AECOM

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Engineering Design Report

Chevron Pipe Line Company Pasco Bulk Terminal

Pasco, Washington
Ecology Cleanup Site ID: 4867
Ecology Facility Site ID: 55763995

Quality Information

Prepared by	Checked and verified by
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Table of Contents

List of Acronyms and Definitions

AST	aboveground storage tank
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
CAO	Cleanup Action Objectives
CAP	Cleanup Action Plan
CMP	Compliance Monitoring Plan
CPL	Chevron Pipe Line Company
CSID	Cleanup Site Identification Number
DO	dissolved oxygen
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
EIM	Environmental Information Management
FEI	Field Environmental Instruments
FRTR	Federal Remediation Technologies Roundtable
FSID	Facility Site Identification Number
ft	feet
HASP	Health and Safety Plan
IC	institutional controls
IDW	investigation-derived waste
IHS	indicator hazardous substance
MNA	monitored natural attenuation
MTCA	Model Toxics Control Act
NGVD	National Geodetic Vertical Datum
ORC	oxygen-releasing compound
O&M	Operations and Maintenance
POC	point of compliance
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
RI/FS	Remedial Investigation/Feasibility Study
RRTF	Reasonable Restoration Time Frame
SAP	Sampling and Analysis Plan
SDS	Safety Data Sheet
Tesoro	Tesoro Logistics Operations, LLC
Tidewater	Tidewater Terminal Company, Inc.
TPH-d	diesel-range total petroleum hydrocarbons
TPH-g	gasoline-range total petroleum hydrocarbons
TPH-o	motor oil-range total petroleum hydrocarbons
TWIC	Transportation Worker Identification Card
UECA	Uniform Environmental Covenant Act
µg/L	micrograms per liter
VOC	volatile organic compound
WAC	Washington Administrative Code

1 Introduction

This Engineering Design Report (EDR) has been prepared for the Washington State Department of Ecology (Ecology) Cleanup Site named "Chevron Pipe Line Company Pasco Bulk Terminal". This Cleanup Site is herein referred to as the Site. The Site is listed in Ecology's Integrated Site Information System with the following information:

- Facility Site Name: Chevron Pipe Line Company Pasco Bulk Terminal
- Facility Address: 2900 Sacajawea Park Road, Pasco, Washington 99301, Franklin County
- Facility Site Identification Number (FSID): 55763995
- Cleanup Site Identification Number (CSID): 4867

Site documents are available on Ecology's website at: https://apps.ecology.wa.gov/cleanupsearch/site/4867.

The Site, which is defined with the **red line** on Figures 1 and 2, is located within the boundary of the larger Pasco Terminal, which is owned and operated by Tesoro Logistics Operations LLC (Tesoro) (an indirect subsidiary of Marathon Petroleum Corporation); the Pasco Terminal is herein referred to as the Terminal. Chevron Pipe Line Company (CPL) initially owned and operated the Terminal since its construction in 1950 until Tesoro purchased the Terminal in June 2013. The Terminal and Site are discussed further in Section 2.1.

This EDR presents the engineering concepts and design criteria that provide the basis for the design of the cleanup action and summarizes administrative and technical procedures necessary to implement the cleanup action required under the *Cleanup Action Plan* (CAP) developed for the Site by Ecology and Agreed Order Number DE 21664 (Ecology, 2023a; 2023b).

The cleanup action is based on the *Supplemental Remedial Investigation/Feasibility Study* (RI/FS) completed for the Site in 2021 (AECOM, 2021). The *Compliance Monitoring Plan* (CMP) (AECOM, 2024) describes groundwater monitoring activities. The CAP, EDR, and CMP provide the information necessary to implement the selected cleanup action. Contact information for project coordinators is provided in the *Quality Assurance Project Plan* (QAPP) that is appended to the CMP.

1.1 Purpose of the EDR

The purpose of this EDR is to satisfy the requirements of Washington Administrative Code (WAC) 173-340-400(4)(a) and those established under the Agreed Order. The EDR documents engineering concepts and criteria used during design of the cleanup action. Table 1 cross-references the WAC 173-340-400(4)(a) requirements with the location where the required information can be found in this EDR.

Table 1. EDR Requirements

WAC 173-340-400(4)(a)		Section Containing Required Information
(i)	Goals of the cleanup action including specific cleanup or performance requirements	EDR Section 3.1
(ii)	General information on the facility including a summary of information in the RI/FS updated as necessary to reflect the current conditions	EDR Sections 2.4 and 2.5
(iii)	Identification of who will own, operate, and maintain the cleanup action during and following construction	EDR Section 5
(iv)	Facility maps showing existing site conditions and proposed location of the cleanup action	Figures 2 and 4
(v)	Characteristics, quantity, and location of materials to be treated or otherwise managed, including groundwater containing hazardous substances	EDR Sections 2.4 and 2.5

WAC 173-340-400(4)(a)		Section Containing Required Information
(vi)	A schedule for final design and construction	EDR Section 4.3.4
(vii)	A description and conceptual plan of the actions, treatment units, facilities, and processes required to implement the cleanup action including flow diagrams	EDR Section 3.3 includes description of the cleanup action; other items *not applicable*
(viii)	Engineering justification for design and operation parameters, including:	
	(A) Design criteria, assumptions, and calculations for all components of the cleanup action	EDR Section 3
	(B) Expected treatment, destruction, immobilization, or containment efficiencies and documentation on how that degree of effectiveness is determined	EDR Section 3.3
	(C) Demonstration that the cleanup action will achieve compliance with cleanup requirements by citing pilot or treatability test data, results from similar operations, or scientific evidence from the literature	EDR Section 3.3
(ix)	Design features for control of hazardous materials spills and accidental discharges (for example, containment structures, leak detection devices, run-on and runoff controls)	*Not applicable*
(x)	Design features to assure long-term safety of workers and local residences (for example, hazardous substances monitoring devices, pressure valves, bypass systems, safety cutoffs)	EDR Section 4.5
(xi)	A discussion of methods for management or disposal of any treatment residual and other waste materials containing hazardous substances generated because of the cleanup action	EDR Section 4.6
(xii)	Facility specific characteristics that may affect design, construction, or operation of the selected cleanup action, including:	
	(A) Relationship of the proposed cleanup action to existing facility operations	EDR Section 2.1
	(B) Probability of flooding, probability of seismic activity, temperature extremes, local planning, and development issues	*Not applicable*
	(C) Soil characteristics and groundwater system characteristics	EDR Sections 2.2 and 2.3
(xiii)	A general description of construction testing that will be used to demonstrate adequate quality control	*Not applicable*
(xiv)	A general description of compliance monitoring that will be performed during and after construction to meet the requirements of WAC 173-340-410	CMP
(xv)	A general description of construction procedures proposed to assure that the safety and health requirements of WAC 173-340-810 are met	EDR Section 4.5
(xvi)	Any information not provided in the RI/FS needed to fulfill the applicable requirements of the State Environmental Policy Act (SEPA) (Revised Code of Washington [RCW] Chapter 43.21C)	SEPA Environmental Checklist (July 2022)
(xvii)	Any additional information needed to address the applicable state, federal and local requirements including the substantive requirements for any exempted permits; and property access issues which need to be resolved to implement the cleanup action	To be provided by Ecology

WAC 173-340-400(4)(a)		Section Containing Required Information
(xviii)	For sites requiring financial assurance and where not already incorporated into the order or decree or other previously submitted document, preliminary cost calculations and financial information describing the basis for the amount and form of financial assurance and, a draft financial assurance document	*Not applicable*
(xix)	For sites using institutional controls (ICs) as part of the cleanup action and where not already incorporated into the order or decree or other previously submitted documents, copies of draft restrictive covenants and/or other draft documents establishing these ICs	Restrictive covenant to be provided by Ecology in the Agreed Order
(xx)	Other information as required by Ecology	None

1.2 Report Organization

The report is organized as follows:

- Section 1 (Introduction) provides the purpose and summarizes the organization of this report.
- Section 2 (Site Description and Background) provides the general Site information, the Site's geology and hydrologic setting, and a summary of the groundwater impacts and source areas.
- Section 3 (Summary of Cleanup Action) provides an overview of the objectives, cleanup standards, and an overview of the cleanup action conceptual design.
- Section 4 (Cleanup Action Implementation) provides the design criteria for the cleanup action, including deployment information, locations, and schedule. Also outlines a plan for the health and safety, waste management, and reporting requirements.
- Section 5 (Contact Information) lists who will own, operate, and maintain the cleanup action.
- Section 6 (Reporting) provides the reporting requirements.
- Section 7 (References) provides a list of report references.

The report includes several figures and tables following the text and the following appendix:

- Appendix A includes the technical data sheet for the Provectus® Oxygen Release Substrate™ product.
- Appendix B includes the *Operations and Maintenance Plan* (O&M Plan).

2 Site Description and Background

2.1 Terminal and Tidewater Site Locations and Description

This section describes the Terminal and Tidewater site areas. In Figures 1 and 2, the Terminal is shown with the brownish orange highlighted area. The Terminal is defined as the properties owned by Tesoro. Most of the Terminal operations are located on top of the bluffs overlooking the Lake Wallula segment of the Snake River adjacent to the south. Sacajawea Park Road and a Burlington Northern Santa Fe rail spur bisect the Terminal with northeast-southwest orientations. The Terminal operations predominantly take place to the south of Sacajawea Park Road over approximately 33 acres; however, the entire Terminal property covers approximately 120 acres. The Terminal includes unimproved land to the southwest, north, and northeast.

The Terminal is developed with aboveground storage tanks (ASTs), loading racks, pumping stations, underground and aboveground pipelines, a barge loading dock, a lined evaporation pond, and terminal offices. The ASTs are used to store diesel, gasoline, jet fuel, and ethanol (AECOM, 2021). The Terminal has been an active fuel terminal since September 1950. The Terminal receives fuel products transferred through underground pipelines and by barge. Nineteen ASTs (with storage capacities ranging between 588,000 and 2,520,000 gallons), eight fuel additive ASTs (with storage capacities ranging between 500 and 12,000 gallons), and one 23,000-gallon relief AST are present at the Terminal (AECOM, 2021).

The elevations at the Terminal range from approximately 356 feet (ft) National Geodetic Vertical Datum (NGVD) along the Snake River to approximately 425 ft NGVD in the upland portion of the Site (AECOM, 2021).

In Figure 2, the **orange line** labeled as the Tidewater site shows the boundary of the separate Ecology Cleanup Site with Facility Site Name “Tidewater Fuel Line Leak”. The Tidewater Terminal Company, Inc. (Tidewater) is responsible for managing ongoing environmental activities in this area associated with a pipeline fuel release (FSID: 39378684; CSID: 2331). The Tidewater site includes fuel pipelines owned and operated by Tidewater, which transfer products between this Terminal and the separate Tidewater Terminal, located approximately ¾-mile upstream along the Snake River at 671 Tank Farm Road in Pasco, Washington.

2.2 Geology

The Site is regionally located within the southeast portion of the Pasco Basin. The stratigraphy of the Pasco Basin consists of unconsolidated, sedimentary deposits underlain by a thick sequence of Miocene-age basalt known as the Columbia River Basalt Group. These unconsolidated deposits, from the deepest to the shallowest, include the Pliocene Ringold Formation, the Cold Creek sediments, and the Pleistocene Hanford Formation (Martin, 2011). At the Site, Hanford sediments were identified to the maximum depth of exploration of approximately 100 ft below ground surface (bgs), based on the interpretation of information provided in Site boring logs (AECOM, 2021).

The “Hanford Formation” is the informal name given to Pleistocene-age cataclysmic flood deposits in the Pasco Basin. Sources for the floodwaters included Glacial Lake Missoula, pluvial Lake Bonneville, and ice-margin lakes that formed around the margins of the Columbia Plateau (Baker et al., 1991). These floods periodically covered the Pasco Basin during the Pleistocene, often eroding existing sediments (e.g. the Ringold Formation and Cold Creek unit). As the floodwaters encountered restricted flow through the Wallula Gap, located south of the Snake River confluence, both coarse- and fine-grained sediments carried in the floodwaters were deposited within the Pasco Basin. Deposition and erosion of the sediments occurred several times, leaving behind lenses of sand and silt surrounded by sand and gravel. The Site is located within the southeast portion of the Pasco Basin, where flood currents were stronger and coarse-grained sediments are more common. Fine-grained sediments are primarily found near the margins of the Pasco Basin.

Borings advanced at the Site indicate the Site geology is generally composed sands and gravels of the Hanford Formation. In some areas, thin layers of overbank silt and silty sand deposits are present with thicker layers observed at the bottom of borings along the Snake River. Cross-sections and available boring and well logs are available in the Supplemental RI/FS (AECOM, 2021).

Lithological descriptions of the sand and gravel facies from the Site are presented below:

- The sand is generally described as brown to gray, fine to medium-grained, loose, and well sorted. The average thickness across the Site is approximately 80 ft; however, it is locally thicker in some locations (e.g. MW-03 where it is 95 ft thick). Borings along the Snake River were terminated at a depth as shallow as 20 ft, therefore the full thickness of sand in these locations is not known. As previously discussed, layers of silt and silty sand are locally interbedded within the sand unit as are thin layers of gravel. One exception to the thin gravel lenses was observed at recovery well RW-1 where gravelly sand extends near the surface from a depth of approximately 7 ft bgs to 40 ft bgs. This relatively recent feature is likely a drainage gully cut into the surrounding sand as surface water drained towards the Snake River. At the base of the sand unit at many of the locations, 1 to 7 ft of sandy gravel overlay the lower gravel deposit.
- The gravel is described as gray to brown to red, dense, and fine to coarse-grained. The gravel is commonly basalt and is typically ¾ to 1½ inches in diameter, with some pieces ranging up to 2 inches in diameter. At several locations trace amounts of sand is observed in addition to cobbles and boulders. Groundwater is typically encountered at or slightly above the sand/gravel interface. The gravel surface appears to dip to the north, south and east with a steeper gradient to the south.

The base of the gravel unit was not encountered during installation of the Site borings that were provided in the Supplemental RI/FS. The maximum gravel thickness penetrated on Site was 23 ft at recovery well RW-1. In a water well installed at Hood Park located approximately 3,500 ft southeast of the Site, basalt was encountered at a depth of 57 ft bgs with approximately 34 ft of gravel and 16 ft of broken basalt overlying competent basalt (AECOM, 2021).

2.3 Hydrogeology

Regional groundwater flow within the Pasco Basin is generally to the southwest, towards the major surface water bodies (the Columbia and Snake Rivers). The unconsolidated aquifer at the Site is unconfined, and groundwater is typically encountered at a depth of approximately 80 ft bgs. Groundwater elevations beneath the Site are generally stable throughout the year, and groundwater flows towards the Snake River to the southeast. The magnitude of the hydraulic gradient varies with distance from the Snake River. In the upland portion of the Site, where the ASTs are located, the hydraulic gradient is relatively flat and ranged from approximately 0.00007 to 0.008 foot per foot between June 2019 and June 2020. Closer to the Snake River, the hydraulic gradient steepens and ranged from approximately 0.006 to 0.01 foot per foot (AECOM, 2021).

2.4 Indicator Hazardous Substances and Source Areas

Occasional releases of petroleum products from ASTs, pipelines and other infrastructure have been documented over time at the Terminal. A timeline of documented historical releases, response actions undertaken, and subsequent investigations and remediation actions, are summarized in the Supplemental RI/FS (AECOM, 2021).

The Supplemental RI/FS concluded that the following eight contaminants of concern (hereafter referred to as indicator hazardous substances ([IHSs]) are present at the Site within three upland source areas. The eight substances and three source areas are listed below.

- Gasoline-range total petroleum hydrocarbons (TPH-g)
- Diesel-range total petroleum hydrocarbons (TPH-d)
- Motor oil-range total petroleum hydrocarbons (TPH-o)
- Five volatile organic compounds (VOCs): benzene, toluene, ethylbenzene, total xylenes (BTEX) and naphthalene

These IHSs are (or have recently been) present in one or more of the following three upland source areas, which are also shown on Figure 2:

1. **Southern Tank Area**: In the southern end of the tank farm, the IHSs are TPH-g, TPH-d, and TPH-o in groundwater and deep subsurface soil (80 to 84 ft bgs which is near or at the depth to the water table).
2. **Northern Tank Area**: In the northern end of the tank farm, the IHSs are TPH-d and TPH-o in groundwater.
3. **North Area**: West of the lined evaporation pond, the IHSs are TPH-g, benzene, toluene, ethylbenzene, total xylenes, and naphthalene in groundwater and deep subsurface soil (83 to 90 ft bgs which is near or at the depth to the water table).

2.5 Nature and Extent of Impacts to Groundwater

Groundwater impacts at the Site are due to historical releases of refined petroleum products, as described in detail in the Supplemental RI/FS. The groundwater analytical results and monitored natural attenuation (MNA) parameter results since 2014 for the IHSs are compiled on Tables 2 and 3 respectively, and the TPH-d and TPH-o results from the past two years are included on Figure 3.

Since at least 2000, TPH-d and TPH-o are the only IHSs which have been detected in groundwater above the cleanup levels. The nature and extent of the TPH-d and TPH-o above the cleanup levels are summarized below.

- **Southern Tank Area:** TPH-d concentrations greater than the cleanup level are present in the vicinity of MW-03 and intermittently present in the vicinity of MW-11 and MW-02. TPH-o concentrations greater than the cleanup level are intermittently present in the vicinity of MW-03, MW-11, and MW-02.
- **Northern Tank Area:** TPH-d and TPH-o concentrations greater than cleanup levels are intermittently present in the vicinity of MW-17.

At MW-06, in November 2022, TPH-o was detected at a concentration (519 micrograms per liter [µg/L]) slightly above the cleanup level (500 µg/L), which was the only cleanup level exceedance at the shoreline over the past 17 events.

3 Summary of Cleanup Action

As stated in the Agreed Order, the CAP sets cleanup standards and selects the cleanup action that meets the cleanup standards for the Site. The CAP indicates that the Ecology-selected cleanup action for the Site is ICs, MNA, and enhanced bioremediation using oxygen-releasing compounds (ORCs).

3.1 Cleanup Action Objectives

The Cleanup Action Objective (CAO) is to remove or degrade the IHSs in groundwater in the source areas to below the cleanup levels to prevent direct contact or ingestion of impacted groundwater by humans. There is no separate CAO for the soil because the potential transfer of IHSs from soil to groundwater will be addressed through the CAO for groundwater. CAOs for surface water and sediments also are addressed through the CAO for groundwater, because IHSs from the historical releases in the source areas could only reach these media via migration of affected groundwater.

3.2 MTCA Cleanup Standards

One of the requirements of the Model Toxic Controls Act (MTCA) cleanup regulation [WAC 173-340] is to establish cleanup standards the Site. The two components of the cleanup standards are (i) cleanup levels and (ii) points of compliance (POCs). Cleanup standards were established in the CAP (Ecology, 2021) and are discussed in this section.

3.2.1 Cleanup Levels

The process used to develop the cleanup levels is described in the CAP. As discussed in Section 4.3 of the CAP, vadose zone soils have hazardous substances detected below MTCA Method A Cleanup Levels, and therefore, Site soil cleanup levels have not been set in the CAP. Also, Section 4.3.1 of the CAP notes IHS exceedances occur at or near the groundwater table, so deep soil contamination is considered to be part of the impacted groundwater to be addressed as part of the groundwater remediation. Consequently, soil cleanup at the Site is not required based on current data. The selected cleanup levels for groundwater are the MTCA Method A Cleanup Levels for Groundwater (Table 720-1 of WAC 173-340-900). The IHSs are TPH-g, TPH-d, TPH-o, BTEX, and naphthalene. Groundwater cleanup levels for these IHSs are listed in Table 4 below.

Table 4. Groundwater Cleanup Levels

Analyte	Groundwater Cleanup Level (µg/L)
TPH-g, Benzene Present	800
TPH-g, No Benzene Present	1,000
TPH-d	500
TPH-o	500
Benzene	5
Toluene	1,000
Ethylbenzene	700
Total Xylenes	1,000
Naphthalene	160

Units:
µg/L = microgram per liter

3.2.2 Points of Compliance

Groundwater: For groundwater, the POC is the point where the groundwater cleanup levels must be attained for a site to be in compliance with the cleanup standards (WAC 173-340-720 [8]). Groundwater cleanup levels are attained in all groundwaters from the POC to the outer boundary of the plume. A standard POC is established throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest-most depth that could potentially be affected by the Site.

As stated in the CAP, at this Site, the proposed groundwater POC is the standard POC for groundwater; the unconfined groundwater located in the sand and gravel deposits beneath the upland portion of the Site. Many of the existing monitoring wells are in source areas where IHSs are present at concentrations exceeding the cleanup levels in soil and groundwater. The Site's current network of monitoring wells provides an adequate assessment of the groundwater and IHSs at the standard POC.

Soil: For soil, the POC is the point or points where the soil cleanup levels must be attained. As described in WAC 173-340-740 (6) (b), the standard soil POC is soils throughout the Site. However, MTCA recognizes that the cleanup action may be determined to comply with cleanup standards, as long as provisions detailed in WAC 173-340-740 (6) (f) are met.

As specified in the CAP, due to the presence of groundwater contamination, the Site soil POC would be from the ground surface down to the top of groundwater. An empirical demonstration will be made using Site groundwater data to show soil contaminant concentrations are protective of groundwater, following procedures described in WAC 173-340-747(9). Compliance will be demonstrated by directly comparing groundwater concentrations at the Site to the proposed groundwater cleanup levels. If groundwater at the Site meets the cleanup levels, this pathway will then have been demonstrated to have met soil cleanup levels and will be in compliance.

3.3 Cleanup Action Conceptual Design

A summary of each of the remedial technologies that comprise the cleanup action for the Site is presented below. The CAP indicates that the Ecology-selected cleanup action for the Site is MNA with emplacement of ORC in key on-Site wells. These elements of the cleanup action, along with ICs, are discussed in the following sections.

3.3.1 Institutional Controls

ICs are long-term measures taken to limit or prohibit activities that may interfere with a cleanup action or result in exposure to hazardous substances at the Site. These measures are required to assure the continued protection of human health and the environment and the integrity of the cleanup action when hazardous substances remain at the Site at concentrations exceeding the cleanup levels. ICs for the Site, which are described in Section 4.2, include physical measures and an environmental covenant.

3.3.2 Enhanced Bioremediation Using Oxygen-Reducing Compounds

Enhanced aerobic bioremediation is the process of stimulating indigenous oxygen-dependent microorganisms in soil and groundwater to create the conditions necessary for the microorganisms to biotransform IHSs to innocuous byproducts. Aerobic bioremediation of petroleum hydrocarbons and other organic compounds has been demonstrated and applied at sites for decades (Federal Remediation Technologies Roundtable [FRTR], 2023). Using ORC is a common strategy for delivering oxygen to the saturated zone. ORCs are a class of solid compounds that release oxygen into groundwater through the hydration of calcium and magnesium peroxides. They can sometimes be used to stimulate bioremediation in the unsaturated zone if adequately hydrated, but more commonly are used to treat contaminated groundwater or saturated soil (FRTR, 2023). Typical means for introducing ORCs to the aquifer include suspending filter socks filled with solid material in monitoring wells, mixing the solid material into open soil excavations, or creating and injecting a slurry into direct-push borings.

In 2020, AECOM completed a biodegradation assessment consisting of an in-situ microcosm test to evaluate electron donor/acceptor relationships and assessment of limiting factors for hydrocarbon degradation, an ex-situ bench-scale treatability assessment, and profiling of archaea and bacteria residing in the vadose zone and aquifer

at the Site. A full summary of sample methods and analyses is summarized in the *2020 Biodegradation Assessment* (AECOM, 2020). Based on the results of that assessment, biodegradation of dissolved-phase petroleum hydrocarbons is occurring at the Site, and the aerobic biodegradation rate would be increased with the addition of electron acceptor amendments (AECOM, 2021).

MNA at the Site will be enhanced by additional oxygen delivered via deployment of ORC in six existing monitoring wells (MW-02, MW-03, MW-11, MW-12, MW-17, and MW-19) as shown in Figure 2 on a pulsed (or periodic) schedule. Details of the selected ORC product and deployment are summarized in Section 4.

3.3.3 Monitored Natural Attenuation

MNA is a passive remedial approach which allows naturally occurring processes within the soils and groundwater to reduce the concentrations of IHSs (FRTR, 2023). MNA has been shown to successfully treat a number of contaminants including petroleum hydrocarbon constituents, chlorinated solvents, and metals. Contaminants that do not biodegrade can still be treated by MNA using other natural attenuation mechanisms, including abiotic degradation and groundwater dispersion (FRTR, 2023).

The effectiveness of MNA can be shown by sampling a network of monitoring wells. The network should consist of background wells to show unimpacted areas, cross- and down-gradient wells to monitor the plume and ensure that it is not migrating, source area and centerline wells to track degradation of IHSs within the plume, and compliance wells to ensure that the plume does not migrate towards sensitive receptors (FRTR, 2023).

The historical releases resulted in localized degradation of groundwater quality within the unconfined groundwater beneath the Site. Groundwater monitoring through December 2022 has demonstrated that previous remedial activities and ongoing natural attenuation processes have reduced IHSs across the Site. IHS concentrations remain above the cleanup levels (Section 2.5) in a few isolated upland source areas. Continued natural attenuation processes have provided significant remedial progress since discontinuation of active remediation in December 2002.

In periodic progress reports, a natural attenuation screening model such as Ecology's *Natural Attenuation Analysis Tool Package for Petroleum-Contaminated Ground Water* will be used to analyze Site data to evaluate whether IHS detections will fall below cleanup levels within the timeframe outlined in the CAP (Ecology, 2005).

4 Cleanup Action Implementation

4.1 Engineering Design Criteria

This section presents the design criteria, or the basis of design, for the cleanup action selected by Ecology in the CAP. Ecology selected the most practicable permanent solution to protect human health and the environment and considered criteria including protectiveness, permanence, cost, effectiveness over the long term, management of short-term risks, technical and administrative implementability, and consideration of public concern.

4.2 Institutional Controls

ICs for the Site include physical measures and an environmental covenant. Physical barriers are currently present at the Site with fencing and signage restricting access. Also, the facility adheres to a strict Permit-To-Work policy, which requires issuance of a Safe Work Permit whenever work is performed. Each Safe Work Permit describes the specific tasks to be performed, and safety precautions to be taken.

An environmental covenant will be recorded limiting property use to industrial activities and prohibiting the extraction of groundwater. The covenant must be recorded to provide adjoining property owners, future purchasers, tenants, and the general public notice of the restrictions on use of the property. Property owners are also required to notify Ecology prior to any lease or sale of the restricted property. The environmental covenant shall be consistent with the State of Washington Uniform Environmental Covenant Act (UECA) Chapter 64.70 RCW. The environmental covenant restrictions regarding use of groundwater will be removed once concentrations of the Site IHSs have met cleanup levels.

4.3 Enhanced Bioremediation Using Oxygen-Releasing Compounds

4.3.1 Product Information

Multiple ORC products are commercially available, differing primarily in chemical composition and packaging for deployment in groundwater wells. AECOM has selected the Provectus® Oxygen Release Substrate™ (Provect-ORS™) as the ORC product to deploy at the Site. Product information is listed below; a technical data sheet is included as Appendix A, and the SDS is attached to the O&M Plan included as Appendix B.

- **Manufacturer:** Provectus®
- **Product:** Provect-ORS™
- **Deployment mechanism:** Provect-ORS™ sleeve (here in referred to as ORC sleeve), which includes the active compound inside a filter sock, deployed inside a reusable polyvinyl chloride (PVC) canister
- **Active compound:** calcium-peroxide based compound with proprietary blend of inorganic nutrients (e.g., nitrogen and phosphorus) at a ratio of 80:20 (80% ORC, 20% nutrients)
- **Available free oxygen per pound of ORC product:** 15 percent

In summary, the ORC product is deployed as sleeves, which are filled with a blend of materials that provide a continuous source of dissolved oxygen (DO) to the bacterial population within the groundwater (via calcium-peroxide). Each sleeve is deployed inside a PVC canister. In the subsurface, the ORC materials will react with water to release oxygen slowly for three to six months (Provectus, 2023).

$$2CaO_2 + 2H_2O \text{ ---------> } 2Ca(OH)_2 + O_2$$

The procedures for storing and handling the new sleeves are discussed in the O&M Plan. The procedures for managing the used sleeves as investigation-derived waste (IDW) are discussed in Section 4.6.

4.3.2 Deployment

ORC sleeves will be deployed in existing monitoring wells MW-02, MW-03, MW-11, MW-12, MW-17, and MW-19, which are also shown on Figure 2. The ORC sleeves will be deployed in such a way that the bottom of the canisters is at the same depth each year within the saturated water column. Monitoring wells will have between one and three ORC sleeves deployed with one ORC sleeve inside each canister.

The minimum saturated water column height was calculated using historical water levels for the deployment period (between spring and fall) (Table 2) to determine the appropriate number of ORC sleeves for each monitoring well. Each canister is attached using D-rings and steel cable to a deployment well cap. A schematic of the ORC sleeve installation is shown as Figure 4. Table 5 (Tables section following the text) shows the rationale for the decision on the number of ORC sleeves per well. Table 6 summarizes the findings from Table 5 including the proposed ORC count and size for each well and the deployment depth.

Initially, Field Environmental Instruments (FEI) will build the ORC hangers set to the deployment depths listed on Tables 5 and 6 and supply the new ORC sleeves. Then each year only new ORC sleeves will be procured early in the first quarter in advance of the first semi-annual monitoring event.

Table 6. PVC Canister Deployment Summary

Well ID	MW-02	MW-03	MW-11	MW-12	MW-17	MW-19	*Units*
Well Diameter	4	4	2	2	2	2	*inch*
Total Well Depth	79.38	95.42	84.60	85.11	83.47	89.90	*ft btoc*
Calculated Shortest Saturated Water Column Height	4.93	14.70	4.21	4.28	4.40	8.49	*ft*
PVC Canister Dimensions (Diameter)	3.5	3.5	1.75	1.75	1.75	1.75	*inch*
PVC Canister Dimensions (Length)	3	3	3	3	3	3	*ft*
Number of PVC Canisters to be Deployed	1	3	1	1	1	2	--
Deployment Depth (Bottom of Lowest PVC Canister)	79.21	95.25	84.43	84.94	83.30	89.63	*ft btoc*

4.3.3 Product Consumption and Oxygen Delivery Rates

Actual ORC product consumption and oxygen delivery rates will depend on groundwater seepage velocities that are variable through fine and coarse soils, the subsequent flow through the well filter pack and around the ORC sleeve, diffusion from within the active compound to the groundwater in the well annulus, and the oxygen concentration gradient created by biological and chemical oxygen demand. Approximate hydrocarbon mass removal can be calculated by multiplying the pounds of oxygen delivered by 0.3125 pounds, which is a general stoichiometric ratio for oxidation of hydrocarbons. Actual mass removal will depend in part on the specific composition of the hydrocarbons in the groundwater that will be preferentially degraded by microorganisms before TPH-d or TPH-o compounds. References suggest ORC deployed in a well may provide increased oxygen levels in a radius or zone of influence twice the diameter of the well (EPA, 2017). However, in this application where MNA is supplemented by enhanced bioremediation, ORC will reduce source mass in “hotspots” represented by wells with surrounding groundwater exceeding cleanup levels. Movement of oxygenated and/or treated groundwater will still depend on the factors discussed in this subsection, and pulsed deployment will provide data on rebound and treatment to determine if the remedy is performing as planned. Estimates on the pounds of oxygen delivered per deployment period and pounds of hydrocarbons removed (per six months) at each monitoring well are listed on Table 5. AECOM estimates that approximately 5.66 pounds of oxygen can be delivered, and approximately 1.77 pounds of hydrocarbons can be removed over each six-month period.

4.3.4 Schedule

For design purposes, the pulsed schedule is initially assumed to include six monitoring wells (MW-02, MW-03, MW-11, MW-12, MW-17, and MW-19 [Figure 2]) as described below.

- Six months of continuous ORC sleeve deployment between the spring and fall during the warm season to take advantage of increased biological activity and contaminant breakdown with higher groundwater temperatures
- Six months of no ORC sleeve deployment during the winter months

The proposed ORC deployment schedule is shown on Table 7 and summarized below. 2023 is the initial year of the cleanup action prior to ORC deployment (baseline), and then 2024 is the first year of ORC deployment.

- In 2023, the 19 compliance monitoring wells will be sampled during the first and second semi-annual events scheduled in spring and fall per the CMP.
- Starting in 2024, the 19 compliance monitoring wells will be sampled in the first semi-annual event scheduled for spring per the CMP, and then ORC sleeves will be deployed pending Ecology's approval of the EDR. In fall, the ORC sleeves will be removed, and groundwater samples will be collected from the 15 compliance monitoring wells not used for ORC deployment.

Table 7. Proposed ORC Deployment Schedule

Month	Month	Season	Monitoring Event	ORC Status
2023	Jan	Winter		None
	Feb	Winter		None
	Mar	Winter/Spring		None
	Apr	Spring	1st Semi-annual: initially 19 wells	None
	May	Spring		None
	Jun	Spring/Summer		None
	Jul	Summer		None
	Aug	Summer		None
	Sep	Summer/Fall		None
	Oct	Fall	2nd Semi-annual: initially 19 wells	None
	Nov	Fall		None
	Dec	Fall/Winter		None
2024+	Jan	Winter		None
	Feb	Winter		None
	Mar	Winter/Spring	1st Semi-annual: initially 19 wells	
	Apr	Spring		Deployed
	May	Spring		Deployed
	Jun	Spring/Summer		Deployed
	Jul	Summer		Deployed
	Aug	Summer		Deployed
	Sep	Summer/Fall		Deployed
	Oct	Fall	2nd Semi-annual: initially 15 wells	
	Nov	Fall		None
	Dec	Fall/Winter		None

4.3.5 Treatment Optimization

The proposed deployment schedule is designed to coincide with the current semi-annual groundwater monitoring schedule for logistical and budgetary efficiency. Following the initial deployment in 2024, the inspection/deployment schedule will be reviewed based on field observations of ORC consumption. If the ORC is

completely consumed, the inspection frequency will be increased during the next deployment (e.g., from semi-annual to quarterly) to collect additional data on the rate of ORC consumption. Once a preliminary ORC consumption rate has been calculated, the schedule will be updated to include additional deployments (if needed) and/or additional ORC per deployment, if practical.

4.4 Cleanup Action and Compliance Monitoring

The CAP indicates that the Ecology-selected cleanup action for the Site is MNA with emplacement of ORC in key on-Site wells.

To drive continuous improvement and adaptive management of the active cleanup technologies, Ecology has established an overall Reasonable Restoration Time Frame (RRTF) for the Site of 15 years based on the longevity of petroleum hydrocarbon compounds in groundwater. This period is consistent with the RRTF for successful cleanup using Alternative 2 as presented in the RI/FS (AECOM, 2021). Ecology finds that a 15-year RRTF is reasonable for the Site. A 15-year RTF allows adequate time to determine whether the selected cleanup action is proving effective, while allowing time to evaluate an alternate cleanup action if the primary alternative is not effective. The RRTF starts when compliance monitoring begins.

The current available data is insufficient to calculate first order decay rates and an estimated time to reach cleanup levels. As more data is collected, analyses will be performed to track progress towards reaching the cleanup levels within the timeframe provided in the CAP. Groundwater compliance monitoring will be continued to track and ensure IHS degradation occurs in a reasonable time.

Currently, the monitoring well network consists of 19 wells outfitted with dedicated bladder pumps and two monitoring wells located on the adjacent Tidewater site. Ten of these wells were installed between 1989 and 1990 and the remaining 11 were installed in 2018 and 2019. These wells will be sampled semi-annually according to the *Compliance Monitoring Plan* (AECOM, 2024). As discussed in the CMP, compliance monitoring under WAC 173-340-410 includes (i) protection monitoring; (ii) performance monitoring; and (iii) confirmational monitoring. This section summarizes these types of monitoring; details on the monitoring is included in the CMP.

4.4.1 Protection Monitoring

Protection monitoring is short-term monitoring conducted to “confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of a cleanup action as described in the safety and health plan” [WAC 173-340-420(a)].

As discussed in Section 4.4.5, health and safety hazards associated with this cleanup action include exposure to site contaminants during deployment of the ORC and groundwater sampling activities. Monitoring for protection of human health and the environment will be addressed in a project-specific Health and Safety Plan (HASP). The HASP supports protection monitoring by specifying emergency procedures, site hazards, protective clothing, equipment, and monitoring required for the protection of human health and the environment during field activities.

4.4.2 Performance Monitoring

Performance monitoring is short-term monitoring that confirms that the cleanup action has attained cleanup standards [WAC 173-340-410(b)].

Given the availability of historical data, the overall declining trend in IHS concentrations, and due to the low hydraulic gradients measured at the Site not being conducive to rapid transport of IHSs in groundwater, performance monitoring will initially be conducted at the Site semi-annually before and during ORC deployment.

- Performance monitoring will begin with semi-annual events during the spring and fall of 2023 before ORC deployment.
- Performance monitoring during ORC deployment starting in 2024 will continue with semi-annual events during spring and fall until the IHS concentrations are below the cleanup levels for two sequential events.

- Performance monitoring will then continue without ORC deployment for one additional year before transitioning to confirmation monitoring.

4.4.3 Confirmational Monitoring and Periodic Reviews

Confirmational monitoring is long-term monitoring performed following the completion of the cleanup action to verify its long-term effectiveness [WAC 173-340-410(c)] (i.e., the site remedy is performing as expected over time).

After compliance with cleanup levels has been demonstrated through performance monitoring, confirmation monitoring will then verify over two additional sequential semi-annual events without ORC deployed that the IHSs remain below the cleanup levels within the compliance monitoring well network. Confirmational monitoring needs to be conducted to ensure that contaminant levels do not rebound and exceed the cleanup levels under high- and low-level groundwater conditions.

Ecology will perform periodic reviews in accordance with WAC 173-340-420 to evaluate the effectiveness of the cleanup action and assess contaminant trends in groundwater. The first periodic review will take place no more than five years after the cleanup action has commenced, which for this Site is considered to occur five years after the ORC sleeves are initially deployed. After groundwater cleanup levels have been achieved, periodic reviews will still be required because ICs are a part of the remedy.

4.5 Health and Safety

AECOM will be responsible for the health and safety of its employees and subcontractors (if any) performing the work described in the report. A HASP will be developed to assign responsibilities, establish personal protection standards and mandatory safety procedures, and provide for contingencies that may arise while operations are being conducted at the Site.

The AECOM Field Team Lead will have a Transportation Worker Identification Card (TWIC) as required by law to work unescorted within the Terminal. AECOM field personnel will comply with all applicable Tesoro Permit to Work Policies, including air monitoring and approval of the use of any equipment that would be considered ‘hot’ by Tesoro (power generators, equipment connected to portable batteries, etc.).

Before the start of work, AECOM will review the project-specific HASP and perform a hazard assessment to ensure that all appropriate front-end safety planning is in place. Upon arrival for a sampling event, the AECOM field team will participate in a safety kickoff meeting with Tesoro representatives to review site-specific safety concerns and requirements. Tesoro requires all work at their facilities to be performed under a Safe Work Permit, which will be issued to field personnel before work begins each day. Morning tailgate safety meetings will also be held daily and documented in the daily field report.

HASPs are considered ‘living’ documents in that they are constantly being updated as site conditions dictate. Creation of and updates to the HASP will be performed as needed.

Spill cleanup procedures relating to the ORC sleeves including compatible spill control materials and location of spill kit are discussed in the HASP.

4.6 Waste Management

As described in the CMP, three types of IDW which will be generated the cleanup action.

1. Purge water and water from decontamination of non-dedicated equipment containing fuel hydrocarbon residues
2. Miscellaneous solid waste including nitrile gloves, tubing, paper towels, and protective plastic wrappers
3. Spent ORC sleeves

The *Sampling and Analysis Plan* (SAP), Section 9 describes the disposal of the first two types of IDW (Appendix A of the CMP; AECOM, 2024). The ORC sleeves will be managed as described below.

4.6.1 Oxidizer Status

According to the Safety Data Sheet (SDS) (Attachment A of the O&M Plan), Provect-ORS™ is an oxidizer, which may react violently when it meets combustible materials. They promote combustion in other materials, generally by the rapid release of oxygen.

Under ideal conditions, sleeves would be deployed until all the ORC has dissolved in the groundwater. In practice, removed sleeves will contain residual amounts of amendment only; the calcium hydroxide byproduct goes into solution along with the DO. Sleeves containing partially spent ORC will not be waste and can be returned to storage in the original shipping containers and/or redeployed. Used sleeves will be stored separately from new sleeves, and completely spent sleeves containing no ORC can be rinsed and disposed of as miscellaneous solid waste in accordance with the SAP, Section 9.The procedures for new sleeves storage and handling due to the oxidizer status are discussed in the O&M Plan.

The safety procedures for the handling of the spent ORC sleeves and spill cleanup procedures are discussed in the HASP.

4.6.2 IDW Disposal

All applicable Federal, State, and local laws pertaining to hazardous waste storage, handling, and disposal will be followed, as applicable.

4.7 Permits

The wells with ORC deployment will be registered as underground injection chambers (UIC) with Ecology in accordance with WAC 173-218-060. The online UIC registration page is:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Underground-injection-control-program/Register-UIC-wells-online

The person filling out the UIC application will need a Secure Access Washington account. All relevant documents are to be uploaded with the UIC application as well as the signed UIC Signature Page. Please notify the Ecology Site manager that wells have been registered. The Site manager will provide concurrence to the Ecology UIC manager that the proposed injections are part of an Ecology-approved cleanup action. Upon this information the UIC coordinator will review the registrations for final approval of the ORC deployment.

5 Contact Information

Table 8 shows Tabulated contact information and examples of when specific people/organizations should be contacted. This contact information must be updated and supplemented as necessary, to ensure clear and accurate lines of communication. Emergency contact information is presented in the Site-specific HASP.

Table 8. Organization of Project Staff and Responsibilities

Title	Staff	Examples of When to Contact
Tesoro Project Coordinator	Kyle Waldron Marathon Petroleum Company LP 3450 S 344th Way, Suite 135 Auburn, WA 98001-5931 kawaldron@marathonpetroleum.com 425-502-1616	AECOM Project Manager to contact the Tesoro Project Coordinator in advance of each compliance monitoring event to coordinate Site access. AECOM Project Manager to report inspection concern to the Tesoro Project Coordinator.
Terminal Operations Supervisor	Dan Anderson Marathon Petroleum Logistics Services LLC 2900 Sacajawea Park Road Pasco, WA 99301 DJAnderson2@marathonpetroleum.com 509-543-6102	AECOM Project Manager to contact the Terminal Operations Supervisor in advance of each compliance monitoring event to coordinate Site access. The Terminal Operations Supervisor is contacted to verify permit required activities at the Site (e.g., hot work in AST farm). AECOM Project Manager to report inspection concern to the Tesoro Operations Supervisor. The Terminal Operations Supervisor to report any damage to compliance monitoring well monuments to the AECOM Project Manager.
Ecology Project Coordinator	Christer Loftenius, LG, LHG Washington Department of Ecology Toxics Cleanup Program Eastern Region 4601 N Monroe Street Spokane, WA 99205 clof461@ecywa.gov 509-329-3400	Questions regarding the cleanup action should be directed to the Ecology Project Coordinator. AECOM Project Manager to notify the Ecology Project Coordinator in advance of each compliance monitoring event. Ecology Project Coordinator will be notified of any development activities at the Site impacting compliance monitoring wells. AECOM Project Manager to submit documentation of inspections to Ecology Project Coordinator.
AECOM Project Manager	Nicky Moody AECOM 888 SW 5th Avenue, Suite 600 Portland, OR 97204 nicky.moody@aecom.com 503-969-6310	Tesoro Operations Supervisor to report any damage to compliance monitoring well monuments to the AECOM Project Manager.

Title	Staff	Examples of When to Contact
AECOM Project Engineer	Keith Fox, PE AECOM 207 N Broadway STE 315, Billings, MT 59101 Keith.fox@aecom.com 406-465-6405	For technical support
AECOM Field Team Leader and Site Safety Officer	Eddie Le Cocq AECOM 888 SW 5th Avenue, Suite 600, Portland, OR 97204 edward.lecocq@aecom.com 503-849-2993	For field support

6 Reporting

In accordance with the Agreed Order, Semi-Annual Progress Reports will be submitted to Ecology and include documentation of the following items:

1. A list of on-Site activities conducted during the last six months.
2. Detailed description of any deviations from required tasks not otherwise documented in project plans or amendment requests.
3. Description of all deviations from the Scope of Work and Schedule (Exhibit C) of the Order during the current six months and any planned deviations in the upcoming six months.
4. For any deviations in the schedule, a plan for recovering lost time and maintaining compliance with the schedule.
5. All raw data (including laboratory analysis) received during the previous period (if not previously submitted to Ecology), together with a detailed description of the underlying samples collected.
6. A list of deliverables for the upcoming six months.

In addition, the raw data (water level elevations and laboratory analytical results) will be submitted online in a format compatible with Ecology's Environmental Information Management (EIM) System, per Ecology Policy 840. The schedule for the Semi-Annual Progress Reports is provided in Table 9 below.

Table 9. Schedule for Reporting

Task	Due Date
Semi-Annual Progress Report to Ecology and EIM update completed	Within 60 days of the last day of the previous six-month period

7 References

AECOM, 2020. *Biodegradation Assessment.* Pasco Bulk Fuel Terminal. August 11.

AECOM, 2021. *Final Supplemental Remedial Investigation / Feasibility Study.* Tesoro Pasco Bulk Fuel Terminal. September 30.

AECOM, 2024. *Compliance Monitoring Plan*. Chevron Pipe Line Company Pasco Bulk Terminal. January.

Baker, Victor R., Bruce N. Bjornstad, Alan J. Busacca, Karl R. Fecht, E. P. Kiver, Ula L. Moody, James G. Rigby, D. F. Stradling, Ann M. Tallman, 1991. *Quaternary Geology of the Columbia Plateau.*

Ecology, 2005. *User's Manual: Natural Attenuation Analysis Tool Package for Petroleum-Contaminated Ground Water.* Washington State Department of Ecology. Toxics Cleanup Program. Publication No. 05-09-091A (Version 1.0). July.

Ecology, 2023a. *Corrective Action Plan.* Chevron Pipeline Co. Pasco Bulk Terminal. February.

Ecology, 2023b. Agreed Order No. DE 21664. In the Matter of Remedial Action by Tesoro Logistic Operation LLC. April.

EPA, 2017. *How To Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites.* Land and Emergency Management. EPA 510-B-17-003. October.

FRTR, 2023. Screening Matrix and Reference Guide, https://frtr.gov/matrix/default.cfm.

Heywood, Charles E., Sue C. Kahle, Theresa D. Olsen, James D. Patterson, and Erick Burns, 2016. *Simulation of Groundwater Storage Changes in the Eastern Pasco Basin, Washington.* U.S.G.S. Scientific Investigations Report 2016-5026.

Martin, C.J. 2011. *Overview of Hanford Hydrogeology and Geochemistry in Hanford Site Groundwater Monitoring Report for 2010*, U.S. Department of Energy. DOE/RL-2011-01 Revision 0, August 2011.

Provectus, 2023. Provect-ORS™ Information. https://www.provectusenvironmental.com/provect-ors/. Accessed in March.

8 Limitations

AECOM has prepared this report for use by MPC. Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions expressed or implied should be understood. Because the historical documents referenced in this report were prepared by other parties, neither AECOM nor the MPC can warrant their accuracy, but for purposes of this document, accuracy is assumed.

Figures

1,000 0 1,000 2,000

SCALE IN FEET

AECOM

SITE VICINITY MAP

TESORO LOGISTICS OPERATIONS LLC
CHEVRON PIPE LINE COMPANY PASCO BULK TERMINAL
PASCO, WASHINGTON

60722666

FIGURE 1

K:\Tesoro_PascoMXD\2023_EDR\Fig 1 Site Viciniy Map.mxd

Explanation

- Compliance Monitoring Well
- Compliance Monitoring Wells Proposed for ORC Deployment
- Tidewater Monitoring Well
- Vapor Extraction Well

Previous Spill
(Size of circle indicates volume released)

- Diesel
- Gasoline
- Jet Fuel

600 12/20/78 — Number of barrels in spill / Date of spill

- BNSF Railroad
- BNSF Right of Way
- Excavation Area
- Terminal Boundary
- Site Boundary
- Tidewater Site Boundary

Areas of Concern

- North Area
- Northern Tank Area
- Southern Tank Area

Imagery Source: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

K:\Tesoro_PascoMXD\2023_EDR\Fig 2 Site Plan.mxd

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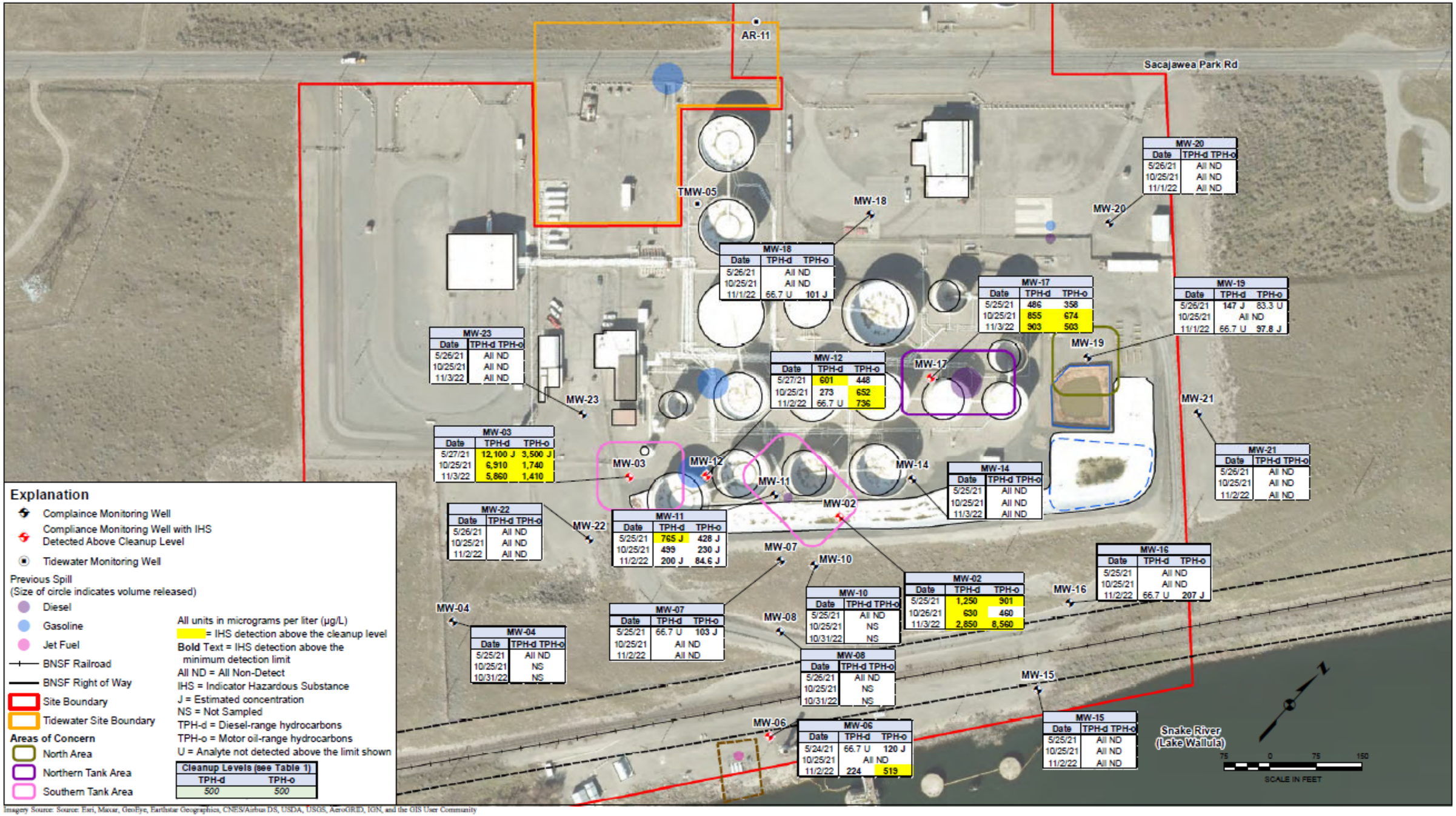
SITE MAP AND MONITORING WELLS PROPOSED FOR ORC DEPLOYMENT

TESORO LOGISTICS OPERATIONS LLC
CHEVRON PIPE LINE COMPANY PASCO BULK TERMINAL
PASCO, WASHINGTON

FIGURE 2



MW-18		
Date	TPH-d	TPH-o
5/26/21	All ND	
10/25/21	All ND	
11/1/22	66.7 U	101 J

MW-20		
Date	TPH-d	TPH-o
5/26/21	All ND	
10/25/21	All ND	
11/1/22	All ND	

MW-17		
Date	TPH-d	TPH-o
5/25/21	486	358
10/25/21	855	674
11/3/22	903	503

MW-19		
Date	TPH-d	TPH-o
5/26/21	147 J	83.3 U
10/25/21	All ND	
11/1/22	66.7 U	97.8 J

MW-23		
Date	TPH-d	TPH-o
5/26/21	All ND	
10/25/21	All ND	
11/3/22	All ND	

MW-12		
Date	TPH-d	TPH-o
5/27/21	601	448
10/25/21	273	652
11/2/22	66.7 U	736

MW-03		
Date	TPH-d	TPH-o
5/27/21	12,100 J	3,500 J
10/25/21	6,910	1,740
11/3/22	5,860	1,410

MW-21		
Date	TPH-d	TPH-o
5/26/21	All ND	
10/25/21	All ND	
11/2/22	All ND	

MW-14		
Date	TPH-d	TPH-o
5/25/21	All ND	
10/25/21	All ND	
11/3/22	All ND	

MW-22		
Date	TPH-d	TPH-o
5/26/21	All ND	
10/25/21	All ND	
11/2/22	All ND	

MW-11		
Date	TPH-d	TPH-o
5/25/21	765 J	428 J
10/25/21	499	230 J
11/2/22	200 J	84.6 J

MW-02		
Date	TPH-d	TPH-o
5/25/21	1,250	901
10/26/21	630	460
11/3/22	2,850	8,560

MW-16		
Date	TPH-d	TPH-o
5/25/21	All ND	
10/25/21	All ND	
11/2/22	66.7 U	207 J

MW-07		
Date	TPH-d	TPH-o
5/25/21	66.7 U	103 J
10/25/21	All ND	
11/2/22	All ND	

MW-10		
Date	TPH-d	TPH-o
5/25/21	All ND	
10/25/21	NS	
10/31/22	NS	

MW-04		
Date	TPH-d	TPH-o
5/25/21	All ND	
10/25/21	NS	
10/31/22	NS	

MW-08		
Date	TPH-d	TPH-o
5/26/21	All ND	
10/25/21	NS	
10/31/22	NS	

MW-15		
Date	TPH-d	TPH-o
5/25/21	All ND	
10/25/21	All ND	
11/2/22	All ND	

MW-06		
Date	TPH-d	TPH-o
5/24/21	66.7 U	120 J
10/25/21	All ND	
11/2/22	224	519

Explanation

- Complaince Monitoring Well
- Compliance Monitoring Well with IHS Detected Above Cleanup Level
- Tidewater Monitoring Well

Previous Spill
(Size of circle indicates volume released)

- Diesel
- Gasoline
- Jet Fuel
- BNSF Railroad
- BNSF Right of Way
- Site Boundary
- Tidewater Site Boundary

Areas of Concern

- North Area
- Northern Tank Area
- Southern Tank Area

All units in micrograms per liter (µg/L)
= IHS detection above the cleanup level
Bold Text = IHS detection above the minimum detection limit
All ND = All Non-Detect
IHS = Indicator Hazardous Substance
J = Estimated concentration
NS = Not Sampled
TPH-d = Diesel-range hydrocarbons
TPH-o = Motor oil-range hydrocarbons
U = Analyte not detected above the limit shown

Cleanup Levels (see Table 1)	
TPH-d	TPH-o
500	*500*

Imagery Source: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

K:\Tesoro_Pasco\MXD\2023_EDR\Fig 3 223A2 GW Data Summary Map.mxd

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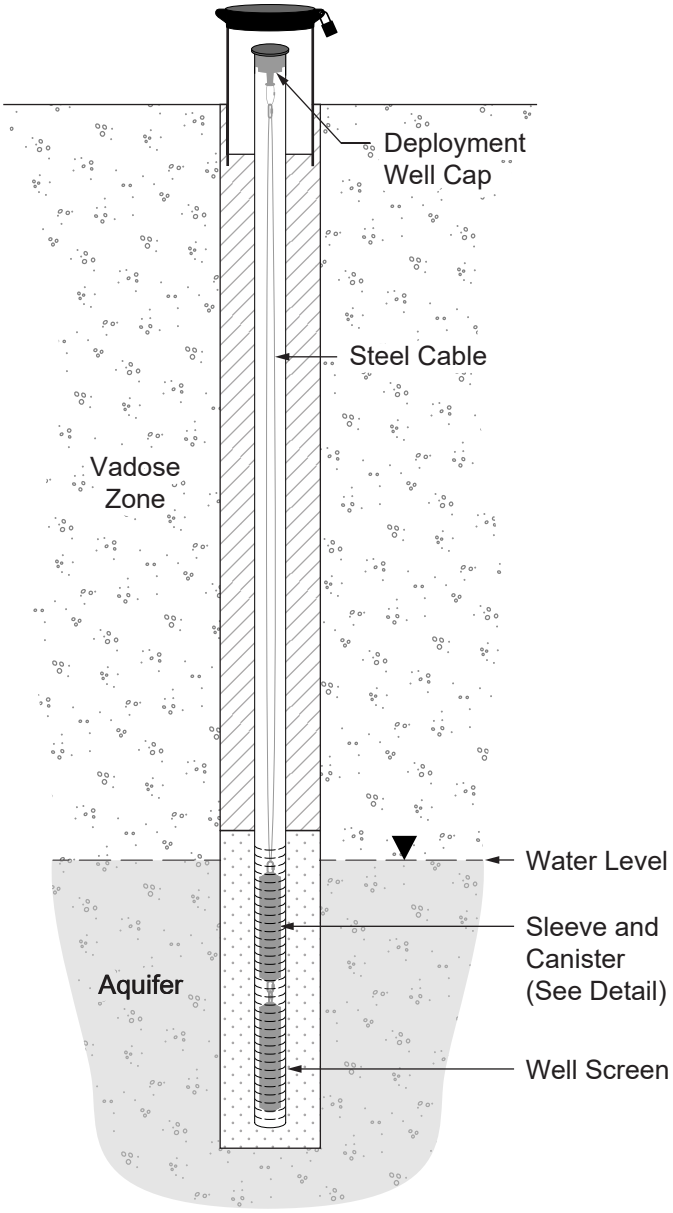
GROUNDWATER ANALYTICAL DATA SUMMARY MAP

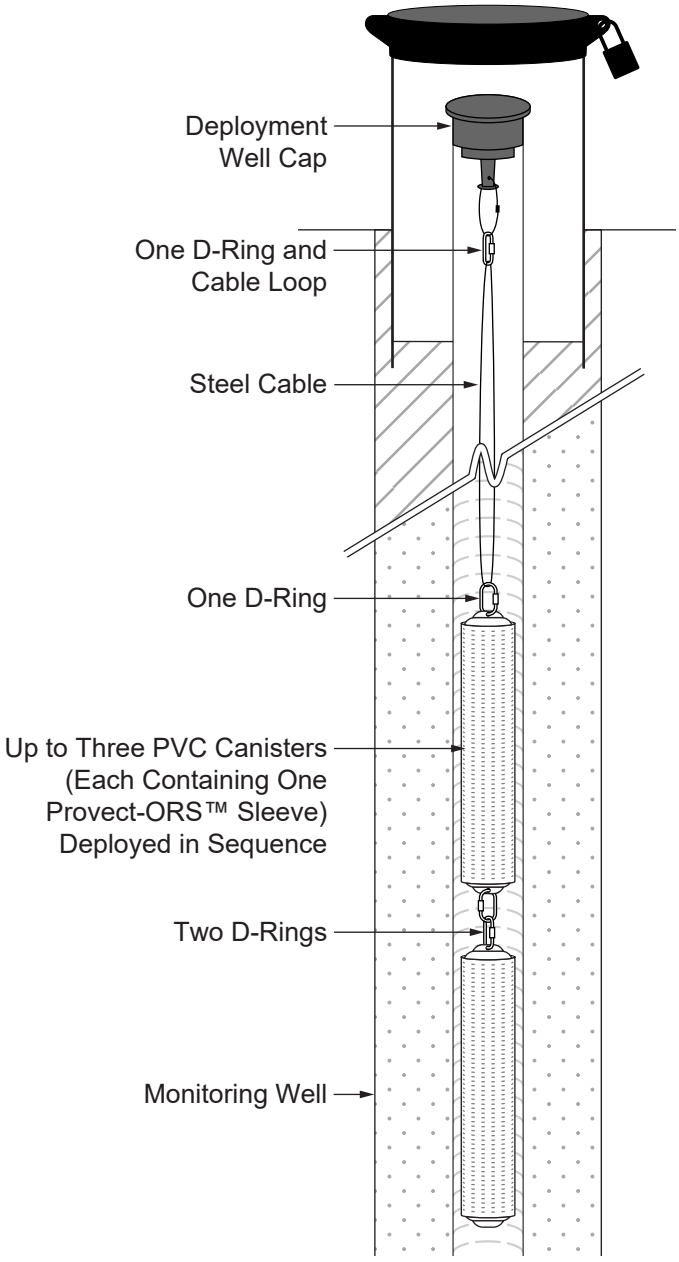
TESORO LOGISTICS OPERATIONS, LLC
CHEVRON PIPE LINE COMPANY PASCO BULK TERMINAL
PASCO, WASHINGTON

FIGURE 3

Monitoring Well



Sleeve and Canister Detail



Not to Scale

ORC SLEEVE INSTALLATION SCHEMATIC

TESORO LOGISTICS OPERATIONS, LLC
CHEVRON PIPE LINE COMPANY PASCO BULK TERMINAL
60722666 PASCO, WASHINGTON

FIGURE 4

Tables

Table 2. Groundwater Elevations and Analytical Results for Contaminants of Concern
Chevron Pipe Line Company Bulk Terminal
Pasco, Washington

Well ID	Sample Date	Depth to GW	TOC Elevation	GW Elevation	Indicator Hazardous Substances							
					TPH-g	TPH-d	TPH-o	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene
***Cleanup Levels** (see Table 4 in Section 3.2.1):*					*800/1,000*	*500*	*500*	*5*	*1,000*	*700*	*1,000*	*160*
Units:		*ft btoc*	*ft NAVD29 (1)*		*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*
Tidewater Wells												
AR-11	6/25/19	78.84	422.62	343.78	--	--	--	--	--	--	--	--
	12/9/19	78.96	422.62	343.66	--	--	--	--	--	--	--	--
	6/22/20	78.63	422.62	343.99	--	--	--	--	--	--	--	--
	12/15/20	79.01	422.62	343.61	--	--	--	--	--	--	--	--
	5/24/21	78.98	422.62	343.64	--	--	--	--	--	--	--	--
	10/25/21	79.62	422.62	343.00	--	--	--	--	--	--	--	--
	10/31/22	79.18	422.62	343.44	--	--	--	--	--	--	--	--
TMW-05	6/25/19	81.29	425.02	343.73	--	--	--	--	--	--	--	--
	12/9/19	81.40	425.02	343.62	--	--	--	--	--	--	--	--
	6/22/20	81.07	425.02	343.95	--	--	--	--	--	--	--	--
	12/15/20	81.46	425.02	343.56	--	--	--	--	--	--	--	--
	5/24/21	81.41	425.02	343.61	--	--	--	--	--	--	--	--
	10/25/21	82.06	425.02	342.96	--	--	--	--	--	--	--	--
	10/31/22	81.63	425.02	343.39	--	--	--	--	--	--	--	--
Site Wells												
MW-02	5/29/14	72.83	417.28	344.45	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	10/29/14	74.03	417.28	343.25	250 U	250 U	500 U	0.50 U	**0.68**	0.50 U	0.50 U	0.50 U
	6/4/15	73.31	417.28	343.97	250 U	**140**	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	9/28/15	74.42	417.28	342.86	250 U	100 U	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	8/29/16	74.52	417.28	342.76	50 U	**1,400**	**710**	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	12/5/16	74.02	417.28	343.26	50 U	**410**	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	5/17/17	72.86	417.28	344.42	--	--	--	--	--	--	--	--
	10/24/17	74.12	417.28	343.16	250 U	**580**	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	6/14/18	72.89	417.28	344.39	250 U	**450**	**480**	3.0 U	2.0 U	3.0 U	3.0 U	4.0 U
	12/2/18	73.93	417.23	343.30	100 U	**1,300**	**1,800**	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/26/19	73.49	417.23	343.74	100 U	**1,500**	**1,200**	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/11/19	73.75	417.23	343.48	100 U	**1,600**	**1,100**	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/24/20	73.38	417.23	343.85	100 U	**1,200**	**930**	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/15/20	73.71	417.23	343.52	100 U	**460**	120 U	0.24 U	0.39 U	0.50 U	3.0 U	4.0 U
	5/25/21	73.69	417.23	343.54	31.6 U	**1,250**	**901**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/26/21	74.38	417.23	342.85	100 U	**630**	**460**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/3/22	73.98	417.23	343.25	100 U	**2,850**	**8,560**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
MW-03	5/28/14	78.85	423.42	344.57	250 U	**1,100**	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	10/30/14	80.18	423.42	343.24	**620**	**18,000**	500 U	0.50 U	**1.4**	0.50 U	0.50 U	0.50 U
	6/4/15	79.46	423.42	343.96	250 U	**3,300**	250 U	0.50 U	0.50 U	0.50 U	1.0 U	**0.51**
	9/29/15	80.58	423.42	342.84	**733**	**3,300**	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	8/30/16	80.60	423.42	342.82	**1,400**	**11,000**	**1,100**	2.0 U	2.0 U	3.0 U	3.0 U	**2.5**
	12/6/16	80.17	423.42	343.25	**290**	**6,600**	**290**	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	5/16/17	79.04	423.42	344.38	500 U	**2,600**	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	10/25/17	80.23	423.42	343.19	**380**	**5,700**	**410**	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	6/14/18	79.20	423.42	344.22	250 U	**4,700**	**860**	3.0 U	2.0 U	3.0 U	3.0 U	4.0 U
	12/4/18	80.00	423.40	343.40	**180 J**	**8,800**	**2,000**	0.53 U	0.39 U	0.50 U	**3.0 U**	0.93 U
	6/26/19	79.64	423.40	343.76	**300**	**8,600**	**1,900**	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/11/19	79.93	423.40	343.47	**230 J**	**2,700 J**	**830 J**	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/24/20	79.57	423.40	343.83	**200 J**	**4,400**	**920**	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/16/20	79.92	423.40	343.48	**150 J**	**2,200**	**210 J**	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	5/27/21	79.86	423.40	343.54	632 U	**12,100 J**	**3,500 J**	0.471 U	1.39 U	0.685 U	0.870 U	5.00 UJ
	10/25/21	80.49	423.40	342.91	**213**	**6,910**	**1,740**	0.471 U	1.39 U	0.685 U	**1.30 J**	5.00 U
	11/3/22	80.16	423.40	343.24	**117 J**	**5,860**	**1,410**	0.094 U	0.278 U	0.137 U	0.174 U	1.00 U

Table 2. Groundwater Elevations and Analytical Results for Contaminants of Concern
Chevron Pipe Line Company Bulk Terminal
Pasco, Washington

Well ID	Sample Date	Depth to GW	TOC Elevation	GW Elevation	Indicator Hazardous Substances							
					TPH-g	TPH-d	TPH-o	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene
Cleanup Levels *(see Table 4 in Section 3.2.1):*					*800/1,000*	*500*	*500*	*5*	*1,000*	*700*	*1,000*	*160*
	Units:	*ft btoc*	*ft NAVD29 (1)*		*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*
MW-04	5/28/14	67.98	412.09	344.11	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	10/28/14	69.17	412.09	342.92	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	6/3/15	68.48	412.09	343.61	250 U	100 U	250 U	0.50 U	**0.52**	0.5 U	1.0 U	0.50 U
	9/28/15	69.52	412.09	342.57	--	--	--	--	--	--	--	--
	8/30/16	69.66	412.09	342.43	50 U	110 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	12/5/16	--	412.09	--	--	--	--	--	--	--	--	--
	5/15/17	68.02	412.09	344.07	500 U	100 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	6/13/18	68.15	412.05	343.90	250 U	110 U	350 U	3.0 U	2.0 U	3.0 U	3.0 U	4.0 U
	6/26/19	68.68	412.05	343.37	100 U	69 U	100 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/9/19	68.98	412.05	343.07	--	--	--	--	--	--	--	--
	6/23/20	68.62	412.05	343.43	100 U	69 U	100 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/14/20	68.90	412.05	343.15	--	--	--	--	--	--	--	--
	5/25/21	68.84	412.05	343.21	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	69.47	412.05	342.58	--	--	--	--	--	--	--	--
	10/31/22	69.11	412.05	342.94	--	--	--	--	--	--	--	--
MW-06	5/29/14	15.57	358.61	343.04	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	10/29/14	16.82	358.61	341.79	250 U	250 U	500 U	0.50 U	**4.9**	0.50 U	0.50 U	0.50 U
	6/3/15	16.18	358.61	342.43	250 U	100 U	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	9/28/15	17.15	358.61	341.46	250 U	100 U	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	8/30/16	17.15	358.61	341.46	50 U	110 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	12/5/16	16.91	358.61	341.70	50 U	110 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	5/16/17	15.88	358.61	342.73	500 U	100 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	10/23/17	17.01	358.61	341.60	250 U	100 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	6/11/18	15.73	358.61	342.88	250 U	**180**	**460**	3.0 U	2.0 U	3.0 U	3.0 U	4.0 U
	12/2/18	16.95	358.52	341.57	100 U	**71 J**	350 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/26/19	16.48	358.52	342.04	100 U	71 U	110 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/10/19	16.97	358.52	341.55	100 U	62 U	92 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/23/20	16.31	358.52	342.21	100 U	69 U	100 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/16/20	16.61	358.52	341.91	100 U	110 U	120 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	5/24/21	16.44	358.52	342.08	31.6 U	66.7 U	**120 J**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	16.99	358.52	341.53	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/2/22	16.75	358.52	341.77	100 U	**224**	**519**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
MW-07	5/28/14	67.02	411.40	344.38	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	10/29/14	68.23	411.40	343.17	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	6/3/15	67.48	411.40	343.92	250 U	100 U	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	9/28/15	68.61	411.40	342.79	250 U	100 U	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	8/30/16	68.74	411.40	342.66	50 U	110 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	12/5/16	68.18	411.40	343.22	50 U	110 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	5/15/17	67.02	411.40	344.38	500 U	100 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	10/24/17	68.22	411.40	343.18	250 U	100 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	6/13/18	67.16	411.40	344.24	250 U	110 U	350 U	3.0 U	2.0 U	3.0 U	3.0 U	4.0 U
	12/4/18	68.03	411.32	343.29	100 U	**86 J**	97 U	0.53 U	0.39 U	**0.60 J**	3.0 U	0.93 U
	6/26/19	67.68	411.32	343.64	100 U	**110**	98 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/11/19	67.58	411.32	343.74	100 U	**67 J**	99 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/23/20	67.57	411.32	343.75	100 U	66 U	98 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/14/20	67.87	411.32	343.45	100 U	110 U	120 U	0.24 U	0.39 U	0.50 U	3.0 U	4.0 U
	5/25/21	67.82	411.32	343.50	31.6 U	66.7 U	**103 J**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	68.47	411.32	342.85	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/2/22	68.12	411.32	343.20	100 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U

Table 2. Groundwater Elevations and Analytical Results for Contaminants of Concern
Chevron Pipe Line Company Bulk Terminal
Pasco, Washington

Well ID	Sample Date	Depth to GW	TOC Elevation	GW Elevation	Indicator Hazardous Substances							
					TPH-g	TPH-d	TPH-o	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene
***Cleanup Levels** (see Table 4 in Section 3.2.1):*					*800/1,000*	*500*	*500*	*5*	*1,000*	*700*	*1,000*	*160*
	Units:	*ft btoc*	*ft NAVD29 (1)*		*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*
MW-08	5/28/14	39.56	383.91	344.35	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	10/29/14	40.78	383.91	343.13	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	6/3/15	40.04	383.91	343.87	250 U	100 U	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	9/28/15	41.13	383.91	342.78	--	--	--	--	--	--	--	--
	8/30/16	40.30	383.91	343.61	50 U	110 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	12/5/16	--	383.91	--	--	--	--	--	--	--	--	--
	5/17/17	39.56	383.91	344.35	500 U	100 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	6/11/18	39.65	383.76	344.11	250 U	110 U	350 U	3.0 U	2.0 U	3.0 U	3.0 U	4.0 U
	6/26/19	40.26	383.76	343.50	100 U	71 U	100 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/9/19	40.48	383.76	343.28	--	--	--	--	--	--	--	--
	6/23/20	40.14	383.76	343.62	100 U	68 U	100 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/14/20	40.44	383.76	343.32	--	--	--	--	--	--	--	--
	5/26/21	40.38	383.76	343.38	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	41.03	383.76	342.73	--	--	--	--	--	--	--	--
	10/31/22	46.71	383.76	337.05	--	--	--	--	--	--	--	--
MW-10	5/28/14	63.46	407.91	344.45	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	10/29/14	64.68	407.91	343.23	250 U	250 U	500 U	0.50 U	**1.1**	0.50 U	0.50 U	0.50 U
	6/3/15	63.91	407.91	344.00	250 U	100 U	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	9/28/15	65.02	407.91	342.89	--	--	--	--	--	--	--	--
	8/30/16	65.22	407.91	342.69	50 U	110 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	12/5/16	--	407.91	--	--	--	--	--	--	--	--	--
	5/15/17	63.50	407.91	344.41	500 U	100 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	6/13/18	63.58	407.83	344.25	250 U	110 U	350 U	3.0 U	2.0 U	3.0 U	3.0 U	4.0 U
	6/26/19	64.15	407.83	343.68	100 U	**88 J**	**110 J**	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/9/19	64.37	407.83	343.46	--	--	--	--	--	--	--	--
	6/23/20	64.03	407.83	343.80	100 U	66 U	98 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/14/20	64.36	407.83	343.47	--	--	--	--	--	--	--	--
	5/25/21	64.30	407.83	343.53	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	64.94	407.83	342.89	--	--	--	--	--	--	--	--
	10/31/22	64.60	407.83	343.23	--	--	--	--	--	--	--	--
MW-11	5/29/14	79.19	423.48	344.29	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	10/30/14	80.31	423.48	343.17	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	6/4/15	79.55	423.48	343.93	250 U	100 U	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	9/29/15	80.67	423.48	342.81	250 U	100 U	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	8/29/16	80.42	423.48	343.06	50 U	**520**	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	12/5/16	80.29	423.48	343.19	50 U	**360**	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	5/16/17	79.15	423.48	344.33	500 U	**390**	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	10/25/17	80.31	423.48	343.17	250 U	**360**	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	6/14/18	79.30	423.48	344.18	250 U	**160**	350 U	3.0 U	2.0 U	3.0 U	3.0 U	4.0 U
	12/2/18	80.14	423.44	343.30	100 U	**500**	**570 J**	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/27/19	79.79	423.44	343.65	100 U	**400**	**320 J**	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/11/19	80.01	423.44	343.43	100 U	**130**	91 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/24/20	79.66	423.44	343.78	100 U	**3,900**	**2,300**	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/15/20	79.95	423.44	343.49	100 U	**210 J**	130 U	0.24 U	0.39 U	0.50 U	3.0 U	4.0 U
	5/25/21	79.95	423.44	343.49	31.6 U	**765 J**	**428 J**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	80.62	423.44	342.82	31.6 U	**499**	**230 J**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/2/22	80.21	423.44	343.23	100 U	**200 J**	**84.6 J**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U

Table 2. Groundwater Elevations and Analytical Results for Contaminants of Concern
Chevron Pipe Line Company Bulk Terminal
Pasco, Washington

Well ID	Sample Date	Depth to GW	TOC Elevation	GW Elevation	Indicator Hazardous Substances							
					TPH-g	TPH-d	TPH-o	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene
***Cleanup Levels** (see Table 4 in Section 3.2.1):*					*800/1,000*	*500*	*500*	*5*	*1,000*	*700*	*1,000*	*160*
	Units:	*ft btoc*	*ft NAVD29 (1)*		*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*
MW-12	5/29/14	79.26	423.65	344.39	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	10/30/14	80.45	423.65	343.20	250 U	250 U	500 U	0.50 U	**0.66**	0.50 U	0.50 U	0.50 U
	6/4/15	79.72	423.65	343.93	250 U	100 U	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	9/29/15	80.83	423.65	342.82	250 U	100 U	250 U	0.50 U	0.50 U	0.50 U	1.0 U	0.50 U
	12/6/16	80.48	423.65	343.17	50 U	110 U	250 U	**6.0**	2.0 U	3.0 U	3.0 U	2.0 U
	5/16/17	79.30	423.65	344.35	500 U	100 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	10/24/17	80.45	423.65	343.20	250 U	**160**	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	6/14/18	79.30	423.65	344.35	250 U	**160**	350 U	3.0 U	2.0 U	3.0 U	3.0 U	4.0 U
	12/3/18	80.22	423.62	343.40	100 U	**270**	**240 J**	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/27/19	79.97	423.62	343.65	100 U	**270**	**300 J**	**0.63 J**	0.39 U	0.50 U	0.75 U	0.93 U
	12/11/19	80.20	423.62	343.42	100 U	**170**	91 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/24/20	79.85	423.62	343.77	100 U	**450**	**330 J**	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/16/20	80.14	423.62	343.48	100 U	110 U	120 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	5/27/21	80.06	423.62	343.56	31.6 U	**601**	**448**	1.00 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	80.79	423.62	342.83	31.6 U	**273**	**652**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/2/22	80.37	423.62	343.25	100 U	66.7 U	**736**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
MW-14	5/29/14	77.58	421.97	344.39	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	10/29/14	78.80	421.97	343.17	250 U	250 U	500 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	6/4/15	78.04	421.97	343.93	250 U	100 U	250 U	0.50 U	**0.72**	0.50 U	1.0 U	0.50 U
	9/28/15	79.18	421.97	342.79	250 U	100 U	250 U	0.50 U	**0.72**	0.50 U	1.0 U	0.50 U
	8/29/16	79.32	421.97	342.65	50 U	**120**	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	12/5/16	78.75	421.97	343.22	50 U	110 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	5/17/17	77.55	421.97	344.42	500 U	100 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	10/24/17	78.78	421.97	343.19	250 U	100 U	250 U	2.0 U	2.0 U	3.0 U	3.0 U	2.0 U
	6/13/18	77.74	421.97	344.23	250 U	**110**	350 U	3.0 U	2.0 U	3.0 U	3.0 U	4.0 U
	12/2/18	78.53	421.84	343.31	100 U	**170**	350 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/27/19	78.28	421.84	343.56	100 U	**80 J**	**120 J**	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/11/19	78.52	421.84	343.32	100 U	67 U	99 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/24/20	78.16	421.84	343.68	100 U	73 U	110 U	0.24 U	0.39 U	0.50 U	0.39 U	**1.0 J**
	12/15/20	78.46	421.84	343.38	100 U	110 U	120 U	0.24 U	0.39 U	0.50 U	3.0 U	4.0 U
	5/25/21	78.43	421.84	343.41	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	79.20	421.84	342.64	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/3/22	78.73	421.84	343.11	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
MW-15	12/3/18	16.69	358.50	341.81	100 U	**70 J**	97 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/26/19	16.41	358.50	342.09	100 U	66 U	98 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/10/19	16.78	358.50	341.72	100 U	64 U	95 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/23/20	16.17	358.50	342.33	100 U	68 U	**110 J**	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/14/20	16.43	358.50	342.07	100 U	110 U	120 U	0.24 U	0.39 U	0.50 U	3.0 U	4.0 U
	5/25/21	16.34	358.50	342.16	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	16.90	358.50	341.60	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/2/22	16.63	358.50	341.87	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
MW-16	12/3/18	27.95	370.92	342.97	100 U	**82 J**	96 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/26/19	27.60	370.92	343.32	100 U	**77 J**	100 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/10/19	27.79	370.92	343.13	100 U	62 U	91 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/22/20	27.41	370.92	343.51	100 U	71 U	100 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/16/20	27.69	370.92	343.23	100 U	120 U	130 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	5/25/21	27.68	370.92	343.24	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	28.32	370.92	342.60	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/2/22	27.92	370.92	343.00	100 U	66.7 U	**207 J**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U

Table 2. Groundwater Elevations and Analytical Results for Contaminants of Concern
Chevron Pipe Line Company Bulk Terminal
Pasco, Washington

Well ID	Sample Date	Depth to GW	TOC Elevation	GW Elevation	Indicator Hazardous Substances							
					TPH-g	TPH-d	TPH-o	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene
***Cleanup Levels** (see Table 4 in Section 3.2.1):*					*800/1,000*	*500*	*500*	*5*	*1,000*	*700*	*1,000*	*160*
	Units:	*ft btoc*	*ft NAVD29 (1)*		*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*
MW-17	12/3/18	81.00	424.28	343.28	**180 J**	**880**	**850**	**2.9 J**	**1.9 J**	**8.6 J**	**38 J**	**4.7 J**
	6/27/19	80.62	424.28	343.66	100 U	**530**	**640**	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/11/19	81.84	424.28	342.44	100 U	**960**	**800**	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/24/20	80.48	424.28	343.80	100 U	**750**	**420**	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/15/20	80.80	424.28	343.48	100 U	**350**	120 U	0.24 U	0.39 U	0.50 U	3.0 U	4.0 U
	5/25/21	80.78	424.28	343.50	31.6 U	**486**	**358**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	81.50	424.28	342.78	31.6 U	**855**	**674**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/3/22	81.04	424.28	343.24	100 U	**903**	**503**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
MW-18	12/3/18	--	423.66	--	**280**	65 U	96 U	**1.4 J**	**0.83 J**	**3.2**	**15**	**1.7 J**
	6/26/19	80.01	423.69	343.68	100 U	**68 J**	100 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	12/12/19	80.12	423.69	343.57	100 U	62 U	91 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/22/20	79.81	423.69	343.88	100 U	68 U	100 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/15/20	80.11	423.69	343.58	100 U	110 U	120 U	0.24 U	0.39 U	0.50 U	3.0 U	4.0 U
	5/26/21	80.11	423.69	343.58	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	80.78	423.69	342.91	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/1/22	80.32	423.69	343.37	100 U	66.7 U	**101 J**	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
MW-19	12/3/18	80.80	424.20	343.40	**18,000 J**	**3,100**	**110 J**	**300**	**160**	**740**	**630**	**390**
	6/27/19	80.50	424.20	343.70	**3,200**	**930**	98 U	**160**	**23**	**180**	**260**	**110 J**
	12/10/19	80.72	424.20	343.48	**530**	**320**	93 U	**27**	4.1 U	**14**	**56**	**18**
	6/24/20	80.27	424.20	343.93	100 U	**110**	**110 J**	**6.0**	0.39 U	**0.57 J**	**2.9 J**	**4.6 J**
	12/16/20	80.65	424.20	343.55	100 U	110 U	120 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	5/26/21	80.61	424.20	343.59	**51.2 J**	**147 J**	83.3 U	1.00 U	0.278 U	0.137 U	3.00 U	**1.56 J**
	10/25/21	81.31	424.20	342.89	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/1/22	80.92	424.20	343.28	100 U	66.7 U	**97.8 J**	0.0941 U	0.278 U	0.137 U	0.17 U	1.00 U
MW-20	12/12/19	82.84	426.52	343.68	100 U	**77 J**	99 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/22/20	82.68	426.52	343.84	100 U	70 U	100 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/16/20	82.93	426.52	343.59	100 U	120 U	130 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	5/26/21	82.94	426.52	343.58	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	83.60	426.52	342.92	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/1/22	83.26	426.52	343.26	100 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
MW-21	12/12/19	82.65	426.16	343.51	100 U	67 U	99 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/22/20	82.42	426.16	343.74	100 U	72 U	**110 J**	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/15/20	82.70	426.16	343.46	100 U	120 U	130 U	0.24 U	0.39 U	0.50 U	3.0 U	0.93 U
	5/26/21	82.66	426.16	343.50	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	83.33	426.16	342.83	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/2/22	83.07	426.16	343.09	100 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
MW-22	12/11/19	77.00	420.45	343.45	100 U	64 U	94 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/23/20	76.76	420.45	343.69	100 U	66 U	97 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/15/20	77.04	420.45	343.41	100 U	120 U	130 U	0.24 U	0.39 U	0.50 U	3.0 U	0.93 U
	5/26/21	77.00	420.45	343.45	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	77.64	420.45	342.81	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/2/22	77.29	420.45	343.16	100 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U

Table 2. Groundwater Elevations and Analytical Results for Contaminants of Concern
Chevron Pipe Line Company Bulk Terminal
Pasco, Washington

Well ID	Sample Date	Depth to GW	TOC Elevation	GW Elevation	Indicator Hazardous Substances							
					TPH-g	TPH-d	TPH-o	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene
***Cleanup Levels** (see Table 4 in Section 3.2.1):*					*800/1,000*	*500*	*500*	*5*	*1,000*	*700*	*1,000*	*160*
Units:		*ft btoc*	*ft NAVD29 (1)*		*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*
MW-23	12/11/19	78.30	421.74	343.44	100 U	61 U	90 U	0.53 U	0.39 U	0.50 U	0.75 U	0.93 U
	6/23/20	77.94	421.74	343.80	100 U	71 U	100 U	0.24 U	0.39 U	0.50 U	0.39 U	0.93 U
	12/15/20	78.26	421.74	343.48	100 U	110 U	120 U	0.24 U	0.39 U	0.50 U	3.0 U	4.0 U
	5/26/21	78.30	421.74	343.44	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 UJ
	10/25/21	78.93	421.74	342.81	31.6 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U
	11/3/22	78.53	421.74	343.21	100 U	66.7 U	83.3 U	0.0941 U	0.278 U	0.137 U	0.174 U	1.00 U

Notes:
Values in **bold** were reported as detected
= Yellow shaded detections exceed the Cleanup Level
= Grey shaded values are limits that exceed the Cleanup Level
-- = Well Not Sampled (for one of these reasons: insufficient water in well, inaccessibility, or date was between sampling events); not submitted for this analyte; not gauged; or not calculated.
(1) On February 7, 2019, the wells were resurveyed by Stratton Surveying and Mapping, P.C. MW-20 through MW-23 were surveyed on December 10, 2019. Horizontal datum = Washington State Plane South Zone North American Datum 1983(1991). Vertical datum = North American Vertical Datum 29.

Acronyms:
µg/L = microgram per liter
btoc = below top of casing
ft = feet
GW = groundwater
J = estimated concentration
mg/L = milligram per liter
NAVD29 = North American Vertical Datum of 1929
ND = not detected
NE = not established
TOC = top of casing
TPH = total petroleum hydrocarbon
TPH-g = gasoline range hydrocarbons (as analyzed by Northwest Method NWPTH-Gx)
TPH-d = diesel range hydrocarbons (as analyzed by Northwest Method NWTPH-Dx)
TPH-o = motor oil range hydrocarbons (as analyzed by Northwest Method NWTPH-Dx)
U = analyte not detected above limit shown. Starting with data collected since September 2018, the limit shown is the method detection limit.
UJ = analyte not detected above laboratory report limit; reporting limit estimated.

Table 3. Monitored Natural Attenuation Parameter Results
Chevron Pipe Line Company Pasco Bulk Terminal
Pasco, Washington

Well ID	Sample Date	Field Parameters								Laboratory Analytical			
		pH	Conductivity	Dissolved Oxygen	Temperature	ORP	Turbidity	Ferrous Iron	Nitrate	Sulfate	Alkalinity	Manganese (Dissolved)	Methane
	Units:	*su*	*µS/cm*	*mg/L*	*°C*	*mV*	*NTU*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*
MW-02	5/29/14	7.16	1,215	2.49	17.58	146.3	--	**1.16**	**13.8**	**100**	**537**	0.0050 U	0.0010 U
	10/29/14	6.85	1,578	1.07	17.51	91.6	--	**1.33**	**2.6**	**140**	**730**	**0.011**	0.0010 U
	6/4/15	6.84	1,018	2.21	17.97	-66.6	--	**0.53**	0.3 U	**107**	**558**	0.0050 U	0.0010 U
	9/28/15	6.91	1,467	1.77	17.60	-7.0	--	--	**1.7**	**167**	**711**	0.0050 U	**0.0242**
	8/29/16	7.38	1,400	1.74	19.89	94	--	--	--	**110**	--	0.020 U	0.0050 U
	12/5/16	6.63	1,050	6.16	15.80	282	--	--	--	**89**	**400**	--	0.0050 U
	10/24/17	7.34	1,270	8.93	17.58	112	--	0.02 U	**9.70**	**110**	**350**	0.020 U	**0.0083**
	6/14/18	6.84	1,160	3.40	22.39	178	--	**0.96**	**11.0**	**110**	**400**	0.020 U	0.0050 U
	12/2/18	7.54	1,680	4.81	13.55	206	--	**0.15**	**10.8**	**92**	**680**	0.0017 U	**0.022**
	6/26/19	6.93	1,400	IE	17.80	115	--	**0.12**	**17.9**	**120**	**560**	**0.0066 J**	**0.0017** U
	12/11/19	7.00	1,540	1.55	13.57	120	2.5	0.02 U	**16.8**	**110**	**530**	0.0017 U	0.0050 U
	6/24/20	6.91	1,420	2.27	29.34	97	0.0	**0.02**	**12.7**	**110**	**560**	0.0017 U	0.0050 U
	12/15/20	7.72	1,319	2.37	15.25	109.4	74.9	**0.82**	**5.4**	**100**	**540**	**0.0022 J**	0.0050 U
	5/25/21	7.45	1,450	3.05	21.30	87	0.0	**0.02**	**11.4**	**97.9**	**692**	**0.0018 J**	0.00291 U
	10/26/21	7.31	1,180	0.00	17.79	133	3.0	0.02 U	**3.3**	**98.6**	**430**	0.000855 U	0.00291 U
	11/3/22	8.22	1,380	0.18	15.60	74	0.0	0.02 U	**>30.0**	**97.9**	**509**	**0.00190 J**	0.00291 U
MW-03	5/28/14	7.15	1,053	--	18.12	-105.6	--	--	--	--	--	--	--
	10/30/14	6.91	1,136	0.84	17.28	-144.7	--	--	--	--	--	--	--
	6/4/15	6.82	1,353	0.95	18.61	-154.0	--	--	--	--	--	--	--
	9/29/15	6.82	1,174	1.01	17.51	-174.4	--	--	--	--	--	--	--
	8/30/16	7.13	1,190	2.42	18.13	-153.0	--	--	--	--	--	--	--
	12/2/16	6.86	963	3.24	16.06	36	--	--	--	--	--	--	--
	5/16/17	7.27	996	0.82	17.01	-37	--	--	--	--	--	--	--
	10/25/17	7.41	1,200	4.01	17.58	-105	--	--	--	--	--	--	--
	6/14/18	6.70	1,030	2.75	19.46	42	--	--	--	--	--	--	--
	12/4/18	7.56	1,280	8.82	16.31	-65	--	--	--	**29**	**520**	**0.96**	**1.7**
	6/26/19	6.99	1,030	IE	18.20	-120	--	**1.71**	**2.7**	**32**	**470**	**0.80**	**2.1**
	12/11/19	7.22	1,310	0.83	14.47	-192	8.1	**1.28**	**1.3**	**63**	**450 J**	**0.81**	**0.50**
	6/24/20	7.02	1,220	0.96	22.25	-100	0.0	**1.90**	**1.9**	**61**	**450**	**0.66**	**0.063**
	12/16/20	7.60	1,274	1.30	16.10	-94.2	769	**1.11**	0.3 U	**49**	**500**	**0.77**	**1.1**
	5/27/21	7.09	1,410	0.00	17.02	-93	0.0	**1.27**	**1.5**	**37.7**	**557**	**0.719**	**1.92**
	10/25/21	7.07	1,350	1.05	16.79	-88	14.9	**2.72**	**2.9**	**27.5**	**648**	**0.862**	**2.74**
	11/2/22	7.20	1,190	0.00	15.67	-98	2.1	**2.79**	**0.7**	**45.2**	**544**	**0.697**	**0.869**
MW-04	5/28/14	7.68	728	--	17.78	82.2	--	--	--	--	--	--	--
	10/28/14	7.38	741	7.75	16.90	36.0	--	--	--	--	--	--	--
	6/3/15	7.40	751	8.28	17.76	-23.6	--	--	--	--	--	--	--
	9/28/15	--	--	--	--	--	--	--	--	--	--	--	--
	8/30/16	8.36	813	7.34	18.32	59	--	--	--	--	--	--	--
	12/5/16	--	--	--	--	--	--	--	--	--	--	--	--
	5/15/17	7.99	861	7.78	17.9	-27	--	--	--	--	--	--	--
	6/13/18	7.49	813	7.56	20.99	161	--	--	--	--	--	--	--
	6/26/19	7.40	962	6.62	19.15	150	0.0	--	--	--	--	--	--
	6/23/20	7.57	1,050	9.28	19.38	84	0.00	--	--	--	--	--	**0.00099 J**
	5/25/21	7.60	1,120	7.74	17.46	165	0.00	--	--	--	--	--	--

Table 3. Monitored Natural Attenuation Parameter Results
Chevron Pipe Line Company Pasco Bulk Terminal
Pasco, Washington

Well ID	Sample Date	Field Parameters								Laboratory Analytical			
		pH	Conductivity	Dissolved Oxygen	Temperature	ORP	Turbidity	Ferrous Iron	Nitrate	Sulfate	Alkalinity	Manganese (Dissolved)	Methane
	Units:	*su*	*µS/cm*	*mg/L*	*°C*	*mV*	*NTU*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*
MW-06	5/29/14	7.93	950	8.78	15.40	127.1	--	0.02 U	**18.5**	**110**	**252**	0.0050 U	0.0010 U
	10/29/14	7.43	817	6.79	19.45	84.7	--	**0.40**	0.3 U	**100**	**185**	0.0050 U	0.0010 U
	6/3/15	7.53	744	8.59	17.18	-44.8	--	0.02 U	0.3 U	**107**	**169**	0.0050 U	**0.00168**
	9/28/15	7.53	812	6.76	19.23	-8.5	--	--	**15.7**	**108**	**189**	0.0050 U	0.0010 U
	8/30/16	8.30	836	7.39	18.88	110	--	--	--	**100**	--	0.020 U	0.0050 U
	12/5/16	6.83	851	6.84	14.54	207	--	--	--	**93**	**170**	0.020 U	0.0050 U
	5/16/17	8.06	824	7.89	14.65	66	--	--	--	**96**	**150**	0.020 U	**0.0085**
	10/23/17	7.61	863	9.32	19.68	186	--	0.02 U	0.3 U	**98**	**180**	0.020 U	0.0050 U
	6/11/18	7.38	828	8.38	20.69	156	--	0.02 U	**8.09**	**96 J**	**150**	0.020 U	0.0050 U
	12/2/18	7.98	963	7.86	18.65	241	--	0.02 U	**66.5**	**100**	**170**	**0.0021 J**	0.0017 U
	6/26/19	7.54	831	IE	17.70	121	--	0.02 U	**14.7**	**100**	**140**	0.0050 U	0.0017 U
	12/10/19	7.69	1,070	9.47	14.60	10	0.0	0.02 U	**9.2**	**110**	**160**	0.0017 U	0.0010 U
	6/23/20	7.55	1,080	9.05	19.09	103	0.0	**0.11**	**8.1**	**110**	**160**	0.0017 U	0.00050 U
	12/16/20	7.88	2,036	8.38	16.20	92	68	0.02 U	**17.4**	**110**	**150**	0.0017 U	0.00050 U
	5/24/21	7.60	1,190	5.53	20.50	102	2.0	0.02 U	**18.3**	**107**	**164**	0.000855 U	**0.0133**
	10/26/21	7.60	1,120	0.00	18.59	174	0.4	**0.47**	**7.8**	**119**	**179**	0.000855 U	0.00291 U
	11/2/22	8.40	984	7.99	17.31	105	0.0	**0.11**	**5.5**	**119**	**348**	**0.0487**	**0.0200**
MW-07	5/28/14	7.63	775	--	18.48	101.7	--	--	--	--	--	--	--
	10/29/14	7.48	773	7.43	16.81	84.1	--	--	--	--	--	--	--
	6/3/15	7.10	843	6.78	18.03	-1.8	--	--	--	--	--	--	--
	9/28/15	7.10	798	7.40	17.31	-6.4	--	--	**6.0**	**103**	**203**	**0.0086**	0.0010 U
	8/30/16	7.96	964	6.92	19.01	94	--	--	--	--	--	--	--
	12/5/16	7.06	839	7.90	15.85	165	--	--	--	--	--	--	--
	5/15/17	7.62	863	6.10	17.30	35	--	--	--	--	--	--	--
	10/24/17	7.83	918	7.73	17.67	145	--	--	--	--	--	--	--
	6/13/18	7.25	837	6.58	22.15	182	--	--	--	--	--	--	--
	12/4/18	8.02	976	8.26	13.19	173	--	--	--	--	--	--	--
	6/26/19	7.42	1,190	4.35	21.12	166	0.0	--	--	--	--	--	--
	12/11/19	7.36	1,050	5.38	14.10	107	0.8	--	--	--	--	--	--
	6/23/20	7.31	1,030	8.37	21.48	94	21.0	--	--	--	--	--	--
	12/14/20	7.66	979	8.02	15.20	132	66	--	--	--	--	--	--
	5/25/21	7.40	1,200	6.20	16.48	180	12.0	--	--	--	--	--	--
	10/27/21	7.61	1,050	0.47	17.21	186	1.7	--	--	--	--	--	--
	11/2/22	7.48	912	4.98	15.50	179	0.2	--	--	--	--	--	--
MW-08	5/28/14	7.70	755	--	17.50	89.5	--	**0.59**	**16.8**	**110**	**242**	0.0050 U	0.0010 U
	10/29/14	7.37	774	7.05	17.34	75.3	--	0.02 U	**18.4**	**100**	**190**	0.0072 U	0.0010 U
	6/3/15	7.39	778	7.38	17.90	-42.7	--	0.02 U	**16.7**	**108**	**185**	0.0050 U	0.0010 U
	9/28/15	--	--	--	--	--	--	--	--	--	--	--	--
	8/30/16	7.72	843	5.29	19.46	143	--	--	--	**100**	--	0.020 U	0.0050 U
	12/5/16	--	--	--	--	--	--	--	--	--	--	--	--
	5/17/17	7.88	869	5.68	17.96	28	--	--	--	**100**	**170**	0.020 U	0.0050 U
	6/11/18	7.28	866	7.46	19.77	175	--	0.02 U	**>30.0**	**120**	**180**	0.020 U	0.0050 U
	6/26/19	7.58	848	IE	18.29	116	--	--	--	--	--	--	--
	6/23/20	7.46	925	5.11	25.04	107	0.00	0.02 U	**15.9**	**130**	**180**	0.0017 U	**0.00062 J**
	5/26/21	7.56	1,140	7.16	17.73	153	4.9	0.02 U	**>30.0**	--	--	--	--

Table 3. Monitored Natural Attenuation Parameter Results
Chevron Pipe Line Company Pasco Bulk Terminal
Pasco, Washington

Well ID	Sample Date	Field Parameters								Laboratory Analytical			
		pH	Conductivity	Dissolved Oxygen	Temperature	ORP	Turbidity	Ferrous Iron	Nitrate	Sulfate	Alkalinity	Manganese (Dissolved)	Methane
	Units:	*su*	*µS/cm*	*mg/L*	*°C*	*mV*	*NTU*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*
MW-10	5/28/14	7.65	764	--	17.91	137.6	--	--	--	--	--	--	--
	10/29/14	7.40	769	7.45	17.02	80.6	--	--	--	--	--	--	--
	6/3/15	7.29	780	7.32	17.90	-34.4	--	--	--	--	--	--	--
	9/28/15	--	--	--	--	--	--	--	--	--	--	--	--
	8/30/16	8.28	831	5.40	18.26	100	--	--	--	--	--	--	--
	12/5/16	--	--	--	--	--	--	--	--	--	--	--	--
	5/15/17	7.39	888	6.24	17.41	29	--	--	--	--	--	--	--
	6/13/18	7.35	730	4.96	28.26	178	--	--	--	--	--	--	--
	6/26/19	7.60	1,010	6.38	18.25	155	8.0	--	--	--	--	--	--
	6/23/20	7.40	1,040	7.45	20.04	91	0.00	--	--	--	--	--	--
	5/25/21	7.71	1,040	6.67	16.54	100	0.0	--	--	--	--	--	--
MW-11	5/29/14	7.20	889	1.08	19.27	102.7	--	--	--	--	--	--	--
	10/30/14	6.96	932	1.12	18.47	89.0	--	--	--	--	--	--	--
	6/4/15	6.89	916	0.94	18.97	-49.8	--	--	--	--	--	--	--
	9/29/15	6.89	914	0.89	18.40	-15.4	--	--	--	--	--	--	--
	8/29/16	7.32	952	2.67	19.99	148	--	--	--	--	--	--	--
	12/5/16	6.70	933	1.73	17.14	204	--	--	--	--	--	--	--
	5/16/17	7.44	949	4.79	17.41	46	--	--	--	--	--	--	--
	10/25/17	7.37	1,040	7.49	18.57	154	--	--	--	--	--	--	--
	6/14/18	6.71	956	3.35	21.77	198	--	--	--	--	--	--	--
	12/2/18	7.48	1,140	5.47	15.49	231	--	--	--	--	--	--	--
	6/27/19	6.98	1,290	1.70	17.37	213	0.0	--	--	--	--	--	--
	12/11/19	7.21	1,100	2.97	15.90	34	1	--	--	--	--	--	--
	6/24/20	6.95	1,380	0.00	20.84	83	0	--	--	--	--	--	--
	12/15/20	7.43	1,154	2.73	15.93	133.1	78.3	--	--	--	--	--	--
	5/25/21	7.23	1,120	1.77	18.78	122	0.0	--	--	--	--	--	--
	10/27/21	7.13	1,070	0.00	17.33	189	4.8	--	--	--	--	--	--
	11/2/22	6.94	952	0.43	16.08	167	1.3	--	--	--	--	--	--
MW-12	5/29/14	7.22	993	1.81	19.82	-27.5	--	--	**9.2**	**110**	**309**	**0.270**	**0.0142**
	10/30/14	6.82	1,135	2.55	16.73	-50.6	--	**4.68**	0.3 U	**110**	**350**	**0.280**	**0.0870**
	6/4/15	6.82	1,017	2.17	18.40	-74.5	--	**0.34**	**10.4**	**113**	**312**	**0.201**	0.0010 U
	9/29/15	6.82	1,124	1.15	16.49	-63.7	--	--	**7.0**	**107**	**367**	**0.252**	**0.0362**
	8/29/16	7.45	1,290	1.10	19.42	-10	--	--	--	**83**	--	**0.25**	**0.760**
	12/6/16	6.80	993	3.22	14.52	121	--	--	--	--	**270**	**0.19**	**0.063**
	5/16/17	7.96	965	3.93	15.97	36	--	--	--	**100**	**240**	**0.16**	**0.012**
	10/24/17	7.50	1,100	3.39	17.70	49	--	0.02 U	**10.5**	**98.0**	**270**	**0.19**	**0.090**
	6/14/18	6.57	1,120	1.95	18.69	212	--	0.02 U	**23.8**	**120**	**290**	**0.043**	0.0050 U
	12/3/18	7.57	1,360	5.67	13.71	176	--	0.02 U	**16.4**	**130**	**370**	**0.074**	0.0017 U
	6/27/19	6.97	1,110	IE	15.90	164	--	**0.09**	**4.7**	**120 J**	**340**	**0.10**	**0.026**
	12/11/19	7.29	1,300	3.22	12.59	15	0.0	0.02 U	**7.0**	**140**	**290 J**	**0.076**	**0.0015 J**
	6/24/20	6.76	1,410	0.00	22.66	114	42.0	**0.11**	**4.3**	**140**	**430**	**0.12**	**0.0064**
	12/16/20	7.59	1,273	3.16	15.10	121.4	70.8	0.02 U	**7.2**	**140**	**360**	**0.14**	**0.0037**
	5/27/21	7.44	1,440	0.19	16.49	141	0.6	**0.06**	**12.4**	**114**	**513**	0.0963	0.0386
	10/27/21	7.26	1,310	0.00	16.54	189	3.8	**0.16**	**0.5**	**123**	**365**	0.000855 U	**0.0190**
	11/2/22	7.06	1,080	1.33	14.93	196	0.0	**0.02**	**0.8**	**122**	**179**	0.000934 U	0.00291 U

Table 3. Monitored Natural Attenuation Parameter Results
Chevron Pipe Line Company Pasco Bulk Terminal
Pasco, Washington

Well ID	Sample Date	Field Parameters								Laboratory Analytical			
		pH	Conductivity	Dissolved Oxygen	Temperature	ORP	Turbidity	Ferrous Iron	Nitrate	Sulfate	Alkalinity	Manganese (Dissolved)	Methane
	Units:	*su*	*µS/cm*	*mg/L*	*°C*	*mV*	*NTU*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*
MW-14	5/29/14	7.53	795	5.70	17.69	101.4	--	--	--	--	--	--	--
	10/29/14	7.23	805	5.65	17.81	105.4	--	--	--	--	--	--	--
	6/4/15	7.39	784	6.22	17.02	-46.6	--	--	--	--	--	--	--
	8/29/16	7.71	877	5.19	18.76	120	--	--	--	--	--	--	--
	12/5/16	6.97	855	6.29	15.43	178	--	--	--	--	--	--	--
	5/17/17	7.71	923	3.02	17.44	46	--	--	--	--	--	--	--
	10/24/17	7.70	932	6.18	17.69	144	--	--	--	--	--	--	--
	12/2/18	7.87	1,010	7.32	15.75	222	--	--	--	--	--	--	--
	6/27/19	7.54	1,180	3.44	16.30	160	0.0	--	--	--	--	--	--
	12/11/19	7.21	1,020	4.27	14.38	107	0.8	--	--	--	--	--	--
	6/24/20	7.24	1,060	4.61	20.61	116	0.0	--	--	--	--	--	--
	12/15/20	7.90	1,032	7.28	16.10	111.3	75.3	--	--	--	--	--	--
	5/25/21	7.58	1,090	5.21	17.23	83	0.0	--	--	--	--	--	--
	10/26/21	7.51	1,060	0.00	17.20	184	3.0	--	--	--	--	--	--
	11/3/22	8.43	916	4.26	15.50	110	0.0	--	--	--	--	--	--
MW-15	12/3/18	8.02	950	6.16	16.03	178	--	--	--	--	--	--	--
	6/26/19	7.60	990	4.44	18.75	168	0.0	--	--	--	--	--	--
	12/10/19	7.37	1,070	4.99	12.99	63	19.8	--	--	--	--	--	--
	6/23/20	7.38	904	4.46	27.69	108	0.0	--	--	--	--	--	--
	12/14/20	7.92	1,017	6.74	15.00	92.8	73.8	--	--	--	--	--	--
	5/25/21	7.51	1,180	5.92	16.67	170	0.0	--	--	--	--	--	--
	10/25/21	7.52	1,040	0.00	19.38	171	0.2	--	--	--	--	--	--
	11/2/22	8.36	914	5.54	16.82	91	2.5	--	--	--	--	--	--
MW-16	12/3/18	8.04	949	6.37	16.40	186	--	--	--	--	--	--	--
	6/2/19	7.58	1,020	4.48	18.08	166	28.0	--	--	--	--	--	--
	12/10/19	7.62	1,010	6.11	15.28	-73	0	0.02 U	**8.4**	**120**	**190 J**	0.0017 U	**0.0029**
	6/22/20	7.18	1,040	4.09	22.10	80	0	**0.03**	**15.7**	**130**	**180**	0.0017 U	0.00050 U
	12/16/20	7.99	1,026	6.62	16.20	69.3	75.9	0.02 U	**17.1**	**130**	**190**	0.0017 U	0.00050 U
	5/25/21	7.46	1,150	4.56	18.87	151	1.2	0.02 U	**26.9**	**124**	**200**	**0.00120 J**	0.00291 U
	10/26/21	7.57	1,040	0.00	16.93	173	15.4	**0.60**	**6.8**	**126**	**206**	0.000855 U	0.00291 U
	11/2/22	8.42	911	3.62	15.07	94	3.5	**0.05**	**>30.0**	**121**	**204**	0.000934 U	0.00291 U
MW-17	12/3/18	7.46	1,770	5.47	13.77	139	--	--	--	--	--	--	--
	6/27/19	7.11	1,630	2.78	15.82	185	0.0	--	--	--	--	--	--
	12/11/19	6.91	1,540	2.96	13.84	118	2.2	--	--	--	--	--	--
	6/24/20	7.18	1,330	9.1	18.86	100	0.0	--	--	--	--	--	--
	12/15/20	7.38	1,259	6.94	14.10	107	65.0	--	--	--	--	--	--
	5/25/21	7.25	1,270	8.75	16.72	118	0.0	--	--	--	--	--	--
	10/26/21	7.28	1,340	0.00	17.01	195	2.8	--	--	--	--	--	--
	11/3/22	7.15	1,170	2.54	14.63	185	0.2	--	--	--	--	--	--
MW-18	12/4/18	7.95	1,060	7.62	11.93	101	--	--	--	--	--	--	--
	6/26/19	7.12	1,100	IE	18.79	126	--	**0.12**	**23.4**	**150 J**	**220**	0.0050 U	0.0017 U
	12/12/19	7.42	1,490	7.25	14.20	46	0	0.02 U	**15.2**	**170**	**240**	0.0017 U	**0.0043**
	6/22/20	7.10	1,280	7.1	19.54	119	0	0.02 U	**10.7**	**160**	**210**	0.0017 U	0.00050 U
	12/15/20	7.53	1,049	8.10	15.50	109	64.0	0.02 U	**16.5**	**150**	**220**	0.0017 U	0.00050 U
	5/26/21	7.33	1,210	6.42	17.10	211	10.3	**0.02**	**23.6**	**131**	**214**	0.000855 U	0.00291 U
	10/26/21	7.44	1,060	4.06	16.62	145	21.0	**0.28**	**25.1**	**136**	**220**	0.000855 U	0.00291 U
	11/1/22	7.31	946	9.21	15.90	224	0.8	0.02 U	**5.5**	**130**	**210**	0.000934 U	0.00291 U

Table 3. Monitored Natural Attenuation Parameter Results
Chevron Pipe Line Company Pasco Bulk Terminal
Pasco, Washington

Well ID	Sample Date	Field Parameters								Laboratory Analytical			
		pH	Conductivity	Dissolved Oxygen	Temperature	ORP	Turbidity	Ferrous Iron	Nitrate	Sulfate	Alkalinity	Manganese (Dissolved)	Methane
	Units:	*su*	*µS/cm*	*mg/L*	*°C*	*mV*	*NTU*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*
MW-19	12/3/18	7.44	2,040	4.76	13.11	-75	--	--	--	--	--	--	--
	6/27/19	7.27	1,050	IE	16.62	-121	--	**1.37**	**13.8**	**120**	**240**	**0.14**	**1.3**
	12/10/19	7.32	1,200	7.16	16.44	-134	11.2	**0.14**	**14.0**	**150**	**220**	**0.079**	**0.27**
	6/24/20	7.26	1,190	7.06	18.80	48	0.0	**0.02**	**13.8**	**140**	**200**	**0.028**	**0.12**
	12/16/20	7.64	1,985	6.41	15.80	103	69.0	0.02 U	**16.1**	**140**	**200**	**0.0021 J**	0.00050 U
	5/26/21	7.29	1,200	3.12	17.73	88	0.0	0.02 U	**20.0**	**115**	**255**	**0.0248**	**0.0724**
	10/27/21	7.47	1,050	0.00	17.24	183	5.3	--	**15.7**	**123**	**219**	**0.00121 J**	0.00291 U
	11/1/22	8.22	928	4.54	15.53	140	0.0	**0.32**	**5.5**	**123**	**215**	**0.00112 J**	0.00291 U
MW-20	12/12/19	7.89	993	6.36	15.70	7	0	0.02 U	**21.5**	**130**	**170 J**	**0.012 J**	0.00050 U
	6/22/20	7.53	1,010	7.95	20.41	93	0	**0.08**	**9.8**	**130**	**170**	0.0017 U	**0.00075 J**
	12/16/20	7.91	1,905	8.04	15.70	89	67.0	**0.02**	**5.7**	**140**	**160**	**0.0019 J**	0.00050 U
	5/26/21	7.29	1,200	3.12	17.54	179	0.0	0.02 U	**>30.0**	**124**	**185**	0.000855 U	0.00291 U
	10/26/21	7.69	978	4.01	14.95	131	3.3	0.02 U	**>30.0**	**129**	**181**	0.000855 U	0.00291 U
	11/1/22	7.56	889	6.83	15.88	214	0.0	**0.06**	**5.5**	**127**	**185**	0.000934 U	0.00291 U
MW-21	12/12/19	7.71	1,020	6.25	14.21	108	1.5	0.02 U	**20.2**	**130**	**170**	0.0017 U	0.00050 U
	6/22/20	7.54	1,070	7.27	18.57	78	0.0	**0.10**	**>30.0**	**130**	**160**	0.0017 U	0.00050 U
	12/15/20	7.85	1,974	8.12	14.90	103	68.0	0.02 U	**20.6**	**150**	**170**	0.0017 U	0.00050 U
	5/26/21	7.81	1,020	7.97	17.59	146	0.0	**0.08**	**12.4**	**124**	**189**	0.000855 U	0.00291 U
	10/27/21	7.63	967	3.81	16.37	182	3.8	**0.07**	**9.9**	**128**	**183**	0.000855 U	0.00291 U
	11/2/22	8.59	910	6.80	15.43	109	0.4	0.02 U	**>30.0**	**128**	**188**	0.001480 J	0.00291 U
MW-22	12/11/19	7.50	1,050	5.69	14.61	102	0.9	**0.04**	**25**	**140**	**170 J**	0.0017 U	**0.00075 J**
	6/23/20	7.62	992	6.57	21.61	107	0.0	**0.09**	**7.4**	**130**	**170**	0.0017 U	0.00050 U
	12/15/20	7.85	1,978	8.17	15.80	92	93.0	0.02 U	**12.3**	**150**	**170**	0.0017 U	0.00050 U
	5/26/21	7.89	999	7.46	18.68	125	0.0	**0.25**	**27.7**	**127**	**189**	0.000855 U	0.00291 U
	10/27/21	7.76	1,030	0.78	16.90	179	0.0	**0.04**	**13.9**	**129**	**179**	0.000855 U	0.00291 U
	11/2/22	7.58	868	6.61	15.61	199	0.0	0.02 U	**5.5**	**124**	**187**	0.000934 U	0.00291 U
MW-23	12/11/19	7.75	1,020	5.90	15.06	12	78	0.02 U	**6.5**	**130**	**170**	**0.042**	0.00050 U
	6/24/20	7.56	1,100	8.01	17.51	84	0	**0.10**	**>30.0**	**130**	**180**	0.0017 U	0.00050 U
	12/15/20	8.11	1,062	8.33	16.60	116.1	87.5	**0.03**	**20.5**	**150**	**170**	0.0017 U	0.00050 U
	5/26/21	7.58	1,180	6.25	18.69	158	10.8	**0.07**	**28.0**	**129**	**186**	0.000855 U	0.00291 U
	10/27/21	7.70	1,060	0.80	17.14	183	1.9	0.02 U	**25.7**	**133**	**189**	0.000855 U	0.00291 U
	11/3/22	7.53	873	5.58	15.46	190	2.2	**0.02**	**5.0**	**124**	**190**	0.000934 U	0.00291 U

Notes:
Values in **bold** were detected above the detection limit

Acronyms:
-- = not analyzed or sample not collected
> = greater than
°C = degrees Celsius
ft = feet
IE = Instrument Error
J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
mg/L = milligrams per liter
mV = millivolts
ORP = Oxidation Reduction Potential
su = Standard Unit
U = analyte not detected above limit shown
µS/cm = microSeimens per centimeter

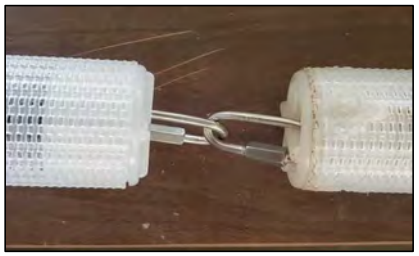
Table 5. List of Existing Monitoring Wells Proposed for ORC Deployment and Deployment Specifications
Chevron Pipe Line Company Pasco Bulk Terminal
Pasco, Washington

ORC Product Information		
Product:	Provect-ORS™	
Manufacturer:	Provectus®	
Estimated Canister Life:	6 months	
Available Free Oxygen per lbs. of ORS:	15	%
Hydrocarbon Mass Loss Rate - lbs. of Oxygen per lb. of Hydrocarbon:	3.2	lbs
Hydrocarbon Mass Loss Rate - lbs. of Hydrocarbon per lb. of Oxygen	0.3125	lbs

PVC Canister Exact Dimensions	Diameter	Length
2 in Diameter	1.75 in	3 ft
4 in Diameter	3.5 in	3 ft

Well Data and Deployment Calculations											
	Well ID	**MW-02**	**MW-03**	**MW-11**	**MW-12**	**MW-17**	**MW-19**	*Units*	**Total**	*Notes*
Well Specifications (see SAP Table A-4)	**Well Diameter**	4	4	2	2	2	2	*inch*		
	Monument Surface Completion	Stick-up	Stick-up	Stick-up	Stick-up	Stick-up	Stick-up			
	Top of Well Screen	65.70	77.35	76.60	75.00	72.70	74.50	*ft btoc*		
	Screen Length	20	20	10	10	10	15	*ft*		
	Total Well Depth	79.38	95.42	84.60	85.11	83.47	89.80	*ft btoc*		*1*
Deployment Details	**Shortest Saturated Water Column Height**	4.93	14.70	4.21	4.28	4.40	8.49	*ft*		*2*
	Number of PVC Canisters to be Deployed (1 sleeve/canister)	1	3	1	1	1	2			*3*
	PVC Canister Diameter	3.50	3.50	1.75	1.75	1.75	1.75	*inch*		
	PVC Canister Length	3.00	3.00	3.00	3.00	3.00	3.00	*ft*		
	PVC Canister Chain Total Length	3.00	9.00	3.00	3.00	3.00	6.00	*ft*		*4*
	2-inch Space At Bottom of Well	0.17	0.17	0.17	0.17	0.17	0.17	*ft*		
	Deployment Depth (Bottom of Lowest PVC Canister)	79.21	95.25	84.43	84.94	83.30	89.63	*ft btoc*		
Oxygen Delivered and Hydrocarbons Removed	**Provect-ORS™ per Sleeve**	7.25	7.25	1.75	1.75	1.75	1.75	*lbs*		
	Provect-ORS™ Deployed per Well	7.25	21.75	1.75	1.75	1.75	3.50	*lbs*		
	Oxygen Delivered per 6 months	1.09	3.26	0.26	0.26	0.26	0.53	*lbs*	**5.66**	*5*
	Hydrocarbons removed per 6 months	0.34	1.02	0.08	0.08	0.08	0.16	*lbs*	**1.77**	*6*

Acronyms:
% = percent
btoc = below top of well casing
ft = feet
lbs = pounds



Notes:
1. Measured in April 2023, Highlighted = Measured in June 2019
2. Calculated using historical gauging data for the deployment period (April through October)
3. Up to three can be combined
4. w/suspension loop & link extended
5. Based on the estimated canister life of 6 months
6. Based on approximate stoichiometry of 3.2 lbs of oxygen per lbs of hydrocarbon, which varies for specific COCs.

Appendix A.

Provectus® Oxygen Release Substrate™
Technical Data Sheet

Provectus ENVIRONMENTAL PRODUCTS®

TECHNICAL DATA SHEET

Provectus® Oxygen Release Substrate™

Well and Bulk Deployment of Dissolved Oxygen and Nutrients

ORS™ TECHNOLOGY DESCRIPTION

Provectus® Oxygen Release Substrate (ORS)™ technology is a proprietary, field-proven source of dissolved oxygen plus inorganic nutrients (e.g., phosphorous, nitrogen) and buffer to enhance the aerobic biodegradation of groundwater contaminants such as petroleum hydrocarbons (*e.g.,* BTEX, jet fuel, semivolatile organics). In the subsurface, the ORS materials will react with water to release oxygen slowly for a period of 3 to 6 months:

$$2CaO_2 + 2H_2O \text{ ---------> } 2Ca(OH)_2 + O_2$$

Our ORS is specifically designed to accelerate the aerobic biodegradation of organic compounds using naturally occurring microbes and enhance subsequent natural attenuation processes. In most cases, microbial inoculants are not required since the naturally occurring microorganisms are already present and well adapted to the site-specific conditions. Typical ORS applications include soil mixing and addition to backfill materials (ORS), placement in wells (ORS Sleeves), and subsurface injection via direct push (I-ORS). Additional information regarding the different ORS lines can be found on our website.

BENEFITS OF PROVECTUS® ORS™

- Three different ORS options depending on site-specific conditions, remedial application and budget.
- Significant cost savings realized due to high oxygen release rate and lower price compared to alternatives.
- Contains nutrients and is pH-buffered to reduce self-encapsulation.
- Estimated longevity of 3 to 6 months.
- Substantial time savings in the field because the reusable ORS Sleeves (PVC or stainless steel) are easy to insert and retrieve from the well (see picture).
- Ease of determining the exact depth at which the ORS Sleeve is deployed.
- Sleeves available for 2” and 4” wells.
- Up to three ORS Sleeves may be suspended in a well to increase vertical zone of influence.

Provectus® ORS™ Sleeve

PROVECTUS® ORS™ FAQs

- **What are the main differences between the Provect-ORS technology and market alternatives?** Our ORS contains a well-buffered source of controlled release oxygen plus inorganic nutrients designed to accelerate the aerobic biodegradation of various organic compounds and enhance natural attenuation processes. Provectus can manufacture site-specific blends based on contaminants of concern, geochemistry and remedial goals.
- **Do I need microbial inoculants?** In most cases, the naturally occurring (indigenous) microorganisms that are already present within the aquifer are well adapted to the contaminants and site-specific conditions. Therefore, inoculants are not required.
- **What contaminants are amenable to aerobic biodegradation with ORS?** Petroleum-based aromatics (*e.g.,* BTEX, phenol) and aliphatic hydrocarbon mixtures (e.g., heating oil, diesel fuel, jet fuel, kerosene) are primary targets; MTBE, dioxane, pentachlorophenol, and other compounds are also potentially amenable to aerobic biodegradation.
- **How much does ORS cost?** Provectus ORS typically costs 25% less than market alternatives.
- **How often should I replace my ORS Sleeves?** The ORS Sleeves are typically replaced every 3 to 6 months. However, various site-specific factors will influence the effective lifetime of the Sleeve.
- **Do I need to install new wells?** No. The ORS Sleeves are designed to fit standard 2-inch and 4-inch diameter groundwater wells.

www.ProvectusEnvironmental.com • tel: (815) 650-2230 • fax: (815) 650-2232 • email: info@provectusenvironmental.com

Appendix B.
Operations and Maintenance Plan

AECOM

Environment

Prepared for
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Submitted by
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Submitted to
Washington Department of Ecology

60650612
January 2024

Appendix B.
Operations and Maintenance Plan
Engineering Design Report
Chevron Pipe Line Company Pasco Bulk Terminal
Pasco, Washington
Ecology Cleanup Site ID: 4867
Ecology Facility Site ID: 55763995

Quality Information

Prepared by

Nicky Moody
AECOM
Project Manager
Senior Environmental Scientist

Checked and verified by

Keith Fox, PE
AECOM
Environmental Engineer

Revision History

Revision	Revision date	Details
0	June 23, 2023	Draft to Ecology
1	January 31, 2024	Final to Ecology

Distribution List

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0	1	Dan Andersen, MPLX, DJAnderson2@marathonpetroleum.com

Table of Contents

List of Attachments

List of Acronyms and Definitions

AST	aboveground storage tank
BTEX	benzene, toluene, ethylbenzene, and xylene
CAP	Cleanup Action Plan
CMP	Compliance Monitoring Plan
COC	contaminant of concern
CPL	Chevron Pipe Line Company
Ecology	Washington Department of Ecology
EDR	Engineering Design Report
Geotech	Geotech Environmental Equipment Inc.
IC	institutional controls
ID	inside diameter
IDW	investigation-derived waste
LDPE	low density polyethylene
MNA	monitored natural attenuation
MTCA	Model Toxics Control Act
OD	outside diameter
O&M Plan	Operations and Maintenance Plan
ORC	oxygen-releasing compound
PTFE	polytetrafluoroethylene
PVC	polyvinyl chloride
RI/FS	Remediation Investigation/Feasibility Study
SDS	Safety Data Sheet
SAP	Sampling and Analysis Plan
Tesoro	Tesoro Logistics Operations, LLC
Tidewater	Tidewater Terminal Company, Inc.
TLPE	Teflon lined Polyethylene
TPH	total petroleum hydrocarbons
WAC	Washington Administrative Code

1 Introduction

This Operations and Maintenance Plan (O&M Plan) presents technical guidance and regulatory requirements to ensure the effective operation of the Ecology-selected cleanup action pursuant to Agreed Order Number DE 21664 (here in referred to as the Agreed Order) (Ecology, 2023b) for the Washington Department of Ecology (Ecology) Cleanup Site named “Chevron Pipe Line Company Pasco Bulk Terminal”. This Cleanup Site is herein referred to as the Site.

1.1 Purpose of the O&M Plan

The O&M Plan has been developed for use during deployment and retrieval of the oxygen-releasing compound (ORC) sleeves and during compliance monitoring, as required by the *Cleanup Action Plan* (CAP) prepared by the Washington Department of Ecology (Ecology, 2023a). This O&M Plan is intended to be consistent with the requirements specified in Model Toxics Control Act (MTCA) Washington Administrative Code (WAC) 173-340-400 I. This O&M Plan includes the following elements listed on Table A-1. Cross-references to the *Engineering Design Report* (EDR) and *Compliance Monitoring Plan* (CMP) are used to reduce information overlap between this O&M Plan (AECOM, 2023a; 2023b) and aforementioned documents.

Table A-1. O&M Plan Requirements

Ecology Required O&M Plan Elements	Deliverable Section Containing Required Information
(i) Name and phone number of the responsible individuals	O&M Plan Section 1.2, Table A-2
(ii) Process description and operating principles	EDR Section 4
(iii) Design criteria and operating parameters and limits	EDR Section 4.1
(iv) General operating procedures, including startup, normal operations, operation at less than design loading, shutdown, and emergency or contingency procedures	EDR Section 4.3 and 4.4
(v) A discussion of the detailed operation of individual treatment units, including a description of various controls, recommended operating parameters, safety features, and any other relevant information	*Not applicable*
(vi) Procedures and sample forms for collection and management of operating and maintenance records	O&M Plan Section 4.1
(vii) Spare part inventory, addresses of suppliers of spare parts, equipment warranties, and appropriate equipment catalogues	O&M Plan Section 4.2
(viii) Equipment maintenance schedules incorporating manufacturers recommendations	O&M Plan Section 4.3
(ix) Contingency procedures for spills, releases, and personnel accidents	O&M Plan Section 3
(x) CMP prepared under WAC 173-340-410 describing monitoring to be performed during operation and maintenance, and a sampling and analysis plan meeting the requirements of WAC 173-340-820	CMP and Sampling and Analysis Plan (SAP)
(xi) Description of procedures which ensure that the safety and health requirements of WAC 173-340-810 are met, including specification of contaminant action levels and contingency plans, as appropriate	EDR Section 4.5

Ecology Required O&M Plan Elements	Deliverable Section Containing Required Information
(xii) Procedures for the maintenance of the facility after completion of the cleanup action, including provisions for removal of unneeded appurtenances, and the maintenance of covers, caps, containment structures, and monitoring devices	*Not applicable*
(xiii) Other information as required by the department	None

1.2 Contact Information

Tabulated contact information for responsible individuals can be found below in Table A-2. This contact information must be updated and supplemented as necessary, to ensure clear and accurate lines of communication. Emergency contact information is presented in the Site-specific HASP.

Table A-2. Contact Information for Responsible Individuals

Title	Staff
Tesoro Project Coordinator	Kyle Waldron Marathon Petroleum Company LP 3450 S 344th Way, Suite 135, Auburn, WA 98001-5931 kawaldron@marathonpetroleum.com 425-502-1616
Terminal Operations Supervisor	Dan Anderson Marathon Petroleum Logistics Services LLC 2900 Sacajawea Park Road, Pasco, WA 99301 djanderson2@marathonpetroleum.com 509-543-6102
Ecology Project Coordinator	Christer Loftenius, LG, LHG Washington Department of Ecology Toxics Cleanup Program Eastern Region 4601 N Monroe Street, Spokane, WA 9920 clof461@ecywa.gov 509-329-3400
AECOM Project Manager	Nicky Moody AECOM 888 SW 5th Avenue, Suite 600, Portland, OR 97204 nicky.moody@aecom.com 503-969-6310
AECOM Project Engineer	Keith Fox, PE AECOM 207 N Broadway, Suite 315, Billings, MT 59101 keith.fox@aecom.com 406-465-6405
AECOM Field Team Leader and Site Safety Officer	Eddie Le Cocq AECOM 888 SW 5th Avenue, Suite 600, Portland, OR 97204 edward.lecocq@aecom.com 503-849-2993

Title	Staff
AECOM Health and Safety Manager	Tim Gilles AECOM 650 Warrenville Road, Suite 350, Lisle, IL 60532 timothy.gilles@aecom.com 503-849-2993

1.3 Description of the Site, Terminal, and Tidewater Site Areas

The Site, which is defined with the **red line** on Figures A-1 and A-2, is located within the boundary of the larger Pasco Terminal, which is owned and operated by Tesoro Logistics Operations LLC (Tesoro) (an indirect subsidiary of Marathon Petroleum Corporation); the Pasco Terminal is herein referred to as the Terminal. Chevron Pipe Line Company (CPL) initially owned and operated the Terminal since its construction in 1950 until Tesoro purchased the Terminal in June 2013.

In Figures A-1 and A-2, the Terminal is shown with the brownish orange highlighted area. The Terminal is defined as the properties owned by Tesoro. Most of the Terminal operations are located on top of the bluffs overlooking the Lake Wallula segment of the Snake River adjacent to the south. Sacajawea Park Road and a Burlington Northern Santa Fe rail spur bisect the Terminal with northeast-southwest orientations. The Terminal operations predominantly take place to the south of Sacajawea Park Road over approximately 33 acres; however, the entire Terminal property covers approximately 120 acres. The Terminal includes unimproved land to the southwest, north, and northeast.

1.4 Background

The Terminal is developed with aboveground storage tanks (ASTs), loading racks, pumping stations, underground and aboveground pipelines, a barge loading dock, a lined evaporation pond, and terminal offices. The ASTs are used to store diesel, gasoline, jet fuel, and ethanol (AECOM, 2021). Since 1950, the Site has been used as a bulk fuel distribution terminal. The Terminal receives fuel products transferred through underground pipelines and by barge. Nineteen ASTs (with storage capacities ranging between 588,000 and 2,520,000 gallons), eight fuel additive ASTs (with storage capacities ranging between 500 and 12,000 gallons), and one 23,000-gallon relief AST are present at the Terminal (AECOM, 2021).

In Figure A-2, the **orange line** labeled as the Tidewater site shows the boundary of the separate Ecology Cleanup Site with the Facility Site Name “Tidewater Fuel Line Leak”. The Tidewater Terminal Company, Inc. (Tidewater) is responsible for managing ongoing environmental activities in this area associated with a pipeline fuel release. The Tidewater site includes fuel pipelines owned and operated by Tidewater, which transfer products between this Terminal and the Tidewater Terminal, located approximately ¾-mile upstream along the Snake River at 671 Tank Farm Road in Pasco, Washington.

Occasional releases of petroleum products from ASTs, pipelines and other facilities have been documented over time at the Site. A timeline of documented historical releases, response actions undertaken, and subsequent investigations and remediation actions, are summarized in the *Supplemental Remedial Investigation/Feasibility Study* (RI/FS) completed in 2021 (AECOM, 2021).

The CAP, developed by Ecology for the Site, is based on the RI/FS (Ecology, 2023a; AECOM, 2021). Contaminants of concern determined from the RI/FS, carried forward in the CAP, and referred to as indicator hazardous substances (IHSs) in the EDR and this O&M Plan, include benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, and gasoline, diesel, and motor oil fractions of total petroleum hydrocarbons (TPH). The CAP indicates that the Ecology-selected cleanup action for the Site is institutional controls (ICs), monitored natural attenuation (MNA), and enhanced bioremediation using ORCs in sleeves (Alternative 2). Additional information including site history, Site physical characteristics, results of previous investigations, and previous remedial activities are documented in the Supplemental RI/FS and the CAP (AECOM, 2021; Ecology, 2023a).

2 Summary of Cleanup Action

As stated in the Agreed Order, the CAP sets cleanup standards and selects the cleanup action that meets the cleanup standards for the Site. The CAP indicates that the Ecology-selected cleanup action for the Site is ICs, MNA, and enhanced bioremediation using ORCs.

2.1 Institutional Controls

The ICs are described in detail in the EDR.

2.2 Monitored Natural Attenuation and Compliance Monitoring

MNA and compliance monitoring programs are described in detail in the CMP. Inspection and maintenance activities for the compliance monitoring wells and dedicated bladder pumps are described in Section 4.1.

2.3 Enhanced Bioremediation Using ORC

The deployment of ORC in oxygen diffusing filter socks (ORC sleeves) in compliance monitoring wells within the source areas (MW-02, MW-03, MW-11, MW-12, MW-17, and MW-19) was included as part of the cleanup action to enhance natural degradation of the contaminants. The EDR describes the ORC deployment plan in detail. A summary of the deployment information is included in Table A-3.

Table A-3. PVC Canister Deployment Summary

Well ID	MW-02	MW-03	MW-11	MW-12	MW-17	MW-19	*Units*
Well Diameter	4	4	2	2	2	2	*inch*
Total Well Depth	79.38	95.42	84.60	85.11	83.47	89.90	*ft btoc*
Calculated Shortest Saturated Water Column Height	4.93	14.70	4.21	4.28	4.40	8.49	*ft*
PVC Canister Dimensions (Diameter)	3.5	3.5	1.75	1.75	1.75	1.75	*inch*
PVC Canister Dimensions (Length)	3	3	3	3	3	3	*ft*
Number of PVC Canisters to be Deployed	1	3	1	1	1	2	--
Deployment Depth (Bottom of Lowest PVC Canister)	79.21	95.25	84.43	84.94	83.30	89.63	*ft btoc*

Inspection and maintenance activities are described in Section 4.

3 Handling and Spill Cleanup of ORC Sleeves

This section summarizes the procedures for storing and handling the ORC sleeves. This information was partially compiled from the Provect-ORS™ Safety Data Sheet (SDS) (Attachment A).

3.1 Handling and Storage

Before the second semi-annual event, new ORC sleeves will be ordered from Field Environmental Instruments (see Section 4.2 for supplier contact information). AECOM will either pick-up the sleeves at Field Environmental Instruments' facility in Portland, Oregon, or the sleeves will be shipped by Field Environmental Instruments to AECOM in Portland, Oregon.

Prior to deployment, the ORC sleeves will be transferred to temporary storage at the AECOM warehouse in Portland, Oregon or the Tesoro owned Conex at the Port of Walla Walla in Burbank, Washington. The location of the Conex is shown on Figure A-1.

According to the SDS, the ORC product is an oxidizer, which may react violently when it meets combustible materials. Oxidizers promote combustion in other materials, generally by the rapid release of oxygen. Below are the recommended storage procedures for the ORC sleeves.

- Store in a cool, well-ventilated area away from all sources of ignition and out of direct sunlight
- Store in a dry location away from heat
- Keep away from incompatible materials
- Keep containers tightly closed
- Do not store in unlabeled or mislabeled containers
- Protect from moisture
- Do not store near combustible materials
- Keep containers labeled and well-sealed
- Ensure pressure relief and adequate ventilation.
- Store separately from organics and reducing materials

Below are the handling procedures for the ORC sleeves.

- Avoid contact with eyes, skin, and clothing
- Use with adequate ventilation
- Do not swallow
- Avoid breathing vapors, mists, or dust
- Do not eat, drink, or smoke in work area
- Prevent contact with combustible or organic materials
- Label containers and keep them tightly closed when not in use
- Wash thoroughly after handling

3.2 Spill Clean-up Procedure

If an ORC sleeve breaks open, AECOM will follow the spill clean-up procedures in the Emergency Response Plan within the HASP. The location of the spill kit is also described in HASP.

4 Inspections and Maintenance

This section provides the inspection and maintenance procedures, field forms, supplier information for equipment and parts, and equipment manuals.

Periodic inspections and maintenance activities are required at the Site to ensure the following:

- The flush and aboveground monuments of the compliance monitoring wells are accessible and in good condition
- The dedicated bladder pumps are in good condition
- ORC usage is optimized to prevent excessive residual ORC at the end of the deployment or additional sleeves are deployed if needed
- The ORC hangers are in good condition

Inspections will be routinely performed on a semi-annual basis. Inspections will be performed by the AECOM Field Team Lead or his/her designee. The inspection frequency may be revised based on the ORC consumption rates.

4.1 Field Documentation

Field documentation for the inspections will consist of the following forms. Examples of each form are attached.

- Form 1: Inspection Form: Monitoring Wells, ORC Sleeves, ORC Hangers, and Bladder Pumps
- Form 2: Investigation Derived Waste Form

Digital versions may be used instead of hard copies; however, if not using digital field forms, field forms practices are listed below.

- All data entries on these forms will be made using indelible ink pen.
- Corrections will be made by drawing a single line through the error, writing the correct information, and then initialing the change.
- Blank lines in all forms will be lined-out and initialed/dated by the individual completing the form.

Copies of the completed inspection forms will be included in the Semi-Annual Progress Reports.

4.2 Supplier and Parts Information

This section summarizes the supplier contact information and spare parts information. Tabulated supplier information can be found below in Table A-4. This contact information must be updated and supplemented as necessary.

Table A-4. Supplier and Parts Information

Equipment	Supplier Contact	Maintenance and Parts Information
ORS hangers, canisters, and sleeves	**Field Environmental Instruments** Matt Houser Regional Manager mhouser.wa@fieldenvironmental.com 11710 Airport Road, Suite A-300, Everett, WA 98204 Fieldenvironmental.com 855-398-5600	• Deployment cap • D-rings • Steel cable • PVC canisters • Provect-ORS™ Sleeves

Equipment	Supplier Contact	Maintenance and Parts Information
Provect-ORS™	**Provectus Environmental Products, Inc.** Andy Lowy Technical Sales andy.lowy@provectusenv.com Scottsdale, AZ 85251 2871 West Forest Rd., Suite 2, Freeport, IL 61032 Provectusenvironmental.com 815-650-2230	Available for technical questions; product is ordered directly from Field Environmental Instruments
Dedicated bladder pumps and replacement parts	**Geotech** Bryan Feack National Account Manager bryanf@geotechenv.com 2650 E. 40th Avenue, Denver, CO 80205 Geotechenv.com 800-833-7958	Manufacturers manual (Attachment B) • PVC bladder pump, model GEO1.66PVC18 (outside diameter [OD] 1.66-inch x length 20-inch) • PVC bladder pump, model GEO1.66PVC36 (OD 1.66-inch x length 38-inch) • Polytetrafluoroethylene (PTFE) bladder 1.66-inch x 18-inch (item number 21150119) • PTFE bladder 1.66-inch x 36-inch (item number 21150124) • Twin skip bonded tubing (item number 87050522): o Air line: 0.17-inch inside diameter (ID) x ¼-inch OD (blue color), low density polyethylene (LDPE) tubing o Water discharge line: ¼-inch OD x 3/8-inch ID (natural color), Teflon lined Polyethylene (TLPE) tubing • Other misc. parts including freeze kit, well cap, O-rings, hose barbs, ferrules, etc.

4.3 Inspection Details

4.3.1 Compliance Monitoring Wells

Compliance monitoring wells will be inspected at the beginning of each monitoring event to determine the surface condition of each well. The inspection is documented on the Inspection Form (Form 1, Attachment C).

The visual inspection will include: the condition of surface monument and surface seal, visible damage to the surface completion, and condition of ground surface which could impact well integrity.

Repairs may be performed before or after sampling, depending on the nature of the repair, or if specialized equipment is required. If identified well repairs cannot be performed during the current monitoring event, repairs will be completed, in coordination with Tesoro, during the next scheduled monitoring event.

If a well screen is determined to be blocked with more than two feet of sediment, an attempt will be made to redevelop the well to remove the accumulated sediment. If wells need to be redeveloped, the accumulated sediment may be removed with a bailer or with compressed air. Total depths will be measured periodically during and after redevelopment to confirm that well screens are free of sediment. Redevelopment, if required, will be performed following the sampling of all remaining compliance monitoring wells, to avoid compromising the integrity of surrounding groundwater samples.

4.3.2 Bladder Pump

Two-inch diameter dedicated polyvinyl chloride (PVC) bladder pumps manufactured by Geotech Environmental Equipment Inc. (Geotech) are deployed in the compliance monitoring wells. For each well, the pump model number, pump intake depths, and well construction specs are listed on Table A-4 of the SAP.

As with any pump, scheduled or periodic maintenance should be performed. Generally, the more turbid the groundwater, the more often the pumps will need to be maintained and decontaminated. Pumps will be inspected on an as-needed basis in wells where no ORC is deployed. Pumps in the wells being used for ORC deployment will be inspected each year after removal during the first semiannual monitoring event. The inspection is documented on the Inspection Form (Form 1, Attachment C). Bladder pump inspection steps are summarized below.

- Pull pump from the well, it is not necessary to remove the air and sample lines from the pump
- Drain any remaining groundwater in the pump into a 5-gallon bucket (manage as IDW in accordance with the SAP or EDR)
- Disassemble the pump referring to the components and assembly diagram in the manufacturer's manual
    - Unscrew the lower cap from the housing, followed by removing the housing from the upper cap
    - Wrench flat features are present on both upper and lower caps
    - Unscrew the compression rings from the upper cap and lower head
    - Spanner wrench holes are located on the lower head to avoid spiral damage to the internal tube
    - Pull the bladder assembly out from the upper cap
    - Remove the internal bladder cartridge
- Decontaminate the pump parts (in accordance with the SAP)
- Inspect all check balls for wear and replace as necessary
- Inspect all O-rings for splits or cracks and replace as necessary
- Inspect the PTFE internal bladder cartridge and replace as necessary
- Reassemble the pump referring to the components and assembly diagram in the manufacturer's manual
- Wrap the pump in new aluminum foil and place the pump into a bag labeled with the monitoring well ID
- Store the pump in a tote in the Conex located at the Port of Walla Walla in Burbank, Washington (Figure A-1).
- When the pump is redeployed, slowly lower the pump to the pump intake depth to prevent stirring up particulates taking care to not touch the well bottom with the pump

4.3.3 ORC Hangers, Canisters, and Sleeves

The ORC hanger design is shown on Figure A-3. Field Environmental Instruments is the supplier for the ORC hangers, PVC canisters, and ORC sleeves. Field Environmental Instruments will build the hangers to the specifications in the EDR.

When not deployed, the ORC hangers and empty PVC canisters will be stored in a tote in the Conex box located at the Terminal.

Prior to each deployment, the hangers and PVC canisters will be inspected. The inspection is documented on the Inspection Form (Form 1, Attachment C). Any frayed wires or damaged PVC canisters will be replaced as needed. If new wire is required, field staff will calculate the required length using the ORC sleeve deployment

depths listed on Table A-3. The ORC hanger and canister parts are listed in Table A-4. A replacement hanger can be procured from Field Environmental Instruments, or replacement parts can be purchased at the hardware store.

The mass of ORC remaining (estimated percentage or weight compared to new) and the amount of additional ORC deployed (if applicable) will be recorded following each deployment or mid-deployment inspection (if required). Field data over multiple deployments will be used to estimate long-term ORC consumption rates, and the ORC deployment schedule (deployment frequency and ORC amounts) will be periodically updated to optimize oxygen delivery over subsequent deployment periods.

4.3.4 ORC Management

Handling of ORC sleeves is addressed in Section 3.1 above. Used sleeves will be evaluated to determine if the sleeve can be redeployed or if the residual ORC should be removed.

Small amounts of residual ORC will be separated from the sleeves using the following procedure:

- Cut the sleeve open, observing the handling and safety precautions listed in Section 3.1 and the HASP.
- Empty the ORC into an empty shipping container (plastic bucket)
- Rinse the sleeve material with clean water while collecting the rinsate in the same plastic bucket
- Allow the empty sleeve material to dry and dispose of as miscellaneous solid waste.
- Mix the residual ORC and water thoroughly and pour into the monitoring well from which the sleeve was removed

Sleeves with larger amounts of residual ORC will be laid out to dry, then stored in an original shipping container separately from new ORC sleeves. Used, partially spent sleeves will be combined with new ORC sleeves during the next deployment. Form 3 in Attachment C will be used to document the initial ORC consumption and will be updated as needed for mid-deployment inspections (if required).

5 References

AECOM, 2023a. *Draft Compliance Monitoring Plan* Chevron Pipe Line Company Pasco Bulk Terminal. June 23.

AECOM, 2023b. *Draft Engineering Design Report*. Chevron Pipe Line Company Pasco Bulk Terminal. June 23.

Ecology, 2023a. *Final Corrective Action Plan.* Chevron Pipeline Co. Pasco Bulk Terminal. March.

Ecology, 2023b. Agreed Order No. DE 21664. In the Matter of Remedial Action by Tesoro Logistic Operation LLC. April.

Figures

1,000 0 1,000 2,000

SCALE IN FEET

AECOM

SITE VICINITY MAP

TESORO LOGISTICS OPERATIONS LLC
CHEVRON PIPE LINE COMPANY PASCO BULK TERMINAL
PASCO, WASHINGTON

60722666

FIGURE A-1

K:\Tesoro_PascoMXD\2023_EDR\Fig 1 Site Viciniy Map.mxd

Explanation

- Compliance Monitoring Well
- Compliance Monitoring Wells Proposed for ORC Deployment
- Tidewater Monitoring Well
- Vapor Extraction Well

Previous Spill
(Size of circle indicates volume released)

- Diesel
- Gasoline
- Jet Fuel

600 — Number of barrels in spill
12/20/78 — Date of spill

- BNSF Railroad
- BNSF Right of Way
- Excavation Area
- Terminal Boundary
- Site Boundary
- Tidewater Site Boundary

Areas of Concern

- North Area
- Northern Tank Area
- Southern Tank Area

Imagery Source: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

K:\Tesoro_PascoMXD\2023_EDR\Fig 2 Site Plan.mxd

AECOM

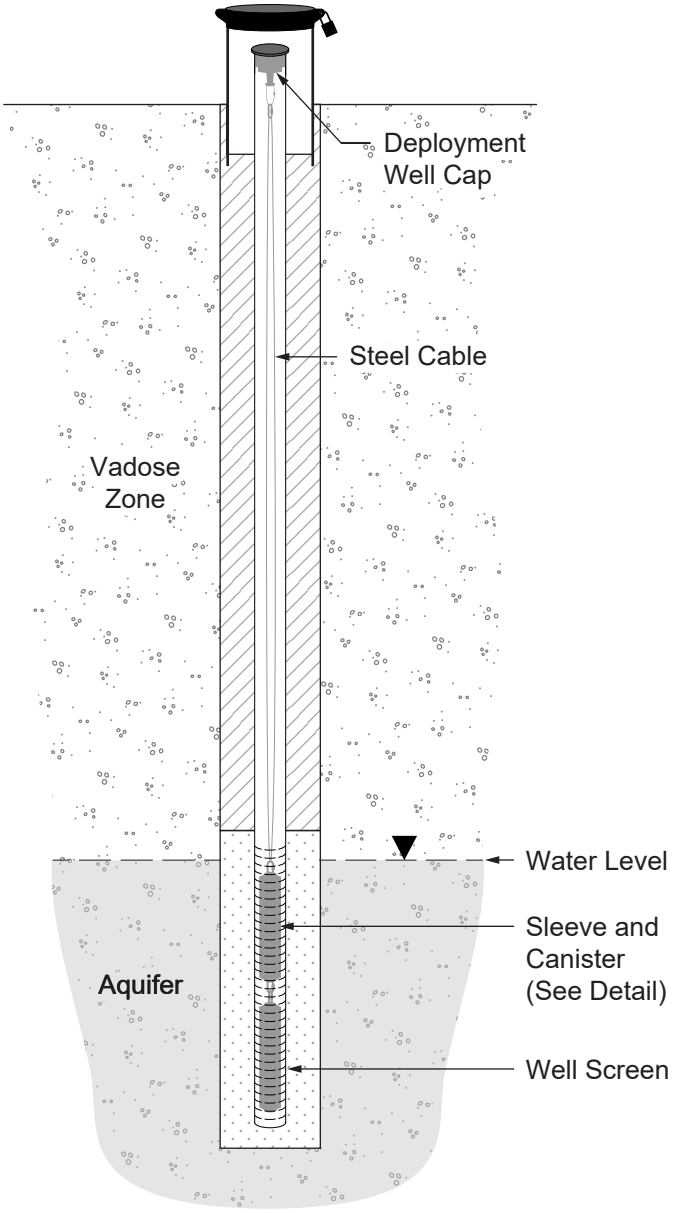
60722666

SITE MAP AND MONITORING WELLS PROPOSED FOR ORC DEPLOYMENT

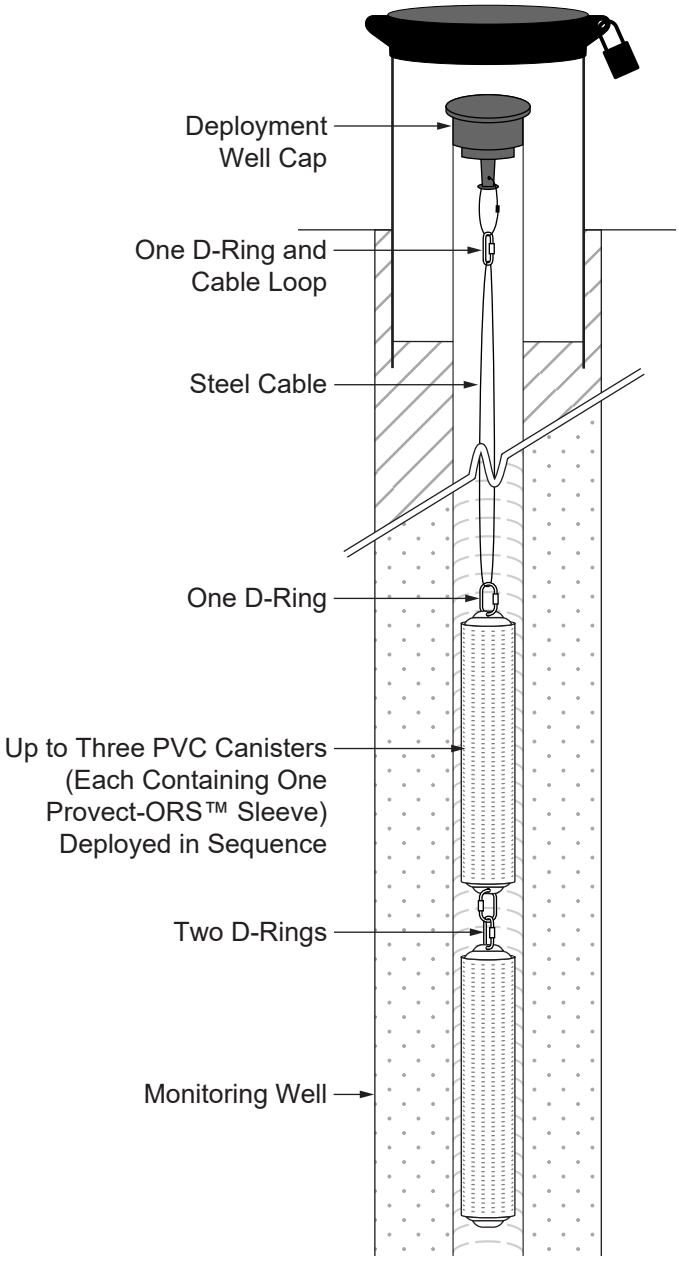
TESORO LOGISTICS OPERATIONS LLC
CHEVRON PIPE LINE COMPANY PASCO BULK TERMINAL
PASCO, WASHINGTON

FIGURE A-2

Monitoring Well



Sleeve and Canister Detail



Not to Scale

ORC SLEEVE INSTALLATION SCHEMATIC

TESORO LOGISTICS OPERATIONS, LLC
CHEVRON PIPE LINE COMPANY PASCO BULK TERMINAL
60722666 PASCO, WASHINGTON

FIGURE A-3

Attachment A
ORC Product Safety Data Sheet

1. PRODUCT IDENTIFICATION: PROVECT-ORS™

PRODUCT USE: Soil and water treatment.

MANUFACTURER:

PROVECTUS ENVIRONMENTAL
PO BOX 358
Freeport, IL 61032
Tel: (815) 650-2230

EMERGENCY PHONE:

Call CHEMTREC
Toll Free: 1-800-424-9300/ +1 703-527-3887 CCN 1010557
For Hazardous Materials Incident (Spill, Leak, Fire, Exposure, or Accident)

TRANSPORTATION OF DANGEROUS GOOD CLASSIFICATION:
Oxidizing Solid, n.o.s. (Calcium Peroxide), Class 5.1, PG II, UN1479

WHMIS CLASSIFICATION:
Oxidizer

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients	Chemical Formula	CAS No.	Percentage
Calcium Peroxide	CaO_2	1305-79-9	75%-90%
Inorganic Nutrients	Proprietary	NA	10%-25%

3. PHYSICAL DATA

Appearance	White & brown granules
Physical state	Solid
Odor threshold	None
Bulk Density	500~650g/L
Solubility in Water	Insoluble
pH	~11
Decomposition Temperature	Self-accelerating decomposition with oxygen release starting from 275 degrees Celsius

4. HAZARDS IDENTIFICATION

Emergency overview
Oxidizing agent, contact with other material may cause fire. Under fire conditions this material may decompose and release oxygen that intensifies fire. This product contains <1% **non-respirable** crystalline silica. The NTP and OSHA have not classified **non-respirable** crystalline silica as carcinogenic. Long term exposure to hazardous levels of *respirable* silica dusts can cause lung disease (silicosis). ORS does not contain respirable crystalline silica.

Potential Health Effects:

- General: Irritating to mucous membrane and eyes.

- Inhalation ..... Irritating to respiratory tract. Long term inhalation of elevated levels may cause lung disease (silicosis).
- Eye contact ..... May cause irritation to the eyes; Risks of serious or permanent eye lesions.
- Skin contact ..... May cause skin irritation.
- Ingestion ..... Irritation of the mouth and throat with nausea and vomiting.

5. FIRST AID MEASURES

- Inhalation ..... Remove affected person to fresh air. Seek medical attention if effects persist.
- Eye contact ..... Flush eyes with running water for at least 15 minutes with eyelids held open. Seek specialist advice.
- Skin contact ..... Wash affected skin with soap and mild detergent and large amounts of water.
- Ingestion ..... If the person is conscious and not convulsing, give 2-4 cupfuls of water to dilute the chemical and seek medical attention immediately. Do not induce vomiting.

6. FIRE FIGHTING MEASURE

Flash Point
- Not applicable

Flammability
- Not applicable

Ignition Temperature
- Not applicable

Danger of Explosion
- Non-explosive

Extinguishing Media
- Water

Fire Hazards
- Oxidizer. Storage vessels involved in a fire may vent gas or rupture due to internal pressure. Damp material may decompose exothermically and ignite combustibles. Oxygen release due to exothermic decomposition may support combustion. May ignite other combustible materials. Avoid contact with incompatible materials such as heavy metals, reducing agents, acids, bases,

combustible (wood, papers, cloths etc.) Thermal decomposition releases oxygen and heat. Pressure bursts may occur due to gas evolution. Pressurization if confined when heated or decomposing. Containers may burst violently.

Fire Fighting Measures

- Evacuate all non-essential personnel
- Wear protective clothing and self-contained breathing apparatus.
- Remain upwind of fire to avoid hazardous vapors and decomposition products.
- Use water spray to cool fire- exposed containers.

7. ACCIDENTAL RELEASE MEASURES

Spill Clean-up Procedure

- Oxidizer. Eliminate all sources of ignition. Evacuate unprotected personnel from equipment recommendations found in Section 9. Never exceed any occupational exposure limit.
- Shovel or sweep material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to inventory. Avoid making dust.
- Flush remaining area with water to remove trace residue and dispose of properly. Avoid direct discharge to sewers and surface waters. Notify authorities if entry occurs.
- Do not touch or walk through spilled material. Keep away from combustibles (wood, paper, oils, etc.). Do not return product to container because of risk of contamination.

8. HANDLING AND STORAGE

Storage

- Oxidizer. Store in a cool, well-ventilated area away from all source of ignition and out of direct sunlight. Store in a dry location away from heat.
- Keep away from incompatible materials. Keep containers tightly closed. Do not store in unlabeled or mislabeled containers.
- Protect from moisture. Do not store near combustible materials. Keep containers well sealed. Ensure pressure relief and adequate ventilation.
- Store separately from organics and reducing materials. Avoid contamination that may lead to decomposition.

Handling

- Avoid contact with eyes, skin, and clothing. Use with adequate ventilation.
- Do not swallow. Avoid breathing vapors, mists, or dust. Do not eat, drink, or smoke in work area.
- Prevent contact with combustible or organic materials.
- Label containers and keep them tightly closed when not in use.
- Wash thoroughly after handling.

9. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

- General room ventilation is required. Local exhaust ventilation, process enclosures or other engineers controls may be needed to maintain airborne levels below recommended exposure limits. Avoid creating dust or mist. Maintain adequate ventilation. Do not use in closed or confined spaces. Keep levels below exposure limits. To determine exposure limits, monitoring should be performed regularly.

Respiratory Protection

- For many condition, no respiratory protection may be needed; however, in dusty or unknown atmospheres or when exposures exceed limit values, wear a NIOSH approved respirator.

Eye/Face Protection

- Wear chemical safety goggles and a full face shield while handling this product.

Skin Protection

- Prevent contact with this product. Wear gloves and protective clothing depending on condition of use. Protective gloves: Chemical-resistant (Recommended materials: PVC, neoprene or rubber)

Other Protective Equipment

- Eye-wash station
- Safety shower
- Impervious clothing
- Rubber boots

General Hygiene Considerations

- Wash with soap and water before meal times and at the end of each work shift. Good manufacturing practices require gross amounts of any chemical removed from skin as soon as practical, especially before eating or smoking.

10. STABILITY AND REACTIVITY

Stability

- Stable under normal conditions

Condition to Avoid

- Water
- Acids
- Bases
- Salts of heavy metals
- Reducing agents
- Organic materials
- Flammable substances

Hazardous Decomposition Products

- Oxygen which supports combustion

11. TOXICOLOGICAL INFORMATION

- LD50 Oral: Min.2000 mg/kg, rat
- LD50 Dermal: Min. 2000mg/kg, rat
- LD50 Inhalation: Min. 4580 mg/kg, rat

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

- Hazards for the environment is limited due to the product properties of no bioaccumulation, weak solubility and precipitation in aquatic environment.

Chemical Fate Information

- As indicated by chemical properties oxygen is released into the environment.

13. DISPOSAL CONSIDERATIONS

Waste Treatment

- Dispose of in an approved waste facility operated by an authorized contractor in compliance with local regulations.

Package Treatment

- The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

14. TRANSPORT INFORMATION

- Proper Shipping Name: P-ORS
- Hazard Class: 5.1
- Labels: 5.1 (Oxidizer)
- Packing Group: II

15. REGULATORY INFORMATION

- SARA Section..... Yes
- SARA (313) Chemicals..... No
- EPA TSCA Inventory..... Appears
- Canadian WHMIS Classification ..... C, D2B
- Canadian DSL..... Appears
- EINECS Inventory..... Appears

Attachment B

Geotech PVC Bladder Pumps Installation and Operation Manual

geotech

Geotech PVC Bladder Pumps

Installation and Operation Manual

Rev 6/16/2023 Part # 11150188

Section 1: System Description

Function and Theory

Geotech's pneumatic Bladder Pumps operate with a unique action, ideal for both, gentle low-flow sampling and high flow rate purging. Timed ON/OFF cycles of compressed air alternately squeeze the flexible bladder to displace water out of the pump to the surface and exhaust allowing the pump to refill. Fluid enters the pump through the fluid inlet check valve at the bottom of the pump body, via hydrostatic pressure (automatically by submergence). The bladder then fills with fluid. Compressed air enters the space between the bladder and the interior of the pump wall housing. The intake check valve closes and the discharge check valve opens. The compressed air squeezes the bladder, pushing the fluid to the surface. The discharge check valve prevents back flow from the discharge tubing. Driven by the BP Controller (300PSI or 500PSI) or Geocontrol PRO, this cycle automatically repeats.

Compressed air does not contact the sample. The bladder prevents contact between the pump drive air and the sample.

Selecting an Air Source

To determine the required capacity of the air source used, use the following chart as reference.

AIR CONSUMPTION PER CYCLE			
	NO PUMP	GEO1.66SS18	GEO1.66SS36
NO TUBING		39in^2	78in^2
.17"ID x.25"OD (100' L)	27in^2	66.25in^2	105in^2
.25"ID x .38"OD (100' L)	59in^2	95in^2	137in^2
AIR CONSUMPTION PER HOUR (6 CYCLES/MIN)			
	GEO1.66SS18	GEO1.66SS36	
.17"ID x.25"OD	25,000 in^3/hr	45,000 in^3/hr	
.25"ID x .38"OD	35,000 in^3/hr	50,000 in^3/hr	

Section 2: System Maintenance

As with any pump, scheduled or periodic maintenance should be performed, according to your sampling program and specific site conditions. Generally, the more turbid or sandy your water, the more often you should maintain and clean your pumps. Disassemble the bladder pump per instructions, decontaminate or replace as needed, then reassemble. Inspect all check balls for wear and replace as necessary. Inspect all O-rings for splits or cracks and replace as necessary.

Disassembly and Bladder Replacement

Pull pump from the well, it is not necessary to remove the air and sample lines from the pump. Unscrew the lower cap from the housing, followed by removing the housing from the upper cap. Wrench flat features are present on both upper and lower caps. Unscrew the compression rings from the upper cap and lower head. Spanner wrench holes are located on the lower head to avoid spiral damage to the internal tube. Pull the bladder assembly out from the upper cap. The internal bladder cartridge can now be removed for maintenance or replacement. Please refer to the Components and Assembly diagram located on the inside of this manual for reassembly.

Section 3: System Troubleshooting

Cycling air with no sample

- Adjust the controller charge/exhaust times properly.
- Excessive drawdown may be preventing pump submergence.
- Screen intake needs to be submerged at least 5' (1.5 m) deep.
- Test cords and battery to ensure you have a sufficient power source.
- Clean any debris that may be clogging the intake screen.

Air bubbles present in sample

- Replace any O-Rings and bladder if showing tearing or damage.
- Repair or replace air and discharge lines if damaged or split.

Discharge line draining back into pump

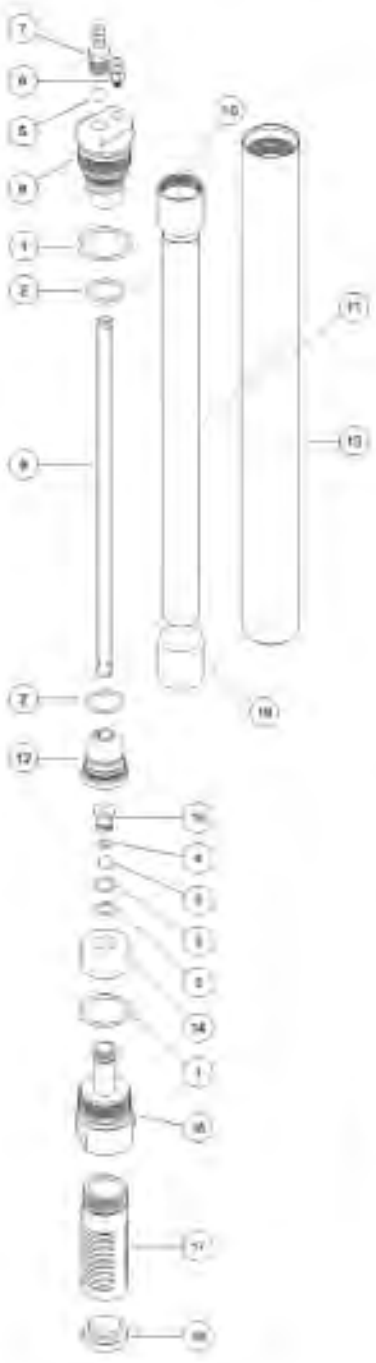
- Remove the discharge hose barb, check ball, and clean any debris in the check ball area.

Section 4: System Specifications

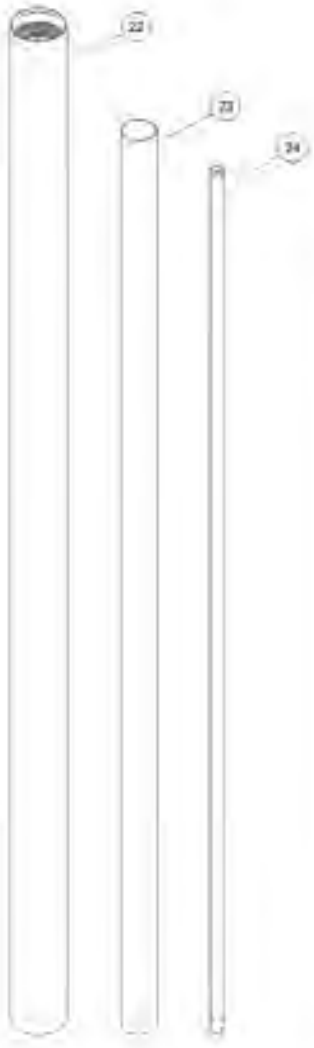
	GEO1.66PVC18	GEO1.66PVC36
Pump Components	PVC	PVC
Bladder Material	Virgin PTFE	Virgin PTFE
O.D.:	1.66" (4.2cm)	1.66" (4.2cm)
Weight	1.1lb (0.5kg)	1.8lb (0.82kg)
Volume/Cycle	3.5oz. (105ml)	7oz. (207ml)
Min. Well I.D.	2" (50mm)	2" (50mm)
Operating Press.	10-125psi (0.7 - 8.6 bar)	10-125psi (0.7 - 8.6 bar)
Min. Operating Range	5psi (0.34 bar)	5psi (0.34 bar)
Maximum Depth	250' (76.2m)	250' (76.2m)
Maximum Operating Temperature	176°F (80°C)	176°F (80°C)

Section 5: System Schematics

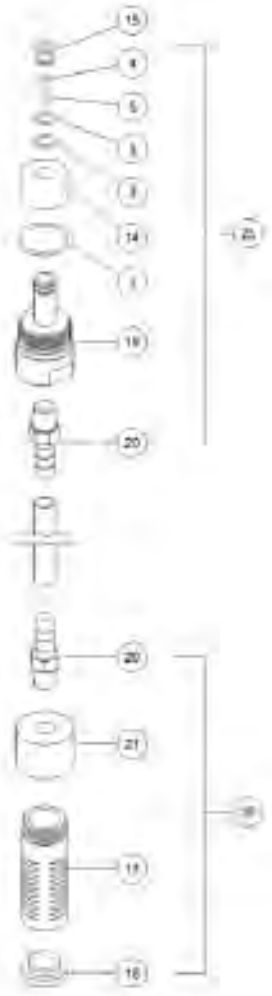
1.66 PVC BLADDER PUMP COMPONENTS AND ASSEMBLY



Pump Assembly



36" Pump Option



Optional Drop Tube Assembly

Section 6: Parts and Accessories

Item	Qty	Description	Part No.
1	2	O-RING,VITON,#125,BROWN	17500120
2	2	O-RING,VITON,2.5MM X 23MM	11150319
3	2	O-RING,VITON,#014,BROWN	17500119
4	1	O-RING,VITON,2mm x 7.5mm,BROWN	16600108
5	2	BALL,VITON ,3/8, PVC BLADDER PUMP 1.66,TOP	17500115
6	1	HOSEBARB,CLEAR PVDF,1/8 NPT TO 5/32 BARB	11150187
7	1	HOSEBARB,POLY,MODIFIED,.25, PVC BLADDER PUMP 1.66	11150134
8	1	UPPER CAP,1.66,PVC,BP,CE	21150122
9	1	TUBE INTRNLSMPL,PVC,1.66BP,18"	11150124
10	2	RING,COMPRESSION,PVC,1.66,BP	21150115
11	1	BLADDER,PTFE,1.66"X18",PVC,CE	21150119
12	1	LOWER,HEAD,PVC,1.66,BP,CE	21150117
13	1	HOUSING,PVC,1.66X18",BP,CE	21150120
14	1	WEIGHT,SS6,INTERNAL,BP,PVC	11150132
15	1	PLUG,BALL RETAINER,1.66 PVC BP, CE	21150116
16	1	CAP,LOWER,PVC,1.66,BP,CE	21150114
17	1	SCREEN,INTAKE,1.66,PVC,BP,CE	21150118
18	1	CAP,SCREEN,INTAKE,1.3,PVC	11150131
19	1	CAP,LOWER,DROP TUBE,1.66,PVC, BP, CE	21150125
20	2	HOSEBARB,PP,1/2X3/8MPT	11150189
21	1	BODY,INTAKE,DROP TUBE,1.66,PVC, BP,CE	21150126
22	1	HOUSING,PVC,36",BP,CE	21150123
23	1	BLADDER,PTFE,1.66"X36",PVC,CE	21150124
24	1	TUBE,INTERNALSAMPLE,BP,36,PVC, 1.66X36	11150125
25	§	ASSY,LOWER CAP,1.66 PVC,DROPTUBE,CE,WITH 1/2" HOSEBARB	51150072
26	§	ASSY,INTAKE,1.66 PVC,DROP TUBE, CE,WITH 1/2" HOSEBARB	51150073
	§	KIT, 1.66, PVC, 0-RING SET, CE [ITEMS: #1(2), #2(2),#3(2), #4(1)]	91150018
	1	MANUAL	
*	2	CROSS PIN,PVC,BLADDER PUMP,12 PACK**	21150152

§ SOLD SEPERATLY

* *Not shown*

** *Sold only as a 12 pack*

Attachment C
Field Forms

Inspection Form: Monitoring Wells, ORC Hangers, and Bladder Pumps

AECOM

Project Information	
Project Name: *Chevron Pipe Line Company Pasco Bulk Terminal*	**Date:**
Project Number:	**Personnel:**

Inspection Item	YES	NO	Comments/Notes
Bladder Pumps			
Any bladder pumps in poor condition?			
ORC Hangers			
Any hangers in poor condition?			

Well Inspection

Well ID	Exterior Condition	Surface Concrete	Bolts / Washers	Gasket	Well Cap	Interior Condition	Well Casing Condition	Access Issues / Other Comments
MW-2								
MW-3								
MW-4								
MW-6								
MW-7								
MW-8								
MW-10								
MW-11								
MW-12								
MW-14								
MW-15								
MW-16								
MW-17								
MW-18								
MW-19								
MW-20								
MW-21								
MW-22								
MW-23								

Investigative Derived Waste Form

AECOM

Project Information			
Project Name:	*Chevron Pipe Line Company Pasco Bulk Terminal*	**Date Form Started:**	
Project Number:		**Personnel:**	

Drum Records		To Be Completed in the Field <--		--> To Be Completed in the Office		
Unique Drum ID	**Date Generated**	**Drum Contents**	**Characterization Sample ID**	**Date Removed**	**Transported By**	**Disposal Facility and Location**

ORC Tracking Form

Project Information	
Project Name: *Chevron Pipe Line Company Pasco Bulk Terminal*	**Date:**
Project Number:	**Personnel:**

ORC Deployment Data

Instructions: During each deployment, record the mass of ORC deployed in each well:
- 3' x 3.5" sleeve = 7.25 lbs.
- 3' x 1.75" sleeve = 1.75 lbs.

When sleeves are retrieved at the end of the deployment period, estimate and record the mass remaining. Refer to Section 4.3.4 of the O&M Plan: If the mass remaining is less than approximately 15%, the remaining ORC can be injected into the well, and the cleaned sleeve material disposed of as municipal solid waste; if the mass remaining is greater than approximately 15%, prepare the used sleeves for storage.

Well ID	Deployment Date	Pounds of ORC Deployed	Retrieval Date	Pounds of ORC Remaining	Used Sleeves Stored or Cleaned?	Notes/Comments
MW-2						
MW-3						
MW-11						
MW-12						
MW-17						
MW-19						

About AECOM

AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water and government. With approximately 145,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and collaborative technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. A Fortune 500 company, AECOM serves clients in more than 100 countries and has annual revenue in excess of $6 billion.

More information on AECOM and its services can be found at www.aecom.com.

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