarse with some sand and trace amounts of silt as a matrix. The gravel parent lithology is mostly basalt and is typically sub-angular to sub-rounded.

3.2 REGIONAL HYDROGEOLOGY

The Pasco Basin is a subset of the regional Columbia Plateau aquifer system. The Columbia Plateau Regional Aquifer System (CPRAS) covers over 50,000 square miles of eastern Oregon and Washington and western Idaho (Kahle, et. al, 2011). The basalts may be as thick as 16,000 feet in the Site area (Drost , et al. 1990). The Columbia River Basalt Group (CRBG) are the primary aquifers in the region. However, the alluvial aquifers are important in some areas of the Columbia Plateau since they are readily accessible and are capable of high yields. The groundwater flow direction in the alluvial and basalt aquifers is typically toward the rivers.

The alluvial aquifers in the Site area range in thickness from 50 to 200 feet (Whitehead, 1994). In the Site area, yields as high as 3,500 gallons per minute (gpm) have been reported in wells completed in the Pasco Gravels.

Site Hydrogeology

Site groundwater levels have been monitored since the first monitoring wells were installed in 1983. Based upon Site groundwater elevations, groundwater beneath the Site generally flows to the southeast toward the Snake River. The aquifer at the Site is unconfined and is usually encountered about 80 feet bgs in the upland part of the Site. Groundwater levels can fluctuate between 2 to 5.5 feet over a season as observed during the more than 25-year monitoring period.

The hydraulic gradient in the upland portion of the Site ranges from about 0.0002 to 0.0003 foot per foot. The gradient closer to the river is approximately 0.002 foot per foot. The flat hydraulic gradient is likely moderated by the reservoir conditions maintained in this reach of the Snake River due to the operations at McNary Dam.

3.3 SURFACE WATER

The Snake River borders the Site to the southeast, and joins the Columbia River about one mile west-southwest of the Site. The McNary Dam reservoir on the Columbia River backs up the Snake River in the Site area to form Lake Wallula. The pool height in the Site area is maintained between 335 and 340 feet above sea level. The river stage is controlled for navigational and hydroelectric power generation purposes.

4.0 REMEDIAL INVESTIGATION

In order to monitor different past releases that occurred at the Site, CPL has installed a total of fifteen monitoring wells. Four monitoring wells were installed in 1983 in response to releases from Tanks 8 and 13. The network was expanded in 1986 with the installation of five additional wells. In 1989, CPL installed six additional wells. In addition to the monitoring network installation, CPL has completed several different remedial actions at the Site.

In July 2000, a leak in a Tidewater pipeline resulted in the release of an estimated 41,000 gallons of gasoline at the Site. The release occurred in the northwest portion of the Site and is referred to as the Tidewater area (Figure 2). An emergency response effort was undertaken to characterize the release and begin remedial efforts to minimize impacts of the release. The investigations and remedial action are further described in the next sections.

4.1 CPL ACTIVITIES

Since 1972, CPL has documented over twenty releases at the terminal. The three largest releases occurred between 1976 and 1984. In 1976, about 665 barrels (27,930 gallons) of diesel were released from Tank 8 due to overfill. Tank 13 was overfilled in 1978 and 600 barrels (25,200 gallons) of gasoline were released. In 1984, a roof drain froze on Tank 17 and caused 610 barrels (25,620 gallons) of gasoline to be released.

Sheen was observed along the river in July 1986. Onshore excavation of pipelines in the sheen area determined a Jet A-dedicated pipeline was leaking, and the contaminated soil was removed. Additionally, terminal-related subsurface pipelines near the sheen area were removed and replaced with aboveground piping. The sections beneath the rail spur were not replaced.

In an effort to contain hydrocarbons near the river and mitigate the sheen, a pumping system was placed in MW-5. The pumping system was intended to reverse the groundwater flow direction and capture any free product. The pumping system was not successful in reversing the flow direction or capturing free product. In May 1987, an additional 1,900 cubic yards of soil was removed from the shoreline, of which 500 cubic yards was determined to be contaminated. After a few months the sheen was no longer observed, suggesting the source had been addressed.

In the late 1980s free product was observed in monitoring well MW-2, which is located downgradient of the storage tanks (Figure 3). A skimmer system was installed to recover the observed free product, but was only partially successful. In an effort to recover more free product, an additional well, RW-1, was drilled near MW-2. The recovery efforts using RW-1 proved ineffective.

Two soil vapor extraction (SVE) systems were installed to address vadose zone contamination and free product. An air sparging system was added in 1992 to enhance volatization of contaminants. The systems were operated from 1989 to 2000. The operation of the remediation systems resulted in the removal of an estimated removal of more than 257,819 pounds of petroleum hydrocarbons and a decrease of observed free product.

Site groundwater has been sampled intermittently from 1983 to present. The presence of free product has disappeared. Contaminant concentrations have steadily declined as a result of installation and operation of remedial systems as well as natural attenuation.

4.2 TIDEWATER ACTIVITIES

On July 21, 2000, a leak was discovered in a Tidewater pipeline that transfers fuel between the CPL Pasco and Tidewater terminals (Figure 2). An estimated 41,000 gallons of unleaded gasoline was released before the leak was repaired. During the emergency response phase, Ecology's Spill Response Program provided oversight to the efforts conducted to address the release. The efforts were directed at identifying the extent of contamination and beginning free product recovery. By September 2000, the emergency response phase of the project was concluded when Tidewater demonstrated the free product plume was contained.

Prior to September 2000, Tidewater installed twelve monitoring wells in the release area to characterize the extent of free product. Four vapor extraction wells were installed within the soil contaminant area to assist in defining the free product plume. Total fluids recovery pumps were placed in several monitoring wells. About 8,000 gallons of liquid phase free product were recovered and sent off-site for reprocessing and eventual re-use.

Along with the monitoring wells, an SVE system was installed during the emergency phase to assist in product recovery. Vapor phase recovery removed between 25,000 to 27,000 gallons of petroleum hydrocarbons which were destroyed on-site with thermal or catalytic oxidation.

In February and March 2001, additional investigation work was completed at the Site to support the design and installation of an air sparging system. Eight additional monitoring wells along with seventeen sparge points were completed in and adjacent to the free product pool. The air sparging in combination with the SVE system was designed to reduce the free product pool and enhance biodegradation in the upper saturated zone.

By February 2003, the free product pool had diminished to the point where only sheen was visible in some monitoring wells. Tidewater monitoring wells were sampled from February 2003 through December 2003. The sampling results indicated the remedial actions successfully addressed the free product plume while stabilizing the dissolved phase plume.

Supplemental sampling completed in March 2006 confirmed the results of the 2003 sampling events. The dissolved phase plume decreased in size as well as concentration.

4.3 SITE-WIDE ACTIVITIES

In 2007 and 2008, URS completed two sampling events that included the sampling of CPL's wells and a limited number of Tidewater monitoring wells. Free product was not observed in any of the CPL or Tidewater monitoring wells during the sampling. Sheen was observed on purge water collected from five of the Tidewater wells sampled in 2007.

In 2010, a joint field investigation was conducted by URS (representing CPL) and CH2M HILL (representing Tidewater). The investigation included well maintenance and rehabilitation, a civil survey of monitoring wells, and groundwater sampling. The civil survey placed site wells on the same vertical datum, which allowed for preparing groundwater elevation contour, flow direction, and gradient maps.

A site-wide groundwater sampling event was completed in June 2010. Nine CPL wells and eleven Tidewater wells were sampled for this event. Some CPL wells were not sampled during this round because of well construction issues or, in the case of Tidewater's wells, sheen was observed in the well purge water. Another site-wide groundwater sampling event was performed in December 2010. The groundwater sampling results from both events indicate petroleum hydrocarbon concentrations have decreased or remain stable at the Site.

5.0 CLEANUP STANDARDS

The cleanup standard development process is used to determine which hazardous substances contribute to an overall threat to human health and the environment at a site. Once these substances are identified, an evaluation is made to determine at what concentration these substances are considered to be protective of human health and the environment. A point of compliance is then established on the site, which is a point or points where these cleanup levels must be attained (WAC 173-340-200). Cleanup standards include both cleanup levels and points of compliance for those cleanup levels.

MTCA provides three main methods for establishing cleanup levels at a site. These are Method A, B, and C. Method A provides cleanup levels for routine cleanup actions or sites with relatively few hazardous substances. Methods B and C cleanup concentrations are calculated from applicable or relevant and appropriate requirements (ARARs) and from using the formulas provided in WAC 173-340-720 through WAC 173-340-760. Method B is the standard method for establishing cleanup levels and is applicable to all sites. Method C is a conditional method for use at sites subject to specified uses.

Following establishment of cleanup levels, media having concentrations above cleanup levels must be addressed using one or more technologies selected as part of the remedy. Criteria for remedy selection are outlined in WAC 173-340-360.

Historic releases to soil at the Site were excavated and disposed at the time of the release. While isolated areas of contaminated soil may be present near the water table at the fuel terminal, soil contamination will be addressed as part of the groundwater remedy. Groundwater is the contaminated medium of focus. Petroleum hydrocarbons (TPH), ranging from gasoline to heavy oil, and benzene, toluene, ethylbenzene, and xylene (BTEX) are the indicator substances (as defined in Section 5.1 below) identified in this medium. The contamination is a direct result of historic releases at the Site. Two exposure pathways have been considered in establishing cleanup standards for this Site. The pathways are the protection of groundwater and surface water. Since Site groundwater is not withdrawn from the same alluvial aquifer and contamination does not leave the Site, Ecology has determined the current most reasonable exposure scenario is through accidental ingestion of drinking water and other domestic uses.

Groundwater cleanup standards are set according to WAC 173-340-720. As stated previously, the highest beneficial use of Site groundwater is as a current and future drinking water source. Ecology has determined the reasonable maximum exposure expected is through accidental ingestion of drinking water and other domestic uses (WAC 173-340-720 (1) (a)). A Method B cleanup standard will be used for establishing cleanup levels in groundwater at the Site.

5.1 INDICATOR SUBSTANCES

Indicator substances as defined by WAC 173-340-200 are a subset of hazardous substances present at a site selected under WAC 173-340-708 for monitoring and analysis. TPH and associated BTEX components have been identified as the chemicals of concern at the Site. Indicator substances are selected from the list of chemicals of concern. The criteria found in WAC 173-340-708 (2) are used to screen the list of chemicals. Following the selection of indicator substances, cleanup levels are developed for the list of substances used to calculate the total site risk. For TPH, groundwater and surface water cleanup levels are the same. For non-carcinogenic substances, the summation of risk for each toxic endpoint of all media must not exceed a hazard index of one. For establishing cleanup levels of carcinogenic substances, the total cancer risk from all chemicals in the affected media must not be greater than one in one hundred thousand or 1×10^{-5}.

<u>Groundwater Indicator Substances</u>

The highest beneficial use of Site groundwater is as a current and future drinking water source. Gasoline-, diesel-, and heavy oil-range TPH and BTEX are the indicator substances for groundwater at the Site. Groundwater indicator substance screening results for the Site are presented in Table 1.

5.2 CLEANUP STANDARD DEVELOPMENT

The indicator substance screening resulted in the selection of seven groundwater contaminants that will be carried forward for cleanup standard development. Groundwater cleanup levels will be set to be protective of human health via ingestion and other domestic uses as well as protection of surface water.

<u>Groundwater Cleanup Levels</u>

Groundwater levels set under Method A for groundwater must be at least as stringent as the criteria in WAC 173-340-720(3)(b), which includes the following:

i) Concentrations listed in Table 720-1 and compliance with the corresponding footnotes;

ii) Concentrations established under applicable state and federal laws, including the requirements in WAC 173-340-720(3)(b)(ii), which includes the following:

   (A) Maximum contaminant levels established under the Safe Drinking Water Act and published in 40 C.F.R. 141;

   (B) Maximum contaminant level goals for noncarcinogens established under the Safe Drinking Water Act and published in 40 C.F.R. 141;

   (C) Maximum contaminant levels established by the state board of health and published in chapter 246-290 WAC.

iii) For hazardous substances deemed indicator hazardous substances for groundwater under WAC 173-340-708 (2) and for which there is no value in Table 720-1 or applicable state and federal laws, concentrations that do not exceed natural background or the practical quantitation limit, subject to the limitations of the chapter.

iv) For protection of surface water beneficial uses.

Groundwater levels set under Method B for groundwater must be at least as stringent as the criteria in WAC 173-340-720(4)(b), which includes the following:

i) Concentrations established under applicable state and federal laws, including the requirements in WAC 173-340-720(3)(b)(ii), which includes the following:

ii) For protection of surface water beneficial uses.

iii) For hazardous substances for which sufficiently protective, health-based criteria or standards have not been established under applicable state and federal laws, those concentrations which protect human health as determined by the equations presented in WAC 173-340-720 (3)(iii)(A) and (B).

To develop cleanup levels for the Site, Ecology evaluated existing Site groundwater data and compared these data to Method A and B groundwater levels. While Site groundwater eventually discharges to the Snake River, the RI empirically demonstrated indicator substance concentrations in groundwater do not pose a threat to surface water. Therefore, groundwater cleanup levels do not need to bet set at surface water cleanup levels. Table 2 presents the cleanup level development for Site indicator substances in groundwater.

As discussed, total TPH cleanup levels are the same for groundwater and surface water. For the BTEX components, the most stringent groundwater concentrations will be selected for the cleanup levels. Gasoline-range TPH has a cleanup level of 800 micrograms per liter (ug/L), while diesel- and heavy oil-range TPH each have a cleanup level of 500 ug/L. The benzene cleanup level of 5 ug/L is based on the Federal and State Primary Drinking Water Maximum Contaminant Level (MCL) groundwater concentration criteria. The most stringent ethylbenzene cleanup level of 800 ug\L is based on MTCA Method B, but the level was adjusted downward to 400 ug\L to maintain a Hazard Quotient (HQ) of one. The toluene and xylene cleanup levels of 640 and 1600 ug\L, respectively, are also based on the Method B non-carcinogenic concentrations. The toluene cleanup level was adjusted downward to 320 ug\L to maintain a HQ of one.

A point of compliance (WAC 173-340-200) is the point or points where cleanup levels established in accordance with WAC 173-340-720 through 173-340-760 shall be attained. Once those cleanup levels have been attained at that point, a site is no longer considered a threat to human health and the environment. If a conditional point of compliance is established (see below), institutional controls must remain in place to prevent exposure where hazardous substances remain on-site above cleanup levels.

Under MTCA, the standard groundwater point of compliance is throughout a site from the uppermost level of the saturated zone extending vertically to the lowest most depth which could potentially be affected by the Site (WAC 173-340-720(8)(b)).

Hazardous substances that remain on-site as part of the cleanup action, a groundwater conditional point of compliance, which shall be as close as practicable to the source of hazardous substances that does not to exceed the property boundary, may be used. If a conditional point of compliance is used, the proponent shall demonstrate all practicable methods of treatment are utilized in the cleanup action (WAC 173-340-720(8)(c)).

A standard point of compliance has been selected for use at the Site. The remedy selected for the Site includes natural attenuation and institutional controls. Natural attenuation has been occurring at the Site since the cessation of interim remedial measures, as demonstrated by the reduction in contaminant concentrations and the stable or shrinking contaminant plume.

5.3 OVERALL SITE RISK

Benzene is the only carcinogenic indicator substance for the Site. The benzene MCL provides an overall site risk of 6.25×10^{-6} for carcinogenic compounds and is considered protective. The remainder of the volatile components, along with benzene, has an associated hazard quotient. The effects from non-carcinogenic substances were used to determine the hazard index by summation of the hazard quotients for each toxicity endpoint. The hazard index for the Site cannot exceed one. The petroleum hydrocarbons indicator substances (gasoline-, diesel- and heavy oil-range TPH) do not have a hazard quotient, and are not used in calculating the hazard index.

The hazard quotient calculations are presented in Table 3. The highest calculated hazard index is 1 from a combination of ethylbenzene and toluene, and is due to hepatotoxicity and nephrotoxicity endpoints. The cleanup levels for these substances were adjusted downward to produce a hazard index of one. Xylene has a hazard quotient of one based upon the toxic endpoints of weight and mortality. Table 4 presents the overall Site risk.

6.0 REMEDIAL ALTERNATIVES

Over time, independent and emergency response actions have occurred at the Site. These remedial actions have reduced the contamination mass and appear to have stabilized the groundwater contamination plume. With this in mind, the FS proposed three alternatives to address the remaining Site contamination. The FS identified the remedial objectives for the Site and compared alternatives according to the MTCA criteria to meet these objectives. The main objective of cleanup action is to continue to prevent contaminants from migrating off-site to the Snake River. Dissolved contaminants have not been detected in monitoring wells near the river since 2007.

The alternatives as presented below are from the FS. Institutional controls and monitored natural attenuation (MNA) are part of each alternative. The alternatives were developed to comply with other applicable or relevant and appropriate requirements (ARARs), and to provide protection of human health and the environment.

6.1 ALTERNATIVE 1 – INSTITUTIONAL CONTROLS AND MONITORED NATURAL ATTENUATION

This alternative would mean the Site would continue to be managed under current conditions with existing wells for passive bioventing, routine monitoring, and maintenance of a groundwater monitoring network. The alternative includes existing institutional controls, such as physical barriers to Site access, signage, and limitations on land use. The primary mechanism of remedial action would be continued natural attenuation processes demonstrated to exist at the Site, and which have provided significant remedial progress since discontinuation of active remedial activities in December 2002. Progress assessment toward the cleanup standards would be accomplished through a performance monitoring program.

6.2 ALTERNATIVE 2 – ENHANCED BIOLOGICAL REMEDIATION, INSTITUTIONAL CONTROLS, AND MONITORED NATURAL ATTENUATION

This alternative would involve the introduction of oxygen-releasing compounds into existing monitoring wells to provide additional dissolved oxygen (DO) within the impacted groundwater areas of the Site. DO concentrations measured within the groundwater plume are suppressed, indicating biological oxygen demand exceeds the passive bioventing. Providing additional oxygen through an oxygen-releasing compound could further drive the biodegradation process and, potentially, over a greater depth of the saturated zone. However, current conditions show significant DO rebound in downgradient wells. This suggests enhanced biological remediation through oxygen-releasing compounds would have limited beneficial effect under the low hydraulic gradient conditions at the Site and may not necessarily have a significant impact on the Site-wide restoration time frame.

6.3 ALTERNATIVE 3 – ENHANCED BIOVENTING, INSTITUTIONAL CONTROLS, & MONITORED NATURAL ATTENUATION

This alternative would include the operation of a blower system to provide additional bioventing capacity to the existing passive system. For some locations this could require additional wells for reasonable implementation, though without assurance of increased effectiveness over existing passive venting, especially since soil vapor extraction has already been implemented as part of the interim remedial activities. This active remediation would also require installation and regular maintenance of one or more blower systems.

6.4 CLEANUP ACTION EVALUATION CRITERIA

The criteria used to evaluate cleanup actions are presented in WAC 173-340-360. All cleanup actions must meet the following four threshold requirements:

- Protect human health and the environment;
- Comply with cleanup standards set forth in WAC 173-340-700 through 760;
- Comply with applicable state and federal laws; and
- Provide for compliance monitoring.

Other requirements for cleanup actions that meet threshold criteria include the following:

- Use permanent solutions to the maximum extent practicable;
- Provide for reasonable restoration time frame; and
- Consider public concerns raised during the public comment period on the DCAP.

WAC 173-340-360(3)(b) describes the specific requirements and procedures for determining whether a cleanup action uses permanent solutions to the maximum extent practicable. A permanent solution is defined as one where cleanup levels can be met without further action being required at a site, other than the disposal of residue from the treatment of hazardous substances. To determine whether a cleanup action uses permanent solutions to the maximum extent practicable, a disproportionate cost analysis is conducted. This analysis compares the costs and benefits of the cleanup action alternatives and involves the consideration of several factors.

The comparison of benefits and costs may be quantitative, but will often be qualitative and require the use of best professional judgment.

WAC 173-340-360(4) describes the specific requirements and procedures for determining whether a cleanup action provides for a reasonable restoration time frame.

Groundwater Cleanup Action Requirements

At sites with contaminated groundwater, WAC 173-340-360(2)(c) requires the cleanup action meet certain additional requirements. For non-permanent groundwater cleanup actions, the regulation requires the following two requirements be met:

1) Treatment or removal of the source of the release shall be conducted for liquid wastes, areas of high contamination, areas of highly mobile contaminants, or substances that can't be reliably contained; and
2) Groundwater containment (such as barriers) or control (such as pumping) shall be implemented to the maximum extent practicable.

Groundwater treatment in the form of air sparging and soil vapor extraction has been performed at the Site. Additionally, free product recovery and contaminated soil removal at the release locations have been completed.

Cleanup Action Expectations

WAC 173-340-370 sets forth the following expectations for the development of cleanup action alternatives and the selection of cleanup actions. These expectations represent the types of cleanup actions Ecology considers likely as a result of the remedy selection process; however, Ecology recognizes there may be some sites where cleanup actions conforming to these expectations are not appropriate.

6.5 EVALUATION OF PROPOSED REMEDIAL ALTERNATIVES

The remedial alternatives proposed in the Feasibility Study (FS) were evaluated according to the criteria set forth in WAC 173-340-360 and discussed in the prior section of this report. The three alternatives meet the threshold requirements and are protective of human health and the environment.

Since groundwater monitoring has demonstrated contamination is not migrating off-site and is declining in concentration, MNA has been selected as the main groundwater treatment method for each alternative. Each alternative is considered protective of human health and the environment since each continues to provide groundwater cleanup via MNA, and institutional controls removes the direct contact pathway. Each alternative is compliant with applicable federal and state requirements and provides for compliance monitoring. Therefore, each alternative meets the threshold criteria set forth in WAC 173-340-360(2)(a).

The second component used to evaluate alternatives is WAC 173-340-360 (2)(b) ("Other Requirements"), which includes requirements that remedies result in permanent solutions to the maximum extent practicable, reflect the consideration of public concerns, and provide for a reasonable restoration time frame. In the absence of a permanent solution, the alternative that displays the greatest degree of permanence becomes the baseline alternative. Groundwater contamination is present and will remain as concentrations continue to attenuate below cleanup levels. While natural attenuation continues to destroy contaminants without additional intrusive actions, it is not considered a permanent remedy. Permanent remedies do not require any additional action. Monitored natural attenuation requires monitoring to demonstrate the remedy performance. For this reason, the alternatives are not considered permanent solutions. Each alternative utilizes the same groundwater treatment, and therefore, exhibits the same degree of permanence. Based on the Remedial Investigation (RI) data, the additional components of enhanced biodegradation and bioventing, respectively for Alternatives 2 and 3 do not provide additional benefit to the alternatives. For the purpose of evaluation, Ecology considers the public concern for each alternative to be equivalent and will rely on actual public input to gauge public concern.

6.5.1 Alternative 1

MNA coupled with passive bioventing are the key components of this alternative. Institutional controls make up the remainder of the alternative. This alternative has been given a high degree of permanence since MNA continues to treat and reduce the groundwater contamination. The alternative has a high level of implement ability since it does not require additional installation or operation of remedial systems. The alternative provides for a reasonable restoration time frame since a large portion of monitoring wells are below cleanup levels and the remainder have declining contaminant concentrations. Restoration time frames are discussed in Section 8.6. The alternative is currently being implemented at the Site, giving it a high level of implement ability. The long-term effectiveness of this alternative is high since groundwater contamination will continue to be removed through natural processes. The short-term risks are currently being addressed with the Site health and safety plan.

6.5.2 Alternative 2

Similar to Alternative 1, Alternative 2 involves MNA and institutional controls. This alternative includes enhanced bioremediation, which includes the introduction of an oxygen–releasing compound into the groundwater. The concept of providing additional dissolved oxygen to groundwater is discussed in Section 6.2. The alternative is given a high degree of permanence since MNA continues to treat and reduce the groundwater contamination. Since it does not appear additional DO will substantially enhance the bioremediation currently occurring, the restoration time frame is the same as Alternative 1. The alternative has a high level of implement ability. The MNA portion of the alternative is occurring and introduction of oxygen-releasing compounds into the existing monitoring wells is readily achievable. The long-term effectiveness of this alternative is high since groundwater contamination will continue to be removed through natural processes. The short-term risks are currently being addressed with the Site health and safety plan.

6.5.3 Alternative 3

Alternative 3 also provides for MNA and institutional controls similar to Alternative 1 and 2, but adds enhanced bioventing to the alternative. The bioventing would provide additional oxygen into the subsurface for bioremediation. Alternative 3 has a high degree of permanence like Alternatives 1 and 2. For the reasons stated in Alternative 2, the restoration time frame is the same as Alternatives 1 and 2. The implement ability is considered medium-high because the enhanced bioventing would require the installation of additional wells along with one or two blower systems. While installation and operation of bioventing systems are usually easily implemented, the installation at an operating fuel terminal presents many challenges. The long-term effectiveness of this alternative is high since groundwater contamination will continue to be removed through natural processes. The short-term risks are the risks associated with intrusive work inside an active fuel terminal.

7.0 SELECTED CLEANUP ACTION

Ecology is selecting Alternative 1, which is a cleanup action protective of human health and the environment. The selected cleanup action is designed to meet the MTCA requirements and expectations. Groundwater contamination will be addressed with the chosen remedial alternative.

Groundwater contamination continues to be present in some of the release areas at the Site. While the groundwater is not currently used as such, the highest beneficial use of Site groundwater is as a drinking water source. In addition, the Snake River borders the site to the east, but based on monitoring results the contaminated groundwater does not flow into the river.

As discussed, remedial actions have been performed in response to the historic releases at the Site. Groundwater monitoring events, since the remedial systems were shut down, indicate contamination remains present in select on-site wells. In the Tidewater portion of the Site, contamination does not extend beyond the areas of remedial action. In the CPL portion of the Site, indicator substances are not detected in wells MW-6, 7, 8 and 10, which are located between the river and the contaminated wells that still have concentrations above cleanup levels. These observations demonstrate and support the MNA remedy for the Site.

Passive bioventing currently provides oxygen into the subsurface. The monitoring well system will need to be maintained to continue to function properly. In order to monitor the ongoing natural attenuation effectiveness, groundwater samples shall be collected and analyzed for benzene, toluene, ethylbenzene, total xylenes, gasoline-, diesel-, and heavy oil-range petroleum hydrocarbons. Field parameters need to include dissolved oxygen (DO), oxygen reduction potential (ORP), pH, temperature, and specific conductance. In addition to using the field parameters to determine when representative samples can be collected, DO and ORP can also be used to confirm continued biodegradation of dissolved phase petroleum hydrocarbons. Analysis of alkalinity, ferrous iron, manganese, sulfate, and nitrate in 2010 suggests natural attenuation is occurring at the Site. Having already demonstrated MNA is a suitable cleanup remedy for the Site, a subset of these parameters (ferrous iron, manganese, and sulfate) shall continue to be analyzed to ensure subsurface conditions do not change significantly during compliance monitoring.

7.1 POINT OF COMPLIANCE

The standard groundwater point of compliance is established throughout the site from the uppermost level of the saturated zone extended vertically to the lowest most depth which could be potentially affected by the Site. A standard point of compliance will be used for the Site. Monitoring will be used to establish compliance with the point of compliance.

7.2 INSTITUTIONAL CONTROLS

Institutional controls are measures undertaken to limit or prohibit activities that may interfere with the cleanup action or result in the exposure to hazardous substances at a site. Institutional controls are required where cleanup actions result in residual concentrations of hazardous substances exceeding cleanup levels established for a site. These controls may not be used as a substitute for a cleanup that is technically possible. Since groundwater cleanup levels will not be achieved immediately, institutional controls will be required.

The institutional control requirements are set forth in WAC 173-340-440. In addition to Ecology's standard conditions for the Uniform Environmental Covenants Acts (UECA - 64.70 RCW), the following institutional controls that prohibit and/or limit groundwater use within the groundwater contamination plume will be required, as incorporated into a restrictive covenant to be filed with the office of the Franklin County Auditor:

1) No groundwater may be taken from the parcel, except for purposes related to the Remedial Action, such as groundwater monitoring.
2) The PLPs will monitor the groundwater and confirm natural attenuation is reducing contamination. Monitoring will continue until data show that cleanup levels have been met in groundwater for a minimum of four consecutive sampling events within designated monitoring networks, as described in the Compliance Monitoring Plan.

7.3 PERIODIC REVIEW

WAC 173-340-420 states that at sites where a cleanup action requires an institutional control, a periodic review shall be completed no less frequently than every five years after the initiation of a cleanup action. Since contaminated groundwater will remain on-site until natural processes achieve cleanup levels and institutional controls will be required, periodic reviews shall take place at this Site. Monitoring data shall be reviewed to continue to assess the effectiveness of the groundwater contamination treatment. If data do not indicate the selected remedy has the capacity to treat contaminant concentrations to meet cleanup levels within the anticipated remediation time frame, then additional remedial action may be required.

8.0 EVALUATION OF THE CLEANUP ACTION USING MTCA CRITERIA

The selected remedy is evaluated using the MTCA criteria set forth in WAC 173-340-360, as follows:

8.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Groundwater is the contaminated medium at the Site. The exposure routes identified at the Site are direct contact and accidental ingestion of contaminated groundwater. Natural attenuation and passive bioventing will reduce contaminant concentrations and the associated risk from direct contact and ingestion of the contaminated medium. Institutional controls will limit exposure via ingestion and dermal contact.

8.2 COMPLIANCE WITH CLEANUP STANDARDS

Natural attenuation has been selected to address groundwater contamination at the Site. Passive bioventing provides oxygen into the subsurface and natural attenuation is reducing the contamination. Groundwater contaminant levels will continue to decrease until cleanup levels are met at a point of compliance for groundwater pursuant to WAC 173-340-720(4). Institutional controls will be part of this cleanup action since groundwater cleanup levels will not be realized immediately.

8.3 COMPLIANCE WITH APPLICABLE STATE AND FEDERAL LAWS

The cleanup action for this Site complies with applicable state and federal laws. Local laws, which can be more stringent, will govern actions when they are applicable.

8.4 COMPLIANCE MONITORING

Compliance monitoring is divided into three categories: protection; performance; and confirmational (WAC 173-340-410). Protection monitoring is designed to protect human health and the environment during construction and the operation and maintenance tasks for the cleanup action. Performance monitoring confirms the cleanup action has attained cleanup and/or performance standards.

Confirmational monitoring confirms the long-term effectiveness of the cleanup action once cleanup standards have been achieved or other performance standards have been attained. Compliance monitoring will be conducted in accordance with a Compliance Monitoring Plan, which has been developed and is included as an exhibit in the consent decree.

8.5 USE PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE

A permanent solution is one in which cleanup standards can be met without further action being required. Ecology believes the selected remedial action provides the highest degree of permanence. The selected remedy will eventually provide a permanent solution, but it will not be realized immediately.

8.5.1 Protection of Human Health and the Environment

The groundwater remedy is considered protective of human health and the environment. The remedy is considered protective since it will continue to reduce contaminant concentrations in groundwater through natural attenuation. Cleanup levels will be met at the applicable point of compliance for groundwater.

Institutional controls will prohibit the withdrawal and use of the contaminated groundwater at the Site. Achieving soil and groundwater cleanup standards will be assessed as part of the periodic review required under WAC 173-340-420. If groundwater cleanup levels have not been met at their respective points of compliance within the anticipated restoration time frame, additional cleanup action may be required. Performance monitoring will be completed according to the schedule established pursuant to Section 8.4 above.

8.5.2 Long-Term Effectiveness

The long-term effectiveness of the groundwater remedy will be assessed as natural attenuation reduces groundwater contaminant concentrations. Passive bioventing is expected to continue to provide oxygen to the subsurface and provide for natural attenuation.

8.5.3 Short-Term Effectiveness

Risks associated with the cleanup action in the short term are the potential exposure of workers to the contaminated groundwater during groundwater sampling. Risks are very limited since trained workers will be collecting samples. Worker health and safety will be addressed as part of the Health and Safety Plan to comply with the appropriate regulations and to satisfy the protection monitoring requirements. Institutional controls to prevent contact with contaminated groundwater will also minimize the short-term risks.

8.5.4 Permanent Reduction of Toxicity, Mobility, and Volume

Natural attenuation continues to reduce groundwater contamination and, most importantly, the contamination does not affect wells downgradient of the contaminated wells. Groundwater treatment will reduce the contaminants in groundwater to meet cleanup levels at the point of compliance for groundwater cleanup levels pursuant to WAC 173-340-720(4).

8.5.5 Implementability

The selected cleanup action can be readily implemented since it is currently happening at the Site.

8.5.6 Cost

The FS did not provide cost data. The selected remedial action is considered the least expensive since it does not require the installation of additional equipment or wells. Because there is no apparent reduction of the restoration time frame with either Alternative 2 or Alternative 3, there is no additional benefit gained for the additional costs of these alternatives.

8.5.7 Provide Reasonable Restoration Time Frame

The proposed cleanup action will provide for the continued biodegradation of contaminated groundwater. Based on the contamination attenuation observed to date, a ten-year restoration time frame is estimated. Groundwater monitoring and periodic review will provide an assessment tool for the cleanup action. Monitoring wells will serve as the points of compliance and the number and location of the wells will be discussed in the Compliance Monitoring Plan.

8.5.8 Public Participation and Community Acceptance

A public comment period will be held to allow the public and parties affected by the cleanup action an opportunity to provide comment on this document. Public comments and concerns will be addressed in a responsiveness summary and incorporated as appropriate in the final cleanup action plan.

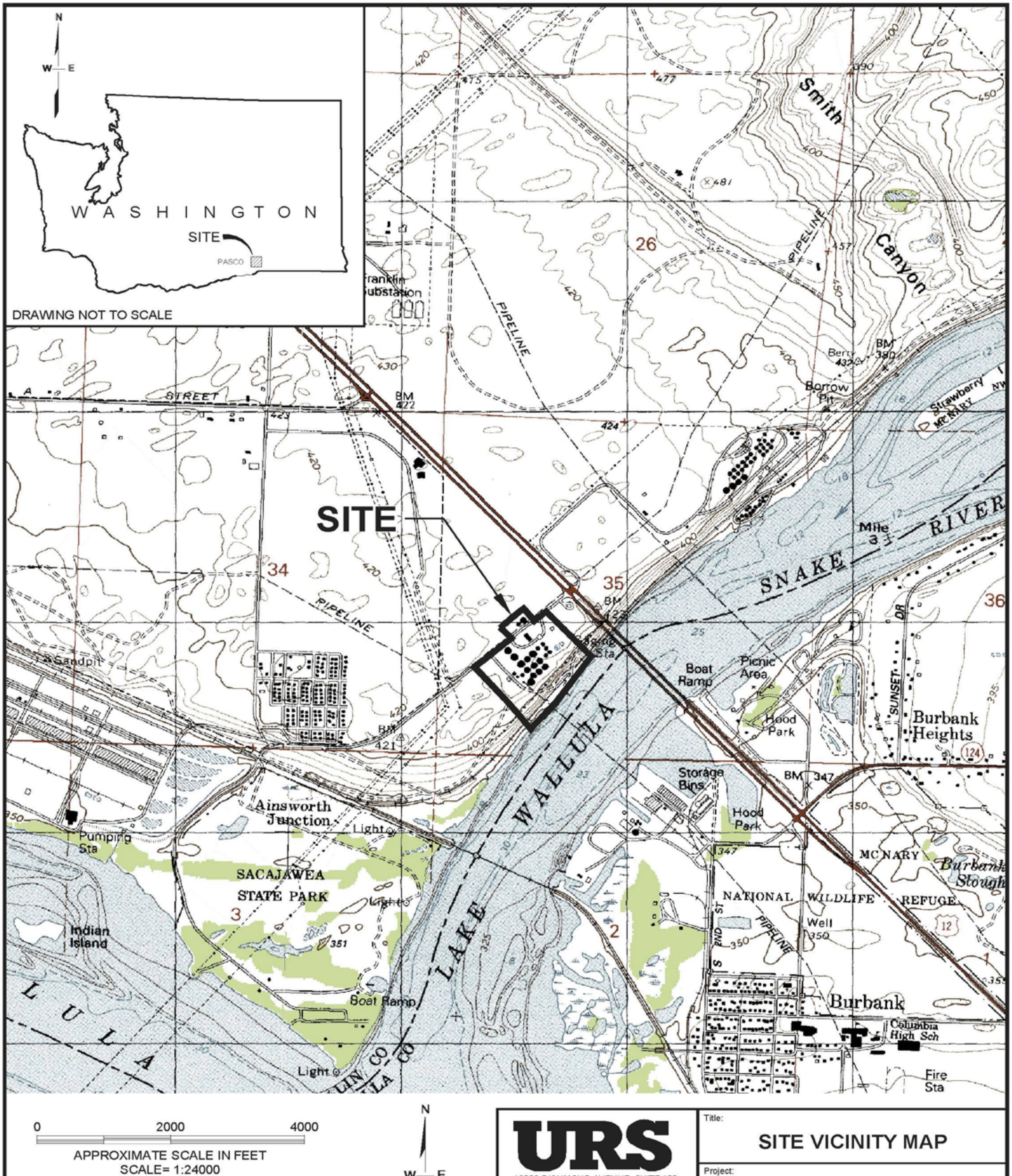
9.0 REFERENCES CITED

Drost, B.W., Whiteman, K.J., and Gonthier, J.B., 1990, Geologic Framework of the Columbia Plateau Aquifer System, Washington, Oregon, and Idaho: U.S. Geological Survey Water-Resources Investigations Report 87-4238, 172 p.

Drost, B. W., Cox, S.E., and Schurr, K.M., 1997, Changes in ground-water levels and ground-water budgets, from predevelopment to 1986, in parts of the Pasco Basin, Washington: U.S. Geological Survey Water-Resources Investigations Report 99-4086, 172 p.

Kahle, S.C., Morgan, D.S., Welch, W.B., Ely, D.M., Hinkle, S.R., Vaccaro, J.J., and Orzol, L.L., 2011, Hydrogeologic framework and hydrologic budget components of the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho: U.S. Geological Survey Scientific Investigations Report 2011�5124, 66 p.

Whitehead, R.L., 1994, Groundwater Atlas of the United States Segment 7 – Idaho, Oregon, and Washington: U.S. Geological Survey – Hydrologic Investigations Atlas 730-H, p. H21.



SOURCE: U.S.G.S. 7.5-MINUTE SERIES TOPOGRAPHIC MAP. PASCO, WASHINGTON (1992) QUADRANGLE.

URS
10550 RICHMOND AVENUE, SUITE 155
HOUSTON, TEXAS 77042
PH: (713) 914-6699
FAX: (713) 789-8404

Title: SITE VICINITY MAP				
Project: CPL PASCO TERMINAL, PASCO, WASHINGTON				
Client: CHEVRON PIPE LINE COMPANY				
Scale: AS SHOWN	Drawn by: CLK	Date: 11/12/12		
	Chk'd by: ED	Date: 11/12/12		
Project No.: 25015004	File Name: Fig 1 - Site Vicinity.dwg	Figure: 1		

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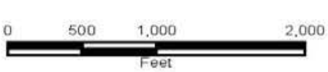
Path: K:\ENV\ENV20\25015004\GIS\MXD\Land Use Map.mxd

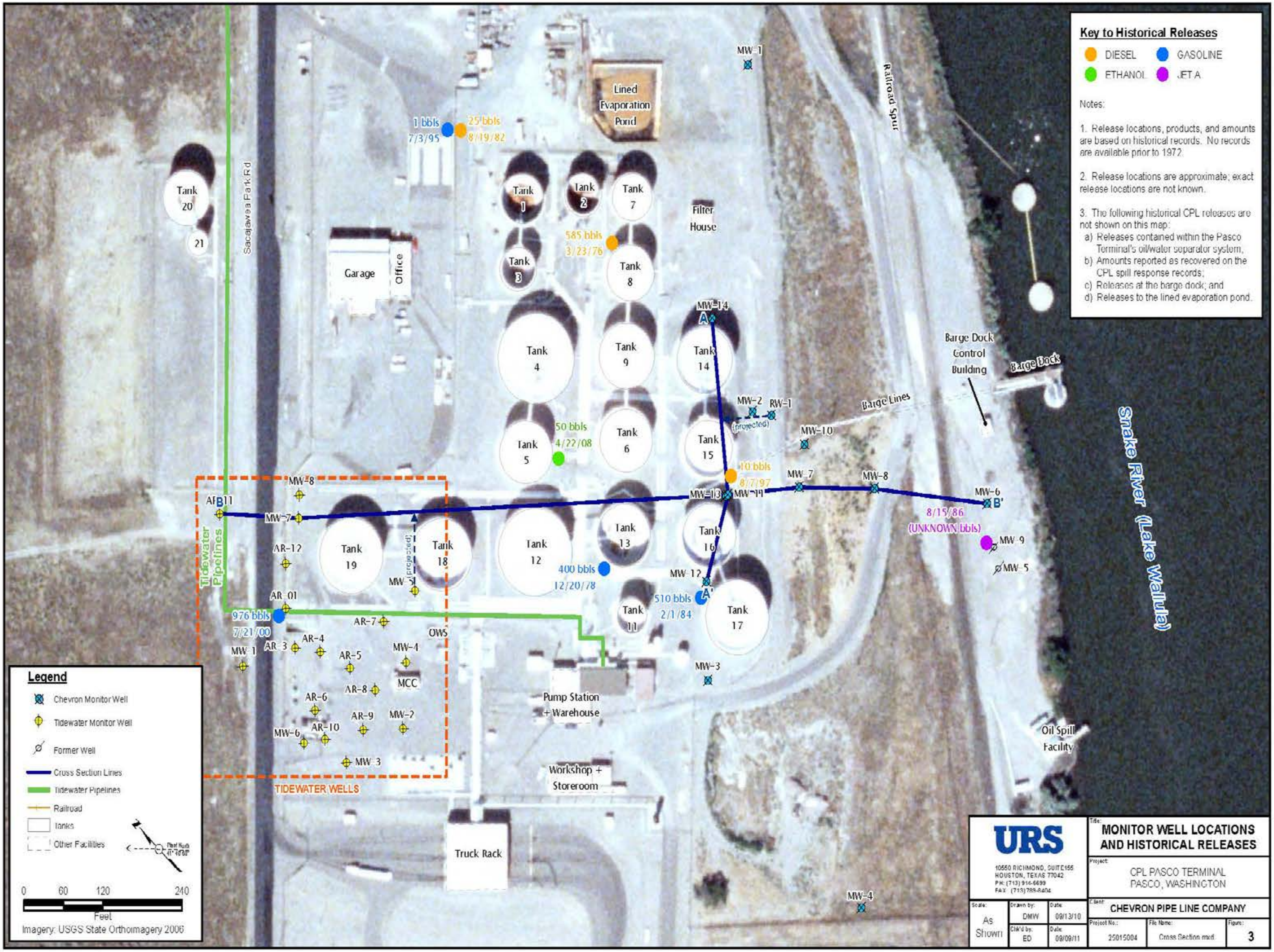
Imagery: Bing Maps August through October 2010



Legend

- SITE
- Railroad
- River Flow Direction

URS 10550 RICHMOND, SUITE155 HOUSTON, TEXAS 77042 PH: (713) 914-6699 FAX: (713) 789-8404			Title: **SITE VICINITY AND LAND USE MAP**			
			Project: CPL PASCO TERMINAL PASCO, WASHINGTON			
Scale: As Shown	Drawn by: NH	Date: 11/12/12	Client: **CHEVRON PIPE LINE COMPANY**			
	Chk'd by: AB	Date: 11/12/12	Project No.: 25015004	File Name: Land Use Map.mxd	Figure: 2	


Key to Historical Releases
DIESEL
GASOLINE
ETHANOL
JET A
Notes:
1. Release locations, products, and amounts are based on historical records. No records are available prior to 1972.
2. Release locations are approximate; exact release locations are not known.
3. The following historical CPL releases are not shown on this map:
a) Releases contained within the Pasco Terminal's oil/water separator system;
b) Amounts reported as recovered on the CPL spill response records;
c) Releases at the barge dock; and
d) Releases to the lined evaporation pond.
Legend
Chevron Monitor Well
Tidewater Monitor Well
Former Well
Cross Section Lines
Tidewater Pipelines
Railroad
Tanks
Other Facilities
0 60 120 240
Feet
Imagery: USGS State Orthoimagery 2006
Sacajawea Park Rd
Railroad Spur
Snake River (Lake Wallula)
Lined Evaporation Pond
Garage
Office
Filter House
Barge Dock Control Building
Barge Dock
Barge Lines
Pump Station + Warehouse
Workshop + Storeroom
Truck Rack
Oil Spill Facility
OWS
MCC
TIDEWATER WELLS
Tidewater Pipelines
Tank 20
21
Tank 1
Tank 2
Tank 7
Tank 3
Tank 8
Tank 4
Tank 9
Tank 14
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50 bbls 4/22/08
10 bbls 8/7/97
400 bbls 12/20/78
510 bbls 2/1/84
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MW-14
MW-2
RW-1
(projected)
MW-10
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MW-8
MW-6
MW-13
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URS
10550 RICHMOND, SUITE 155
HOUSTON, TEXAS 77042
PH: (713) 914-6699
FAX: (713) 789-8404
Title:
MONITOR WELL LOCATIONS AND HISTORICAL RELEASES
Project:
CPL PASCO TERMINAL
PASCO, WASHINGTON
Client:
CHEVRON PIPE LINE COMPANY
Scale: As Shown
Drawn by: DMW
Date: 09/13/10
Chk'd by: ED
Date: 09/09/11
Project No.: 25015004
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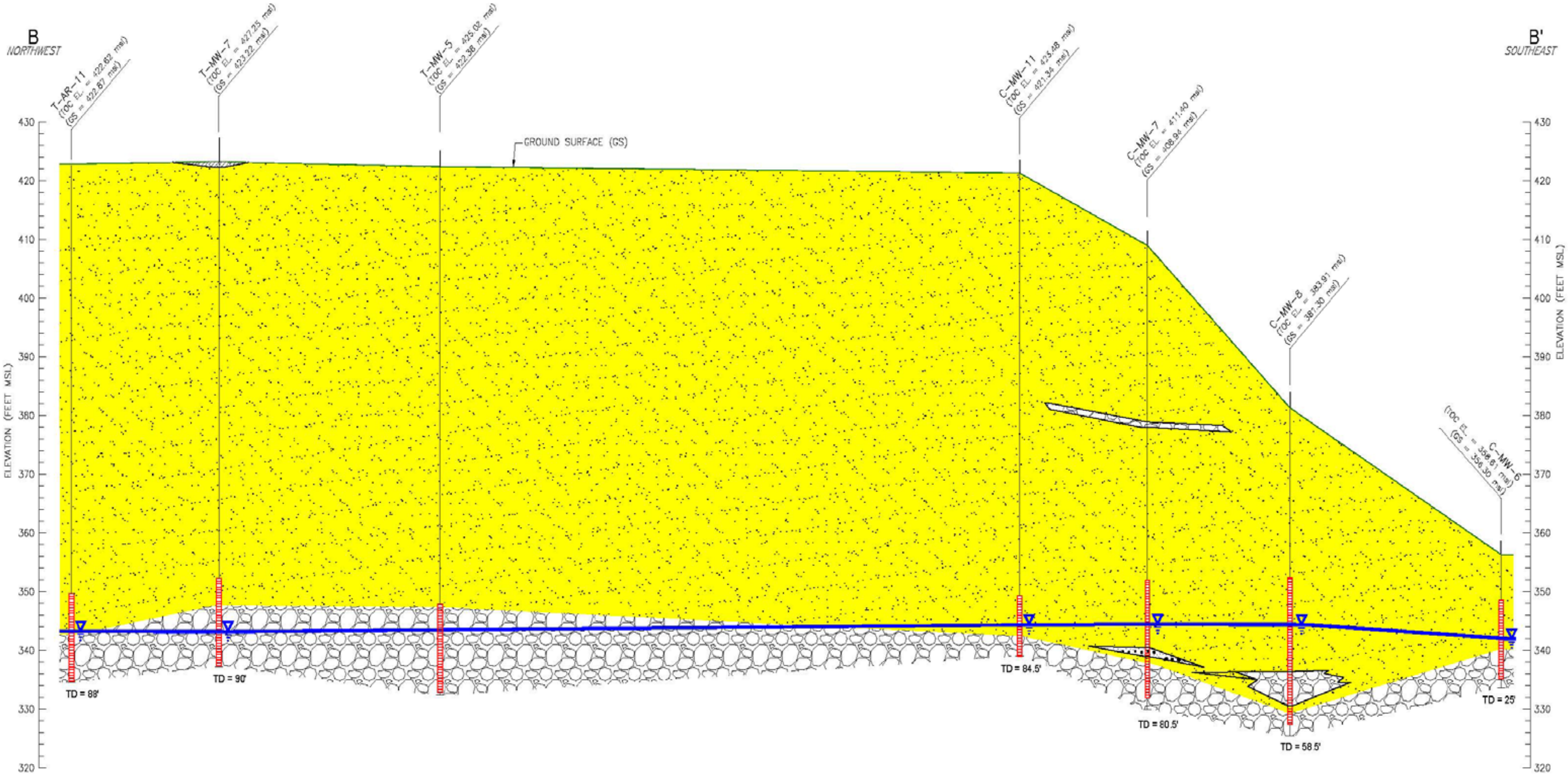
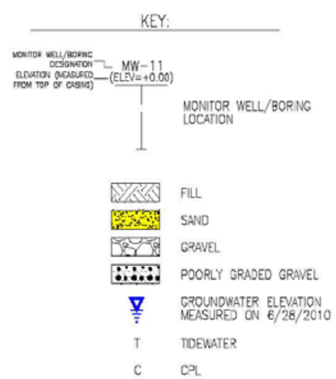
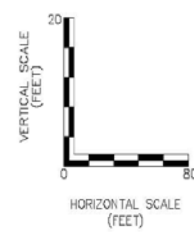
Figure: 3







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HOUSTON, TEXAS 77042
PH: (713) 914-6699
FAX: (713) 789-8404

Title:

REVISED GEOLOGIC CROSS-SECTION B - B'

Project:

CPL PASCO TERMINAL
PASCO, WASHINGTON

Client:

CHEVRON PIPE LINE COMPANY

Scale:	Drawn by:	Date:	Project No.:	File Name:	Figure:
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TABLE 1. INDICATOR SUBSTANCE SCREENING - GROUNDWATER

Contaminant	Frequency of Detection	Maximum Concentration, ug/L	MTCA Cleanup Level, ug/L	Basis	Screening Results
Benzene	**22%**	**6,750**	**5**	**MCL**	**Indicator**
Diesel	**45%**	**1,165,000**	**500**	**Method A**	**Indicator**
Ethylbenzene	**19.90%**	**1,500**	**800**	**CWA**	**Indicator**
Gasoline	**29.50%**	**77,000,000**	**800**	**Method A**	**Indicator**
Heavy Oil	**37.30%**	**5,900**	**500**	**Method A**	**Indicator**
Toluene	**21%**	**17,000**	**320**	**BNCAR**	**Indicator**
Xylene	**21.70%**	**12,590**	**800**	**BNCAR**	**Indicator**
MTBE	0	0	20	Method A	<5% detection
Ethanol	NA	NA	NA	NA	NA

TABLE 2. DEVELOPMENT OF CLEANUP LEVELS - METHOD B
GROUNDWATER METHOD B CRITERIA FOR CHEVRON SITE [WAC 173-340-720(4)(b)]
GROUNDWATER

	POTABLE GROUNDWATER ARARS			MTCA METHOD B FORMULA	MOST STRINGENT CONCENTRATION, (ug/L)	**METHOD B CLEANUP LEVEL, (ug/L)**	
CONTAMINANT	Federal MCL	State MCL	MTCA Risk @ MCL/HQ at MCL				BASIS
benzene	5	5	$6.29x10^{-6}$	0.8/BCAR	0.8	**5**	MCL
diesel	NA	NA		500/A		**500**	Method A
ethylbenzen	700	700	0.875	800NCAR	530	**800**	GWBNCAR
gasoline	NA	NA		800/A	800	**800**	Method A
heavy oil	NA	NA		500/A		**500**	Method A
toluene	1000	1000	1.563	640/NCAR	640	**640**	GWBNCAR
xylenes	10000	10000	6.25	1600/NCAR		**1600**	GWBNCAR

BCAR - Method B Carcinogenic
BNCAR - Method B Non-carcinogenic
GW - Groundwater
SW- Surface Water
CWA - Clean Water Act
A - Method A

TABLE 3. GROUND WATER CLEANUP LEVELS ADJUSTMENT/CANCER RISK AND HAZARD QUOTIENTS CALCULATIONS

						HAZARD QUOTIENT							
INDICATOR SUBSTANCE	METHOD B CLEANUP LEVEL, ug/l	BASIS	ADJUSTED METHOD B CLEANUP LEVEL, ug/L	PROPOSED CLEANUP LEVEL, ug/L	CANCER RISK **	HEMOTOXICITY	HEPATOTOXICITY	NEPHROTOXICITY	NEUROTOXICITY	WEIGHT	MORTALITY	INCREASED ALKALINE PHOSPHATASE ACTIVITY	UNSPECIFIED
Benzene	0.8	BCAR	8	5	$6.29x10^{-6}$								
Ethylbenzene	800	Clean Water Act	400	400			0.5	0.5					
Toluene	640	BNCAR	320	320			0.5	0.5	0.5				
Xylene	1600	BNCAR	1600	1600						1	1		
				Total Cancer Risk =	$6.29x10^{-6}$								
				Hazard Index = 1			1.0	1.0	0.5	1.0	1.0		

LPAH - Low-density PAH
HPAH - High-density PAH

A - Method A
BCAR - B, carcinogen
BNCAR, - B, noncarcinogen
MCL - Maximum Contaminant Level

TABLE 4. TOTAL SITE RISK AND HAZARD QUOTIENT CALCULATIONS

MEDIUM	CANCER RISK	HAZARD QUOTIENT							
		HEMOTOXICITY	HEPATOTOXICITY	NEPHROTOXICITY	NEUROTOXICITY	WEIGHT	MORTALITY	INCREASED ALKALINE PHOSPHATASE ACTIVITY	UNSPECIFIED
Ground Water	6.23×10^{-6}	0	1	1	0.5	1	1	0	
Total Site Cancer Risk =	6.23×10^{-6}								
Total Hazard Quotient =		**0.000**	**1.000**	**1.000**	**0.500**	**1.000**	**1.000**	**0.000**	