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Compliance Monitoring Plan

Chevron Pipe Line Company Pasco Bulk Terminal

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

Quality Information

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	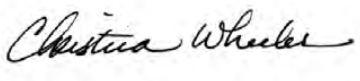	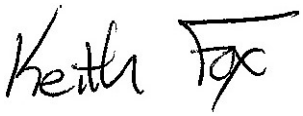
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Revision History

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

Distribution List

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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
DTW	depth-to-groundwater
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
EIM	Environmental Information Management
FSID	Facility Site Identification Number
HASP	Health and Safety Plan
IC	institutional controls
IDW	investigation-derived waste
IHS	indicator hazardous substances
MNA	monitored natural attenuation
MTCA	Model Toxics Control Act
MW	Monitoring Well
ORC	oxygen-releasing compound
ORP	oxidation-reduction potential
POC	point of compliance
QAPP	Quality Assurance Project Plan
QA	quality assurance
QC	quality control
RI/FS	Remediation Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
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
VOC	volatile organic compound
WAC	Washington Administrative Code

1 Introduction

This Compliance Monitoring Plan (CMP) 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 is discussed further in Section 1.2.

This CMP describes the groundwater monitoring activities 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 *Engineering Design Report* (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 (AECOM, 2024). The CAP, EDR, and CMP provide the information necessary to implement the selected cleanup action.

1.1 Statement of Work

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 institutional controls (ICs), monitored natural attenuation (MNA), and enhanced bioremediation using oxygen-releasing compounds (ORCs). As required by the Agreed Order and defined in the CAP, this CMP describes the groundwater monitoring locations, methods, frequency, analytical parameters, and reporting obligations required to ensure that the cleanup objectives established in the CAP are met. ICs, MNA, and ORC deployment are summarized below. Included as appendices to this CMP are the *Sampling and Analysis Plan* (SAP) and *Quality Assurance Project Plan* (QAPP).

1.1.1 Institutional Controls

ICs are long term measures taken to limit or prohibit activities that may interfere with the integrity of 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 of the EDR, include physical measures and an environmental covenant.

1.1.2 Monitored Natural Attenuation

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 Site indicator hazardous substances (IHSs) across the Site. IHS concentrations remain above the cleanup standards (Section 2.2) in a few isolated upland source areas. One of the mechanisms of the cleanup action is continued MNA processes that have provided significant remedial progress since the discontinuation of active remediation in December 2002.

1.1.3 Enhanced Bioremediation with Deployment of Oxygen-Releasing Compounds

Enhanced bioremediation relies primarily on the same natural processes to achieve cleanup as MNA. However, in localized areas, the lack of dissolved oxygen (DO) may limit the rate of natural biodegradation. The deployment of an ORC into the groundwater system at wells where IHSs remain above cleanup levels will increase the DO concentration and should enhance (accelerate) the aerobic degradation process in the vicinity of otherwise slowly responding wells, thereby reducing IHS concentrations.

The deployment of ORC in oxygen diffusing filter socks (ORC sleeves) in compliance monitoring wells (MW) 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.

1.2 Terminal and Tidewater Site Locations and Description

This section defines the Terminal and Tidewater Site areas. In Figures 1 and 2, the Terminal is shown as 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 along the Snake River to approximately 425 feet in the upland portion of the Terminal, see Section 4.2 for elevation datum. (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.

1.3 Site Indicator Hazardous Substances and Source Areas

Occasional releases of petroleum products from ASTs, pipelines, and other infrastructure 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 RI/FS (AECOM, 2021).

The CAP concluded that the following eight 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 labeled in 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 feet below ground surface [bgs] that 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, BTEX, and naphthalene in groundwater and deep subsurface soil (83 to 90 feet bgs that is near or at the depth to the water table).

1.4 Compliance Monitoring Requirements

This CMP meets the requirements of the Model Toxics Control Act (MTCA), and other regulatory guidance documents, such as Ecology's *Guidance on Remediation of Petroleum-Contaminated Ground Water by Natural Attenuation* (Ecology, 2005) and Ecology's *Guidance on Sampling and Data Analysis Methods* (Ecology, 1995). The purpose of the CMP is to describe short- and long-term compliance monitoring to be conducted at the Site during remediation and following its completion. Under Washington Administrative Code (WAC) 173-340-410, compliance monitoring includes (i) protection monitoring; (ii) performance monitoring; and (iii) confirmational monitoring.

1.4.1 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)].

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.

1.4.2 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.

1.4.3 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.

1.5 Report Organization

The CMP is organized as follows:

- Section 1 (Introduction) provides the statement of work, background information, and compliance monitoring requirements.
- Section 2 (Summary of Cleanup Action) summarizes the selected cleanup action.
- Section 3 (Compliance Monitoring Program) summarizes the program.
- Section 4 (Reporting) summarizes the reporting requirements.
- Section 5 (Plan Amendment) presents the procedure for amending the CMP.
- Section 6 (References) provides a list of report references.
- Section 7 (Limitations) provides the report limitations.

The report includes several figures following the text and two appendices.

- Appendix A includes the SAP.
- Appendix B includes the QAPP.

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 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.

2.2 MTCA Cleanup Standards

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

2.2.1 Groundwater Cleanup Levels

The process used to develop the cleanup levels is described in the CAP. 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. Cleanup levels for these IHSs are listed in Table 1 below.

Table 1. Groundwater Cleanup Levels

Analyte	Cleanup Level
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

2.2.2 Groundwater Points of Compliance

For groundwater, the POC is the point where the groundwater cleanup levels must be attained for the 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.

3 Compliance Monitoring Program

Tesoro will conduct compliance monitoring until the groundwater monitoring results demonstrate that the IHS concentrations are below the required cleanup levels, and that the Site has achieved the cleanup standards. Compliance monitoring includes both performance and confirmational monitoring. Performance monitoring will begin in spring of 2023. Performance monitoring for the Site will be conducted until the IHSs are no longer detected above the cleanup levels established in the CAP (Table 1). At that time, confirmational monitoring will begin and will continue until the cleanup standards are met.

3.1 Monitoring Objectives

The goal of compliance monitoring is to monitor the effectiveness of natural attenuation as one of the selected cleanup actions for the Site. Specific objectives of the CMP are listed below.

- To document groundwater flow patterns, including changes that might adversely impact the effectiveness of the natural attenuation remedy
- To identify the monitoring wells to be sampled and analyses to be performed to demonstrate compliance with the cleanup standards
- To establish a monitoring frequency that ensures that human health and the environment continue to be protected during the performance and confirmational monitoring periods
- To provide periodic reports to demonstrate progress toward achieving Site cleanup standards

The compliance monitoring activities performed by Tesoro will be conducted in accordance with this CMP, including the SAP and QAPP presented in Appendices A and B, respectively. Together, the use of the SAP and QAPP are intended to promote:

- Consistent field procedures;
- Collection of representative samples;
- Proper calibration of field equipment to obtain accurate field measurements;
- Minimization of cross-contamination and the introduction of artificial contaminants;
- Accurate documentation of field observations, sampling procedures, and decontamination procedures;
- Consistent laboratory analytical procedures; and
- Collection of data that are accurate and defensible and are of adequate technical quality to meet the data quality objectives for the Site.

Field activities will also be performed in accordance with a site-specific HASP.

3.2 Monitoring Well Network and Monitoring Schedule

The monitoring well network is listed on Tables 2 and 3 and includes:

- Nineteen compliance monitoring wells (MW-02 through MW-08, MW-10 through MW-12, and MW-14 through 23)
- Two monitoring wells located at the Tidewater site (AR-11 and TMW-05) (herein referred to as the Tidewater wells).

These 21 monitoring wells are shown in Figure 2 in addition to the vapor extraction wells VE-01 through VE-04 and other monitoring wells at the Tidewater site.

As discussed in Section 1.4.2, performance monitoring will initially be conducted at the Site semi-annually in the spring and fall. Performance monitoring will be conducted during the ORC deployment until the IHSs are no longer detected above the cleanup levels established in the CAP.

The proposed performance monitoring schedule for the first two years is shown as Tables 2 and 3. The initial year of the cleanup action prior to ORC deployment is 2023, and then the first year of ORC deployment is 2024.

- In 2023, the 19 compliance monitoring wells will be sampled during the first and second semi-annual events scheduled in the spring and fall (Table 2).
- Starting in 2024, the 19 compliance monitoring wells will be sampled in the first semi-annual event scheduled for the spring, and then ORC sleeves will be deployed pending Ecology's approval of the EDR (Table 3). Compliance monitoring wells MW-02, MW-03, MW-11, MW-12, MW-17, and MW-19 will be used for ORC sleeve deployment between spring and fall in accordance with the EDR (AECOM, 2024). In the late summer or 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 2. Compliance Monitoring Wells and Performance Monitoring Schedule – 2023

Location	Well Type	Well ID	Location Relative to Source Area	Collect Groundwater Water Level Measurements (During both Semi-Annual Events)	Collect Samples (During 1st Semi-Annual Event in Spring)	Collect Samples (During 2nd Semi-Annual Event in Fall)
Site	Compliance Monitoring Wells	MW-02	Interior	X	X	X
		MW-03	Interior	X	X	X
		MW-04	Outside	X	X	X
		MW-06	Outside	X	X	X
		MW-07	Outside	X	X	X
		MW-08	Outside	X	X	X
		MW-10	Outside	X	X	X
		MW-11	Interior	X	X	X
		MW-12	Outside	X	X	X
		MW-14	Outside	X	X	X
		MW-15	Outside	X	X	X
		MW-16	Outside	X	X	X
		MW-17	Interior	X	X	X
		MW-18	Outside	X	X	X
		MW-19	Interior	X	X	X
		MW-20	Outside	X	X	X
		MW-21	Outside	X	X	X
		MW-22	Outside	X	X	X
		MW-23	Outside	X	X	X
Tidewater Site	Monitoring Wells	AR-11	Outside	X	--	--
		TMW-05	Outside	X	--	--

Table 3. Compliance Monitoring Wells and Performance Monitoring Schedule – 2024+

Location	Well Type	Well ID	Location Relative to Source Area	Collect Groundwater Water Level Measurements (During both Semi-Annual Events)	Collect Samples (During 1st Semi-Annual Event in Spring)	Deploy ORC Sleeves (Over 6 months in Summer)	Collect Samples (During 2nd Semi-Annual Event in Fall)
Site	Compliance Monitoring Wells	MW-02	Interior	X	X	X	--
		MW-03	Interior	X	X	X	--
		MW-04	Outside	X	X	--	X
		MW-06	Outside	X	X	--	X
		MW-07	Outside	X	X	--	X
		MW-08	Outside	X	X	--	X
		MW-10	Outside	X	X	--	X
		MW-11	Interior	X	X	X	--
		MW-12	Outside	X	X	X	--
		MW-14	Outside	X	X	--	X
		MW-15	Outside	X	X	--	X
		MW-16	Outside	X	X	--	X
		MW-17	Interior	X	X	X	--
		MW-18	Outside	X	X	--	X
		MW-19	Interior	X	X	X	--
		MW-20	Outside	X	X	--	X
		MW-21	Outside	X	X	--	X
		MW-22	Outside	X	X	--	X
		MW-23	Outside	X	X	--	X
Tidewater Site	Monitoring Wells	AR-11	Outside	X	--	--	--
		MW-05	Outside	X	--	--	--

After compliance with cleanup levels has been demonstrated through performance monitoring, the ORC will no longer be deployed, and confirmation monitoring will begin. Confirmation monitoring will be used until cleanup criteria have been achieved in compliance monitoring wells. Confirmation monitoring will continue until two consecutive events have verified IHSs concentrations are below the cleanup levels.

3.3 Monitoring Events

Each groundwater monitoring event will include the determination of the hydraulic gradient and sampling of specific monitoring wells in accordance with the Agreed Order to assess the progress toward achieving the cleanup levels. Applicable procedures for these activities are described in the SAP (Appendix A) and QAPP (Appendix B).

3.3.1 Static Groundwater Level Measurement

The compliance monitoring program will include measuring the depth-to-groundwater (DTW) in accordance with the SAP. The DTW measurements will be used to construct a potentiometric surface map for each monitoring event. Measurable phase-separated hydrocarbons have not been detected in the Site monitoring wells since 2003

(AECOM, 2021); therefore, the use of an interface probe when collecting DTW measurements at the Site is not warranted.

3.3.2 Sample Collection

After measuring the DTW, low flow purging and sampling procedures will be implemented to collect representative groundwater samples from monitoring wells in accordance with the SAP. During monitoring well purging activities before sampling, field parameters will be measured and recorded to determine when water removed from a well is representative of in-situ groundwater conditions and ready for sampling. The field parameters to be measured include pH, conductivity, DO, conductivity, temperature, oxidation-reduction potential (ORP), and turbidity. Groundwater sampling procedures are discussed in detail in the SAP Section 2.

3.3.3 Analytical Parameters

Site IHSs for the compliance monitoring program are TPH-g, TPH-d, TPH-o, BTEX, and naphthalene. Tables A-2 and A-3 in the SAP list the analytical parameters, methods, and estimated number of groundwater samples to be collected during the compliance monitoring period. Analytical methods and data quality objectives are described in the QAPP. All groundwater samples will be analyzed by an Ecology-accredited laboratory.

MNA parameters will also be collected to provide data indicating the status of petroleum hydrocarbon degradation processes in groundwater at the Site. The MNA parameters will include:

- Field-measured parameters: pH, conductivity, DO, temperature, ORP, ferrous iron, and nitrate
- Laboratory-measured parameters: dissolved manganese, sulfate, alkalinity, and methane

3.3.4 Quality Control/Quality Assurance

Quality control (QC) and quality assurance (QA) processes employed during compliance monitoring will involve collection of field QC samples, calibration of field equipment, analysis of internal laboratory QC samples, and external data quality review of the laboratory analytical results. The types and numbers of field QC samples are described in the SAP (Appendix A). QC requirements for the laboratory analytical methods and external QA reviews are described in the QAPP (Appendix B).

3.4 Waste Management

Compliance monitoring at this Site will involve collection of groundwater samples from selected existing monitoring wells. The investigation-derived waste (IDW) that will be generated during compliance monitoring includes:

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

As discussed in Section 9 of the SAP, the Terminal has procedures in place for handling this IDW, and a formal waste management plan is not required. The disposal of the ORC sleeves is described in Section 4.6 of the EDR (AECOM, 2024).

3.5 Health and Safety

AECOM will be responsible for the health and safety of its employees and subcontractors (if any) performing work under the CMP. AECOM will develop a project-specific HASP 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, Tesoro safety requirements, and the SAP (Appendix A), and will perform a hazard assessment to ensure that all appropriate up-front safety planning is in place. Upon arrival for a monitoring 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.

4 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 4 below.

Table 4. 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

5 Plan Amendment

As the cleanup action proceeds, changes to the CMP may be warranted due to changed Site conditions and to comply with permits or substantive requirements of regulations that are forthcoming. All proposed changes will be submitted to Ecology for review and approval in compliance with the Agreed Order. CMP modifications may include changes to which compliance monitoring wells are gauged/sampled, frequency or dates of scheduled monitoring events, or analytical methods.

If required by the Terminal, proposed modifications to the compliance monitoring well network may include replacement, relocation, or physical removal (plugging and abandonment) of one or more wells. These types of changes will not require modification of the Agreed Order.

6 References

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

AECOM, 2024. *Engineering Design Report*. Chevron Pipe Line Company Pasco Bulk Terminal. January.

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CEECON, 2017. *Addendum to Supplemental Remedial Investigation Feasibility Study.* Andeavor - Tesoro Logistics (Former Chevron) Pasco Bulk Fuel Terminal, Pasco, Washington. December 10.

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7 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_CMP\Fig 1 Site Vicinity 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_CMP\Fig 2 Site Plan and Compliance MW Network.mxd

AECOM

60722666

SITE MAP AND COMPLIANCE MONITORING WELL NETWORK

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

FIGURE 2

Appendix A
Sampling and Analysis Plan

AECOM

Environment

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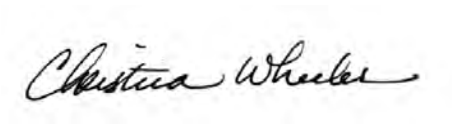
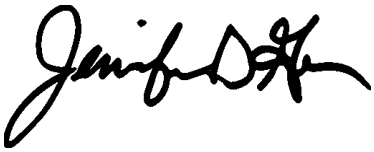
January 2024

Appendix A.
Sampling and Analysis Plan
Compliance Monitoring Plan

Chevron Pipe Line Company Pasco Bulk Terminal

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

Quality Information

Prepared by	Checked by	Verified by
		
Christina Wheeler, PhD AECOM Chemist	Jennifer B. Garner AECOM Chemist	Nicky Moody AECOM Project Manager Senior Environmental Scientist

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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Table of Contents

List of Attachments

List of Acronyms and Definitions

%	percent
AST	aboveground storage tank
BTEX	benzene, toluene, ethylbenzene, and xylene
btoc	below top of casing
CAP	Cleanup Action Plan
CMP	Compliance Monitoring Plan
CPL	Chevron Pipe Line Company
DI	deionized or distilled
DO	dissolved oxygen
DQO	data quality objectives
DTW	depth-to-groundwater
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
Fe^{2+}	ferrous iron
EPA	United States Environmental Protection Agency
HCl	hydrochloric acid
IC	institutional controls
ID	identification
IDW	investigation-derived waste
IHS	indicator hazardous substances
mg/L	milligrams/liter
mL	milliliter
mL/min	milliliter per minute
MNA	monitored natural attenuation
MP	measuring point
MS/MSD	matrix spike/matrix spike duplicate
MTCA	Model Toxics Control Act
mV	millivolts
MW	monitoring well
NAD83	Washington State Plane South Zone North American Datum 1983
NO_3^-	nitrate
NGVD 29	National Geodetic Vertical Datum of 1929
NTU	nephelometric turbidity unit
ORC	oxygen-releasing compound
ORP	oxidation-reduction potential
PSI	pound force per square inch
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
QA	quality assurance
QA/QC	quality assurance/quality control
QED	QED Environmental Systems
redox	oxidation-reduction
RI/FS	Remediation Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
Tesoro	Tesoro Logistics Operations, LLC
Tidewater	Tidewater Terminal Company, Inc.
TPH	total petroleum hydrocarbons
TPH-d	diesel-range total petroleum hydrocarbons
TPH-g	gasoline-range total petroleum hydrocarbons

TPH-o	motor oil-range total petroleum hydrocarbons
VOA	volatile organic analysis
WAC	Washington Administrative Code

1 Introduction

This Sampling and Analysis Plan (SAP) presents a description of sample collection, handling, and analysis procedures to be conducted during the cleanup action pursuant to Agreed Order Number DE 21664 (here in referred to as the Agreed Order) (Ecology, 2023b) 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.

1.1 Purpose of the SAP

The SAP has been developed for use during compliance monitoring, as required by the *Cleanup Action Plan* (CAP) prepared by Ecology (Ecology, 2023a). This SAP is intended to meet the requirements specified in Model Toxics Control Act (MTCA) Washington Administrative Code (WAC) 173-340-820 and Ecology’s *Guidance on Sampling and Data Analysis Methods* (Ecology, 1995).

The SAP shall specify procedures, that ensure sample collection, handling, and analysis will result in data of sufficient quality to plan and evaluate remedial actions at the Site. Additionally, information necessary to ensure proper planning and implementation of sampling activities shall be included. The SAP shall contain the elements listed on Table A-1 per WAC 173-340-820. To avoid unnecessary repetition, Table A-1 includes cross-references to the *Compliance Monitoring Plan* (CMP) and *Quality Assurance Project Plan* (QAPP).

Table A-1. SAP Requirements

Ecology Required SAP Elements	Deliverable Section Containing Required Information
(a) A statement on the purpose and objectives of the data collection, including quality assurance and quality control requirements	SAP Sections 1.4 and 1.5; CMP Section 3.1; QAPP Sections 1.1 and 4
(b) Organization and responsibilities for the sampling and analysis activities	QAPP Section 3
(c) Requirements for sampling activities including:	
(i) Project schedule	SAP Section 1.7; CMP Sections 3.3 and 4
(ii) Identification and justification of location and frequency of sampling	CMP Section 3.2 and 3.3
(iii) Identification and justification of parameters to be sampled and analyzed	SAP Section 2.2.2.3 and Table A-4
(iv) Procedures for installation of sampling devices	SAP Section 2.2
(v) Procedures for sample collection and handling, including procedures for personnel and equipment decontamination	SAP Sections 2.2 and 8
(vi) Procedures for the management of waste materials generated by sampling activities, including installation of monitoring devices, in a manner that is protective of human health and the environment	SAP Section 9
(vii) Description and number of quality assurance and quality control samples, including blanks and spikes	SAP Section 3 and QAPP Section 8.1
(viii) Protocols for sample labeling and chain of custody	SAP Sections 5.2 and 6.3
(ix) Provisions for splitting samples, where appropriate	Not included except for field quality samples in SAP Section 3

Ecology Required SAP Elements	Deliverable Section Containing Required Information
(d) Procedures for analysis of samples and reporting of results, including:	
(i) Detection or quantitation limits	QAPP Sections 6.3 and 8.2
(ii) Analytical techniques and procedures	QAPP Section 6
(iii) Quality assurance and quality control procedures	SAP Section 3 and the QAPP
(iv) Data reporting procedures, and where appropriate, validation procedures	QAPP Section 7

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

This section defines 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.

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).

The elevations at the Terminal range from approximately 356 feet along the Snake River to approximately 425 feet in the upland portion of the Terminal, see Section 4.2 for elevation datum. (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.

1.3 Background

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 Supplemental RI/FS (Ecology, 2023a; AECOM, 2021). Indicator hazardous substances (IHSs) determined from the RI/FS and carried forward as IHSs in the CAP, 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 oxygen-releasing compounds (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 (AECOM, 2021) and the CAP (Ecology, 2023a). The *Engineering Design Report* (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 (AECOM, 2024). The CAP, EDR, and CMP provide the information necessary to implement the selected cleanup action.

1.4 Sampling and Analysis Objectives

MNA, coupled with ICs and ORCs is the Ecology-selected remedy for cleanup of the remaining IHSs in groundwater at the Site (Ecology, 2023a). The goal of the CMP is to monitor the effectiveness of natural attenuation with the deployment of ORC as the selected cleanup action for the Site and enable evaluation of the current and future risk to human health and the environment. Specific objectives of the CMP are listed below.

- Document groundwater flow patterns, including changes that might adversely impact the effectiveness of the MNA remedy
- Identify the wells to be sampled and analyses to be performed to demonstrate compliance with the cleanup standards
- Establish a monitoring frequency that ensures that human health and the environment continue to be protected during the performance monitoring period
- Provide periodic reports to demonstrate progress toward achieving Site cleanup standards

The compliance monitoring activities performed by Tesoro will utilize selected wells within the existing monitoring well network as outlined in the CMP. IHS concentrations will be compared to MTCA cleanup levels as established in the CAP to evaluate the effectiveness of the MNA remedy, as well as the progress toward achieving the cleanup standards.

This SAP has been prepared in conjunction with the QAPP (Appendix B of the CMP) to ensure that the field and laboratory procedures utilized during the implementation of the CMP are consistent with standard, generally accepted methods. This SAP provides a description of the specific procedures, activities, and protocols to be followed to meet the data collection and evaluation objectives. Compliance monitoring activities performed on behalf Tesoro will be conducted in accordance with this SAP and the QAPP. When used in together, the SAP and QAPP are intended to promote the following:

- Consistent field procedures
- Collection of representative samples
- Proper calibration of field equipment to obtain accurate field measurements
- Minimization of cross-contamination and the introduction of artificial contaminants
- Accurate documentation of field observations, sampling procedures, and decontamination procedures
- Consistent laboratory analytical procedures
- Collection of data that are accurate and defensible and are of adequate technical quality to meet the data quality objectives (DQO) for the Site

1.5 Data Quality Objectives

Data generated during the compliance monitoring program will require standard levels of quality assurance (QA). Data will be of sufficient quality and quantity to support the assessment of current groundwater conditions, document the concentration of IHSs in the groundwater, and confirm the effectiveness of MNA as the selected cleanup action for the Site. Field sampling and monitoring, laboratory analysis, and data validation will be designed to meet those needs.

Two types of data, with correspondingly different levels of data quality, will be generated as part of the compliance monitoring program. The two types of data are listed below.

- Validated laboratory-analyzed groundwater data
- Non-validated field measurements

Laboratory-analyzed groundwater samples, along with field and laboratory quality assurance/quality control (QA/QC) samples, will be subject to data validation, as described in the Section 7 of the QAPP. The overall data quality objectives for these samples are to provide analytical data of known quality in terms of precision, bias, representativeness, completeness, and comparability. Project-specific DQOs are presented in the QAPP (Section 4 and Table B-3).

Field calibration data will be maintained in on the Daily Field Report (Attachment A, Form 1) to document field meter-derived data are collected from functional and properly calibrated equipment. As an additional validation step, field-collected data will also be compared to normally expected values or historical measurements.

1.6 Revisions

The focus of this SAP is on compliance groundwater monitoring; however, data gaps may be identified during implementation of the CMP. If the field activities are expanded, the SAP will be revised, as needed, to document the procedures that will be followed. Revisions will be submitted to Ecology for approval; however, revisions to the SAP will not require modification of either the CMP or the Agreed Order.

1.7 Monitoring Schedule

Tesoro will conduct compliance monitoring until the groundwater monitoring results demonstrate that the IHS concentrations are below the required cleanup levels, and the Site has achieved the cleanup standards. Compliance monitoring includes both performance and confirmational monitoring.

Performance monitoring, as detailed in the CMP, began in April 2023 after the Agreed Order was signed. Performance monitoring for the Site will be conducted until the IHSs are no longer detected above the cleanup levels established in the CAP (CMP, Table 1). At that time, the ORC sleeves will be removed and confirmational monitoring will begin and will continue until the cleanup standards are met as detailed in the CMP.

Semi-annual performance groundwater monitoring initially followed Table A-2 in 2023 and will then transition to Table A-3 in 2024. Scheduling and preparations for all field work will be coordinated between AECOM and Tesoro personnel at the Terminal due to access restrictions.

2 Groundwater Sampling Procedures

The following is a discussion of the methods proposed in the collection and analysis of groundwater samples during the compliance monitoring period. Groundwater measurements and samples will be collected from 19 monitoring wells at the Site, as described in the CMP (Section 3.2, Table 2). Tables A-2 and A-3 also summarize the program and lists the analytical parameters and estimated number of groundwater samples to be collected.

2.1 Static Groundwater Level Measurement

This section describes the required equipment and the procedures used for the collection of depth-to-groundwater (DTW) measurements, which are used to calculate groundwater elevations and evaluate groundwater flow directions and gradients. The DTW is the distance between a measuring point (MP) (a marked point on the top edge of the inner well casing) and the static groundwater level. The MP should be notched at the lip of the casing, either on the high side or on the north side. The DTW is measured using a decontaminated electric water level meter. A light on the water level meter illuminates and a tone is generated when the weighted probe tip contacts the groundwater surface in the well and completes an electronic circuit. The measured DTW is determined to within 0.01 foot by noting the point on the probe cable that corresponds to the MP at the initial point of contact.

2.1.1 Equipment

The following equipment is required for the collection of water level data:

- Well lock keys
- Standard water level meter or the QED Environmental Systems (QED) MicroPurge® MP30, which is a combined drawdown and water level meter
- Weighted steel measuring tape with decimal foot increments (if depth to the bottom of the well is to be determined)
- Decontamination equipment (see Section 8)
- Handheld tablet for recording measurements

2.1.2 Procedures

The DTW measurements will be obtained for a single data set for as short a period as practical, to reduce the potential for external factors (e.g., rainfall, barometric pressure, and river tidal changes) to affect groundwater levels nonuniformly; therefore, AECOM will attempt to collect the DTW measurements in all wells on the same day at the beginning of each event, prior to any well purging or sampling for the Site.

The following steps are necessary to collect DTW level measurements:

1. If possible, gauging should be conducted in order from the least to most impacted well (or generally start with wells furthest from the block valves)
2. Make sure area around well heads are clean and free of debris, remove the well cap from all monitoring wells
3. Inspect the condition of each well (as directed in the *Operations and Maintenance Plan* (Appendix A of the EDR)
4. Wait at minimum of 15 minutes to approach an equilibrium state with atmospheric pressure before taking measurements
5. Check the operation of the meter by turning on the indicator switch and pressing the test button

6. Decontaminate the probe and graduated cable per Section 8
7. Holding the water level meter above the well casing, lower the cable gradually into the monitoring well until the indicator contacts the water surface (observed by the buzzer sounding and illumination of the indicator light)
8. At this point, stop lowering the cable
9. Note the point on the graduated cable that corresponds to the MP at the top of the casing when the electronic circuit is first completed; if necessary, grasp tape with thumb and index finger exactly at the MP; pull tape out of well slowly and read measurement; if the cable is not graduated to hundredths of feet, use the measuring tape and measure from the point on the cable that corresponds to the MP down to the first incremental marker; add this measurement to the marker measurement for the DTW reading
10. Draw the cable a 1 foot above the surface of the water, then lower it and repeat Steps 3 and 4; if these two readings differ by more than 0.02 foot, repeat until the measured readings stabilize
11. Measurements should always be taken as the indicator is lowered into the well, not as it is raised
12. Record the DTW to the nearest 0.01 foot along with the date and time of measurement on the handheld tablet
13. Remove the cable from the monitoring well
14. Decontaminate the probe and graduated cable per Section 8

2.2 Low Flow Method

This section describes the required equipment and the procedures for collection of groundwater samples in accordance with United States Environmental Protection Agency (EPA)'s low flow purging and sampling procedure (EPA, 2017). Sampling a groundwater monitoring well utilizing the low-flow method relies on stabilization of field water quality parameters to determine when groundwater is representative of aquifer conditions.

2.2.1 Equipment and Forms

2.2.1.1 Equipment

The following equipment is required for the collection of groundwater samples:

- Well lock keys
- Standard water level meter or the QED MicroPurge® MP30, which is a combined drawdown and water level meter (one per setup)
- Select a pump controller suitable for the bladder pump deployment depths (one per setup); examples listed below; and the controller manuals are in Attachment B:
    - QED MicroPurge® MP10 Controller, external compressor, and deep cycle vehicle battery
    - QED MicroPurge® MP10H Controller, pure nitrogen tank, and regulator (female)
    - QED MicroPurge® MP50 Controller/Compressor and deep cycle vehicle battery
    - QED MicroPurge® MP15 Backpack Controller with carbon dioxide cylinder
    - Spectra Hydro Pro Controller/Compressor and deep cycle vehicle battery
    - Geotech Geocontrol PRO™ Controller/Compressor and deep cycle vehicle battery
- Bladder pump maintenance kit including spare bladders, o-rings, and check balls

- Scissors/tubing cutter
- Nitrile gloves
- Multi-parameter meter equipped with a flow-through cell (one per setup)
- Graduated cylinder (size according to flow rate) (one per setup)
- Graduated buckets used to record total water purged from the well (two per setup)
- HACH® DR 900 Multiparameter Portable Colorimeter Instrument (herein referred to as the HACH® DR 900) (one per setup) (manual in Attachment B)
- HACH® ferrous iron (Fe^{2+}) reagent powder pillows (item number 103769) (at least 20)
- HACH® nitrate (NO_3^-) reagent powder pillows (item number 2106169) (at least 20)
- Stop watch or timer on cell phone (one per setup)
- Laboratory-supplied containers (see Table A-4), sample labels, cooler(s), and ice
- Handheld tablet

2.2.1.2 Dedicated Bladder Pumps

Two-inch diameter dedicated polyvinyl chloride (PVC) bladder pumps manufactured by Geotech Environmental Equipment Inc. are deployed in the Site monitoring wells. The pump model number, pump intake depths, and monitoring well construction specs are listed on Table A-5. It is recommended that the pump intake depth and pumping rate remain the same for all sampling events. The lowest historical midpoint of the saturated screen length is often used as the location of the pump intake depth.

If a dedicated bladder pump is being re-deployed or a substitute pump is used for sampling, pre-measure and mark the tubing length to the deployment depth and slowly lower the pump to the pump intake depth. To prevent stirring up particulates, it is important not to touch the well bottom with the pump.

Dedicated bonded polyethylene tubing (with air and water discharge lines) is installed at each dedicated bladder pump; if a substitute pump is used for sampling, new disposable tubing is deployed for each sample.

A dedicated bladder pump is only decontaminated if the pump is removed for maintenance or deployment of ORC. Bladder pump maintenance is discussed in the *Operations and Maintenance Plan* in Appendix A of the EDR. When removed from a monitoring well, the bladder pump is first drained and then decontaminated as discussed in Section 8. The removed dedicated bladder pump will be bagged with the tubing still attached and labeled with the monitoring well location and stored securely until the next event. If a substitute pump is required to be used temporarily for sample collection during an event, then the pump is required to be stainless-steel and decontaminated both before and after sampling the well as specified in Section 8.

2.2.1.3 Forms

The following forms are required for the collection of groundwater samples:

- Monitoring Well Sampling Field Log (Attachment A, Form 2) (digital version on handheld tablet which syncs with the multi-parameter meter)
- Chain-of-Custody Form (Attachment A, Form 3) (hard copy)

2.2.2 Procedures

The low flow procedure can be separated into three main activities listed and then summarized in detail below.

- Well purging sufficiently with minimal drawdown

- Measurement of field water quality parameters
- Sample collection for field and laboratory analysis

2.2.2.1 Well Purging

Preparation for sampling includes calibrating and decontaminating sampling equipment. General procedures are presented below:

1. Calibrate the multi-parameter meter at the start of the monitoring event
2. Decontaminate equipment before and after introduction to each well (as specified in Section 8)
3. If possible, sampling should be conducted in order from the least to most impacted well
4. Make sure area around well head is clean and free of debris
5. Remove well cap
6. Don nitrile gloves during possible water-contact or equipment-contact activities; at a minimum, change gloves between each well or when introduction of potential contaminants to the well is possible
7. If available, check flow rates, drawdown, and pump setting information from previous sampling events for each well. Duplicate, to the extent practicable, the pound force per square inch (PSI), refill and discharge settings, and flow rates from previous events to determine the initial settings to reach stabilization of the water level as quickly as possible. The sampler will need to “fine-tune” the operating conditions since the recharge rate of groundwater may vary.
8. Place the water level meter in the well so the initial DTW can be measured as described in Section 2.1.2
9. If a dedicated bladder pump is not functioning and a substitute stainless-steel pump is required:
    a. Gently remove the dedicated bladder pump
    b. Bag the dedicated bladder pump and tubing and label with the monitoring well location
    c. Mark the disposable tubing for the decontaminated stainless-steel pump with the desired target sampling depth to top of well casing
    d. Slowly lower the decontaminated stainless-steel pump to the pump intake depth (Table A-5)
    e. Secure the pump at the surface to prevent it from moving
10. Setup the controller/compressor to the pump
11. Setup the multi-parameter meter with the flow-through cell
12. Start the controller/compressor unit and adjust the PSI setting and fill-discharge cycle lengths as listed below to ensure a flow rate between 100 and 500 milliliter (mL) per minute (mL/min) (using the graduated cylinder to calculate the flow rate). The PSI setting for each monitoring well has been calculated on Table A-5, and the fill-discharge cycle lengths from the past two events for each monitoring well are listed on Table A-5.
13. Find the appropriate PSI setting using these steps:
    a. The PSI setting should be close to the PSI needed to lift groundwater the depth of the pump intake, plus 10-20 feet, to maximize the discharge volume from the bladder. However, setting the PSI too high can result in a sample stream that shoots out of the tubing during sampling and/or damages the bladder. Use this simplified formula to estimate the PSI setting:

$$\text{Required PSI} = (0.5 \times \text{pump inlet depth [feet]}) + 10 \text{ PSI}$$

b. Once final PSI selection is made, lock flow throttle in place. The additional 10 PSI is to account for the pump itself and friction loss along the airline tubing. When the length of the airline is 50 feet or less, there is no need for the additional pressure.

14. Find the appropriate fill-discharge cycle lengths using these steps:

    a. Fill (or vent) cycle – during this phase, the controller allows air to vent from the pump through the air tubing. This allows the hydrostatic pressure around the pump to force water inside the bladder through a check valve in the base of the pump.

        - If the pump intake depth is less than 100 feet, the vent time is 2-3 times the drive time
        - If the pump intake depth is greater than 100 feet, the vent time is 3-4 times the drive time

    b. Discharge (or drive) cycle – during this phase, the controller supplies compressed air to the pump. This air surrounds and squeezes the bladder without ever contacting the sample. This pressure seats the check valve on the base (or intake) of the pump where the sample enters and forces the sample up through the check valve on the top of the pump and up the sample tube. This effluent check valve then seats, stopping the sample from returning into the bladder during the fill phase.

        - Turn on the controller and submerge tubing outlet water and watch for air bubbles, which mean the bladder is being compressed and air is traveling up the tubing
        - Count the seconds until the bubbles stop
        - When the bubbles stop, the bladder is fully compressed, which is the end of the drive time
        - 80 percent (%) of that time is a good starting time for the drive time

15. Adjust the flow rate to be high enough to fill sample bottles efficiently and with minimal exposure to atmospheric conditions, but low enough to minimize both drawdown and sample alteration by agitation or aeration. The flow will be smooth and uniform. In general, when using a bladder pump, the flow rate should be set to deliver a pulse long enough to fill one 40 mL glass volatile organic analysis (VOA) vial (EPA, 2017).

16. The water flow out of the bladder pump needs to be a laminar flow without air bubbles. If air bubbles are observed, they can usually be removed by elevating the discharge tube and pump to allow the air to continue rising until discharged with the water. If it is difficult to remove the captured air bubbles in the tubing, use the “pause-hold-sample” mode to flush the air bubbles out of the tubing.

17. Troubleshooting the bladder pump may require:

    a. Adjusting the PSI and cycle phase timing or

    b. Pulling the pump from the well casing and performing maintenance on the pump assembly such as changing out an o-ring, bladder, or check ball (see the *Operations and Maintenance Plan* in Appendix A of the EDR)

18. Record the purge volume, DTW measurements, flow rates, PSI settings, and fill/discharge settings on the Monitoring Well Sampling Field Log via the handheld tablet

19. From the time the pump starts purging and until the time the samples are collected, discharge the purged water into a graduated bucket to determine the total volume of groundwater purged

20. Adjust the pump speed until there is little or no drawdown; achievement of a stable drawdown of less than 0.3 feet is desirable but not mandatory

21. Drawdown can be controlled by using the QED MicroPurge® MP30 meter combined with either the MP10, MP15, or MP50 controller. The MP30 performs as both a water level meter and but also a drawdown sensor if connected to the controller; the MP30 switches between both modes. For wells purged with a different type of controller, the MP30 can still be used to provide an audible alert when drawdown has exceeded 0.3 feet.
22. During the early phase of purging, emphasis should be put on minimizing and stabilizing drawdown instead of stabilization of field parameters, which is described in the next section.

2.2.2.2 Field Parameter Measurement and Stabilization

Field parameters (temperature, pH, specific conductance, dissolved oxygen [DO], oxidation-reduction potential [ORP], and turbidity) will be measured using a multi-parameter meter equipped with a flow-through cell. Each field parameter measurement will be recorded on the Monitoring Well Sampling Field Log via the handheld tablet (Attachment A, Form 2).

Well purging should generally proceed with collection of field parameters as follows:

1. Purge the initial volume of water in the tubing before connecting the flow-through cell
2. Fill the flow-through cell and collect your first set of readings; reading include: time, volume purged, purge rate, DTW, and field parameters
3. During purging, record these readings every 3 to 5 minutes
4. As purging continues, label sample bottles as described in Section 5.2
5. Purging is considered complete when the field parameters have stabilized for three consecutive reading with the following criteria (EPA, 2017):

Field Parameter	Units	Stabilization Criteria
Temperature	degrees Celsius	± 3 %
pH	standard units	± 0.1 standard units
ORP	millivolts (mV)	± 10 mV
Specific conductivity	microSiemens per centimeter (µS/cm)	± 3%
Turbidity	nephelometric turbidity unit (NTU)	If > 5 NTU, ± 10% for values If three consecutive turbidity values < 5 NTU, considered stabilized
DO	milligrams per liter (mg/L)	If > 0.5 mg/L, ± 10% for values If three consecutive DO values < 0.5 mg/L, considered stabilized

<u>Deviations from Standard Purging Procedures</u>

This section describes how to handle deviations from the low flow purging and sampling procedure. Any deviations from the procedures described in this SAP will be noted on the Monitoring Well Sampling Field Log (Attachment A, Form 2). Potentially acceptable deviations include:

- Parameter stabilization has not been achieved; however, sampling commenced as more than three well casing volumes had been purged.
- Parameter stabilization has not been achieved as the monitoring well purged dry, but the well was sampled as described below.

Even with a low flow rate, some of the Site monitoring wells may experience significant drawdown or purge dry. Slow-recovering wells or wells that purge dry require extra care to be purged and sampled with minimal

disturbance to the water column and fine materials in and around the well screen. Attempts should be made to avoid purging low yielding wells dry. However, if a well does purge dry, sample the well as listed below.

1. Shut the pump off and allow the well to recover to at least 80% of its initial groundwater column at least once before collecting samples. This generally constitutes an adequate purge, and the well can be sampled as soon as it has recovered sufficiently to produce an adequate volume of water to fill the sample containers.
2. If time permits, purge the well a second time and allow it to recover before sampling.
3. Samples should be collected within 24 hours of the final purge/recovery cycle.
4. If the well has been purged dry and allowed to recover, field parameters should be measured after sample collection if there is an adequate volume of water.

2.2.2.3 Sample Collection

Samples will be collected immediately following the completion of well purging, as determined by the stabilization of the field parameters. Samples will be submitted for two types of analytical parameters: the Site IHSs and MNA parameters.

- The Site IHSs for the compliance monitoring program:
    - Diesel-range total petroleum hydrocarbons (TPH-d)
    - Motor oil-range total petroleum hydrocarbons (TPH-o)
    - Gasoline-range total petroleum hydrocarbons (TPH-g)
    - BTEX
    - Naphthalene
- The MNA parameters, which will be used to evaluate oxidation-reduction (redox) conditions, biodegradation status, and other natural attenuation processes at the Site:
    - Field-measured parameters using meter (Section 2.2.2.2): pH, specific conductivity, DO, temperature, and ORP
    - Field-measured parameters using the HACH® DR 900: Fe^{2+} and NO_3^-
    - Laboratory-measured parameters: dissolved manganese, sulfate, alkalinity, and methane

The analytical methods, laboratory container types, preservatives, and holding times for all these analyses except the field-measured parameters are included in Table A-4.

<u>Site IHSs Analytical Parameters</u>

The general procedures for collection of the Site IHSs samples are as follows:

1. After the parameters have stabilized, disconnect the tubing originating in the well from the influent (inflow) side of the flow cell
2. Confirm you have the correct containers per Table A-4
3. Directly fill the laboratory-supplied containers from the tubing originating in the well
4. Fill all the 40 mL VOA vials first, then any unpreserved bottles; and finally, the preserved bottles
5. When filling the VOA vials, which include pre-measured amounts of hydrochloric acid (HCl) as a preservative, direct flow from the pump discharge down the side of the sample container to minimize aeration. Hold caps in hand to minimize contamination of sample. Fill all VOA vials to the top. A positive

meniscus at the top of the container will help ensure that no air is trapped inside when cap is screwed down on the container. No air bubbles should be trapped in the sample when the container is sealed.

6. Collect QA/QC samples (i.e., field duplicate or matrix spike/matrix spike duplicate [MS/MSD] samples) at the same time by filling all bottles from the same flow. The number and types of QA/QC samples are specified in Section 3.
7. Place sample bottles in a cooler on ice to keep the samples cool (4°C)
8. Record the sample identification (ID) and time for each primary and QA/QC sample on the Monitoring Well Sampling Field Log
9. Complete the Chain-of-Custody Form (Attachment A, Form 3), package the samples for shipment, and ship, deliver, or courier the samples to the laboratory

Additional information on chain-of-custody and sample shipment is included in Sections 5 and 6.

Field-Measured Natural Attenuation Parameters using the HACH® DR 900

The steps for collection of the field-measured NA parameters (Fe^{2+} and NO_3^-) using the HACH® DR 900 are included in the instrument manual and test method procedures (Attachment B). Table A-6 below provides the test method program values from the HACH® DR 900 and the reagent powder pillow for each test method. As shown on Table A-6, the HACH® DR 900 includes only one test for Fe^{2+} but three tests for NO_3^- split into three concentration ranges: low (LR), medium (MR), and high (HR). Table A-7 provides the NO_3^- concentration ranges from May 2014 to April 2023 and the recommended test program based on that range (AECOM, 2023). The selected test methods can be pre-programed as favorites in the HACH® DR 900 at the start of the monitoring event; the directions for adding the favorites are included in Section 7 of the manual in Attachment B.

Table A-6. HACH® DR 900 Methods for the Field-Measured Natural Attenuation Parameters

NA Parameter	Test Program	Reagent Power Pillow		HACH® Test Method	Concentration Range (mg/L)
		Description	Item No.		
Fe^{2+}	255 Iron Ferrous	Ferrous Iron, 25-ml	103769	8146	0.02 - 3.00
NO_3^-	351 N, Nitrate LR	NitraVer® 6 Nitrate, 10-mL	2107249	8192	0.01 - 0.50
	353 N, Nitrate MR PP	NitraVer® 5 Nitrate, 10-mL	2106169	8171	0.2 - 5.0
	355 N, Nitrate HR PP			8039	0.3 - 30.0

Table A-7. Nitrate Ranges and Selected HACH® DR 900 Program

Monitoring Well ID	NO_3^- Concentration Range (mg/L) [(a)]	NO_3^- Concentration Median (mg/L) [(a)]	Selected NO_3^- HACH® DR 900 Test Program
MW-02	0.3 U to >30.0	11.00	355 N, Nitrate HR PP
MW-03	0.3 U to 2.9	1.4	**353 N, Nitrate MR PP**
MW-04	9.6	9.6	355 N, Nitrate HR PP
MW-06	0.3 U to >30.0	8.2	355 N, Nitrate HR PP
MW-07	6.0 to 8.0	7.0	355 N, Nitrate HR PP
MW-08	15.0 to >30.0	16.8	355 N, Nitrate HR PP
MW-10	9.6	9.6	355 N, Nitrate HR PP
MW-11	16.5	16.5	355 N, Nitrate HR PP
MW-12	0.3 U to 23.8	7.0	355 N, Nitrate HR PP
MW-14	18.6	18.6	355 N, Nitrate HR PP
MW-15	8.6	8.6	355 N, Nitrate HR PP
MW-16	6.8 to >30.0	17.1	355 N, Nitrate HR PP

Monitoring Well ID	NO_3^- Concentration Range (mg/L) [(a)]	NO_3^- Concentration Median (mg/L) [(a)]	Selected NO_3^- HACH® DR 900 Test Program
MW-17	12.3	12.3	355 N, Nitrate HR PP
MW-18	5.5 to 25.1	15.9	355 N, Nitrate HR PP
MW-19	5.5 to 20.0	13.9	355 N, Nitrate HR PP
MW-20	5.5 to >30.0	11.6	355 N, Nitrate HR PP
MW-21	7.4 to >30.0	20.2	355 N, Nitrate HR PP
MW-22	5.5 to 27.7	13.9	355 N, Nitrate HR PP
MW-23	5 to >30.0	20.5	355 N, Nitrate HR PP

Notes:
(a) = The concentration range was calculated using the data in Table C2 in the *Semi-Annual Progress Report: January 1 through June 30, 2023* (AECOM, 2023).
U = analyte not detected above the detection limit shown
>X = analyte concentration greater than range of colorimeter

A summary of the procedures for collection of the NA parameters is below:

1. Power on the HACH® DR 900
2. Complete the Fe^{2+} and NO_{3-} analyses including the blank and sample tests as described in each test method provided in Attachment B following the powder pillow procedures
3. Record the Fe^{2+} and NO_{3-} concentration on the Monitoring Well Sampling Field Log via the handheld tablet
4. Triple rinse the vials with DI water between tests and between sample locations
5. Remove the water level meter and bladder pump fittings from the well head
6. If using a non-dedicated stainless-steel pump, pull pump and discard tubing; decontaminate the pump per Section 8
7. Close and lock the well
8. Handle the purge and decontamination water and dispose of used sampling supplies as described in Section 9

3 Field Quality Assurance and Quality Control Samples

QC procedures provide the means of evaluating and controlling the precision and bias of the analytical results. Careful adherence to established procedures for sample collection, preservation, and storage will minimize errors due to sampling and sample instability. QA/QC samples relevant to this SAP are described in the following sections, the sample ID nomenclature for each of these QA/QC samples is described in Sections 5.2.2 through 5.2.5. The purpose of these samples in relation to the DQOs is discussed in Section 8 of the QAPP.

3.1 Field Related Blanks

The primary purpose of blanks is to trace sources of artificially introduced contamination. The diagram below shows how comparison of different blank sample results can be used to identify and isolate the source of contamination introduced in the field or the laboratory. The three field related blanks include the equipment blank, field blank, and trip blank; they are each defined in the following subsections including their purpose and collection frequency.

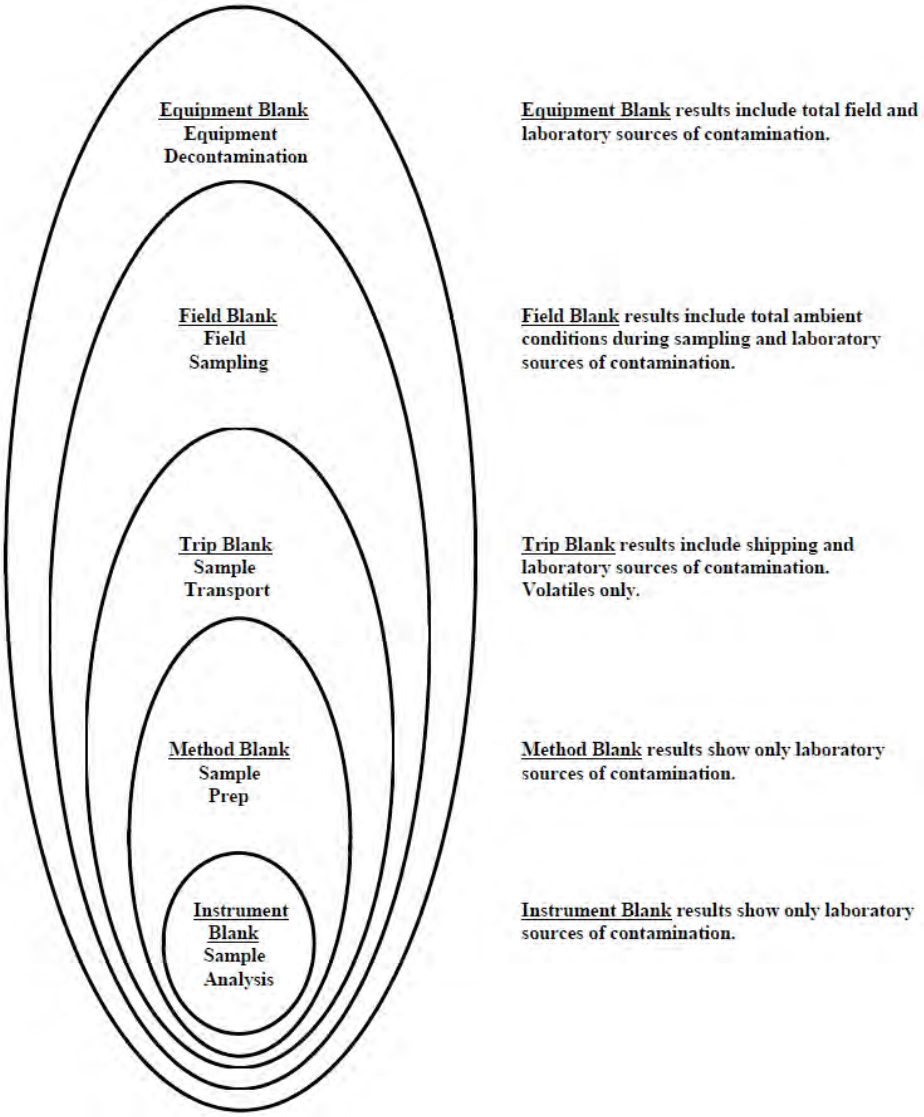

Figure reference: EPA, 2009. EPA Region III Fact Sheet Quality Control Tools: Blanks, revision 1, April 27.

3.1.1 Equipment (Rinsate) Blank

The equipment blank is a sample of laboratory-grade, organic-free, DI water (here in referred to as lab DI water) poured over the non-dedicated decontaminated sampling equipment and collected into the appropriate sample containers.

- Purpose: Assess the adequacy of the decontamination process. Assess contamination from the total sampling, sample preparation and measurement process, when decontaminated sampling equipment is used to collect samples.
- Frequency: 1 blank/day that non-dedicated sampling equipment is used.
- Analysis: Site IHSs (Table A-4)

Monitoring wells currently installed at the Site have dedicated bladder pumps; consequently, pump decontamination and equipment blanks should not be needed. If a bladder pump fails, then one equipment blank will be collected each day sampling is conducted using a non-dedicated rental pump. The decontamination procedures are included in Section 8. The equipment blank sample ID, sample time, and the source of the water used will be recorded in the Daily Field Report (Attachment A, Form 1).

3.1.2 Field Blank

The field blank is a sample of lab DI water poured into the appropriate sample containers in the field.

- Purpose: Assess contamination from field conditions during sampling.
- Frequency: 1 blank/semiannual groundwater sampling event.
- Analysis: Site IHSs (Table A-4)

The field blank will be collected in the location with the highest potential risk for cross-contamination (i.e. the tank farm). The field blank sample ID, sample time, sample location, and the source of the water used will be recorded in the Daily Field Report (Attachment A, Form 1).

3.1.3 Trip Blank

The trip blank is a sample provided by the laboratory in a VOA bottle containing lab DI water. The trip blank will be taken from the laboratory to the Site and transported back to the laboratory without having been exposed to sampling procedures.

- Purpose: Assess contamination introduced during shipping and field handling procedures.
- Frequency: 1 blank/cooler that contains sample containers for analysis of TPH-g, BTEX, and naphthalene only (Table A-4).

3.2 Field Duplicate

One field duplicate sample will be collected during each semi-annual groundwater sampling event. The field duplicate sample will be analyzed for the same parameters as the primary (parent) sample. The field duplicate sample will be obtained by alternately filling like sample containers for the two sample sets (primary and duplicate).

The field duplicate sample location is selected from a well that has historically shown to have detectable concentrations of Site IHSs. The monitoring wells (MW) tentatively designated for duplicate collection are identified in Tables A-2 and A-3 (MW-03, MW-06, or MW-19), These wells historically have measurable concentrations of the Site IHSs. The duplicate will be assigned a different sample ID than the primary sample (Section 5.2). The duplicate sample ID will be such that it does not alert the laboratory personnel about which sample the duplicate is derived from (see Section 5.2.2). Both the original sample ID number and the duplicate

sample ID number should be entered in the Monitoring Well Sampling Field Log (Attachment A, Form 2) at the time they are collected and recorded in the Daily Field Report (Attachment A, Form 1).

3.3 MS/MSD Designated Sample (collected for laboratory QA/QC)

One MS/MSD sample will be designated during each event and analyzed for the Site IHSs and MNA parameters (QAPP, Section 8.2). The monitoring wells pre-selected for MS/MSD analysis are indicated in Tables A-2 and A-3 (MW-03, MW-06, or MW-19); these wells historically have measurable concentrations of the Site IHSs.

At the designated well, triple volume will be collected to perform the primary, MS, and MSD analysis (Tables A-2 and A-3) (the field team will select an alternative well for the field duplicate). All the containers for the MS/MSD are assigned the same sample ID and sample time as the primary (Section 5.2) but will not be notated as separate samples on the Chain-of-Custody Form. Each primary sample designated for MS/MSD analysis is identified under the comments on the Chain-of-Custody Form and the Monitoring Well Sampling Field Log (Attachment A, Forms 3 and 2, respectively). Additionally, the designated sample should be recorded in the Daily Field Report (Attachment A, Form 1).

4 Monitoring Well Surveying and Modifications

4.1 Monitoring Well Maintenance and Redevelopment

Compliance monitoring wells will be inspected, maintained, and redeveloped in accordance with the *Operations and Maintenance Plan* (Appendix A of the EDR).

4.2 Surveying

The Site monitoring wells were surveyed by a Washington State-licensed professional land surveyor, Stratton Surveying and Mapping to provide precise locations and a common datum for the preparation of groundwater elevation contour maps and hydraulic gradient calculations. The Site datums are listed below.

- Horizontal datum: Washington State Plane South Zone North American Datum 1983 (1991) (NAD83 [91])
- Vertical datum: National Geodetic Vertical Datum of 1929 (NGVD 29)

At each well on the north rim/top of the PVC well casing of each well at the MP, the surveyor recorded the global positioning system northing and easting and elevation. Additionally, the ground surface elevation was surveyed adjacent to each well monument.

If a replacement monitoring well is installed, or the top of casing of an existing monitoring well is modified, it will be surveyed by the licensed professional. A written survey report will be provided in addition to electronic data files in a format that can be uploaded into a database. The written report will be signed by a Washington State-licensed professional land surveyor. All survey data is reported to the nearest 0.01 foot.

4.3 Monitoring Well Modifications

Based upon facility operational requirements, existing monitoring wells may need to be modified or relocated.

4.3.1 Monitoring Well Decommissioning

Potential monitoring well decommissioning will be recorded and reported in accordance with WAC 173-160-381. This SAP will be revised, at that time, to include detailed decommissioning procedures and reporting criteria. These types of revisions to the SAP may be made without modification of the Agreed Order.

4.3.2 Replacement Monitoring Well Installation

Potential monitoring well replacement will be done in accordance with WAC 173-160 by a Washington State-licensed driller. Well screen intervals will be determined based on location and the depth of groundwater. This SAP will be revised at that time to describe the procedures for field screening, collection, and laboratory analysis of soil samples related to a new monitoring well installation. These types of revisions to the SAP may be made without modification of the Agreed Order.

5 Documentation and Sample Identification

5.1 Field Documentation

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

- Form 1. Daily Field Report
- Form 2. Monitoring Well Sampling Field Log
- Form 3. Chain-of-Custody 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.

5.1.1 Daily Field Report

The purpose of the Daily Field Report is to document events that occur, and record data measured in the field to the extent that someone not present at the Site can reconstruct the activity without relying on the memory of the field crew. Each page in the Daily Field Report will be initialed and dated by all persons making entries on that page. The author will sign and date the last page at the end of each day, and a line will be drawn through the remainder of the page.

A Daily Field Report (Attachment A, Form 1) will be completed for each day's field work and should include the following information:

- Name and location of project
- The time and date the field work began
- A purpose and description of the field task
- The names and titles of field personnel and anyone present during the field work, including the times they are present
- The name, agency, and telephone number of any field contacts
- Equipment model number and calibration information for each meter used in the field
- Health and safety discussions
- The meteorological conditions at the beginning of the field work and any changes that occur throughout the day, including the approximate time of the change
- Sequence of events: include only a factual description of Site-related activities (do not include superfluous comments, speculation, or other non-factual observations regarding the field activities)
- Any field measurements or results not appearing in another field form (i.e., groundwater sampling form)
- References to other field forms used to record information (e.g., station log, sample log, health and safety log)
- Decontamination methods

- Management of investigation-derived waste (IDW) (i.e., collection method and where purge/decontamination water is discharged into the on-site wastewater treatment system)
- Identity of QA/QC samples collected
- Any changes or deviations from the CMP, SAP, or QAPP

5.1.2 Monitoring Well Sampling Field Log

A Monitoring Well Sampling Field Log (Attachment A, Form 2) will be completed for each monitoring well sampled and should include the following information:

- Name and location of project
- Well ID
- Date
- Sampler's name
- Total Well depth (feet below top of casing, [btoc])
- Well screen interval depth (feet btoc)
- Pump intake depth (feet btoc)
- Pump type
- Odor, color, sheen, and clarity description of the purge water
- Monitoring well purging data during the purging process including:
    - Measurement time (on a 24-hour clock)
    - DTW measurement
    - Incremental and total volume removed during well purging
    - Flow rate
    - Pump controller setting
    - Field parameter measurements measured after each purge volume
- Sampling data including:
    - Date and time of sample collection
    - Sample IDs (for primary, field duplicate, equipment rinsate blank, and field blank samples)
    - Number and type of containers (and preservatives) for each sample (primary, duplicate, equipment rinsate blank, and field blank)
    - If designated for MS/MSD analysis
    - Number and type of extra containers (and preservatives) for MS/MSD analysis
    - Method of collection (e.g., bladder pump)
- Fe^{+2} and NO_3^- measurements from field kits
- Miscellaneous observations regarding well integrity, other nearby field activities or unusual circumstances that might affect interpretation of results, and equipment problems/troubleshooting measures.

5.1.3 Chain-of-Custody

Field personnel will maintain custody records for all samples collected as part of the performance monitoring field program. The Chain-of-Custody Form (Attachment A, Form 3) will be completed for each shipping container, and the information will be consistent with the sample ID matrix. The following information is to be included on the Chain-of-Custody Form:

- Client name and contact information
- Name of sampler, company name, and contact information
- Site name and location
- Sample ID
- Date and time of collection
- Type of sample
- Type of container
- Number of containers per sample
- Analyses requested (if not submitted on a separate sample analysis request form)
- Inclusive dates of possession
- Signature of sampler
- Signature of receiver(s)

In addition to the labels, seals, and Chain-of-Custody Form, other components of sample tracking include the Daily Field Report (Attachment A, Form 1) and sample shipment receipt from the shipping company (e.g., Federal Express).

5.2 Sample Identification Nomenclature and Labels

Each groundwater sample will be identified with a unique monitor well ID and sample date. Sample labels will be affixed to containers prior to sample collection.

Each sample label will contain the following information:

- Sample ID
- Sampler's initials
- Date and time of sample collection
- Preservatives used if any
- Type of analysis (e.g., NWTPH-Dx)
- Site name (Chevron Pipe Line Company Pasco Bulk Terminal [shortened to CPL Pasco])

5.2.1 Primary Samples

The following sample ID naming convention will be used for the primary samples:

- MW-XX-yyyymmdd, where:
    - MW-XX – monitor well ID (e.g., MW-02).
    - yyyymmdd – The year and month collected (e.g., 20230401 = April 1, 2023).

For example, the primary sample collected at monitoring well MW-02 on April 1, 2023 will be MW-02-20230401.

5.2.2 Field Duplicate

The field duplicate will have a 100 added to the well ID number but otherwise will have the same naming conventions as the primary (parent) sample.

For example, if MW-03 has been selected for the field duplicate, the field duplicate collected on April 1, 2023 will be labeled: MW-030-20230401.

To avoid missing analysis holding times, the sample time assigned to the field duplicate will be the same as the primary sample.

5.2.3 Trip Blanks

Trip blank samples will be designated with “TB” followed by the day of sample collection. If more than one trip blank is submitted on the same day, then these samples will be labeled in sequences as follows: TB-01-20230401, TB-02-20230402, and so on.

5.2.4 Field Blank

Field blank samples will be designated using the abbreviation “FB” followed by the day of sample collection. For example, a field blank sample collected on April 6, 2023, would be labeled: FB-20230406.

5.2.5 Equipment Rinsate Blank

Equipment rinsate blank samples will be designated using the abbreviation “ERB” followed by the day of sample collection. For example, an equipment blank sample collected on April 6, 2023, would be labeled: ERB-20230406.

5.2.6 MS/MSD

Extra volume for the MS and MSD will be collected as replicate samples from the designated monitoring well. On the Chain-of-Custody Form, the designated primary sample for the MS/MSD analysis will be clearly identified (Attachment A, Form 3).

As shown on Table A-4, the triple volume will be collected at either MW-03, MW-06 or MW-19.

- Primary
- MS (same sample ID and sample time as the primary)
- MSD (same sample ID and sample time as the primary)

6 Sample Handling, Shipping, and Laboratory Receipt

During compliance monitoring, the sampling events will be planned and performed by AECOM in coordination with Tesoro and will be conducted in accordance with the Site CMP, SAP, and QAPP. Specific procedures for sample collection, packaging and shipping will be followed to assure sample quality and minimize breakage during collection and transport to the laboratory.

6.1 Sample Containers

Containers, sample size, preservation, and holding times are provided in Tables A-4 for groundwater samples for each analytical methodology that may be used. Samples will be identified according to the sample designation system described in Section 5.2 on waterproof labels with indelible markers. Sample custody will be tracked with the Chain-of-Custody Form (Attachment A, Form 3) following the procedures outlined in Section 5.1 of the QAPP and as summarized below.

6.2 Sample Preservation

Some groundwater samples require preservation to retard biological action, slow hydrolysis, and reduce sorption effects. Preservation methods generally consist of pH control through chemical addition (e.g., HCl), refrigeration (chill from zero to six degrees Celsius), and protection from light (e.g., use of amber glass bottles). When a chemical preservative is needed for selected parameters, the laboratory will provide bottles with appropriate preservatives already added addition (e.g., HCl). Bottles prepared with preservatives will be pre-labeled and identified as "preserved" in order to distinguish them from non-preserved bottles.

Samples will be placed in a cooler containing ice (refrigerated) immediately after collection and held under chain-of-custody until samples are ready for packaging and shipment. The ice will be in double-sealed plastic bags to contain the meltwater.

6.3 Chain-of-Custody

Samples are in one’s custody if they are: (1) in the custodian’s possession or view; (2) in a secured location (under lock) with restricted access; or (3) in a container that is secured with an official seal(s) such that the sample cannot be reached without breaking the seal(s). Chain-of-custody procedures will be followed for all samples throughout the collection, handling, and analysis process. The principal document used to track the possession and transfer of samples is the Chain-of-Custody Form (Attachment A, Form 3). Each sample will be represented on the Chain-of-Custody Form the day it is collected.

The Chain-of-Custody Form will accompany the delivery of samples to the analytical laboratory. Each person who has custody of the samples will sign the Chain-of-Custody Form and ensure that the samples are not left unattended unless properly secured. Copies of all Chain-of-Custody Forms will be retained in the project files.

Upon transfer of sample possession to the analytical laboratory, the person(s) transferring custody of the sample container will sign the Chain-of-Custody Form. Upon receipt of samples at the laboratory, the shipping container seal will be broken, and the receiver will record the cooler temperature and condition of the samples on a sample receipt form. Section 5.1 of the QAPP has additional information on laboratory custody procedures.

6.4 Sample Packaging and Shipment

Samples to be shipped to the contracted laboratory for analyses will be handled and packaged appropriately to prevent damage during transport and to maintain complete chain-of-custody records. Coolers will be provided by the contracted laboratory and will be used for shipping sample containers. Bubble wrap may be used to pack and cushion the sample containers in the cooler. The Chain-of-Custody Form will be sealed in a plastic bag and placed inside the cooler. At least one custody seal will be adhered on the cooler at the front of the container. The

name and address of the receiving laboratory will be placed in a position clearly visible on the outside of the cooler, and the lid will be secured with strapping tape.

Samples will be shipped in accordance with Department of Transportation-approved procedures. Samples will be transported to the laboratory by a member of the sampling team or will be shipped via overnight courier (e.g., FedEx) to the contracted Ecology-accredited laboratory.

6.5 Laboratory Receipt

Sample handling and custody requirements at the laboratory shall be as specified in the laboratory's Quality Assurance Manual and associated laboratory Standard Operating Procedures. The QAPP has additional information on field custody (Section 5.1.1), laboratory custody (Section 5.1.2) and custody documentation (Section 5.2). The analytical methods and method reporting limits are listed in Table A-4, and Section 5 of the QAPP.

7 Calibration and Preventative Maintenance of Field Equipment

The following field equipment will be used to support the groundwater sampling program:

- Multi-parameter water quality meter capable of measuring temperature, pH, specific conductivity, DO, turbidity, and ORP
- Electronic water-level meter

Calibration will be performed prior to each sampling event per the manufacturer's specifications. Recalibration will be performed, as needed if inconsistent readings or unexpected readings are obtained. Field instrument calibration will follow the manufacturers' guidelines, and any deviation from the established guidelines will be documented. All calibration activities will be recorded on Daily Field Report (Attachment A, Form 1). To assure that field instruments are properly calibrated and remain operable, the following procedures will be used, at a minimum:

- Operation, maintenance, and calibration will be performed in accordance with the instrument manufacturers' specifications.
- All standards used to calibrate field instruments will meet the minimum requirements for source and purity recommended in the equipment operation manual.
- Acceptable criteria for calibration will be based on the limits set in the operations manual.
- All users of the equipment will be trained in the proper calibration and operation of the instrument.
- Operation and maintenance manuals for each instrument will be brought to the Site.
- Field instruments will be inspected before they are taken to the Site.
- Specific conductivity and pH meters will be calibrated at the start of each work period. Meters will be recalibrated, as necessary, during the work period.
- Calibration procedures (including time, standards used, and calibration results) will be recorded in the Daily Field Report (Attachment A, Form 1).

Although not reviewed during routine QA/QC, the calibration data will be available if problems are encountered.

A schedule of preventive maintenance activities will be followed to minimize downtime and ensure the accuracy of measurement systems and the availability of critical spare parts and backup systems and equipment. The preventive maintenance approach for specific pieces of equipment used in sampling, monitoring, and documentation will follow the manufacturers' specifications and good field practices.

8 Decontamination of Sampling Equipment

To prevent potential cross-contamination of samples, all non-dedicated field equipment that comes into contact with groundwater (e.g., field meters, probes, and submersible pumps) will be thoroughly decontaminated before use at each monitoring well. Monitoring wells currently installed at the Site have dedicated bladder pumps; consequently, groundwater sampling equipment decontamination will not be necessary in most cases, except for water level meter contamination. Equipment blanks will be collected, as needed, as described in Section 3.2 to document the effectiveness of the decontamination process if a non-dedicated stainless-steel submersible pump is used. The lead sampler will set up the area used to decontaminate sampling equipment consisting of three stations, as described below. This area will be located upwind from the specific sampling area. Water used for decontamination of non-dedicated equipment will be collected and disposed of according to Section 9.

8.1 Decontamination of Water Level Meter

This section summarizes the procedure to decontaminate the water level meter only.

8.1.1 Equipment

- 5-gallon bucket
- Labeled spray bottle containing deionized or distilled water (DI water)
- Labeled spray bottle containing pure methanol
- Labeled spray bottle containing Alconox® (or equivalent) at minimum of 1% solution with tap water or DI water
- Hard-bristle brush
- Plastic sheeting and garbage bags, as needed

8.1.2 Procedures

The specific procedures used for decontaminating water level meter include the following:

1. At Station No. 1, rinse the meter with the Alconox® solution
2. At Station No. 2, rinse the meter with the pure methanol
3. At Station No. 3, rinse the meter with DI water
4. Collect the decontamination water in the 5-gallon bucket
5. Store the equipment in a clean location until reuse

8.2 Decontamination of Non-Dedicated Stainless-Steel Sampling Pump

This section summarizes the procedure to decontaminate a non-dedicated stainless-steel sampling pump, which would only be required if a dedicated bladder pump fails.

8.2.1 Equipment

- Three water tight containers deep enough to submerge the pump (if a non-dedicated stainless-steel submersible pump is used) labeled:
    - No. 1 - Soap
    - No. 2 - Methanol

    - No. 3 - DI
- Labeled spray bottle containing DI water
- Labeled spray bottle containing pure methanol
- Approximately 5 ounces of Alconox® (or equivalent) in a sealed labeled container
- Approximately 250 mL of pure methanol in a sealed labeled container
- 10 gallons of DI water
- Hard-bristle brushes
- Approximately 4 foot long piece of pump discharge tubing
- Plastic sheeting and garbage bags

8.2.2 Procedures

It is advisable to begin sampling with the well containing the lowest anticipated analyte concentration. Successive samples should be obtained from wells anticipated to have increasing analyte concentrations. Use of dedicated pump equipment is preferable when feasible.

Non-dedicated stainless-steel pumps should be decontaminated between uses. The specific procedures used for decontaminating pumps include the following:

1. Attach a short piece of tubing to the outlet of the pump
2. Setup the three labeled containers (note: the water level in each container should be deep enough to submerge the pump):
    - Station No. 1: Alconox® at a minimum of 1% solution with tap water or DI water
    - Station No. 2: Methanol at an approximate 5% solution with DI water
    - Station No. 3: DI water only
3. Then complete the following steps:
    - At Station No. 1:
        - First, submerge the pump in the Station No. 1 container
        - Scrub the pump with a hard bristle brush
        - Cycle the pump for a minimum of 10 seconds with the inlet and tubing outlet submerged in the Station No. 1 container
        - Remove the pump from the Station No. 1 liquid
        - Spray the pump exterior with the DI spray bottle collecting the rinse water in the Station No. 1 container
    - At Station No. 2:
        - Next, submerge the pump in the Station No. 2 container
        - Cycle the pump for a minimum of 10 seconds with the inlet and tubing outlet submerged in the Station No. 2 container
        - Remove the pump from the Station No. 2 liquid
        - Spray the pump exterior with the pure methanol spray bottle and then the DI spray bottle collecting the rinse water in the Station No. 2 container

- At Station No. 3:
  - Finally, submerge the pump in the Station No. 3 container.
  - Cycle the pump for a minimum of 10 seconds with the inlet and tubing outlet submerged in the Station No. 3 container
  - Remove the pump from the Station No. 3 liquid
  - Spray the pump exterior with the DI spray bottle collecting the rinse water in the Station No. 3 container

4. If using a bladder pump (instead of a centrifugal pump), complete the above three steps; disassemble the pump; and replace the internal bladder between sample locations. Or instead of cycling the bladder pump through the three stations, once the bladder pump is disassembled, the parts can be cleaned using the three stations.
5. The procedure should be repeated after sampling from each monitoring well location using a non-dedicated pump. The pump should always be placed on clean polyethylene sheeting, a plastic bag, or aluminum foil to avoid contact with the ground surface.

9 Disposal of Investigation-Derived Waste

The groundwater sampling field activities will generate the following IDW:

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

The compliance monitoring program will be conducted at an operating facility. The Terminal has procedures in place for handling the above IDW.

- Decontamination and purge water will be temporarily placed into five-gallon buckets during sampling and transferred to a trench drain connected to the Terminal's permitted wastewater treatment system. With the use of low-flow sampling techniques, the estimated purge volume will be less than 5 gallons per well. Purge water derived as part of well re-development, if performed, will be managed the same way.
- Miscellaneous solid waste will be placed in plastic bags after use and disposed of in Tesoro-designated waste containers on Site. The total volume is expected to be one large plastic trash bag per day.
- The disposal of spent ORC sleeves is discussed in the EDR (AECOM, 2024).

10 References

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Figures

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SCALE IN FEET

AECOM

SITE VICINITY MAP

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

FIGURE A-1

K:\Tesoro_PascoMXD\2023_SAP\Fig A-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_SAP\Fig A-2 Site Plan and Compliance MW Network.mxd

AECOM

60722666

SITE MAP AND COMPLIANCE MONITORING WELL NETWORK

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

FIGURE A-2

Tables

Table A-2. Groundwater Monitoring and Sampling Program Summary - 2023
Chevron Pipe Line Company Pasco Bulk Terminal

Location / Well Type	Well ID	Monitoring and Sampling Program										
					IHS - Lab Analysis		Natural Attenuation - Field Analysis		Natural Attenuation - Lab Analysis			
		Collect GW Level Measurements (During both SA Events)	**Collect Samples** (During 1st SA Event in Spring)	**Collect Samples** (During 2nd SA Event in Fall)	**TPH-g, TPH-d, & TPH-o** (NWTPH-Gx / NWTPH-Dx)	**BTEX+N** (EPA 8260D)	**Field Parameters** (pH, Cond, DO, Temp, & ORP)	**Ferrous Iron & Nitrate** (Field Test Kits)	**Alkalinity** (SM 2320B)	**Sulfate** (anions) EPA 300)	**Methane** (dissolved gases) (RSKSOP-175)	**Dissolved Manganese** (lab-filtered) (EPA 6010B)
Site Compliance Monitoring Wells	MW-02	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-03*	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-04	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-06*	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-07	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-08	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-10	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-11	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-12	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-14	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-15	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-16	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-17	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-18	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-19*	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-20	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-21	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-22	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-23	X	X	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
Tidewater Site Monitoring Wells	AR-11	X	--	--	--	--	--	--	--	--	--	--
	TMW-05	X	--	--	--	--	--	--	--	--	--	--

Notes:
* These well locations have been selected as potential sites for one field duplicate and/or extra volume collection for one MS/MSD for sampling events (as < 20 primary samples).

Acronyms:
-- = Not applicable, not available, or not sampled
bgs = below ground surface
BTEX+N = benzene, toluene, ethylbenzene, total xylenes and naphthalene
btoc = below top of casing
Cond = conductivity
DO = dissolved oxygen
EPA = US Environmental Protection Agency
ft = feet
GW = groundwater
IHS = indicator hazardous substances
MW = monitoring well
ORP = oxidation reduction potential
RSKSOP-175 = EPA Procedure RSKSOP-175 (Robert S. Kerr Standard Operating Procedure)
SA = semiannual
SM = Standard Method
TPH = total petroleum hydrocarbons
TPH-d = diesel range hydrocarbons (as analyzed by Northwest Method NWTPH-Dx)
TPH-g = gasoline range hydrocarbons (as analyzed by Northwest Method NWPTH-Gx)
TPH-o = motor oil range hydrocarbons (as analyzed by Northwest Method NWTPH-Dx)
X = collect or deploy as listed for that well

Table A-3. Groundwater Monitoring and Sampling Program Summary - 2024+
Chevron Pipe Line Company Pasco Bulk Terminal

Location / Well Type	Well ID	Monitoring and Sampling Program											
						IHS - Lab Analysis		Natural Attenuation Field Analysis		Natural Attenuation Lab Analysis			
		Collect GW Level Measurements (During both SA Events)	**Collect Samples** (During 1st SA Event in Spring)	**Deploy ORC Sleeves** (Over 6 months in Summer between two Events)	**Collect Samples** (During 2nd SA Event in Fall)	**TPH-g, TPH-d, & TPH-o** (NWTPH-Gx / NWTPH-Dx)	**BTEX+N** (EPA 8260D)	**Field Parameters** (pH, Cond, DO, Temp, & ORP)	**Ferrous Iron & Nitrate** (Field Test Kits)	**Alkalinity** (SM 2320B)	**Sulfate** (anions) EPA 300)	**Methane** (dissolved gases) (RSKSOP-175)	**Dissolved Manganese** (lab-filtered) (EPA 6010B)
Site Compliance Monitoring Wells	MW-02	X	X	X	--	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only
	MW-03*1SA	X	X	X	--	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only
	MW-04	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-06*2SA	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-07	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-08	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-10	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-11	X	X	X	--	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only
	MW-12	X	X	X	--	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only
	MW-14	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-15	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-16	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-17	X	X	X	--	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only
	MW-18	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-19*1SA	X	X	X	--	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only	1st SA only
	MW-20	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-21	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-22	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
	MW-23	X	X	--	X	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA	1st SA & 2nd SA
Tidewater Site Monitoring Wells	AR-11	X	--	--	--	--	--	--	--	--	--	--	--
	TMW-05	X	--	--	--	--	--	--	--	--	--	--	--

Notes:
MW-XX*1SA = These well locations have been selected as potential sites for one field duplicate and/or extra volume collection for one MS/MSD for the 1st semiannual event (as < 20 primary samples).
MW-XX*2SA = These well locations have been selected as potential sites for one field duplicate and/or extra volume collection for one MS/MSD for the 2nd semiannual event (as < 20 primary samples).

Acronyms:
-- = Not applicable, not available, or not sampled
bgs = below ground surface
BTEX+N = benzene, toluene, ethylbenzene, total xylenes and naphthalene
btoc = below top of casing
Cond = conductivity
DO = dissolved oxygen
EPA = US Environmental Protection Agency
ft = feet
GW = groundwater
IHS = indicator hazardous substances
MW = monitoring well
ORP = oxidation reduction potential
RSKSOP-175 = EPA Procedure RSKSOP-175 (Robert S. Kerr Standard Operating Procedure)
SA = semiannual
SM = Standard Method
TPH = total petroleum hydrocarbons
TPH-d = diesel range hydrocarbons (as analyzed by Northwest Method NWTPH-Dx)
TPH-g = gasoline range hydrocarbons (as analyzed by Northwest Method NWPTH-Gx)
TPH-o = motor oil range hydrocarbons (as analyzed by Northwest Method NWTPH-Dx)
X = collect or deploy as listed for that well

Table A-4. Groundwater Monitoring Sample Containers, Preservatives, and Holding Times Criteria
Chevron Pipe Line Company Pasco Bulk Terminal

Sample Type	Parameter	Method	Container Count	Container Type [3]	Preservation	Extraction Holding Time	Analysis Holding Time
Primary Samples **Field Duplicate Sample** (1 per 20, collect one additional set) [1] **Designated MS/MSD** (1 per 20, collect two additonal sets) [1]	**Site IHSs**						
	BTEX+N	EPA 8260D	5	40-mL VOA glass vials with teflon septum (zero headspace)	HCl pH<2, cool 0 to 6ºC	not applicable	14 days
	TPH-g	NWTPH-Gx			HCl pH<2, cool 0 to 6ºC	not applicable	14 days
	TPH-d and TPH-o	NWTPH-Dx	2	40-mL amber VOA glass vials with teflon lined (blue) cap	HCl pH<2, cool 0 to 6ºC	14 days	40 days
	Natural Attenuation Parameters (laboratory-measured)						
	Alkalinity	SM 2320	1	250-mL HDPE	Cool 0 to 6ºC	not applicable	14 days
	Sulfate (anions)	EPA 300			Cool 0 to 6ºC	not applicable	28 days
	Methane (dissolved gases)	RSKSOP-175	3	40-mL amber VOA glass vials with teflon septum	HCl pH<2, cool 0 to 6ºC	not applicable	14 days
	Dissolved Manganese [2]	EPA 6010B	1	250-mL HDPE	cool 0 to 6ºC	not applicable	6 months
Trip Blank (1 per cooler)	**Site IHSs (VOCs only)**						
	BTEX+N	EPA 8260D	2	40-mL VOA glass vials with teflon septum (zero headspace)	same as above	same as above	same as above
	TPH-g	NWTPH-Gx			same as above	same as above	same as above
Field Blank (1 per 20, collected while sampling within tank farm)	**Site IHSs**						
	BTEX+N	EPA 8260D	5	40-mL VOA glass vials with teflon septum (zero headspace)	HCl pH<2, cool 0 to 6ºC	same as above	same as above
	TPH-g	NWTPH-Gx			HCl pH<2, cool 0 to 6ºC	same as above	same as above
	TPH-d and TPH-o	NWTPH-Dx	2	40-mL amber VOA glass vials with teflon lined (blue) cap	HCl pH<2, cool 0 to 6ºC	same as above	same as above
Equipment Rinsate Blank (1 per event if using non-dedicated submersible pump)	**Site IHSs**						
	BTEX+N	EPA 8260D	5	40-mL VOA glass vials with teflon septum (zero headspace)	HCl pH<2, cool 0 to 6ºC	same as above	same as above
	TPH-g	NWTPH-Gx			HCl pH<2, cool 0 to 6ºC	same as above	same as above
	TPH-d and TPH-o	NWTPH-Dx	2	40-mL amber VOA glass vials with teflon lined (blue) cap	HCl pH<2, cool 0 to 6ºC	same as above	same as above

Notes:

(1) At either MW-03, MW-06, MW-12, or MW-18 (depending on the event), at a rate of 1 per 20 primary sample, collect both the field duplicate sample and MS/MSD sample, which is equivalent to four sets of the above containers.
(2) Samples for dissolved metals will be sent to laboratory unpreserved and filtered by the laboratory.
(3) Container types are based on Pace Analytical lab protocols. Amber VOAs and blue caps are not required for the method.
BTEX+N = benzene, toluene, ethylbenzene, total xylenes and naphthalene
EPA = US Environmental Protection Agency
HCl - hydrochloric acid
HDPE - high density polyethylene
IHS = indicator hazardous substances
mL - milliliter
MS/MSD = matrix spike/matrix spike duplicate sample
ºC = degrees Celsius
SM = Standard Method
TPH = total petroleu
TPH-d = diesel range hydrocarbons (as analyzed by Northwest Method NWTPH-Dx)
TPH-g = gasoline range hydrocarbons (as analyzed by Northwest Method NWPTH-Gx)
TPH-o = motor oil range hydrocarbons (as analyzed by Northwest Method NWTPH-Dx)
VOA = volatile organic analysis
VOC = volatile organic compounds

Table A-5. Well Construction and Bladder Pump Information
Chevron Pipe Line Company Pasco Bulk Terminal

Location / Well Type	Well ID	Install Date	Monument Type	Well Diameter	Dedicated Geotech PVC Bladder Pump Model [2]	Depth to Pump Inlet	PSI Setting [3]	Fill-Discharge Cycles from Last Two Events	Northing	Easting	TOC Elevation [4]	Ground Surface Elevation [4][5]	Well Stickup Height	Total Boring Depth	Total Well Depth (Calculated from Survey & Well Logs)	Measured Total Well Depth (June 2019)	Measured Total Well Depth (April 2023)	Well Casing Interval		Well Screen Interval		Screen Length	Screen Slot Size
	Units:		--	*inches*	--	*ft btoc*	*PSI*	*Seconds*	*NAD83 (91)*	*NAD83 (91)*	*ft NAVD29*	*ft NAVD29*	*ft*	*ft bgs*	*ft btoc*	*ft btoc*	*ft btoc*	*ft bgs*	*ft btoc*	*ft bgs*	*ft btoc*	*ft*	*inches*
Site Compliance Monitoring Wells	MW-02 [1]	11/1983	SU	4	1.66PVC36	77.0	49	20-10; 10-5	325074.904	2012937.736	417.23	414.49	2.7	83.3	86.0	79.45	79.38	-3 - 63.3	0 - 66.0	63.3 - 83.3	66.0 - 86.0	20	--
	MW-03 [1]	11/1983	SU	4	1.66PVC36	85.0	53	20-10; 20-10	324891.488	2012641.745	423.40	421.02	2.4	94.95	97.3	95.30	95.42	-2 - 75.0	0 - 77.3	75.0 - 95.0	77.3 - 97.3	20	--
	MW-04 [1]	11/1983	SU	4	1.66PVC36	72.0	46	20-10	324524.487	2012589.193	412.05	409.64	2.4	76.75	79.2	76.87	--	-2 - 56.8	0 - 59.2	56.8 - 76.8	59.2 - 79.2	20	--
	MW-06	11/17/1986	SU	2	1.66PVC18	21.0	21	20-10; 11-9	324734.994	2013094.558	358.52	356.30	2.2	25	25.7	26.92	--	-2 - 8.5	0 - 10.7	8.5 - 23.5	10.7 - 25.7	15	0.020
	MW-07	11/18/1986	SU	2	1.66PVC36	72.0	46	20-10; 20-10	324957.838	2012915.419	411.32	408.94	2.4	79	79.4	78.05	--	-2 - 57	0 - 59.4	57 - 77	59.4 - 79.4	20	0.020
	MW-08	11/25/1986	SU	2	1.66PVC18	44.0	32	20-10	324873.003	2012992.060	383.76	381.30	2.5	56	56.5	55.50	--	-2 - 29	0 - 31.5	29 - 54	31.5 - 56.5	25	0.020
	MW-10	1/6/1989	SU	4	1.66PVC36	68.0	44	20-10	324989.314	2012960.533	407.83	404.97	2.9	78.25	78.9	78.94	--	-3 - 55	0 - 57.9	55 - 76	57.9 - 78.9	21	0.020
	MW-11	1/16/1989	SU	2	1.66PVC36	83.0	52	20-10; 40-20	325029.784	2012834.914	423.44	421.34	2.1	84.5	86.6	84.88	84.60	-2 - 74.5	0 - 76.6	74.5 - 84.5	76.6 - 86.6	10	0.020
	MW-12	1/17/1989	SU	2	1.66PVC36	83.0	52	40-20; 11-9	324978.468	2012732.605	423.62	421.48	2.1	85	86.6	85.11	--	-2 - 33	0 - 35.1	33 - 60	35.1 - 62.1	27	0.010
																		60 - 75	62.1 - 77.1	75 - 84.5	75.0 - 86.6	10	0.010
	MW-14	1/17/1989	SU	2	1.66PVC36	84.0	52	20-10; 10-5	325200.637	2012982.336	421.84	421.11	0.7	82.5	82.7	85.20	--	-1 - 27.5	0 - 28.2	27.5 - 53	28.2 - 53.7	26	0.010
																		53 - 72.5	53.7 - 73.2	72.5 - 82	72.5 - 82.7	10	0.010
	MW-15	9/5/2018	SU	2	1.66PVC18	21.0	21	20-10; 12.5-7.5	325086.624	2013364.511	358.50	355.60	2.9	23.5	26.4	25.67	--	-3 - 8.5	0 - 11.4	8.5 - 23.5	11.4 - 26.4	15	0.010
	MW-16	9/6/2018	SU	2	1.66PVC18	31.0	26	20-10; 11-4	325224.955	2013308.089	370.92	367.92	3.0	30	33.0	32.80	--	-3 - 20	0 - 23.0	20 - 30	23.0 - 33.0	10	0.010
	MW-17	9/8/2018	SU	2	1.66PVC36	84.0	52	10-5; 20-10	325342.855	2012893.522	424.28	421.38	2.9	83	85.9	85.40	83.47	-3 - 73	0 - 75.9	73 - 83	75.9 - 85.9	10	0.010
	MW-18	10/11/2018	Flush	2	1.66PVC36	86.5	53	20-10; 20-10	325471.936	2012640.728	423.69	423.96	-0.3	87	86.7	87.70	--	0.3 - 72	0 - 71.7	72 - 87	71.7 - 86.7	15	0.010
	MW-19	10/12/2018	SU	2	1.66PVC36	85.0	53	20-10; 11-9	325539.662	2013058.631	424.20	421.66	2.5	87	89.5	89.80	--	-3 - 72	0 - 74.5	72 - 87	74.5 - 89.5	15	0.010
	MW-20	11/25/2019	SU	2	1.66PVC36	95.0	58	20-10; 20-10	325725.096	2012936.726	426.52	423.32	3.2	99	97.7	--	--	-3 - 79	0 - 82.2	79 - 94	82.2 - 97.2	15	0.010
	MW-21	11/19/2019	SU	2	1.66PVC36	93.0	57	40-20; 10-5	325594.049	2013251.362	426.16	423.43	2.7	93	95.2	--	--	-3 - 77	0 - 79.7	77 - 92	79.7 - 94.7	15	0.010
	MW-22	11/22/2019	SU	2	1.66PVC36	94.0	57	20-10; 10-5	324772.561	2012662.284	420.45	417.59	2.9	95	97.4	--	--	-3 - 79	0 - 81.9	79 - 94	81.9 - 96.9	15	0.010
	MW-23	11/24/2019	Flush	2	1.66PVC36	92.0	56	20-10; 10-5	324916.047	2012515.709	421.74	422.03	-0.3	96	95.2	--	--	0.3 - 80	0 - 79.7	80 - 95	79.7 - 94.7	15	0.010
Tidewater Site Monitoring Wells	AR-11	8/10/2000	Flush	2	--	--	--	--	325577.520	2012292.090	422.62	422.87	-0.3	88	87.8	--	--	0.3 - 73	0 - 72.8	73 - 88	72.8 - 87.8	15	0.020
	TMW-05	3/7/2001	SU	2	--	--	--	--	325294.110	2012422.170	425.02	422.38	2.6	90	92.6	--	--	-3 - 74.5	0 - 77.1	74.5 - 89.5	77.1 - 92.1	15	0.020

Notes:
(1) Boring logs not available. Data obtained from Table 3 of September 2011 Remedial Investigation/Feasibility Study.
(2) Geotech bladders were deployed in 2019; pump specs: https://www.geotechenv.com/pdf/ground_water_sampling_equipment/geotech_pvc_bladder_pumps.pdf
(3) Required PSI = (0.5 x pump intake depth) + 10 PSI
(4) On February 7 and December 10, 2019, all wells except the Tidewater monitoring wells were resurveyed by Stratton Surveying and Mapping, P.C. using horizontal datum Washington State Plane South Zone North American Datum 1983 (1991) and vertical datum North American Vertical Datum 29.
(5) Ground surface elevations for MW-1 through MW-14 obtained from 2010 survey, ground surface elevations for MW-15 to MW-17 were calculated from stick up heights measured by AECOM in June 2019, ground surface elevations for MW-18 to MW-23 obtained from 2019 survey.

Acronyms:
-- = Not applicable or not available
bgs = below ground surface
btoc = below top of casing
ft = feet
ID = identification
MW = monitoring well
NAVD29 = North American Vertical Datum of 1929
NAVD83 (91) = North American Datum of 1983, as modified in 1991
PSI = pound force per square inch
PVC = polyvinyl chloride
RW = recovery well
SU = stick up
TOC = top of casing
VE = vapor extraction well

Attachment A
Field Forms

AECOM

Daily Field Report

DATE _____

DAY	S	M	T	W	TH	F	S

PROJECT MANAGER:

PROJECT:

PROJECT NUMBER:

AECOM FIELD PERSONNEL:

WEATHER	SNOW	RAIN	OVERCAST	CLEAR	BRIGHT SUN
TEMP	To 32	32-50	50-70	70-85	85 up
WIND	Still	Moder	High	Report No.	
HUMIDITY	Dry	Moder	Humid		

TIME ON-SITE: TIME OFF-SITE:

SUBCONTRACTORS/OTHER PERSONNEL ON SITE:

EQUIPMENT:	SERIAL NUMBER:	CALIBRATION INFO (TIME, CAL STANDARD, METER READING):

TAILGATE SAFETY CONDUCTED; TOPICS COVERED:

WORK PERFORMED:

SIGNATURE: NAME:

SHEET _____ OF _____

Daily Quality Control Report

PROJECT:

REPORT NO.

PROJECT NUMBER:

DATE

PROBLEMS ENCOUNTERED/CORRECTION ACTION TAKEN:

TOMORROW'S EXPECTATIONS:

SIGNATURE:

NAME:

AECOM

GROUNDWATER SAMPLING LOG

Client:	Marathon Petroleum Corporation (MPC)	Project #:	
Site:	Chevron Pipe Line Company Pasco Bulk Terminal	Event:	

Sample Information	
Sample ID:	Date:
Well ID:	Location Type:
Duplicate ID:	Sampler:
Equipment:	
Comments:	

Well Information	
Well Completion:	Well Diameter:
Total Depth (ft bgs):	Screen Interval (ft bgs):
SAP Pump Depth (ft btoc):	

Water Level	
Date:	Measured Well Depth:
Is Well Dry?	Depth to Water:
Notes:	

Purge Information	
Begin Date and Time:	End Date and Time:
Initial Pump Depth:	Final Pump Depth:
Purge Method:	Sample Method:
Notes:	

Natural Attenuation Field Parameters	
Ferrous Iron (mg/L):	Nitrate (mg/L):

Time	Purge Rate (ml/min)	Purge Volume (ml)	Cumulative Purge Volume (ml)	Purge Depth to Water (ft)	Temperature (deg C)	pH (su)	Conductivity (us/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	Turbidity (NTU)

Company Name/Address:

Reference Only

MW-XX- = Not collected in 2SA event

Billing Information:

Report to:

Email To:

Project Description: **CPL Co. Pasco Bulk Fuel Terminal**

City/State Collected:

Please Circle: PT MT CT ET

Phone:

Client Project #

Lab Project #

Collected by (print):

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ____ Y ____

Rush? (Lab MUST Be Notified)

____ Same Day ____ Five Day
____ Next Day ____ 5 Day (Rad Only)
____ Two Day ____ 10 Day (Rad Only)
____ Three Day

Date Results Needed

Quote #

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

Pace PEOPLE ADVANCING SCIENCE

MT JULIET, TN

12065 Lebanon Rd Mount Juliet, TN 37122

Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at: https://info.pacelabs.com/hubfs/pas-standard-terms.pdf

SDG #

Table #

Acctnum:

Template:

Prelogin:

PM:

PB:

Shipped Via:

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	Pres Chk	ALK,SULFATE 250mlHDPE-NoPres	MNDICP 250mlHDPE-NoPres	NWTPHDXLVINOSGT 40mlAmb-HCl-BT	NWTPHGX 40mlAmb HCl	NWTPHGX 40mlAmb-HCl-Blk	RSK175 40mlAmb HCl	V8260BTEXN 40mlAmb-HCl	V8260BTEXN 40mlAmb-HCl-Blk			Remarks	Sample # (lab only)
MW-02-		GW				12		X	X	X	X		X	X					
MW-03-		GW				12		X	X	X	X		X	X					
MW-04-		GW				12		X	X	X	X		X	X					
MW-06-		GW				36		X	X	X	X		X	X				MS/MSD	
MW-07-		GW				12		X	X	X	X		X	X					
MW-08-		GW				12		X	X	X	X		X	X					
MW-10-		GW				12		X	X	X	X		X	X					
MW-11-		GW				12		X	X	X	X		X	X					
MW-12-		GW				12		X	X	X	X		X	X					
MW-14-		GW				12		X	X	X	X		X	X					

* Matrix:
SS - Soil **AIR** - Air **F** - Filter
GW - Groundwater **B** - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____

Flow _____ Other _____

Samples returned via:
__ UPS __ FedEx __ Courier _____

Tracking #

Sample Receipt Checklist

COC Seal Present/Intact: __NP __Y __N
COC Signed/Accurate: __Y __N
Bottles arrive intact: __Y __N
Correct bottles used: __Y __N
Sufficient volume sent: __Y __N
If Applicable
VOA Zero Headspace: __Y __N
Preservation Correct/Checked: __Y __N
RAD Screen <0.5 mR/hr: __Y __N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: °C Bottles Received:	If preservation required by Login: Date/Time
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: Time:	Hold: Condition: NCF / OK

Company Name/Address:

Billing Information:

Report to:

Email To:

Project Description: **CPL Co. Pasco Bulk Fuel Terminal**

City/State Collected:

Please Circle: PT MT CT ET

Phone:

Client Project #

Lab Project #

Collected by (print):

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ____ Y ____

Rush? (Lab MUST Be Notified)

____ Same Day ____ Five Day
____ Next Day ____ 5 Day (Rad Only)
____ Two Day ____ 10 Day (Rad Only)
____ Three Day

Date Results Needed

Quote #

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

Pace PEOPLE ADVANCING SCIENCE

MT JULIET, TN

12065 Lebanon Rd Mount Juliet, TN 37122

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SDG #

Table #

Acctnum:

Template:

Prelogin:

PM:

PB:

Shipped Via:

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	ALK,SULFATE 250mlHDPE-NoPres	MNDICP 250mlHDPE-NoPres	NWTPHDXLVINOSGT 40mlAmb-HCl-BT	NWTPHGX 40mlAmb HCl	NWTPHGX 40mlAmb-HCl-Blk	RSK175 40mlAmb HCl	V8260BTEXN 40mlAmb-HCl	V8260BTEXN 40mlAmb-HCl-Blk			Remarks	Sample # (lab only)
MW-15-		GW				12	X	X	X	X		X	X					
MW-16-		GW				12	X	X	X	X		X	X					
MW-17-		GW				12	X	X	X	X		X	X					
MW-18-		GW				12	X	X	X	X		X	X					
MW-19-		GW				12	X	X	X	X		X	X					
MW-20-		GW				12	X	X	X	X		X	X					
MW-21-		GW				12	X	X	X	X		X	X					
MW-22-		GW				12	X	X	X	X		X	X					
MW-23-		GW				12	X	X	X	X		X	X					
MW- 0-		GW				12	X	X	X	X		X	X					

* Matrix:
SS - Soil **AIR** - Air **F** - Filter
GW - Groundwater **B** - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____

Flow _____ Other _____

Samples returned via:
__ UPS __ FedEx __ Courier _____

Tracking #

Sample Receipt Checklist
COC Seal Present/Intact: __NP __Y __N
COC Signed/Accurate: __Y __N
Bottles arrive intact: __Y __N
Correct bottles used: __Y __N
Sufficient volume sent: __Y __N
If Applicable
VOA Zero Headspace: __Y __N
Preservation Correct/Checked: __Y __N
RAD Screen <0.5 mR/hr: __Y __N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: °C Bottles Received:	If preservation required by Login: Date/Time
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: Time:	Hold: / Condition: NCF / OK

Company Name/Address:

Billing Information:

Report to:

Email To:

Project Description: **CPL Co. Pasco Bulk Fuel Terminal**

City/State Collected:

Please Circle: PT MT CT ET

Phone:

Client Project #

Lab Project #

Collected by (print):

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ____ Y ____

Rush? (Lab MUST Be Notified)

____ Same Day ____ Five Day
____ Next Day ____ 5 Day (Rad Only)
____ Two Day ____ 10 Day (Rad Only)
____ Three Day

Quote #

Date Results Needed

Chain of Custody Page ___ of ___

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SDG #

Table #

Acctnum:

Template:

Prelogin:

PM:

PB:

Shipped Via:

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	Pres Chk	ALK,SULFATE 250mlHDPE-NoPres	MNDICP 250mlHDPE-NoPres	NWTPHDXLVINOSGT 40mlAmb-HCl-BT	NWTPHGX 40mlAmb HCl	NWTPHGX 40mlAmb-HCl-Blk	RSK175 40mlAmb HCl	V8260BTEXN 40mlAmb-HCl	V8260BTEXN 40mlAmb-HCl-Blk			Remarks	Sample # (lab only)
								Analysis / Container / Preservative											
FB-01-		GW				7				X	X			X					
TB-01-		GW				2						X			X				
TB-02-		GW				2						X			X				

* Matrix:
SS - Soil **AIR** - Air **F** - Filter
GW - Groundwater **B** - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____

Flow _____ Other _____

Samples returned via:
__ UPS __ FedEx __ Courier _____

Tracking #

Sample Receipt Checklist

COC Seal Present/Intact: __NP __Y __N
COC Signed/Accurate: __Y __N
Bottles arrive intact: __Y __N
Correct bottles used: __Y __N
Sufficient volume sent: __Y __N
If Applicable
VOA Zero Headspace: __Y __N
Preservation Correct/Checked: __Y __N
RAD Screen <0.5 mR/hr: __Y __N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: °C Bottles Received:	If preservation required by Login: Date/Time
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: Time:	Hold: / Condition: NCF / OK

Attachment B
Manuals

Removed from Ecology version to reduce PDF size

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.

888 SW 5th Avenue, Suite 600
Portland, OR 97204
971-323-6262

Appendix B
Quality Assurance Project Plan

AECOM

Environment

Prepared for
Tesoro Logistics Operations LLC.
3450 S. 344th Way
Suite 135
Auburn, WA 98001-5931

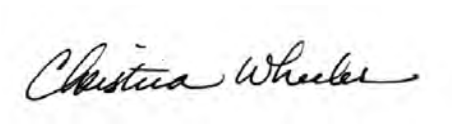
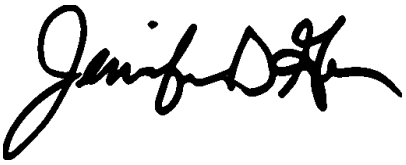
Submitted by
AECOM
888 SW 5th Avenue
Suite 600
Portland, OR 97204

Submitted to
Washington Department of Ecology

60722666
January 2024

Appendix B.
Quality Assurance Project Plan
Compliance Monitoring Plan
Chevron Pipe Line Company Pasco Bulk Terminal
Pasco, Washington
Ecology Cleanup Site ID: 4867
Ecology Facility Site ID: 55763995

Quality Information

Prepared by	Checked by	Verified by
		
Christina Wheeler, PhD AECOM Chemist	Jennifer B. Garner AECOM Chemist	Nicky Moody AECOM Project Manager Senior Environmental Scientist

Revision History

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

Distribution List

Hard Copies	Electronic Copies	Association / Company Name
0	1	Christer Loftenius, Washington State Department of Ecology, clof461@ecy.wa.gov
0	1	Nick Acklam, Washington State Department of Ecology, nack461@ecy.wa.gov
0	1	Kyle Waldron, MPC, kawaldron@marathonpetroleum.com
0	1	Michael Mungas, MPLX, MMungas@marathonpetroleum.com
0	1	Dan Andersen, MPLX, DJAnderson2@marathonpetroleum.com

Table of Contents

List of Attachments

List of Acronyms and Definitions

AECOM	AECOM Technical Services, Inc.
AST	aboveground storage tank
BTEX	benzene, toluene, ethylbenzene, and xylene
CAP	Cleanup Action Plan
CMP	Compliance Monitoring Plan
CoC	chain-of-custody
CSID	cleanup site identification number
DO	dissolved oxygen
DQO	data quality objectives
DVR	data validation report
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EDR	Engineering Design Report
EIM	environmental information management system
EPA	United States Environmental Protection Agency
FSID	facility site identification number
FTL	field team leader
HASP	health and safety plan
HAZWOPER	hazardous waste operations and emergency response
HSM	health and safety manager
IC	institutional controls
ID	identification
IHS	indicator hazardous substance
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LIMS	laboratory information management system
LLOQ	lower limit of quantification
MDL	method detection limit
MNA	monitored natural attenuation
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Control Act
NELAP	National Environmental Laboratory Accreditation Program
ORC	oxygen-releasing compound
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
PACE	Pace Analytical National
PDF	portable data file
PE	performance evaluation
PM	Project Manager
QA	quality assurance
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
QC	quality control
RI/FS	Remedial Investigation/Feasibility Study
RL	reporting limit
RPD	relative percent difference
SAP	Sampling and Analysis Plan

SOP	standard operating procedure
SSO	site safety officer
Tesoro	Tesoro Logistics Operations, LLC
TPH-d	diesel-range total petroleum hydrocarbons
TPH-g	gasoline-range total petroleum hydrocarbons
TPH-o	motor oil-range total petroleum hydrocarbons
WAC	Washington Administrative Code

1 Project Description

This document presents a Quality Assurance Project Plan (QAPP) for the implementation of the Compliance Monitoring Plan (CMP) for the Washington State Department of Ecology (Ecology) Cleanup Site named "Chevron Pipe Line Company Pasco Bulk Terminal", which is herein referred to as the Site. This QAPP is written to provide guidance for sampling and analysis for the compliance monitoring that will be conducted under Agreed Order Number DE 21664 (here in referred to as the Agreed Order) (Ecology, 2023b) and sampling and analysis supporting the Cleanup Action Plan (CAP) developed for the Site by Ecology (Ecology, 2023a). This document is intended to be used as the basis to evaluate chemical analytical data collected as part of the Agreed Order and the CAP. The generated data will be of adequate technical quality and detail to support the implementation of the cleanup action and to be compared to cleanup standards, to assess the effectiveness of the Site cleanup actions.

AECOM Technical Services, Inc. (AECOM) has prepared this QAPP as an Appendix to the CMP on behalf of Tesoro Logistics Operations, LLC (Tesoro). This QAPP has been prepared in accordance with Model Toxic Control Act (MTCA) Washington Administrative Codes (WAC) 173-340-820 and WAC 173-340-830 and Ecology's *Guidance on Sampling and Data Analysis Methods* (Ecology 1995) and *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Ecology 2016). The procedures outlined in this plan govern all aspects of the chemical data collection activities currently conducted under the Ecology-approved CAP and any future work plans prepared for and approved by Tesoro and Ecology to support the Agreed Order.

The purpose of this QAPP is to ensure that the data are representative of the conditions in the field and that analytical data are documented, verifiable, and defensible. The procedures and information presented in this QAPP focus on chemical analytical requirements, quality control (QC), assurance procedures that apply to field data collection and sample collections, and data evaluation requirements. This QAPP is intended to be used with the CMP and any future work plans that describe the objectives of each data collection effort, sampling procedures, sample locations, testing requirements, and sampling frequency. The QAPP will be updated as needed with approval from Ecology and Tesoro.

Sampling will be conducted at the Site under the Agreed Order in association with the CAP. The CAP describes the groundwater monitoring activities, selects the cleanup action, and lists the cleanup standards. The CAP indicates that the Ecology-selected cleanup action for the Site is institutional controls (ICs), monitored natural attenuation (MNA), and enhanced bioremediation using oxygen-releasing compounds (ORCs) (Alternative 2). The objective of the data collection related to the CMP is to assess the effectiveness of the Ecology-selected remedy during and after implementation. The chemical data will be compared to cleanup standards as specified in the CAP to assess the effectiveness of the cleanup actions.

The cleanup is being overseen by Ecology. The Site is listed in Ecology's Integrated Site Information System under the following:

- 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

1.1 Project Objectives

The goal of the CMP is to monitor the effectiveness of MNA with the emplacement of ORC as the selected cleanup action for the Site and enable evaluation of the current and future risk to human health and the environment. Specific monitoring objectives as outlined in the CMP are listed below.

- Document groundwater flow patterns, including changes that might adversely impact the effectiveness of the MNA remedy
- Identify the wells to be sampled and analyses to be performed to demonstrate compliance with the cleanup standards
- Establish a monitoring frequency that ensures that human health and the environment continue to be protected during the compliance monitoring period
- Provide periodic reports to demonstrate progress toward achieving Site cleanup standards

The compliance monitoring activities performed by Tesoro will utilize selected wells within the existing monitoring well network as outlined in the CMP. Indicator hazardous substance (IHS) concentrations will be compared to cleanup levels as established in the CAP to evaluate the effectiveness of the MNA remedy and the progress toward achieving the cleanup standards.

1.2 Revisions

This QAPP focused on compliance groundwater monitoring; however, data gaps may be identified during the implementation of the CMP. If the field activities are expanded, the QAPP will be revised, as needed, to document the procedures that will be followed. Revisions will be submitted to Ecology for approval. However, revisions to the QAPP will not require modification of either the CMP or the Agreed Order.

1.3 QAPP Review Checklist

Ecology guidance describes 14 elements to be addressed in a QAPP (Ecology, 2016). Several of these elements are also covered in the CMP or *Sampling Analysis Plan* (SAP). To avoid unnecessary repetition, cross-references to these other documents are provided in this QAPP. Table B-1 below is a modified version of the QAPP checklist provided by Ecology (2016), which identifies the location of the required QAPP elements in AECOM's QAPP, SAP, or CMP.

Table B-1. Ecology QAPP Requirements

Ecology Required QAPP Elements	Deliverable Section Containing Required Information
1. Title Page with Approvals	
Title, author, organization	QAPP Cover
Date prepared or revised	QAPP Cover and Quality Information (page i)
Approval signatures of key individuals	QAPP Quality Information (page i)
2. Table of Contents and Distribution List	
Table of Contents	QAPP Page ii
Distribution List	QAPP Quality Information (page i)
3. Background	
Introduction and problem statement	CMP Section 1
Study area and surroundings	CMP Section 1
History of study area	Supplemental RI/FS Section 2, CMP Section 1.2
Summary of previous studies and existing data	Supplemental RI/FS Section 3
Contaminates of Concern and Source Areas	CMP Section 1.3
Compliance Monitoring Requirements	CMP Section 1.4

Ecology Required QAPP Elements	Deliverable Section Containing Required Information
Water quality impairment studies	*Not applicable*
Effectiveness monitoring studies	*Not applicable*
4. Project Description	
Project goals	CMP Section 1
Project objectives	CMP Section 1, QAPP Section 1.1
Information needed and sources	CMP Section 1
Tasks required	QAPP Section 1.1
Systematic planning process	CMP Section 1, QAPP Section 1, QAPP Section 4
5. Organization and Schedule	
Key individuals and their responsibilities	QAPP Section 3.1, Table B-2
Special training and certifications	QAPP Section 3.3
Organization chart	QAPP Section 3.3, Table B-2
Proposed project schedule	CMP Section 3.2, Tables 2 and 3
Budget and funding	*Not applicable*
6. Quality (Assurance) Objectives	
Data quality objectives	QAPP Section 4, Table B-3
Measurement quality objectives	QAPP Section 4, Table B-3
Targets for precision, bias, and sensitivity	QAPP Section 4, Table B-3
Targets for comparability, representativeness, and completeness	QAPP Section 4, Table B-3
Acceptance criteria for quality of existing data	QAPP Section 11
Model quality objectives	*Not applicable*
7. Sampling Process (Study) Design	
Study boundaries	CMP Section 1, CMP Figures 1 and 2
Field data collection	QAPP Section 5, SAP Section 2
Sampling locations and frequency	CMP Table 1, SAP Tables A-2 and A-3
Field parameters and laboratory analytes to be measured	SAP Table A-2, QAPP Tables B-3 and B-4
Modeling and analysis design	*Not applicable*
Analytical framework	*Not applicable*
Model setup and data needs	*Not applicable*
Assumptions underlying design	CMP Section 3
Possible challenges and contingencies	CMP Section 5 and 6, QAPP Section 12, SAP Section 2.2.2.2 Deviations from Procedures
Logistical problems	*Not applicable*
Practical constraints	*Not applicable*
Schedule limitations	*Not applicable*

Ecology Required QAPP Elements	Deliverable Section Containing Required Information
8. Sampling (Field) Procedures	
Invasive species evaluation	*Not applicable*
Measurement and sampling procedures	QAPP Section 5, SAP Section 2
Containers, preservation, holding times	QAPP Table B-4, SAP Table A-2, SAP Section 6
Equipment decontamination	SAP Section 8
Sample ID	SAP Section 5.2
Chain-of-custody	SAP Section 5.1.4, QAPP Section 5.1
Field log requirements	SAP Section 5.1
Other activities	*Not applicable*
9. Measurement (Laboratory) Procedures	
Lab procedures table	QAPP Section 6, QAPP Tables B-3 and B-4
Sample preparation methods	*Not applicable*
Special method requirements	*Not applicable*
Laboratories accredited for methods	QAPP Section 6.2
10. Quality Control	
Table of field and lab quality controls	Table B-3
Corrective action processes	QAPP, Section 12
11. Data Management Procedures	
Data recording and reporting requirements	CMP Section 4, QAPP Section 7
Lab data package requirements	QAPP, Section 7
Electronic transfer requirements	QAPP, Section 7
EIM/STORET data upload procedures	QAPP, Section 7
Model information management	*Not applicable*
12. Audits and Reports	
Field, laboratory, and other audits	QAPP, Section 9
Responsible personnel	QAPP, Section 9
Frequency and distribution of reports	QAPP, Section 9
Responsibility for reports	QAPP, Section 9
13. Data Verification	
Field data verification, requirements, and responsibilities	QAPP, Sections 7 and 10
Laboratory data verification	QAPP, Section 7
Validation requirements, if necessary	QAPP, Section 7
Model quality assessment	*Not applicable*
Calibration and validation	QAPP, Sections 7 and 10
Analysis of sensitivity and uncertainty	QAPP, Section 7

Ecology Required QAPP Elements	Deliverable Section Containing Required Information
14. Data Quality (Usability) Assessment	
Process for determining project objectives was met	QAPP, Section 11
Treatment of non-detects	QAPP, Section 6.3
Data analysis and presentation methods	*Not applicable*
Sampling design evaluation	*Not applicable*
Documentation of assessment	QAPP, Section 11

2 Background

The Site is located approximately three miles east-southeast from the City of Pasco. The nearest surface water body, the Snake River, bounds the Site to the south. Before 1950, the Site was undeveloped land. Since 1950, the Site has been used as a bulk fuel distribution terminal. Petroleum hydrocarbon products are received through pipelines via Salt Lake City, Utah, and pipeline transfer from barges docked along the Snake River. Petroleum hydrocarbon products are held on Site in aboveground storage tanks (ASTs) before being distributed by truck or barge to locations downstream along the Columbia River.

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 *Final Supplemental Remedial Investigation/Feasibility Study (RI/FS)* completed in 2021 (AECOM, 2021).

Tesoro, an indirect subsidiary of Marathon Petroleum Corporation, is responsible for the cleanup action at the Site.

The CAP, developed by Ecology for the Site, is based on the *Supplemental RI/FS* (Ecology, 2023a; AECOM, 2021). IHSs determined from this investigation and carried forward as indicator substances in the CAP, include:

- 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

Additional information including site history, site physical characteristics, previous investigations' results, and remedial activities are documented in the *Supplemental RI/FS* (AECOM, 2021) and the CAP (Ecology, 2023a). The *Engineering Design Report* (*EDR*) (AECOM, 2024) 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. The CAP, EDR, and CMP provide the information necessary to implement the selected cleanup action.

3 Project Organization and Responsibility

This section describes the project personnel, responsibilities, and training requirements.

3.1 Key Individuals and their Responsibilities

The project team will consist of personnel from Tesoro, AECOM Technical Services, Inc. (AECOM), and their subcontractors including the laboratory Pace Analytical National (Pace), located in Mount Juliet, Tennessee. This Section describes the major positions and responsibilities of the team along with the approach to quality assurance management. All listed personnel will receive an electronic copy of the QAPP. Table B-2 is current as of March 2023. It should be noted that some designated individuals may change during the compliance monitoring period. Tesoro will notify Ecology for approval of significant personnel changes, per Agreed Order requirements. However, such changes will not require modification of the Agreed Order or CMP.

Table B-2. Organization of Project Staff and Responsibilities

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
Ecology Project Coordinator	Christer Loftenius, LG, LHG Ecology Toxics Cleanup Program, Eastern Region 4601 N Monroe Street, Spokane, WA 99205 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 QA/QC Manager	Christina Wheeler, PhD AECOM 888 SW 5th Avenue, Suite 600, Portland, OR 97204 christina.wheeler@aecom.com 360-608-3212
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 Rd, Suite 350, Lisle, IL 60532 timothy.gilles@aecom.com 503-849-2993
Laboratory Project Manager	Craig Cothron Pace Analytical 12065 Lebanon Road, Mount Juliet, TN 37122 Craig.cothron@pacelabs.com 615-758-5858

3.1.1 Project Coordinators

The Project Coordinators will be responsible for overseeing the implementation of site-associated Enforcement under the Agreed Order and cleanup actions as described in the CMP. To the maximum extent possible, all communications between Ecology and Tesoro and all documents should be directed through the Project Coordinators. These documents include but are not limited to reports, QAPPs, SAPs, project plans, and other correspondence concerning the activities performed under the order. If Ecology or Tesoro changes Project Coordinators, written notification will be provided to Ecology or Tesoro at least 10 calendar days before the change, when possible.

3.1.2 AECOM Project Manager

The AECOM Project Manager (PM) is responsible for all aspects of the implementation of the site associated with Enforcement under the Agreed Order and cleanup actions as described in the CMP. Specific responsibilities include developing and implementing the CMP and associated tasks, including groundwater sampling, data management, and reporting. The PM will have overall responsibility for planning, scheduling, coordinating, and implementing the activities of their respective field teams, monitoring the project progress and quality, interfacing with Tesoro, and ensuring the timeliness of all project deliverables.

3.1.3 AECOM Project Engineer

The AECOM Project Engineer will act as the technical resource of the project and will advise the PM regarding site history, geology, and technology applications to meet the requirements of the CMP. In addition, the Project Engineer will assist the PM in providing a technical review of the groundwater monitoring reports and will provide the final report under the seal of a licensed Washington State professional (geologist, hydrogeologist, or engineer).

3.1.4 AECOM QA/QC Manager

The Quality Assurance/Quality Control (QA/QC) Manager is responsible for developing and managing procedures described in the QAPP, interfacing with the project laboratory, implementing necessary corrective action procedures, reviewing, and evaluating analytical laboratory results, reviewing data quality assessment reports, facilitating database management and submitting to Ecology's Environmental Information Management System (EIM) reporting to the AECOM PM.

3.1.5 AECOM Field Team Leader and Site Safety Officer

The field team will consist of a Field Team Leader (FTL) who will also act as the Site Safety Officer (SSO). The FTL is responsible for implementing the sampling and handling procedures as specified in the QAPP, SAPs, and/or applicable Ecology-approved project plans, ensuring all field procedures follow the appropriate project plan, notifying the PM and QA/QC Manager of any difficulties encountered during the field program, ensuring adherence to the safety requirements specified in the health and safety plan (HASP) and implementing corrective

actions to the field procedures as approved by the PM. Figure 2 presents the communication and data flow lines between the individuals listed above.

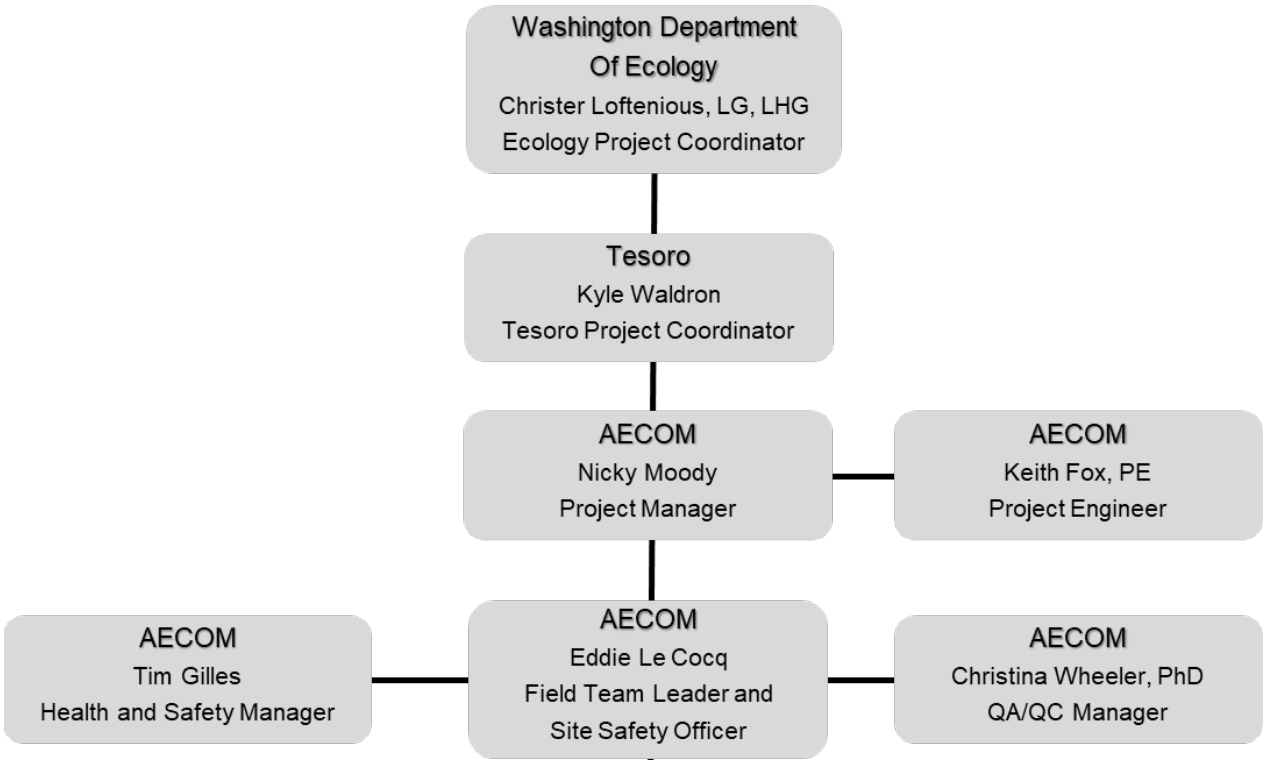
3.1.6 AECOM Health & Safety Manager

The field team will follow the requirements of the HASP, as well as any site-specific procedures at the Pasco Terminal. The Health and Safety Manager (HSM) will review and approve the HASP for all field activities performed at the Site. The HSM will work directly with the PM and the SSO and will be responsible for monitoring and verifying that the work is performed in accordance with the HASP.

3.1.7 Laboratory Project Manager

All laboratories will be Ecology-accredited for testing performed by the laboratory. The analytical laboratory project manager is responsible for reviewing and reporting all analytical data generated during the project; responding to questions or concerns regarding the quality of the data that the PM or QA/QC Manager may have; and implementing any corrective actions deemed necessary by these individuals regarding laboratory operations.

3.2 Organization Chart



3.3 Special Training and Certifications

AECOM personnel and subcontractor personnel working on this program on Site will be required to review and incorporate the requirements of the HASP in effect at the time of site work. The HASP provides general and site-specific information related to emergency, fire prevention, safety, and environmental protection measures that are required to be implemented by all personnel working on the Site.

3.3.1 Safety, Health, and Environmental Protection

All contractors are required to have a site-specific HASP that provides their scope of activities, associated safety concerns, procedures to maintain a safe working environment, and personnel training requirements. Safety

requirements will be determined by the work scope and will comply with applicable federal and state laws, site-specific rules, and contractor-based requirements. All personnel sampling media will be required to complete Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and the annual 8-hour HAZWOPER refresher training.

3.3.2 Washington State Licensed Geologist, Hydrogeologist, or Engineer

An appropriately licensed Washington State professional (geologist, hydrogeologist, or engineer) will review and sign reports. Personnel responsible for sample collection and reporting for the project will be under the direction of a state-licensed geologist or hydrogeologist. Field personnel will be trained on sample collection procedures by experienced field staff and as needed, using outside resources (equipment vendors, information resources) and/or laboratory instruction.

3.3.3 Laboratory Accreditation

Analytical services will be provided by laboratories with a current Ecology-accreditation for the analyses that will be performed. Laboratory staff will meet the training requirements specified in each laboratory's quality assurance (QA) program.

4 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and/or quantitative statements of the precision (a measure of the random error), bias (a measure of systematic error), representativeness, completeness, and comparability necessary for the data to serve the objectives of each sampling program. The objectives of the CMP are discussed in detail in the project plan. During plan implementation, field, as well as laboratory data, will be generated. The quality of the field data will be evaluated based on the successful calibration of each instrument supplying the data and the stated accuracy and precision by the manufacturer. The quality of laboratory data will be evaluated based on the relative precision, bias, representativeness, completeness, and comparability of the data generated by each type of analysis. These terms are defined below:

Precision	Precision is a measure of the scatter in the data due to random error. For most environmental measurements, the major sources of random error are sampling and analytical procedures. Sampling and analytical precision are expressed as the relative percent difference (RPD).
Bias	Bias is a measure of the difference between the analytical result for a parameter and the true value due to systematic errors. Potential sources of systematic errors include sample collection, physical/chemical instability of samples, interference effects, calibration of the measurement system, and artificial contamination.
Representativeness	Representativeness of the environmental conditions at the time of sampling is achieved by selecting sampling locations, methods, and times so that the data describe the site conditions that the project seeks to evaluate.
Completeness	Completeness refers to the amount of usable data produced in the project.
Comparability	Comparability refers to the ability to compare the data from the project to other data.

Project DQOs for laboratory reporting limits (RLs) are summarized in Table B-3. The analytical methods and RLs presented in this table were selected to achieve data that meets cleanup levels for Site IHSs as listed in Table B-3. The process used to develop the cleanup levels is described in the CAP included in Agreed Order.

The DQOs for precision and bias are assessed based on the laboratory control limits for the matrix spike/matrix spike duplicates (MS/MSDs), and laboratory control sample/laboratory control samples duplicates (LCS/LCSDs). The current laboratory control limits in use by Pace Analytical as of the date on this QAPP are presented in Table B-3. These limits are recalculated by the laboratories based on QA procedures described under United States Environmental Protection Agency (EPA) protocols and as described in the laboratory QA programs. The control limits in effect at the time of sample analysis will be used to validate data.

Representativeness of the data collected will be ensured by using appropriate sampling procedures at sampling locations designed to produce data meeting the objectives of the sampling plan. In addition, representative samples will also be ensured by following proper protocols for sample handling (storage, preservation, packaging, custody, and transportation), sample documentation, and laboratory sample handling and documentation procedures.

Comparability of the data will be ensured by selecting standard EPA and/or state analytical methodologies for sample analysis.

Data will be reported from the laboratory to the AECOM electronically in portable data file (PDF) format (laboratory report) and in a database format (electronic data deliverable [EDD]) compatible with the project database. The EDD and laboratory reports will be checked by AECOM to ensure reporting accuracy. Data quality will be assessed in terms of precision, bias, representativeness, completeness, and comparability using specific data quality assessment procedures outlined in Section 11 including data validation by AECOM personnel independent of the field sampling personnel. The results of these assessments, along with any data that is qualified, will be submitted in a data validation report (DVR) as described in Section 7.

5 Sampling Procedures

Specific sampling procedures for collecting groundwater samples from the existing monitoring wells are discussed in the CMP and SAP approved by Ecology before implementation. During compliance monitoring and cleanup actions, the field sampling events will be planned and performed by AECOM in coordination with Tesoro and will be conducted in accordance with the Site CMP, SAP, and QAPP. The schedule for collecting samples is also presented in the CMP. The CMP and project SAP can be updated or replaced in conjunction with submittals related to planning, design, and implementation of final cleanup actions, as required by the CAP.

Pertinent information obtained during sampling (including field measurements, physical description of the sample, time and date collected, and the person collecting the sample) will be recorded on field forms provided in the SAP. The CMP and SAP describe the format for field data entry and field procedures for assuring accuracy.

Containers, sample size, preservation, and holding times are provided in Table B-4 for groundwater samples for each analytical methodology that may be used. Samples will be identified according to the sample designation system described in the SAP on waterproof labels with indelible markers. Sample custody will be tracked with a chain-of-custody (CoC) form following the procedures outlined in Section 5.1. Samples will remain in the custody of the sample collector until transport to the laboratory unless a secure storage area is available. The standard turnaround time for receiving sample data from the laboratory is 10 business days from receipt of samples by the laboratory. The turn-around time may be adjusted to accommodate specific needs to support field activity or reporting deliverables.

5.1 Chain-of-Custody Procedures

A sample is physical evidence collected from the Site. Possession of samples will be traceable from the time the empty containers are sent from the laboratory to the field, to the time the samples are analyzed. This section discusses the CoC procedures and corrections to documentation.

CoC procedures are used to maintain and document sample possession. The CoC form is filled out by the sampler(s) in the field and remains with the samples until analyses are completed. The principal documents used to identify samples and to document possessions are:

- Chain-of-custody records
- Air bills or shipping records (e.g., Federal Express), if applicable
- Field notebooks and/or field record sheets
- A sample is under custody if one or more of the following criteria are met:
    - It is in your possession;
    - It is in your view, after being in your possession;
    - It was in your possession and then you locked it up to prevent tampering; or
    - It is in a designated secure area.

5.1.1 Field Custody, Transfer of Custody, and Shipping Procedures

All samples will be accompanied by a CoC record. When transferring or shipping samples, the individual relinquishing and receiving them will sign, date, and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the analyst at the laboratory. Field custody procedures, including sample packaging, custody, and shipping, are described in the SAP, Section 6.4.

5.1.2 Laboratory Custody Procedures

Sample handling and custody requirements at the laboratory shall be as specified in the laboratory's Quality Assurance Manual and associated laboratory Standard Operating Procedures (SOPs). These requirements should be generally consistent with National Environmental Laboratory Accreditation Program (NELAP) requirements.

The laboratory sample custodian will accept custody of the shipped samples, sign the CoC form, record the date and time of receipt, verify that the samples received match those in the CoC records, and fill out a laboratory receipt checklist. The laboratory sample receipt checklist will explicitly state the condition of the sample containers, any evidence of damage, preservation (including temperature upon receipt), and the completeness of accompanying records.

After inspection, each sample will be logged in and assigned a unique laboratory sample identification (ID). In addition, the following information will be entered in the laboratory information management system (LIMS) for each sample:

- Field sample ID
- Laboratory sample ID
- Date received
- Project name and number
- Collection date
- Sample type
- Analyses to be performed

After the sample login is complete, a copy of the CoC record, with laboratory sample numbers and notations of any discrepancies will be sent to the QA/QC Manager for the data to be entered into the project file. The Laboratory Project Manager will report any problems or discrepancies immediately to the QA/QC Manager. The Laboratory Project Manager is responsible for e-mailing the QA/QC Manager a confirmation of sample receipt within one working day of sample receipt. The original copy of the CoC form will be included with the final data package submitted to the QA/QC Manager.

The laboratory sample custodian will distribute the samples to the appropriate analysts, who will be responsible for the care and custody of samples from the time they are received until the samples are exhausted or returned to the custodian. The data of sample analysis will be recorded on the laboratory report form. While in the laboratory, samples shall be stored in limited-access, temperature-controlled areas. Refrigerators, coolers, and freezers shall be monitored for temperature daily. The acceptance criteria for refrigerator and cooler temperatures shall be 0 to 6 degrees Celsius, and the acceptance criteria for freezer temperature shall be less than 0 degrees Celsius.

When sample analyses and necessary QA checks have been completed, the unused portion of the sample must be disposed of properly. All identifying stickers, data sheets, and laboratory records will be retained as part of the permanent documentation. Sample containers and remaining sample materials will be disposed of appropriately.

5.2 Corrections to Sample and Custody Documentation

All original data recorded in field logs, sample identification tags, and CoC records will be written in waterproof ink or recorded electronically using iPads in the field. None of these documents are to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. If an error is made on a field or laboratory document, the original entry may be corrected by crossing a line through the error and entering the correct information. The erroneous information should not be obliterated. If possible, any error discovered in the field or laboratory documentation should be corrected by the person who made the entry. All corrections must

be initialed and dated. Following completion of the project, all field and laboratory documents must be retained for a minimum of ten years as required by the Agreed Order.

6 Analytical Procedures

The analytical procedures that will be used in the field and by the laboratories are presented in Table B-3 and discussed below.

IHSs for the compliance monitoring program are the following petroleum constituents: TPH-g, TPH-d, TPH-o, BTEX, and naphthalene.

MNA parameters will include:

- Field-measured parameters: pH, conductivity, dissolved oxygen (DO), temperature, oxidation-reduction potential (ORP), ferrous iron soluble, and nitrate
- Laboratory-measured parameters: dissolved manganese, sulfate, alkalinity, and methane

6.1 Field Analytical Procedures

In addition to the Site IHSs, several groundwater parameters indicative of MNA will be analyzed at the time of sample collection as listed above. These indicator parameters will be used in conjunction with laboratory-measured, sulfate, alkalinity, and methane concentrations to evaluate oxidation-reduction (redox) conditions, biodegradation status, and other natural attenuation processes at the Site. Field-measured concentrations of the above-listed analytes will be recorded in field logs at the time of sample collection as described in the SAP.

The portable instruments (as described in the SAP) used for digital field measurements will be operated, maintained, and calibrated following the manufacturer's operations manual specific to the instrument. Calibration of field instruments will be performed in the field. The portable colorimetric test kits used to measure ferrous iron and nitrate (as described in the SAP, Section 2) will be operated and calibrated following the manufacturer's operations manual. This information will be documented in the field records.

6.2 Laboratory Analytical Procedures

The analytical methodologies, including laboratory RLs, used to analyze groundwater are listed in Table B-3. These methods derived from SW-846, Methods for Chemical Analysis of Water and Wastes, March 1983 (EPA, 1983), Ecology's document *Analytical Methods for Petroleum Hydrocarbons* (Ecology, 1997), *Sample Preparation and Calculation for Dissolved Gas Analysis in Water Samples Using a GC Headspace Equilibrium Technique (RSK-175)*, (EPA 2004), and *Method 300.1: Determination of Inorganic Anions in Drinking Water by Ion Chromatography, Revision 1.0*, (EPA, 1997).

All chemical analyses will be conducted by a laboratory with Ecology accreditation for requested analyses. The laboratory will perform all organic and inorganic analyses of groundwater for each sampling event in general accordance with the appropriate specific EPA, Ecology, or approved methodology as indicated in Tables B-3. Filtration associated with dissolved metal analysis will be performed at the laboratory upon sample delivery. All method-required QC will be completed by the laboratory conducting the analyses/tests and reported with the analytical and testing results.

6.3 Reporting Limits

Analytical results will be compared to cleanup levels established in the CAP. Table B-3 lists the cleanup levels and reporting limits (RLs) for each IHS and MNA parameter. As shown in the table, the RLs for all IHSs are lower than the cleanup levels. Data will be reported to the RL value; results detected below the RL will be reported as not detected.

7 Data Reduction, Review, Reporting, and Management

7.1 Data Reduction

Data reduction is the process of converting raw data to results. Data from direct-reading field instruments will be obtained from the instrument and recorded onto a sample collection form or other appropriate field forms as described in the SAP. Laboratory analytical data reduction, review, and reporting will be conducted by the laboratory following their standard operating procedures discussed in their Quality Assurance Manual and requirements of the CMP. Results will be reported to the RL as defined by the QAPP (Table B-3). Data deliverables will include the project sample results and QC results in PDF format (laboratory report) and in a database format (EDD) compatible with the project database.

7.2 Data Review

The laboratory data submitted to AECOM for data quality assessment will undergo a minimum Stage 2A validation (EPA, 2009a) by AECOM personnel independent of the field sampling personnel. The data assessment will consist of ensuring that the laboratory has met the QC control limits established see Section 11 for additional information.

7.3 Reporting

Results will be compared to the cleanup levels as identified in Table B-3. A DVR will be generated for each laboratory report or a group of laboratory reports describing the items reviewed, findings, and assignment of data qualifiers if needed. The DVRs and summary laboratory reports will be included in project submittals to Ecology. At the time of reporting analytical data will also be uploaded to Ecology's EIM, as described in the CMP.

7.4 Data and Document Management

The field team will maintain a detailed Daily Field Report (as described in the SAP). The signature of the author and the date of entry, the project name and number, and the location of the work will accompany all entries in the Daily Field Report. At the beginning of each sampling day, the designated team member will start the daily entry by noting the date and time, the locations to be sampled, weather conditions, the field team present, and any potential problems. Other information to be entered into the Daily Field Report includes observations of field activities, progress, a description of any problems, a summary of equipment preparation procedures and a description of any equipment problems (including corrective action), and explanations of any deviations from the SAP, QAPP, or HASP. At the end of the field event the field sampling team will deliver copies of the field forms completed to the PM.

As required by Agreed Order, all field and laboratory records, reports, documents, and underlying data shall be preserved for a minimum of ten years from the completion of the work, and throughout the effective period of the Agreed Order. Tesoro will make all records available to Ecology upon request and allow access for review within a reasonable time. The laboratory will maintain all associated raw data in archives for a period of 10 years. AECOM will store records on electronic servers with backup protocols.

8 Quality Control Procedures

QC procedures provide the means of evaluating and controlling the precision and bias of the analytical results. Careful adherence to established procedures for sample collection, preservation, and storage will minimize errors due to sampling and sample instability.

8.1 Field QC Procedures

The types of field QC samples that will be collected during the corrective action program and their purpose in relation to the DQOs discussed in Section 4 are listed below. The analytical results for the field QC samples will be assessed with the primary samples using the guidelines presented in Section 11.

8.1.1 Field Related Blanks

The primary purpose of blanks is to trace sources of artificially introduced contamination. The diagram below shows how comparison of different blank sample results can be used to identify and isolate the source of contamination introduced in the field or the laboratory. The three field related blanks include the equipment blank, field blank, and trip blank; they are each defined in the following subsections including their purpose and collection frequency.

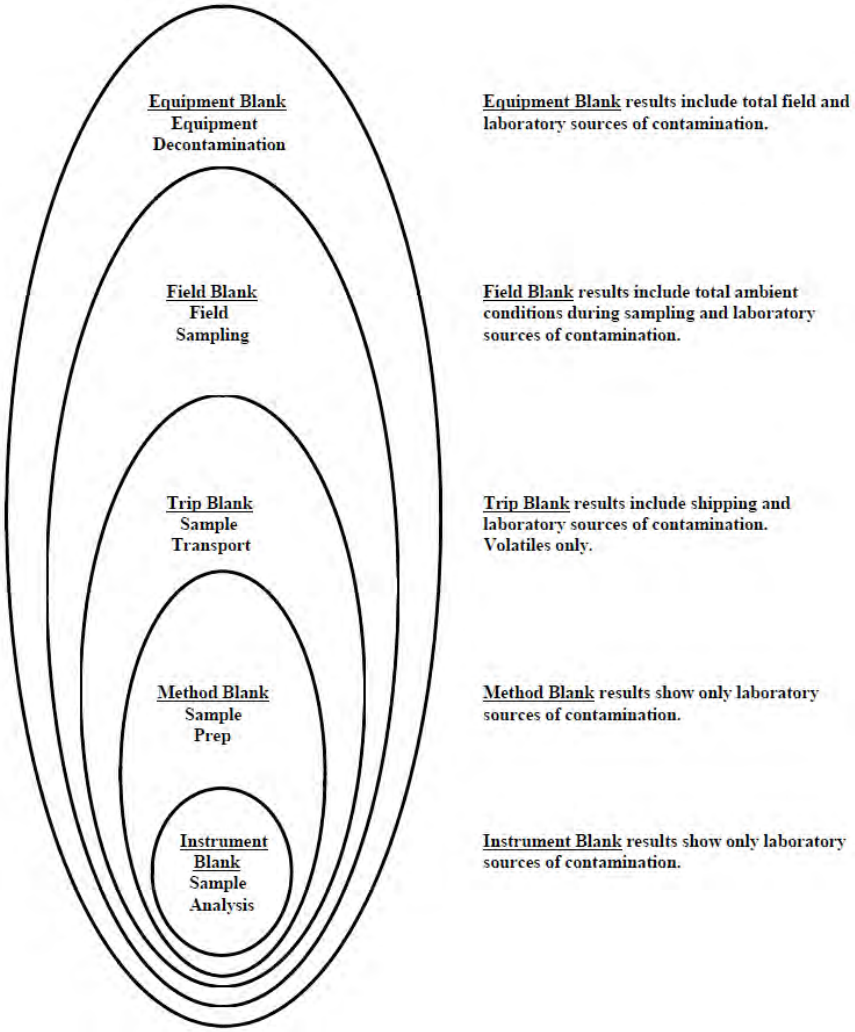


Figure reference: EPA, 2009b. EPA Region III Fact Sheet Quality Control Tools: Blanks, revision 1, April 27.

8.1.1.1 Equipment (Rinsate) Blanks

Monitoring wells currently installed at the Site have dedicated sampling equipment; consequently, groundwater sampling equipment decontamination will not be necessary. If non-dedicated sampling equipment is used during sample collection, one rinsate blank will be prepared each day sampling is conducted with non-dedicated equipment. This sample will consist of laboratory-provided deionized water poured over the non-dedicated sampling equipment after the equipment has been cleaned following the procedures specified in the applicable project plan. The rinsate water will be collected in the appropriate sample containers provided by the laboratory for the type of analysis to be conducted. The rinsate sample results will only be compared to analytical results collected at the sample location using the associated non-dedicated sampling equipment.

8.1.1.2 Field Blank

Field blanks are samples of clean water that are handled (i.e., collected, filtered, and preserved) in the field and shipped to the laboratory with the field samples. Field blanks can indicate bias in analytical results caused by artificially introduced contamination from sample containers, sampling equipment, filtration equipment, preservation reagents, transportation and storage practices, and other samples. One field blank will be collected during each semiannual groundwater sampling event. The field blank will consist of laboratory-provided deionized water poured into the appropriate sample containers provided by the laboratory for the type of analysis to be conducted. The field blank will be collected in the location with the highest potential risk for cross-contamination (i.e. the tank farm).

8.1.1.3 Trip Blanks

Trip blanks will accompany all samples analyzed for VOCs as they are transported to and from the sampling site and then to the laboratory. They will consist of 40-ml glass vials filled with laboratory-provided deionized water. One trip blank will be included with each cooler of sample containers destined for volatiles analysis.

8.1.1.4 Filter Blank

A filter blank is not necessary and will not be collected during dissolved metals collection. Sample volume for metal analysis will be sent to the laboratory unpreserved, and filtering will be performed by the laboratory upon sample receipt. The laboratory performs independent lot checks on laboratory filters used for dissolved metals analysis. Lot filters will be recorded by the laboratory for potential reference.

8.1.1.5 Field Duplicates

Field duplicates are samples that are collected at the same time and location and are preserved, stored, and analyzed under identical conditions as the parent sample. Generally, the most significant source of random error is the sampling procedures. The sampling error cannot be measured directly, although it may be the largest source of error in the results. Evaluation of the difference between the analytical results of field duplicates can provide an estimate of the sampling error for project samples. A good estimate of the random error due to sampling can only be made if the results of the field duplicates are significantly above the RL for a particular analysis. Hence, samples selected for duplication should be those expected to produce positive results, if possible. In addition, to provide a better estimate of the standard deviation of field duplicate results, it is important to collect several pairs of duplicates.

One field duplicate sample will be collected for each semiannual groundwater sampling event. The field duplicate sample will be analyzed for the same parameters as the primary sample. The field duplicate sample will be obtained by alternately filling like sample containers for the two sample sets (primary and duplicate).

Field duplicates will not be identified to the laboratory but will be recorded on the sample collection forms or other appropriate field forms for identification after analysis has been conducted. A list of field duplicates will be provided to the data quality assessment personnel. Field duplicate comparability will be assessed if both results

are reported at concentrations greater than five times the reporting limits. Results for parent and field duplicate samples may be qualified if the RPD is greater than 30% for aqueous samples.

8.2 Laboratory Quality Control Procedures

Laboratory QC samples are used to assess if analytical results are within QC limits and documented. The types of QC samples the laboratory will employ depend on the analytical methodology that will be used to analyze the samples. Each analytical method has required QC that must meet laboratory-developed acceptance limits for the data to be considered valid. In addition, as part of the laboratory's annual accreditation program, performance evaluation (PE) samples and method detection limit (MDL) studies, and lower limit of quantitation LLOQ evaluation are conducted to evaluate the laboratory's capability of performing the method accurately and precisely. MS/MSD shall be performed on project samples at a rate of one per 20 samples collected for each matrix and analysis. In some cases, this will require the collection of additional sample volume in the field. If so, the SAP will specify the sample volume required.

The control limits provided in Table B-3 were obtained from the laboratory during the formulation of this QAPP. In general, these control limits were statistically calculated for each analytical method and matrix following SW-846 guidance based on actual sample results from a sample population that includes samples from other projects in addition to Tesoro. In some cases, the control limits are defined by the analytical method. The control limits, therefore, represent the normal laboratory variability associated with the analysis of samples from many sites and are not specific to Tesoro samples. MS, LCS, and surrogate recoveries associated with analyses of Tesoro samples are reviewed by the laboratory to assess whether the recoveries indicate an out-of-control situation and to determine if corrective action is necessary. The laboratory will document the findings of their QC review and the corrective actions performed in the case narrative for the analytical reports.

9 Performance and System Audits

Two types of audits may be conducted to determine whether procedures outlined in the project plans and laboratory QA program are being followed or to detect problems so that corrective action can be initiated. The two different types of audits are described below.

9.1 Performance Audits

In a performance audit, PE samples are submitted to the laboratory and analyzed to evaluate the performance of the measurement or analytical procedures used by the laboratory. The PE sample consists of some type of environmental matrix (e.g., soil, water) which contains a known amount of a particular analyte(s). The laboratory analyzes the sample using routine procedures and then reports the results. The laboratory identified in the QAPP, Pace is an Ecology-accredited laboratory for the testing identified and routinely participates in performance audits of their routine procedures. The results of these audits are available from the laboratory. A review of the audit results that are part of Ecology's accreditation program may be conducted if there are questions concerning the capability of the laboratory in performing any of the series of analytical measurements of this interim action. Field measurement systems such as pH meters, etc., are assumed to be performing adequately if they can be successfully calibrated following the manufacturer's operating instructions and documented in the field notes.

9.2 System Audits

System audits are conducted to determine if the requirements described in the applicable project plan are being properly carried out. A system audit may cover the field and laboratory portions of the project. The PM, upon recommendation by the QA/QC manager, may request that a system audit of the field or laboratory operations be performed. The results of system audits will be reported to the PM and Project Coordinators. Tesoro will notify the Ecology Project Coordinator of the results of system audits within 15 calendar days of receiving the audit report. The results will be summarized in a technical memorandum that describes problems encountered and corrective measures taken to correct the problem. Any corrective actions required should be implemented as discussed in Section 12.

10 Preventative Maintenance and Calibration Procedures

Preventative maintenance procedures and schedules for field sampling equipment and measurement equipment will be conducted following the manufacturer's operations manual for each piece of equipment. Any critical spare parts or sampling equipment disposables such as small tools, disposable bailers, sample containers, and other small items should be inventoried by field personnel to prevent and/or minimize equipment downtime. The laboratory will be responsible for preventative maintenance of its measurement equipment.

10.1 Field Calibration Procedures

The calibration of field equipment is discussed in Section 7 of the SAP. If an equipment malfunction is suspected, the device will be removed from service, tagged to identify the suspected problem, and the appropriate personnel notified so that a recalibration can be performed, or a substitute piece of equipment can be obtained. Field equipment that fails calibration or becomes inoperable will be repaired and satisfactorily recalibrated before reuse. Equipment that cannot be repaired will be replaced.

Data collected with equipment that later fails recalibration will be evaluated. If the data appear to be affected, the results of the evaluation will be documented, and the PM will be notified. Suspected problems with the field equipment will be documented in the field logbook.

10.2 Maintenance Procedures

To reduce the potential of equipment malfunction, preventative maintenance for field sampling and measurement equipment will be performed following the frequency and methods described in the manufacturer's operations manual or handbook for each piece of equipment. Any critical spare parts or sampling equipment disposables such as small tools, sample containers, and other small items should be inventoried by field personnel to prevent and/or minimize equipment downtime. Field colorimetric test kit reagent packets will be inspected by the field team lead prior to the sampling event. Expired reagent packets will be disposed of and replaced prior to each event.

10.3 Laboratory Calibration Procedures

Laboratory instrumentation will meet applicable calibration requirements to ensure that the instrumentation is capable of producing acceptable quantitative data. Initial calibration demonstrates that the instrument is capable of acceptable quantitative performance at the onset of analysis. Calibration during operation verifies the acceptable performance of the instrument on a day-to-day basis. Tuning and instrument performance criteria will also be established, as appropriate, to ensure that instrument measurements may be interpreted correctly. Laboratory calibration procedures and frequencies are specified in the protocol for the specific analytical methods used. When there are no previously defined specifications, the calibration procedures will, at a minimum, be performed every six months, or after a significant change made to the equipment (e.g., a new column). The analytical laboratory will be responsible for preventive maintenance of the equipment used during analytical procedures. Instrument maintenance logbooks will be maintained in laboratories at all times. The logbooks, in general, will contain a schedule of maintenance as well as a complete history of past maintenance, both routine and non-routine. In addition, the laboratory will maintain current SOPs for review at all times.

11 Data Assessment Procedures

When the results of the measurements have been obtained, the PM and QA/QC manager will determine whether the project DQOs have been achieved. Whether the overall project DQOs have been met will be assessed by a review of the DVRs generated by the data quality assessment personnel as well as information from field data collection and documented field activities.

The responsibility of the data quality assessment personnel will be to ensure that the analytical DQOs have been met through a review of the QC results associated with the project's analytical data. DVRs will discuss the completeness of the data and will document the reasons for any data qualifiers that are assigned. Specific procedures to be used in the data quality assessment of project data precision, bias, and completion are discussed in this section.

To ensure that data is of known and acceptable quality, all analytical data generated to support the enforcement and Agreed Order will undergo a Stage 2A data quality review (EPA, 2009a). The validation stage will be determined by the type of data and reason for collection, as outlined below. A more detailed data validation may be warranted under some conditions following the initial data validation review.

Data review is an assessment of data precision and accuracy using quality control summary sheet results provided by the laboratory for each data package. If outliers occur during calibration or calibration verification or other analytical problems are identified, the laboratory will contact the AECOM QA/QC manager to discuss the problems/outliers. Professional judgment will be used to determine necessary actions if any. The problems/outliers and corrective actions by the laboratory will be noted in the case narrative of the laboratory reports. Data will be evaluated, and data qualifiers assigned based on the method requirements and guidance for qualification outlined in the EPA documents *National Functional Guidelines for Organic Superfund Methods Data Review, November 2020* (as updated) and *National Functional Guidelines for Inorganic Superfund Methods Data Review, November 2020* (as updated) (EPA, 2020a; 2020b). If several problems or deficiencies are encountered or specific data appear to be problematic based on the initial data review, a more extensive data review will be implemented such as a review of raw data that may be beyond the planned validation stage. The data review will consist of the elements listed below.

- Verification that sample numbers and analyses match the CoC request
- Verification that sample preservation and holding times are met
- Verification that field and laboratory blanks were performed at the proper frequency and that no analytes were present in the blanks
- Verification that field and laboratory duplicates, MS, and LCS were run at the proper frequency and that control limits were met
- Verification that surrogate compound analyses have been performed and that results met the QC criteria

Data quality assessment will also include a review of the precision, bias, and completeness of analytical data. Precision will be assessed based on the RPD of MS/MSD or LCS/LCSD pairs. Calculated RPDs will be compared to the control limits; and if the RPD is within these limits, then the precision of the analysis will be assumed to meet the DQOs of the project.

Bias will be reviewed by comparing the percent recoveries of surrogates, MS samples, and LCS samples to the appropriate control limits. The control limits for addressing precision and bias for each analysis are included in Table B-3 or as updated by the laboratories. The control limits presented in this table were provided by the laboratory during the development of this QAPP and represent the output of statistical evaluation of results from a set of samples. Sample data will be assessed against associated the field related blank results; the project chemist will evaluate the data to determine if qualifiers or changes to field procedures are necessary.

Completeness will be expressed as the percentage of the total tests (including sample and field QC results) conducted that are valid and considered usable for project objectives. Analytical results qualified as estimated based on data quality assessment are considered usable, but the reason for qualification should be considered when using the data. Rejected data are not usable.

In conjunction with the data quality assessment, the electronic deliverable will be spot-checked with the .pdf copy analytical results. If transcription errors are discovered by AECOM, the laboratory will be notified, and the discrepancy corrected. Data qualifiers will be added to the project database during data validation. Reason codes for qualifiers are included in Table B-5. If additional reason codes are deemed necessary during data validation, these will be included in the DVR.

12 Corrective Action

Evaluation of field and laboratory QC data and/or audits conducted for field operations and/or laboratory operations may indicate the need for corrective action. Problems with analytical QC data will be addressed by the laboratory QC officer. Problems arising during field operations, however, will be addressed by the QA/QC manager through the communication of the identified problem and potential corrective action to the AECOM, and/or Tesoro Project Manager. The Project Manager will then relay this information to the field personnel for implementation. The field personnel will then report back to the Project Manager upon successful implementation of the corrective action. Ecology will be notified of variances to the QAPP or applicable project plans through status reports, data review reports, quarterly reports, or other written correspondence as deemed appropriate.

13 Quality Assurance Reports

DVRs will be prepared for the analytical data generated for each sampling event. The DVRs will indicate if analytical DQOs were met and identify general QA problems, assigned data qualifiers and reasons for the qualifier, impact on data quality, if any, and the recommended and/or implemented corrective actions. DVRs will be submitted to the QA/QC manager and the PM for review before the final reporting of analytical data. The results of the data review process described in the DVR will be used with information from field data collection and documented field activities to assess if the project objectives as described in SAPs and other project plans have been achieved.

14 References

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Tables

Table B-3. Quality Control Criteria for Data Quality Assessment of Groundwater
Chevron Pipe Line Company Pasco Bulk Terminal

Parameter	Method	Pace Analytical National, LLC				Groundwater Cleanup Level [3]
		MRL [1]	MS/MSD [2]	LCS/LCSD [2]	RPD [2]	
	Units:	µg/L	%	%	%	µg/L
Total Petroleum Hydrocarbons (TPH)						
TPH-g	Ecology June 1997; NWTPH-Gx	150	78-122	78-122	30	800 (benzene present) 1,000 (no benzene present)
TPH-d	Ecology June 1997; NWTPH-Dx	100	36-132	36-132	30	500
TPH-o	NWTPH-Dx, Extended	100	36-132	36-132	30	500
Volatile Organic Compounds (VOCs)						
Benzene	EPA 8260D	1.00	79-120	79-120	20	5
Toluene	EPA 8260D	1.20	80-121	80-121	20	1,000
Ethylbenzene	EPA 8260D	1.00	79-121	79-121	20	700
Total Xylenes	EPA 8260D	3.00	79-121	79-121	20	1,000
Naphthalene	EPA 8260D	5.00	61-128	61-128	20	160
Natural Attenuation Parameters (laboratory-measured)						
Alkalinity	SM 2320	20,000	8-1210	85-115	20	--
Sulfate (anions)	EPA 300	5,000	87-112	87-112	15	--
Methane (dissolved gases)	RSKSOP-175	12	73-125	73-125	30	--
Dissolved Manganese	EPA 6010B	10	75-125	80-120	20	--
Natural Attenuation Parameters (field-measured)						
Ferrous iron	Hach DR900 Portable Colorimeter	--	--	--	--	--
Nitrate		--	--	--	--	--

Notes:
(1) MRLs will vary based on sample size, dilutions, matrix interference, and/or moisture content. MRLs were provided by the laboratories and may change based on updated MDL studies and/or LLOQ evaluations.
(2) Control limits for MS/MSD, LCS/LCSD and RPDs were provided by the laboratories. Control limits will change when limits are recalculated based on each laboratory's QA procedures. The control limits in effect at the time of sample analysis will be provided in laboratory reports and will be used to validate the data.
(3) Cleanup levels as identified in the Cleanup Action Plan (CAP) Agreed Order Number DE 21664 from Washington State Department of Ecology to Tesoro effective April 2023. Values are derived from MTCA Method A Cleanup Levels for Groundwater, Table 720-1 of Washington Administrative Code 173-340-900.
EPA - United States Environmental Protection Agency
LCS/LCSD - laboratory control sample/laboratory control sample duplicate
MS/MSD - matrix spike/matrix spike duplicate
MTCA = Washington State Model Toxics Control Act
% = percent
RL - reporting limit
RPD - relative percent difference
SM - Standard Method
TPH-d = diesel range hydrocarbons (as analyzed by Northwest Method NWTPH-Dx)
TPH-Dx =diesel-range total petroleum hydrocarbons
TPH-g = gasoline range hydrocarbons (as analyzed by Northwest Method NWPTH-Gx)
TPH-Gx = gasoline-range total petroleum hydrocarbons
TPH-o = motor oil range hydrocarbons (as analyzed by Northwest Method NWTPH-Dx)
µg/L = micrograms per liter

Table B-4. Groundwater Monitoring Sample Containers, Preservatives, and Holding Times Criteria
Chevron Pipe Line Company Pasco Bulk Terminal

Parameter		Method Reference	Method	Container Count		Container Type [2]	Preservation	Extraction Holding Time	Analysis Holding Time
Site Indicator Hazardous Substances	TPH-d and TPH-o	Ecology	NWTPH-Dx	**2**		40-mL amber VOA glass vials with teflon lined (blue) cap	HCl pH<2, cool 0 to 6ºC	14 days (if not preserved, 7 days)	40 days [3]
	BTEX+N	EPA	8260D	3		40-mL amber VOA glass vials with teflon septum (zero headspace)	HCl pH<2, cool 0 to 6ºC	NA	14 days
	TPH-g	Ecology	NWTPH-Gx	2	**8**			NA	14 days
Natural Attenuation Parameters (laboratory-measured)	Methane (dissolved gases)	RSK-175	RSKSOP-175	3				NA	14 days
	Alkalinity	Standard Method	SM 2320	1		250-mL HDPE	Cool 0 to 6ºC	NA	14 days
	Sulfate (anions)	EPA	300		**2**		Cool 0 to 6ºC	NA	28 days
	Dissolved Manganese [1]	EPA	6010B	1			cool 0 to 6ºC	NA	6 months
				12					

Notes:
(1) Samples for dissolved metals will be sent to laboratory unpreserved and filtered by the laboratory.
(2) Container types are based on Pace Analytical lab protocols. Amber VOAs and blue caps are not required for the method.
(3) Days from extraction date
BTEX+N = benzene, toluene, ethylbenzene, total xylenes and napthalene
Ecology - Washington State Department of Ecology
EPA = US Environmental Protection Agency
HCl - hydrochloric acid
HDPE - high density polyethylene
mL - milliliter
NA - not applicable
ºC = degrees celsius
SM = Standard Method
TPH = total petroleum hydrocarbons
TPH-d = diesel range hydrocarbons (as analyzed by Northwest Method NWTPH-Dx)
TPH-g = gasoline range hydrocarbons (as analyzed by Northwest Method NWPTH-Gx)
TPH-o = motor oil range hydrocarbons (as analyzed by Northwest Method NWTPH-Dx)
VOA = volatile organic analysis

Table B-5. Valid EQuIS Reason Codes for Data Validation Qualifiers
Chevron Pipe Line Company Pasco Bulk Terminal

Reason code	Description
be	Equipment blank contamination
bf	Field blank contamination
bl	Laboratory blank contamination
bm	Missing Blank Information
c	Calibration issue
cr	Chromatographic resolution
cv	Calibration verification
d	Reporting limit raised due to chromatographic interference
e	exceeds calibration range
fd	Field duplicate RPDs
g	Chromatographic pattern match issue
h	Holding times
hs	headspace greater than 6mm in sample vials
i	Internal standard areas
l	LCS recoveries
ld	Laboratory duplicate RPDs (matrix duplicate, MSD, LCSD)
lq	Less than limit of quantitation
m	Matrix spike recovery
ma	Multiple results present from different analytical methods. Value from another analytical method should be used.
nb	Negative laboratory blank contamination
p	Chemical preservation issue
pe	Post Extraction Spike
q	Quantitation issue
r	Dual column RPD
s	Surrogate recovery
sp	Sample preparation issue
t	Temperature Preservation Issue
v	compound identification issue
x	Low % solids
y	Serial dilution results
z	ICS results

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