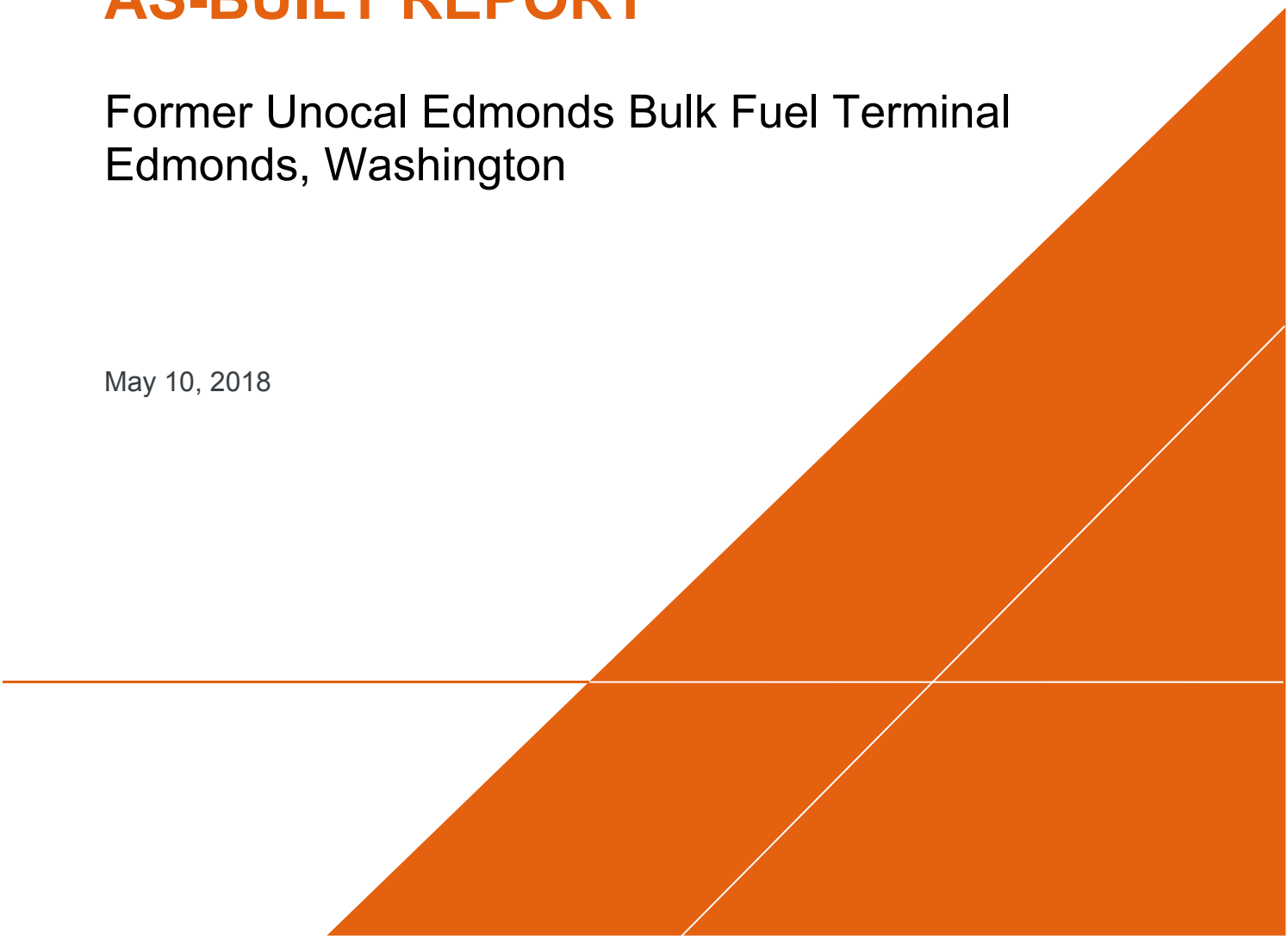
ARCADIS Design & Consultancy for natural and built assets

Chevron Environmental Management Company

DUAL-PHASE EXTRACTION SYSTEM AS-BUILT REPORT

Former Unocal Edmonds Bulk Fuel Terminal
Edmonds, Washington

May 10, 2018



Ophélie Encelle
Environmental Scientist

Peter Campbell, PE (License No. 45051)
Senior Engineer

Scott Zorn
Project Manager

DUAL-PHASE EXTRACTION SYSTEM AS-BUILT REPORT AS-BUILT REPORT

Former Unocal Edmonds Bulk Fuel Terminal
Edmonds, Washington

Prepared for:

Chevron Environmental Management Company

Prepared by:

Arcadis U.S., Inc.
1100 Olive Way
Suite 800
Seattle
Washington 98101
Tel 206 325 5254
Fax 206 325 8218

Our Ref.:

B0045362.0011

Date:

May 10, 2018

CONTENTS

TABLES (IN TEXT)

TABLE (ATTACHED)

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

2018 GOR	2018 Groundwater and Operation Report
AO	Agreed Order
ARAR	applicable or relevant and appropriate requirement
Arcadis	Arcadis U.S., Inc.
bgs	below ground surface
btoc	below top of casing
Cascade	Cascade Drilling
CatOx unit	catalytic oxidizer unit
Clearcreek	Clearcreek Contractors Inc.
CMP	Compliance Monitoring Plan
COC	constituent of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSID	Cleanup Site Identification Number
CUL	cleanup level
DB-1	Detention Basin No. 1
DB-2	Detention Basin No. 2
DOT	U.S. Department of Transportation
DPE	dual-phase extraction
DPE System As-Built Report	Dual-Phase Extraction System As-Built Report
Draft CAP	Draft Cleanup Action Plan
DRO	diesel range organics
Ecology	Washington State Department of Ecology
EDR	Final Engineering Design Report
FSID	Facility Site Identification Number
FS Report	Public Review Draft Final Feasibility Study Report
GAC	granular activated carbon
gpm	gallons per minute

GPRS	Ground Penetrating Radar Systems, LLC.
GRO	gasoline range organics
groundwater extraction unit	groundwater extraction and treatment unit
HDPE	high-density polyethylene
HMI	human machine interface
HO	heavy oil range organics
IAWP	Final Interim Action Work Plan
in. Hg	inches of mercury
LNAPL	light nonaqueous phase liquid
mg/kg	milligrams per kilogram
Newterra telemetry service	Newterra Site-Link Basic Wireless Telemetry Service
NPDES	National Pollutant Discharge Elimination System
Otak	Otak, Inc.
PLC	programmable logic controller
POC	point of compliance
PSCAA	Puget Sound Clean Air Agency
psi	pounds per square inch
PUD	Snohomish County Public Utility District
PVC	polyvinyl chloride
REL	remediation level
scfm	standard cubic feet per minute
Site	former Unocal Edmonds Bulk Fuel Terminal, located at 11720 Unoco Road, Edmonds, Washington
SOOW	service oil-resistant jackets, oil-resistant insulation, and weather-/water water-resistant
SVE	soil vapor extraction
SVE unit	soil vapor extraction and treatment unit
TEQ	toxic equivalent
TPH	total petroleum hydrocarbons
Unistrut	strut channel structural support

Unocal	Union Oil Company of California
USEPA	United States Environmental Protection Agency
VFD	variable frequency drive
VLS	vapor liquid separator
VOC	volatile organic compound
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation
µg/L	micrograms per liter

1. INTRODUCTION

On behalf of Chevron Environmental Management Company, Arcadis U.S., Inc. (Arcadis) prepared this Dual-Phase Extraction System As-Built Report (DPE System As-Built Report) for the former Union Oil Company of California (Unocal) Edmonds Bulk Fuel Terminal located at 11720 Unoco Road in Edmonds, Washington (the Site). The Site and surrounding area are shown on Figure 1-1.

This DPE System As-Built Report was prepared according to the requirement of the Compliance Monitoring Plan (CMP), which will be provided as Appendix B to the Draft Cleanup Action Plan (Draft CAP).The performance monitoring report will be submitted as part of an addendum to this DPE System As-Built Report after 12 months of operation of the dual-phase extraction (DPE) system, or upon obtaining asymptotic DPE system mass removal rates from the pretreatment effluent vapor stream (whichever comes earlier).

The Site is being managed by Ecology pursuant to Agreed Order (AO) No. DE 4460 effective on July 5, 2007 and amended on June 19, 2017 (Ecology 2007, 2017). The June 19, 2017 AO No. DE 4460 amendment (Ecology 2017) allows for work associated with the selected remedy as described in the Public Review Draft Final Feasibility Study Report (FS Report; Arcadis 2017) to be implemented before finalizing the Draft CAP. The allowed work is described in the Final Interim Action Work Plan (IAWP; Arcadis 2016b), Exhibit G of the AO No. DE 4460 amendment (Ecology 2017), and the Final Engineering Design Report (EDR; Arcadis 2016a) both approved by Ecology.

The Site is formally known as Unocal Edmonds Bulk Fuel Terminal 0178 in Ecology's database. Identifiers are:

- Facility Site Identification Number (FSID): 2720
- Cleanup Site Identification Number (CSID): 5180.

Previous studies, including historical investigations and remedial actions that have been conducted at and near the Site, are summarized in the FS Report (Arcadis 2017). Ecology's website for the Site is available at: https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=5180. Documents available electronically can be accessed by clicking View Electronic Documents in the sidebar (or clicking on the preceding hyperlink). Documents are also available at the public repository at the Edmonds Public Library. The complete file can be reviewed at Ecology's Northwest Regional Office in Bellevue (phone 425.649.7000). Data collected during investigations of the Site are available in Ecology's Environmental Information Management System database (see Study IDs UNOCAL01 and UNOCAL 02). Chevron's website for the Site is available at: http://www.unocaledmonds.info/.

2. SITE DESCRIPTION AND BACKGROUND

This section provides a brief description of the Site and its cleanup activities according to Ecology's regulatory framework.

2.1 Site Description

The Site, as defined by the Model Toxics Control Act, comprises areas of the Lower Yard and the former Upper Yard. The Site layout is shown on Figure 2-1.

The approximately 25-acre former Upper Yard is located south of the Lower Yard (Figure 2-1). Unocal sold the former Upper Yard to Point Edwards, LLC in October 2003 and, since then, this area was redeveloped and has been occupied by the Point Edwards condominium complex. Remedial actions in the Upper Yard were conducted in 2003; upon completion, Ecology issued a letter (Ecology 2003) confirming that Unocal successfully completed the cleanup actions and confirming that no further cleanup action was required at the Upper Yard. Therefore, this report focuses solely on work completed in the Lower Yard.

The approximately 22-acre Lower Yard surrounds the former Upper Yard to the north, east, and west, and is currently owned by Unocal. The Lower Yard is currently a vacant property, with no permanent aboveground structures. A temporary shed, concrete pad, and system enclosure are located along lower Unoco Road in the central portion of the Lower Yard. The Lower Yard stormwater system conveys direct precipitation and stormwater to Detention Basin No. 1 (DB-1) located in the northern part of the Lower Yard and which is then discharged into Willow Creek. A Washington State Department of Transportation (WSDOT) stormwater line, installed between 1972 and 1975, crosses beneath the Lower Yard at depths of 9 to 12 feet below ground surface (bgs) to the top of the pipe and discharges stormwater collected from State Route 104 to Puget Sound. The WSDOT stormwater line generally runs along the northern edge of lower Unoco Road and trends west across the Lower Yard to the tidal basin leading to Puget Sound, with sections of increasing diameter from 48 to 72 inches from east to west.

Willow Creek, a small tributary of Puget Sound adjacent to the Site, runs along the northern portion of the western boundary and the entire eastern boundary of the Lower Yard. Willow Creek is approximately 10 feet wide, is underlain by silt and sand material, and carries surface water into a tidal basin, where the water is conveyed beneath the Port of Edmonds through a culvert to Puget Sound. To the north and northeast of the Lower Yard beyond Willow Creek is Edmonds Marsh, which is a 23-acre freshwater and brackish-water marsh. Willow Creek and Edmonds Marsh are directly connected to Puget Sound and are tidally influenced. At high tide, water flows from Puget Sound upstream into Edmonds Marsh; at low tide, water drains from Edmonds Marsh into Puget Sound. At its nearest point (the southwest corner of the Lower Yard), the Site is approximately 160 feet from the Puget Sound shoreline. The tidal variations in water levels in Puget Sound also influence groundwater elevations at the perimeter of the Site.

2.2 Background

2.2.1 Cleanup Actions History

After termination of the terminal activities in 1993, Unocal entered into AO No. DE-92TC-N328 (Ecology 1993), which was superseded by AO No. DE 4460, effective in 2007 and amended in 2017 (Ecology 2007, 2017).

In accordance with the AOs (Ecology 1993, 2007, 2017), Unocal conducted remedial activities at the Upper Yard and Lower Yard. In 2001, Unocal conducted an interim action under AO No. DE92TC-N328 (Ecology 1993) to remove light non-aqueous phase liquid (LNAPL) and petroleum-saturated soil and groundwater from four areas of the Lower Yard. Additional interim actions were conducted in 2003 under AO No. DE92TC-N328 (Ecology 1993), including soil excavations in the southwest Lower Yard, DB-1, Metals Area 3 (located adjacent to the southwest Lower Yard excavation area), and the Point Edwards storm drain line area. Remedial actions were also conducted in the Upper Yard in 2003; upon completion, Ecology issued a letter (Ecology 2003) confirming that Unocal successfully completed the cleanup actions identified for the Upper Yard. Unocal sold the Upper Yard to Point Edwards, LLC in October 2003. In 2007 and 2008, interim action excavation activities were conducted at the Lower Yard and in Willow Creek, in accordance with AO No. DE 4460 (Ecology 2007, 2017).

2.2.2 Cleanup Action Objectives

The objectives of the cleanup action required at the Site per AO No. DE 4460 (Ecology 2007, 2017) include:

- Remediate soil that contains petroleum hydrocarbon concentrations greater than the soil remediation level (REL) and cleanup levels (CULs) defined in Table 2-1, in the areas of remaining impacts at the Site as described in the FS Report (Arcadis 2017) and summarized below:
    - *WSDOT stormwater line and Point Edwards storm drain.* Twelve sample locations in soil along the WSDOT stormwater line and two sample locations in soil along the Point Edwards storm drain contain soil with constituent of concern (COC) concentrations greater than site CULs and/or REL.
    - *DB-2 area.* Free-phase and/or residual LNAPL was encountered in the DB-2 area. Additionally, 11 sample locations contained soil with COC concentrations greater than site CULs and/or RELs.
- Remove recoverable free product (LNAPL) beneath the Site.
- Obtain the following data, which is necessary to assess future groundwater compliance at the Site:
    - Data necessary to calculate the restoration timeframes for COC concentrations to meet groundwater CULs, as defined in Table 2-2, at the groundwater points of compliance (POCs).
    - Data necessary to evaluate if the remaining soil concentrations will cause an exceedance of groundwater CULs at the groundwater POCs.

The cleanup action will also comply with all applicable or relevant and appropriate requirements (ARARs) that apply to the Site as listed in the IAWP (Arcadis 2016b).

This DPE System As-Built Report focuses on the DPE system installation near the WSDOT stormwater line and Point Edwards storm drain (see Section 2.2.3).

CULs and REL at the Lower Yard are summarized in Tables 2-1 and 2-2 for soil and groundwater, respectively. Further details regarding CULs and REL identification are provided in the FS Report (Arcadis 2017).

Table 2-1. Soil CULs and REL for the Lower Yard

Constituents of Concern	Cleanup Levels and Remediation Level
TPH[1]	2,775 mg/kg[3]
Benzene	18 mg/kg[3]
Total cPAHs TEQ[2]	0.14 mg/kg[3]

Notes:

[1] Total petroleum hydrocarbons (TPH) calculated by summing the concentrations of gasoline range organics (GRO), diesel range organics (DRO), and heavy oil range organics (HO).

[2] Total carcinogenic polycyclic aromatic hydrocarbons (cPAHs) calculated by summing the concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene; adjusted for toxicity using toxic equivalency (TEQ) factors to represent a total benzo(a)pyrene concentration (Washington Administrative Code [WAC] 173-340-900).

[3] Proposed soil CULs and REL based on soil direct contact pathway and soil leaching pathway.

mg/kg = milligrams per kilogram

Table 2-2. Groundwater CULs and REL for the Lower Yard

Constituents of Concern	Cleanup Levels Groundwater (as protection of surface water)
TPH[1]	–[3]
Benzene	16 µg/L[4]
Total cPAHs TEQ[2]	0.05 µg/L[5]

Notes:

[1] TPH calculated by summing the concentrations of GRO, DRO, and HO.

[2] Total cPAHs calculated by summing the concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene; adjusted for toxicity using TEQ factors to represent a total benzo(a)pyrene concentration (WAC 173-340-900).

[3] Method A (WAC 173-340-900, Table 720-1); TPH calculated on a sample-specific basis. The CUL will fall between 500 and 800 µg/L, depending on the sample's composition.

[4] National Recommended Water Quality Criteria for human-health (organisms only) (United States Environmental Protection Agency [USEPA] 2015). http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm#hhtable. Accessed on June 6, 2016.

[5] Total cPAHs TEQ adjusted for practical quantitation limit based on WAC 173-340-730(5)(c).

µg/L = micrograms per liter

2.2.3 Selected Remedy

The June 19, 2017 AO No. DE 4460 amendment (Ecology 2017) allows for work associated with the selected remedy described in the FS Report (Arcadis 2017) to be implemented and to complete the cleanup action objectives.

The selected remedy includes excavation activities near the former Detention Basin No. 2 (DB-2) vicinity and treatment through a DPE system of the remaining impacts near the WSDOT stormwater line:

- The DB-2 excavation activities were implemented during summer and fall 2017 and are described in the Detention Basin 2 Excavation As-Built Report (Arcadis 2018b).
- The DPE system installed near the WSDOT stormwater line is designed to dewater soil, expose residual LNAPL to induced vapor flow, remediate COC concentrations in soil to less than CULs and REL, and prevent off-site migration of dissolved-phase COCs and potential LNAPL.

Design of the selected remedy is presented in the EDR (Arcadis 2016a). Data from the 2015 DPE pilot test data were used for overall design specifications for a DPE system capable of extracting and treating groundwater at up to 100 gallons per minute (gpm) and soil vapor at up to 350 standard cubic feet per minute (scfm) at 20 inches of mercury (in. Hg) vacuum.

This DPE System As-Built Report focuses on the DPE system installation to remediate the remaining impacts near the WSDOT stormwater line.

3. DUAL-PHASE EXTRACTION SYSTEM INSTALLATION ACTIVITIES

DPE system installation included the following activities:

- Permitting
- Pad construction
- Well installation and completion
- DPE system construction
- Electrical installation
- Conveyance piping installation
- Waste handling
- Startup commissioning.

This section is organized according to the activities listed above.

Field activities related to DPE system installation were implemented periodically between March and December 2017 and were monitored by Arcadis. DPE system As-Built Notes, Drawings, and Diagrams are provided as Appendix A.

The contractors involved in DPE system installation and the activities performed are listed below:

- Arcadis prepared construction specifications as part of the EDR (Arcadis 2016a). Arcadis also observed the construction work completed by the contractors identified below.
- Subsurface utility locations were marked by Ground Penetrating Radar Systems, LLC (GPRS), located in Seattle, Washington.
- Survey at the Site was conducted by Otak, Inc. (Otak), a registered land surveyor located in Redmond, Washington.
- The DPE treatment system was constructed off site by Newterra of Brockville, Ontario, Canada.
- Drilling activities associated with monitoring well decommissioning and installation were conducted by Cascade Drilling (Cascade), a registered drilling company located in Woodinville, Washington.
- Electrical services were provided by SHJ Electric, a licensed electrician located in SeaTac, Washington.
- General construction services for DPE system installation were provided by Clearcreek Contractors Inc. (Clearcreek), located in Marysville, Washington.

General notes regarding construction specifications and contractors' roles are provided in Appendix A.

3.1 Permitting

The cleanup action complies with all ARARs that apply to the Site. A State Environmental Policy Act checklist was submitted to Ecology, and approved permits were obtained before implementation of the DPE system installation activities:

- On September 28, 2016, Ecology issued National Pollutant Discharge Elimination System (NPDES) Permit No. WA0991007 to discharge treated groundwater to Willow Creek.
- On December 19, 2016, the Puget Sound Clean Air Agency (PSCAA) issued Permit No.29892 to discharge treated effluent vapors per the permit restrictions and conditions.

Although cleanup work at the Site is exempted from obtaining local permits because remedial actions are being implemented under an AO per WAC 173-340-710(9)(b)(vii), the City of Edmonds was consulted to assess any needs for local permitting. The remedial actions planned did not require additional permitting from the City of Edmonds. Labor and Industries inspections and Snohomish County Public Utility District (PUD) approval for electrical connections were performed by the appropriate entities.

NPDES Permit No. WA0991007 and PSCAA Permit No. 29882 are provided as Appendix B.

3.2 Pad Construction

From March 21 to April 3, 2017, the concrete pad as described in the EDR was constructed by Clearcreek to provide the foundation of the DPE system enclosure. The concrete pad is located in the central portion of the Lower Yard near the WSDOT stormwater line, at a location agreed upon by Ecology and the WSDOT prior to pad construction (see Figure 2-1). Pad construction details are presented on DPE System As-Built Drawings provided as Appendix A. A photograph of the concrete pad construction is presented in Appendix C.

The concrete pad specifications are as follows:

- 50 feet long by 20 feet wide by 1 foot thick
- Reinforced with:
  - Welded wire mesh with a minimum 3-inch coverage and a 25-inch overlap
  - No. 4 rebar made of grade 60 steel and with a turndown of 1 foot 10 inches.
- Constructed of normal weight concrete with a designed strength of 3,000 pounds per square inch (psi) at 28 days curing time.

3.3 Wells Installation and Completion

The wells installed as part of the DPE system include:

- Fourteen DPE wells used for both groundwater and soil vapor extraction
- Two soil vapor extraction (SVE) wells used for soil vapor extraction only
- Nine piezometers used as observation wells for the DPE system monitoring.

The well locations are shown on Figure 3-1.

Three DPE wells (DPE-1 through DPE-3) and three piezometers (PZ-1 through PZ-3) were installed in 2015 for pilot testing activities. 2015 well installation details are provided in the EDR (Arcadis 2016a). The remaining wells were installed from October 9 to 21, 2017 under Arcadis supervision. Piezometer PZ-3 installed in 2015 was converted to DPE well DPE-4 during system construction.

Installation details are summarized below:

- Washington 811 OneCall was contacted prior to drilling the wells.
- Site utility maps were consulted, and any potential additional utilities were located by GPRS on October 9, 2017.
- Otak pre-surveyed the well locations on October 9, 2017.
- Cascade drilled and constructed the wells from October 9 to 21, 2017.
    - Well locations were pre-cleared for subsurface utilities to 8 feet bgs with an air knife and vacuum truck to protect any potential underground improvements.
    - Well installation was implemented according to the design provided in the EDR (Arcadis 2016a) and Ecology's recommendations.
    - The sand pack extended from 1 foot above the screened interval to the total depth of the well. Each well was completed with hydrated bentonite chips and neat cement.
- Following well installation, Clearcreek completed the remediation wells (DPE and SVE wells) with above-grade well vault and at-grade level conveyance piping, and installed control wiring connections.
- Otak surveyed the as-built locations and casing elevations of the wells on November 21, 2017, after completion of the well vault installation.

Well boring logs are provided in Appendix D. Well construction details are included in Table 3-1. The well locations are shown on the As-Built Drawings presented in Appendix A. Photographs of the new wells installed are presented in Appendix C.

3.3.1 Dual-Phase Extraction Well Installation

Ten DPE wells (DPE-5, DPE-6, DPE-7, DPE-8, DPE-9, DPE-10, DPE-11, DPE-12, DPE-13, and DPE-14) were installed in 2017. DPE wells DPE-1, DPE-2, DPE-3 were installed during the 2015 pilot test activities. PZ-3 was installed as a dual-purpose well in 2015, with the intent to convert piezometer PZ-3 to a DPE well if pilot test results were favorable. PZ-3 was converted to DPE well DPE-4 during DPE system installation and construction activities and will hereafter be referred to as DPE-4. DPE well DPE-12 was compromised during well installation activities and therefore decommissioned on March 22, 2018 (Arcadis 2018a). A replacement well, DPE-12R, was installed approximately four feet to the west of DPE-12.

During the installation of DPE-5, DPE-7, DPE-11 to DPE-14 and DPE-12R, a 20-mil polyethylene sheeting installed during previous excavation activities to demarcate fill from native soil was encountered above the water table at depths ranging from 3.6 to 7 feet bgs. The screen intervals were adjusted to place the top of the screen below the 20-mil polyethylene sheeting to focus extraction influence below the

20-mil polyethylene sheeting and prevent pneumatic short-circuiting through the clean backfill placed above the 20-mil polyethylene sheeting.

The DPE wells were constructed as follows:

- Advanced to 30 feet bgs (DPE-1 and DPE-2), 22 feet bgs (DPE-3 and DPE-4), and 24 feet bgs (DPE-5 to DPE-14 and DPE-12R).
- Constructed with a solid polyvinyl chloride (PVC) casing with sump:
    - 4-foot sump (DPE-3 and DPE-4)
    - 5-foot sump (DPE-1, DPE-2, and DPE-5 to DPE-14 and DPE-12R).
- Constructed of 4-inch-diameter Schedule 40 PVC pipe with 0.02-inch slotted screen.
- Screen lengths range from 4 to 8 feet bgs for the top of screen and from 18 to 25 feet bgs for the bottom of screen.
- Finished with an approximately 2- to 3-foot stickup for well vault completion by Clearcreek.

3.3.2 Soil Vapor Extraction Well Installation

The original design presented in the EDR (Arcadis 2016a) focused soil remediation of shallow soil (approximately 4 to 8 feet bgs) as delineated in previous investigations and remediation near the WSDOT stormwater line. According to the EDR (Arcadis 2016a), it was expected that the 20-mil polyethylene sheeting would be encountered at some DPE well locations. Therefore, a specific design for DPE wells penetrating the 20-mil polyethylene sheeting was established: the screen lengths should start below the 20-mil polyethylene sheeting to target the backfill surrounding the WSDOT stormwater line. However, the 20-mil polyethylene sheeting was deeper than anticipated at DPE wells DPE-11 through DPE-14 and DPE-12R (at depths ranging from 3.6 to 7 feet bgs). Therefore, to improve the SVE radius of influence and address soil impacts throughout the vadose zone near those DPE wells, two SVE wells (SVE-1 and SVE-2) were installed.

The SVE wells were installed within smear zone and vadose zone soil to increase soil vapor recovery and were constructed as follows:

- Advanced to 8 feet bgs.
- Constructed of 4-inch-diameter Schedule 40 PVC.
- Set with a 0.02-inch slotted screen from 4 to 8 feet bgs
- Finished with an approximately 2-foot stickup for well vault completion by Clearcreek.

3.3.3 Observation Wells Installation

Seven piezometers (PZ-4, PZ-5, PZ-6, PZ-7, PZ-8, PZ-9, and PZ-10) were installed in 2017. Piezometers PZ-1 and PZ-2 were installed during the 2015 pilot test activities.

The piezometers were constructed as follows:

- Advanced to 25 feet bgs (PZ-1 and PZ-2) and 19 feet bgs (PZ-4 and PZ-10).

- PZ-1 and PZ-2 were constructed of 2-inch-diameter Schedule 40 PVC pipe with 0.02-inch slotted screen from 5 to 25 feet bgs.
- PZ-4 through PZ-10 were constructed of 2-inch-diameter Schedule 40 PVC pipe with 0.02-inch slotted screen from 4 to 19 feet bgs.
- Completed with a flush-mounted traffic-rated well monument set in concrete at the ground surface.

Additionally, nine pre-existing monitoring wells located near the DPE system (MW-126, MW-143, MW-511, MW-512, MW-519, MW-525, MW-526, MW-531, and MW-532) are considered as observation wells for the DPE system monitoring but are not considered part of the DPE system.

3.3.4 Remediation Wells Completion

Each DPE and SVE well was completed with an aboveground weatherproof fiberglass vault as follows:

- The base of the vault was set at 6 inches bgs.
- The vault was set in a concrete skirt, reinforced with rebar, and set in gravel backfill to allow for drainage.
- The vault was topped with a custom-built, lightweight, high-density polyethylene (HDPE) lid to reduce the infiltration of rainwater.
- A high-level float switch was installed within the vault to shut down the corresponding pump in case a leak occurs within the vault.

Each DPE and SVE well is connected to conveyance piping and control wires that enter the vault, and is sealed to contain any potential leaks:

- *Groundwater conveyance piping*. Extracted groundwater is pumped through a 1-inch-diameter HDPE conveyance line contained inside a 3-inch-diameter HDPE secondary containment line running from each DPE well to the groundwater manifold. Groundwater conveyance piping is connected to the DPE wellhead via steel pipe through a gate valve and check valve. The steel pipe is then connected to 1-inch-diameter polyethylene hose that penetrates the well casing through a jet well seal and leads down the DPE well to the pump.
- *Vapor conveyance piping*. Extracted vapors are conveyed through individual 3-inch HDPE conveyance lines running from each DPE well to the SVE manifold. Wells SVE-1 and SVE -2 are connected to the individual vapor conveyance lines for DPE-13 and DPE-14, respectively, through a 3- by 3-inch HDPE tee. Vapor conveyance piping is connected to the DPE and SVE wellheads via a 3- by 4-inch PVC tee. A threaded HDPE to PVC threaded fitting connects the conveyance piping to the wellhead. A vacuum gauge is installed on the vapor conveyance piping at the wellhead to confirm vacuum is applied to the well.
- Three wires (pump lead wire, float switch wire, and pressure transducer wire) are sealed through penetrations in the sidewall of the well vault. The pump lead wire and transducer wire then enter the well casing through sealed penetrations in the jet well seal.

- Two service oil-resistant jackets, oil-resistant insulation, and weather-/water-resistant (SOOW) cords lead to a weatherproof junction box located outside of each DPE well vault. The pump lead wire connects to the SOOW cord.

The well vault design is shown on the As-Built Drawings presented in Appendix A.

3.4 Dual-Phase Extraction System Construction

The DPE system was constructed by Newterra according to specifications provided by Arcadis in the EDR (Arcadis 2016a) to meet the cleanup action objectives described in Section 2.2.2.

The DPE system was constructed within two 40- by 8- by 9-foot shipping containers at the Newterra Brockville, Ontario, Canada facility. Upon construction, the DPE system was tested and inspected by an Arcadis engineer at the Newterra facility on December 20, 2017. The two shipping containers were then delivered to the Site on April 12, 2017 and placed side by side with a walkthrough door on the dedicated concrete pad. The two shipping containers are the DPE system enclosure. The DPE system was further inspected upon placement of the DPE system enclosure at the Site. The DPE system enclosure layout is shown on DPE System As-Built Drawings provided as Appendix A. General notes regarding construction specifications are shown on the Construction Notes and Specifications provided in Appendix A.

The DPE system enclosure includes:

- Control room located within the east container and accessible by the northeast door.
- Groundwater extraction and treatment unit (groundwater extraction unit) located within the west container and accessible by the west door.
- Soil vapor extraction and treatment unit (SVE unit) located within the east container and accessible by the east door.
- Catalytic oxidizer (CatOx) unit placed in a caged area within the east container and accessible by the southeast door.

Additionally, the DPE system enclosure contains several safety devices. System components and safety devices are described in the following sections.

3.4.1 Control Room and Dual-Phase Extraction System Safety

The DPE system control room contains the main control panels for operation of the DPE system. The control panels include a 480-volt stepdown transformer, two variable frequency drive (VFD) control panels, and the main programmable logic controller (PLC) and human machine interface (HMI) control panel. The PLC and HMI are used to turn on and off pumps, obtain flow and temperature readouts, and adjust the groundwater intake elevation setting based on target drawdown depths.

The DPE system is also equipped with safety interlock alarms to prevent equipment damage and physical harm to operators.

The following DPE system interlocks and critical safety devices are controlled through the PLC:

- Emergency stop buttons

- Lower explosive level sensor to detect explosive vapors
- Sump alarm to detect leaks in the process piping
- High-level alarms in the vapor liquid separator, conical bottom settling tank, and equalization tank
- High-level alarms in groundwater extraction well vaults
- High-pressure alarms on groundwater process lines
- High-vacuum and low-flow alarms on vapor process lines
- Temperature-controlled ventilation fans
- High-temperature alarms on vapor extraction blowers
- Individual VFDs.

When a critical alarm triggers a shutdown, a notification email is automatically sent to the project team by the Newterra Site-Link Basic Wireless Telemetry Service (Newterra telemetry service). Additionally, operations can be remotely accessed via the Newterra telemetry service.

3.4.2 Groundwater Extraction Components

The groundwater extraction unit extracts groundwater through submersible well pumps installed in each of the 14 DPE wells, lowering the groundwater to expose smear zone and vadose zone soil to vapor extraction. The extracted groundwater is then treated though the groundwater extraction unit before being discharged under NPDES Permit No. WA991007.

The groundwater extraction unit and DPE well installation consists of the following:

- Each DPE well is equipped with an electric submersible well pump (model Grundfos Redi-Flo 4 SPE) and controlled by:
    - A pressure transducer within each well, signaling the drawdown set points to the individual VFD. The target drawdown depth is set using the PLC.
    - An individual VFD located in the control room and controlling the pump speed. When the groundwater level reaches the targeted depth on the transducer as set at the PLC, the pump speed is automatically adjusted by the VFD to maintain the targeted depth.
    - Pump lead and transducer wires.
- A 14-leg groundwater extraction manifold connecting groundwater conveyance piping from each DPE well to the treatment system with the following components on each leg:
    - Flowmeter totalizer
    - Flow control gate valve
    - Pressure gauge
    - Sampling port
    - Check valve.

- A 500-gallon conical bottom settling tank receiving the extracted groundwater for removal of sediment with a high-level alarm to shut down the system as needed.
- A 500-gallon equalization tank receiving the extracted groundwater with a high-level alarm to shut down the system as needed and float controls to operate the transfer pump.
- A Goulds 3ST transfer pump with a capacity of 110 gallons per minute (gpm) at 90 feet total discharge head, pumping the extracted water toward the bag filters with a high-pressure shutdown switch.
- Two sets, in parallel, of two Pentair #2 type bag filters for removal of sediment in series with a high-pressure shutdown switch.
- Two sets, in parallel, of two 3,000-pound liquid granular activated carbon (GAC) vessels, removing volatile organic compounds (VOCs) from the extracted groundwater with sampling ports and pressure relief valves on each vessel.
- A digital flow totalizer, providing instantaneous and total flow to the PLC.

Treated water is conveyed toward DB-1 through a discharge line by the main Goulds transfer pump with a high-point siphon break to stop the occurrence of continued water discharge during system shutdown. Treated water is then discharged at the DPE system outfall into DB-1. A high-level alarm shuts down the DPE system if DB-1 water elevation exceeds the target elevation. The water is then discharged from DB-1 to Willow Creek at Outfall #002.

DPE system discharge configuration is shown on As-Built Drawing Riprap Design at Detention Basin No. 1 provided in Appendix A.

3.4.3 Soil Vapor Extraction Components

The SVE components of the DPE system extract soil vapor by inducing vacuum in each of the 14 DPE and two SVE wells. The extracted soil vapors are then treated though the SVE and CatOx units before being discharged under PSCAA Permit No.29892.

The SVE components include the SVE and CatOx units, and comprise:

- Three blowers, inducing vacuum to extract the soil vapors at each DPE and SVE well; blowers flow and vacuum rates are controlled by:
  - A manual dilution air valve that can be opened or closed.
  - A VFD manually controlled by the main control panel.
- A 14-leg SVE manifold, connecting vapor extraction piping from the DPE and SVE wells to the SVE unit. Each leg of the manifold consists of a sample port, vacuum gauge, and gate valve to control the vapor flow.
- A vapor liquid separator (VLS), removing liquid from the extracted soil vapors conveyed though the SVE manifold.
- A Moyno™ progressive cavity pump, transferring the accumulated water from the vapor liquid separator to the groundwater unit.

- A vapor control valve, automatically controlling the dilution of extracted dried soil vapors based on temperature and flow inputs to the CatOx unit.
- Pre- and post-dilution differential pressure flow transducers with data readouts at the PLC.
- Pre- and post-treatment sampling ports for PSCAA permit compliance.
- A flameless CatOx (Intellishare Model ECO500), treating the VOCs present in extracted soil vapors by catalytic oxidation according to PSCAA Permit No.29892.

3.5 Electrical Installation

Power was available at the northeast corner of the Site from an overhead line connected to a three-phase, 200-amp, 480-volt service; the service provided power to the DB-1 transfer pumps and a main disconnect and a breaker panel was mounted with strut channel structural support (Unistrut) equipment rack. This existing service was not sufficient to adequately supply power to the DPE system and electrical updates were implemented before DPE system startup.

Electrical upgrades and connection activities included:

- New transformer installed by the PUD located on an existing power pole along the Burlington Northern Santa Fe right of way.
- New 600-amp 480-volt service provided by the PUD, from a new overhead line.
- New meter, a main disconnect, and supply cabinet installed by SHJ Electric to supply power to the existing DB-1 transfer pumps and the DPE system.
- Electrical conduit placed along the fence line leading from the upgraded supply cabinet to the DPE system.
- A 350 MCM 4 copper wire pulled through the conduit and connected to the disconnect at the DPE system.

The supplied DPE system components were pre-wired and tested prior to shipment. Panel components within the control room were certified by a third-party listing service including the Canadian Standards Association Underwriters Laboratory. The electrical service equipment location is shown on As-Built Drawing Riprap Design at Detention Basin No. 1 provided as Appendix A. An electrical conduit cross-section detail is included in Appendix A.

3.6 Conveyance Piping Installation

From October to November 2017, Clearcreek contractors installed conveyance piping leading from the remediation wells to the DPE system manifolds. To avoid ground disturbance, allow for easy optimization and maintenance, and reduce additional waste handling, all conveyance piping was installed on grade.

Conveyance piping consists of vapor, groundwater, and treated groundwater discharge piping. All conveyance piping constructed with HDPE was pressure tested by Clearcreek and observed by an Arcadis representative to pass 5 psi for 15 minutes without losing pressure. At several locations, HDPE pipe is covered with a minimum of 2 feet of sand and gravel for temporary crossover. PVC pipe is

contained inside steel casing at crossover locations. The conveyance piping and cross sections are shown in Appendix A.

3.6.1 Vapor Conveyance Piping

The vapor conveyance piping was installed without hard elbows or turns, using the flexible nature of the HDPE pipe. Each end of the vapor conveyance pipe is secured to concrete by Unistrut brackets. Vapor conveyance piping was constructed as follows:

- Twenty-foot sections of 3-inch-diameter SDR 11 black HDPE were fusion welded to total length from well to system compound.
- Vapor conveyance piping transitions to flexible reinforced PVC hose for approximately 3 feet, where the HDPE pipe transitions from on grade to the Unistrut rack.
- From the Unistrut rack, the flexible PVC hose connects the HDPE pipe to the SVE manifold through the DPE system sidewall using camlock fittings.

The vapor conveyance piping layout is shown on the DPE System Piping Layout Drawing provided in Appendix A.

3.6.2 Groundwater Conveyance Piping

Groundwater conveyance piping was constructed as follows:

- A continuous length of 1-inch-diameter SDR 11 black HDPE roll pipe, installed within fusion welded 3-inch-diameter black HDPE secondary containment pipe leading from each well to the Unistrut rack at the system compound.
- The groundwater conveyance piping transitions the 3-inch secondary containment line from HDPE to flexible reinforced PVC pipe using a camlock fitting and 3- by 1-inch reducing rubber coupling at the system sidewall.
- Wrapped ¼-inch jacketed foam insulation around all groundwater conveyance piping to reduce the occurrence of freezing pipes during cold weather and minimize pipe expansion during exposure to sunlight.

3.6.3 Treated Groundwater Discharge Conveyance Piping

Treated groundwater discharge conveyance piping was constructed as follows:

- Constructed using PVC couplers and low VOC adhesive cement.
- Connected through the DPE system sidewall via an HDPE to Schedule 40 PVC threaded coupler a 3-inch to 2-inch reducing coupler and elbow down to ground surface.
- Approximately 480 feet of 2-inch-diameter Schedule 80 PVC piping wrapped in ¼ inch jacketed foam insulation.
- Installed at grade from the DPE system to the constructed riprap outfall at DB-1.

The electrical contractor attached SOOW cord to the outside of the conveyance pipe from the DPE system to DB-1 for the high-level switch located at the DPE system outfall. The SOOW cord and conveyance pipe wrapped in ¼ inch jacketed foam insulation.

3.7 Waste Handling

The above grade construction design limited the amount of soil handling and disposal required. Soil generated from the installation of DPE wells, SVE wells, and piezometers was containerized in DOT-approved 55-gallon steel drums. Soil drums were labeled and staged in a designated area. A composite soil sample was collected, and the soil will be disposed of under a new site waste profile. Soil will be transported off site to a Chevron-approved landfill.

Development purge water from DPE wells and piezometers was stored in closed top DOT-approved 55-gallon steel drums. Disposal of these drums is pending approval of a new site waste profile and will be transported off site upon approval.

3.8 Startup Commissioning

DPE system startup commissioning was performed from November 27 through December 1, 2017 with the assistance of a Newterra technician. DPE system components were tested, and the remote Newterra telemetry service was placed online. The Newterra technician performed a system walkthrough, including training of field staff and minor trouble shooting. Arcadis field personnel collected baseline monitoring data and completed the DPE system startup check list.

The DPE system startup began on December 1, 2017 with the groundwater extraction components in operation. The SVE portion of the DPE system commenced on December 5, 2017 to allow for groundwater drawdown within the radius of influence prior to vacuum application. Data collected during system startup will be reported in the 2018 Groundwater and Operation Report (2018 GOR).

4. SUMMARY

The DPE system was installed on site as planned in the EDR (Arcadis 2016a) with the addition of two SVE wells, and consists of:

- Fourteen DPE wells used for both groundwater and soil vapor extraction
- Two SVE wells used for soil vapor extraction
- Nine piezometers used as observation wells for the DPE system monitoring
- A Newterra-provided DPE system enclosure with equipment capable of extracting and treating groundwater at up to 100 gpm and soil vapor at up to 350 scfm at 20 in. Hg vacuum:
    - A groundwater extraction unit, including 14 Grundfos Redi-Flo 4 electric submersible pumps controlled by pressure transducers and VFDs, a 500-gallon conical bottom settling tank, a 500-gallon batch tank, a Goulds centrifugal transfer pump, two sets in parallel of bag filters in series, and two sets in parallel of two 3,000-pound GAC vessels.
    - A SVE unit including a VLS, three Minke rotary claw blowers in parallel controlled by VFD and PLC, various monitoring and safety devices, and a catalytic combustion electric CatOx.

The DPE system startup began on December 1, 2017 with the groundwater extraction components in operation. The SVE portion of the DPE system commenced on December 5, 2017 to allow for groundwater drawdown within the radius of influence prior to vacuum application. Data collected during system startup will be presented in the 2018 GOR.

The performance monitoring report for the DPE system will be submitted as part of an addendum to the DPE System As-Built Report after 12 months of operation, or upon obtaining asymptotic DPE system mass removal rates from the pretreatment effluent vapor stream (whichever comes earlier).

5. REFERENCES

Arcadis. 2016a. Engineering Design Report. Former Unocal Edmonds Bulk Fuel Terminal. March 8.

Arcadis. 2016b. Final Interim Action Work Plan. Former Unocal Edmonds Bulk Fuel Terminal. July 19.

Arcadis. 2017. Public Review Draft Final Feasibility Study Report. Former Unocal Edmonds Bulk Fuel Terminal. June 16.

Arcadis. In Progress. Compliance Monitoring Plan. Former Unocal Edmonds Bulk Fuel Terminal.

Arcadis. 2018a. DPE-12 Replacement Work Plan. Former Unocal Edmonds Bulk Fuel Terminal. February 13.

Arcadis. 2018b. Detention Basin 2 Excavation As-Built Report. Former Unocal Edmonds Bulk Fuel Terminal. March 29.

Ecology. 2003. Letter RE: Edmonds Bulk Fuel Terminal, Upper Yard: Completion of Cleanup per Interim Action Report. October 9.

Ecology. 1993. AO No. DE-92TC-N328

Ecology. 2007. AO No. DE 4460

Ecology. 2017. AO No. DE 4460 amendment

TABLE

Table 3-1
Well Construction Details
Former Unocal Edmonds Bulk Fuel Terminal
11720 Unoco Road
Edmonds, Washington

ARCADIS Design & Consultancy for natural and built assets

Well ID	Well Type	Casing Diameter	Casing Elevation[1]	Top of Screen Depth	Bottom of Screen Depth	Sump Length	Total Well Depth	Submersible Pump Installed	Pump Type Configuration
	DPE / PZ / SVE / MW	inches	feet NAVD88	feet bgs	feet bgs	feet	feet bgs	Yes/No	Top/Bottom Loading[2]
DPE-1	DPE	4	14.58	5.0	25.0	5.0	30.0	Yes	Top
DPE-2	DPE	4	14.88	5.0	25.0	5.0	30.0	Yes	Top
DPE-3	DPE	4	13.94	5.0	18.0	4.0	22.0	Yes	Top
DPE-4 (PZ-3)	DPE[3]	4	13.83	5.0	18.0	4.0	22.0	Yes	Top
DPE-5	DPE	4	15.33	7.0	19.0	5.0	24.0	Yes	Top
DPE-6	DPE	4	15.34	4.0	19.0	5.0	24.0	Yes	Top
DPE-7	DPE	4	13.68	6.5	19.0	5.0	24.0	Yes	Top
DPE-8	DPE	4	14.86	4.0	19.0	5.0	24.0	Yes	Top
DPE-9	DPE	4	14.32	4.0	19.0	5.0	24.0	Yes	Top
DPE-10	DPE	4	14.34	4.0	19.0	5.0	24.0	Yes	Top
DPE-11	DPE	4	14.27	5.0	19.0	5.0	24.0	Yes	Top
DPE-12	DPE	4	14.16	8.0	19.0	5.0	24.0	Yes	Top
DPE-12R	DPE	4	14.30	6.0	19.0	5.0	24.0	Yes	Top
DPE-13	DPE	4	13.77	5.0	19.0	5.0	24.0	Yes	Top
DPE-14	DPE	4	13.67	6.5	19.0	5.0	24.0	Yes	Top
SVE-1	SVE	4	14.91	4.0	8.0	0.0	8.0	No	NA
SVE-2	SVE	4	14.65	4.0	8.0	0.0	8.0	No	NA
PZ-1	PZ	2	12.96	5.0	25.0	0.0	25.0	No	NA
PZ-2	PZ	2	13.18	5.0	25.0	0.0	25.0	No	NA
PZ-4	PZ	1	14.16	4.0	19.0	0.0	19.0	No	NA
PZ-5	PZ	1	12.84	4.0	19.0	0.0	19.0	No	NA
PZ-6	PZ	1	12.96	4.0	19.0	0.0	19.0	No	NA
PZ-7	PZ	1	13.05	4.0	19.0	0.0	19.0	No	NA
PZ-8	PZ	1	12.91	4.0	19.0	0.0	19.0	No	NA
PZ-9	PZ	1	12.85	4.0	19.0	0.0	19.0	No	NA
PZ-10	PZ	1	12.62	4.0	19.0	0.0	19.0	No	NA
MW-126	MW[4]	2	12.40	3.7	13.7	0.0	14.2	No	NA
MW-143	MW[4]	2	11.94	3.5	13.6	0.0	14.1	No	NA
MW-511	MW	2	15.20	5.0	15.0	0.0	15.0	No	NA
MW-512	MW	2	13.19	3.0	13.0	0.0	13.0	No	NA
MW-519	MW	2	12.60	3.0	13.0	0.0	13.0	No	NA
MW-525	MW	2	12.62	3.0	13.0	0.0	13.0	No	NA
MW-526	MW	2	12.90	3.0	13.0	0.0	13.0	No	NA
MW-531	MW	2	13.26	3.0	13.0	0.0	13.0	No	NA
MW-532	MW	2	13.38	3.0	13.0	0.0	13.0	No	NA

Notes:

1. Casing elevation surveyed by Otak, Inc. on 11/21/2017 for DPE, SVE, and PZ wells besides DPE-12R surveyed on 04/10/2018; on 08/08/2012 for MW-525, MW-526, MW-531, and MW-532; and on 10/27/2008 for MW-126, MW-143, MW-511, MW-512, and MW-519.
2. Grundfos Redi-flo 4 top-loading electric submersible pump.
3. During the 2015 DPE pilot test, DPE-4 was used as an observation well named PZ-3. DPE-4 has been used as a remediation well since DPE system startup on 12/01/17.
4. The monitoring well includes a well end cap of 0.5 foot.

Shaded cells show decommissioned well.

bgs = below ground surface

DPE = dual phase extraction well; remediation well used for both groundwater and soil vapor extraction

MW = monitoring well; observation well used for DPE system monitoring and groundwater compliance monitoring

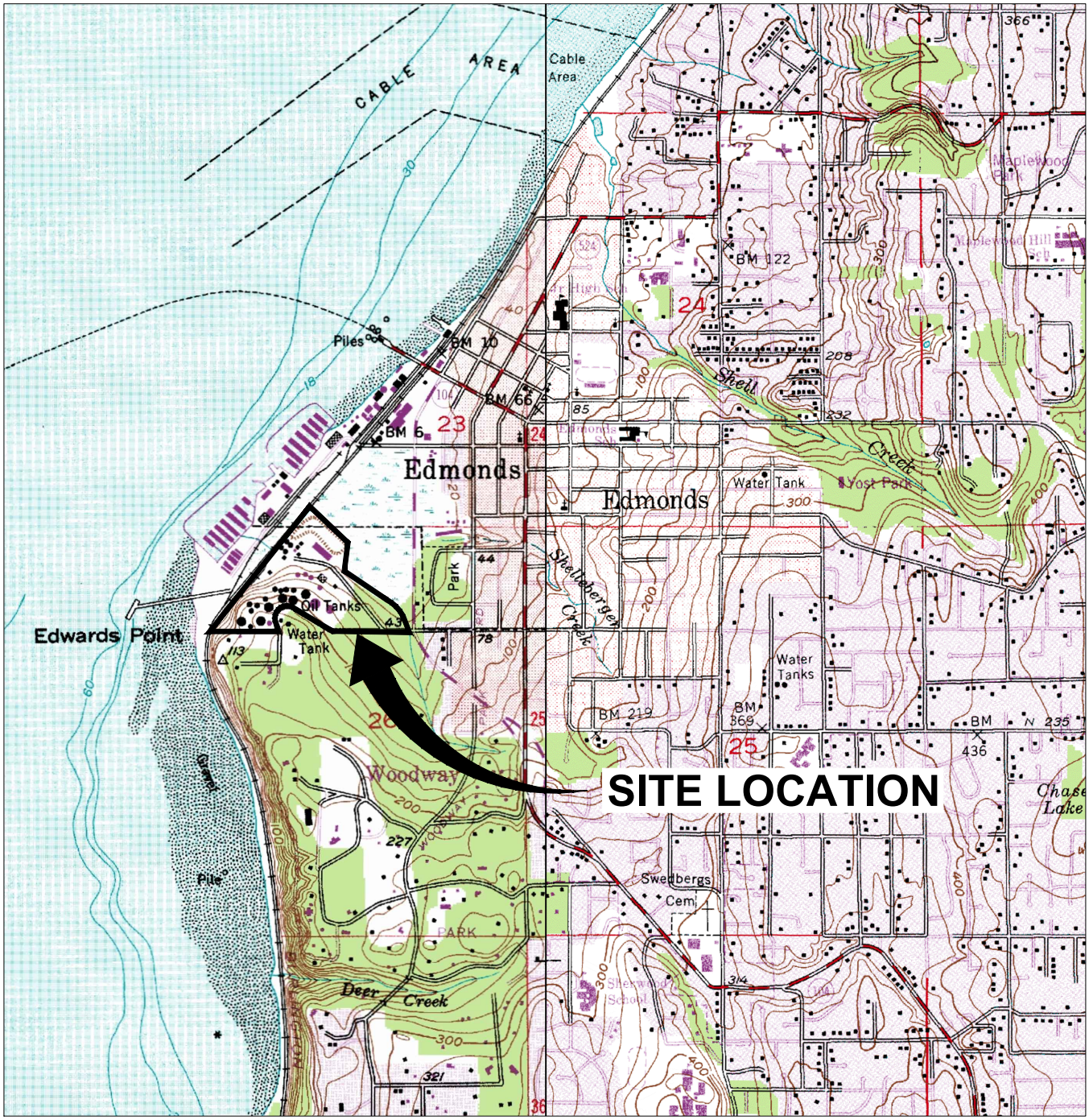
NA = not applicable

NAVD88 = North American Vertical Datum of 1988

PZ = piezometer; observation well used for DPE system monitoring

SVE = soil vapor extraction well; remediation well used for soil vapor extraction

FIGURES



REFERENCE: BASE MAP USGS QUADS., 7.5 MIN. SERIES (TOPOGRAPHIC) - EDMONDS EAST, WASH. AND EDMONDS WEST, WASH.

0 2000' 4000'

GRAPHIC SCALE

WASHINGTON

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS BULK FUEL TERMINAL
EDMONDS, WASHINGTON

DETENTION BASIN 2 EXCAVATION AS-BUILT REPORT

SITE LOCATION

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1-1

CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
D:\PROJECTS\33. Edmond Figures\E-Drawings\Edmonds\45362D01-1.dwg LAYOUT: 1-1 SAVED: 12/5/2017 12:03 PM ACADVER: 20.0S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: --- PLOTTED: 2/16/2018 2:49 PM BY: PAVAN KUMAR ANJANEYAKUMAR
XREFS: IMAGES: PROJECTNAME: ---
45362X0A Edmond-E.tif
Edmond-W.tif

PUGET SOUND

OUTFALL #002

FENCE

WILLOW CREEK

DPE SYSTEM OUTFALL

PORT OF EDMONDS

TIDAL BASIN

DETENTION BASIN NO. 1

EDMONDS MARSH

LOWER YARD

DPE SYSTEM

WILLOW CREEK

BNSF RAILWAY

LOWER UPPER UNOCO ROAD

UPPER YARD
(POINT EDWARDS CONDOMINIUMS)

FISH HATCHERY

0 200' 400'

GRAPHIC SCALE

LEGEND:

- FORMER UNOCAL EDMONDS BULK FUEL TERMINAL PROPERTY BOUNDARY
- SD — POINT EDWARDS STORM DRAIN LINE
- S — WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) STORMWATER LINE
- SITE BOUNDARY
- DPE DUAL-PHASE EXTRACTION

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS BULK FUEL TERMINAL
EDMONDS, WASHINGTON
DUAL-PHASE EXTRACTION SYSTEM AS-BUILT REPORT

SITE LAYOUT

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2-1

CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD:(Opt) PIC: K. ABBOTT PM: S. ZORN TM: S. ZORN LYR:(Opt)ON=*;OFF=*REF*
D:\PROJECTS\33. Edmond Figures\E-Drawings\DPE\DB-2 AS BUILT REPORT\45362_2-1.dwg LAYOUT: 2-1 SAVED: 2/13/2018 2:44 PM ACADVER: 20.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 2/16/2018 2:30 PM BY: PAVAN KUMAR ANJANEYAKUMAR
XREFS: IMAGES: PROJECTNAME: ----
45362X02
45362X03
45362X00
RECORD-INT-ACT-X-RECORDTOPO

PUGET SOUND

OUTFALL #002

FENCE

WILLOW CREEK

PORT OF EDMONDS

TIDAL BASIN

DPE SYSTEM OUTFALL

LOWER YARD

DPE SYSTEM

DETENTION BASIN NO. 1

EDMONDS MARSH

WILLOW CREEK

POINT EDWARDS RETENTION POND

UPPER YARD
(POINT EDWARDS CONDOMINIUMS)

MW-530 MW-535 MW-533 MW-534 MW-139R MW-509 MW-518 MW-515 MW-516 MW-517 MW-513 MW-514 MW-526 MW-512 MW-525 MW-532 MW-511 MW-502 MW-503 MW-507 MW-506 MW-505 MW-504 MW-E-R MW-129R MW-131 MW-108 MW-109 MW-13U MW-203 MW-134X MW-501 MW-500 MW-135 MW-527 MW-136 MW-528 MW-101 MW-104 MW-20R MW-8R MW-522 MW-520 MW-521 MW-519 MW-143 MW-128 MW-523 MW-147 MW-524 MW-151 MW-149R MW-150

LM-2 D-2 D-3 D-4 D-5

TB

AS-1 DPE-3 DPE-4 /PZ-3 PZ-1 DPE-7 DPE-1 DPE-5 PZ-2 DPE-2 PZ-4 DPE-6 DPE-8 DPE-9 PZ-5 PZ-6 PZ-7 DPE-10 DPE-11 DPE-12 PZ-9 PZ-10 PZ-8 DPE-12R DPE-14 SVE-1 SVE-2 DPE-13

P-1 P-2 P-3 P-4 P-5 P-6 P-7 P-8

LEGEND:

- FORMER UNOCAL BULK FUEL TERMINAL PROPERTY BOUNDARY
- MW-515 INTERIOR MONITORING WELL LOCATION
- MW-518 PERIMETER MONITORING WELL LOCATION
- MW-13 MONITORING WELL LOCATION
- PZ-1 PIEZOMETER LOCATION
- D-2 STAFF GAUGE LOCATION
- AS-1 AIR SPARGE WELL LOCATION
- DPE-10 DUAL PHASE EXTRACTION (DPE) WELL LOCATION
- DPE-12 DECOMMISSIONED DPE WELL
- SVE-1 SOIL VAPOR EXTRACTION (SVE) WELL LOCATION
- S WSDOT STORMWATER LINE
- 50 POINT EDWARDS STORM DRAIN LINE
- 20-MIL POLYETHYLENE SHEETING
- SITE BOUNDARY
- DPE DUAL-PHASE EXTRACTION

NOTES:

1. 20-MIL POLYETHYLENE SHEETING INSTALLED UPON COMPLETION OF PHASE I EXCAVATION. SHEETING REACHES TO APPROXIMATELY 7.5 FEET ABOVE MEAN SEA LEVEL.
2. HORIZONTAL DATUM: WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE (NAD 83/98).
   VERTICAL DATUM: N.A.V.D. 88
   UNITS: U.S. SURVEY FEET
   HORIZONTAL AND VERTICAL CONTROL ESTABLISHED BY GPS VIA VERTICAL REFERENCE STATION NETWORK (VRSN).
3. SOUTHEAST PORTION OF WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) STORMWATER LINE HAS NOT BEEN SURVEYED.
4. MONITORING WELL MW-E WAS RE-INSTALLED IN PLACE ON OCTOBER 20th, 2017 AND RENAMED MW-E-R.

0 80' 160'
GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL BULK FUEL TERMINAL
EDMONDS, WASHINGTON
DUAL-PHASE EXTRACTION SYSTEM AS-BUILT REPORT

WELL LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3-1

CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
D:\PROJECTS\33. Edmond Figures\E-Drawings\PUBLIC RE\VIEW DRAFT\DB-2 AS BUILT REPORT\45362D02-X.dwg LAYOUT: X SAVED: 4/18/2018 4:42 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 4/19/2018 11:22 AM BY: ANJANEYAKUMAR, PAVAN KUMAR
XREFS:
45362X03
45362X02
45362XD1
RECORD-INT-ACT-X-RECORDTOPO
IMAGES:
PROJECTNAME: ----

APPENDIX A

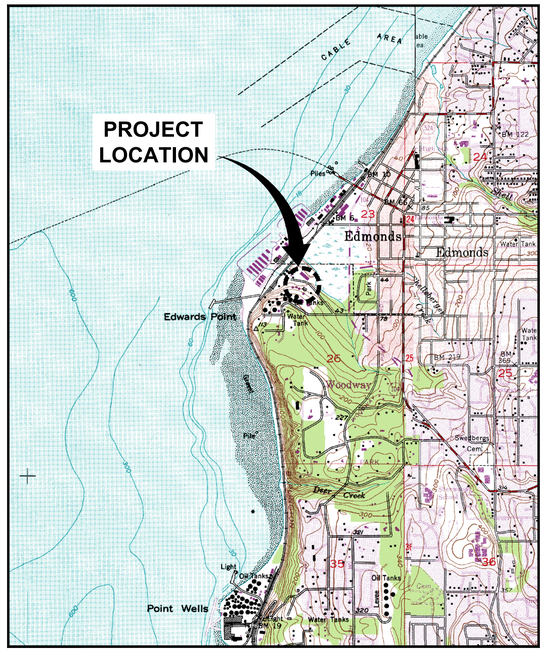
As-Built Notes, Drawings, and Diagrams

CONSTRUCTION DRAWINGS FOR

SYSTEM DESIGN SPECIFICATION

FORMER UNOCAL BULK FUEL TERMINAL

MAY 10, 2018



REFERENCE: BASE MAP USGS 7.5 MINUTE QUADRANGLE., (QUADNAME), (ST)., (DATE)

LOCATION MAP

0 2000' 4000'

GRAPHIC SCALE

WASHINGTON

KEY CONTACTS:

SFSP PROJECT MANAGER:
KIM JOLITZ
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
6101 BOLLINGER CANYON ROAD
SAN RAMON, CA 94538
TELEPHONE: 925.790.3946
EMAIL: kjolitz@chevron.com

ENGINEER:
PETER CAMPBELL
ARCADIS U.S., INC.
7 TOVEY ROAD
CHARLESTON, SC
TELEPHONE: 206.910.0217
EMAIL: Peter.Campbell@arcadis.com

PROPERTY DATA:

PROPERTY ADDRESS:
11720 UNOCO ROAD
EDMONDS, WASHINGTON

ZONED:
MP2

AS-BUILT

ARCADIS Design & Consultancy for natural and built assets

ARCADIS U.S., INC.

INDEX TO DRAWINGS

CITY: SYRACUSE, NY DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC: P. CAMPBELL PM: TM: A. PATEL LYR:ON=*;OFF=*REF*
D:\PROJECTS\33. Edmond Figures\E-Drawings\DPE\DPE SYSTEM AS BUILT REPORT\45362A01.dwg LAYOUT: C-COVER SAVED: 3/1/2018 2:48 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS-EDMONDS.CTB PLOTTED: 5/4/2018 4:40 PM BY: ANJANEYAKUMAR,
PAVAN KUMAR
XREFS: IMAGES: PROJECTNAME: ---
o47122g3.tiff
o47122g4.tiff

1.0 Introduction

The enclosed drawings and specifications contain information for the construction and installation of a treatment facility. The following drawings depicting the treatment facility are required for construction and installation:

Drawing No.	Revision	Title
G1A	0	Construction Notes and Specifications
G1B	0	Construction Notes and Specifications
G-2	0	Major Equipment and Instrument List
C-1	0	DPE System Piping Layout
C-2	0	DPE System Enclosure Layout Detail
C-3	0	DPE System Enclosure Layout Elevation Detail
C-4	0	Piping Cross Sections
C-5	0	DPE System Wellhead Connection Construction Details
C-6	0	Well Construction Details
C-7	0	DPE System Manifold Connection Details
C-8	0	DPE System Pad Details
C-9	0	Riprap Design at Detention Basin 1
P-1	0	DPE System Process and Instrumentation Diagram (Vapor)
P-2	0	DPE System Process and Instrumentation Diagram (Groundwater Extraction)
P-3	0	DPE System Process and Instrumentation Diagram Instrument Designation

CHEVRON: Chevron Environmental Management Company
ENGINEER: Arcadis U.S. Inc.
CONTRACTOR: Clearcreek Contractors Inc. - Washington State Licensed
ELECTRICAL CONTRACTOR: SHJ Electric Inc. - Washington State Licensed
DRILLING CONTRACTOR: Cascade Drilling - Washington State Licensed
SYSTEM VENDOR: Newterra Inc.

2.0 General Construction Specifications

2.0.1 The CONTRACTOR reviewed the facility design plans, and field verified all dimensions and site conditions before starting work.

2.0.2 All materials used for construction of the facility were new.

2.0.3 The ENGINEER was granted National Pollution Discharge Elimination System permit for treated water and a Puget Sound Clean Air Agency air permit, prior to discharge.

2.0.4 The CONTRACTOR obtained all necessary Labor and Industries (L&I) inspections.

2.0.5 The CONTRACTOR has provided a one year warranty on all CONTRACTOR-provided materials and supplies. The CONTRACTOR provided a warranty on workmanship for a period of not less than one year. All defects in CONTRACTOR supplied and installed materials and supplies shall be repaired at CONTRACTOR expense.

2.0.6 In addition to the remediation design plans, the ENGINEER supplied the CONTRACTOR with manufacturer's equipment handling and installation procedures. The CONTRACTOR has installed all equipment in accordance with the manufacturers' specifications and instructions.

2.0.7 The CONTRACTOR was responsible for keeping the site free of excessive debris and waste during construction. The CONTRACTOR took necessary precautions to control dust and stormwater runoff from construction activities.

2.0.8 The CONTRACTOR and DRILLING CONTRACTOR provided independent location of all utilities and took appropriate measures to protect them from damage. The CONTRACTOR and DRILLING CONTRACTOR used the regional underground utility notification service One Call and obtained all necessary clearances before breaking ground. No utilities, including but not limited to, electrical conduits, telephone lines, water lines, sewer, or storm drain lines were damaged during construction.

2.0.9 The DRILLING CONTRACTOR was responsible for installation of wells DPE-5 through DPE-14, SVE-1, SVE-2 and PZ-4 through PZ-10. The DRILLING CONTRACTOR also was responsible for the replacement of well DPE-12, that was damaged during installation, by DPE-12R.

2.0.10 The CONTRACTOR restored all disturbed areas to match the pre-construction conditions.

2.0.11 Upon completion of the project, the CONTRACTOR assisted the ENGINEER in preparing “as-built” drawings. The “as-built” drawings show the actual construction details, including final cross-over and well locations, compound layout, and piping details.

2.0.12 A final inspection was performed by the ENGINEER and a CHEVRON representative. All items not meeting the specifications and the remediation design plans were promptly repaired and/or replaced by the CONTRACTOR.

2.0.13 The ELECTRICAL CONTRACTOR supported startup of the equipment. The ELECTRICAL CONTRACTOR assisted SYSTEM VENDOR personnel in demonstrating proper motor rotation, proper connections of equipment to circuit breakers, and repair of electrical problems with the system.

3.0 Piping

3.1 General

3.1.1 All piping work was installed by trained personnel operating under the CONTRACTOR.

3.1.2 All materials were new.

3.1.3 All materials and work were installed in accordance with the pipe manufacturer's specifications, the design plans, and all applicable codes.

3.1.4 Above ground piping has pipe supports and clamps at each end of the pipe with adequate space for the pipes to expand and contract due to temperature as specified in the piping manufacturer's specifications. Unistrut supports ends are covered with plastic protective caps.

3.1.5 The CONTRACTOR made all wellhead connections as shown on Drawing C-5.

3.1.6 The use of dissimilar metals and alloys in direct contact with each other was avoided in all pipe lines containing liquids due to the potential for galvanic corrosion.

3.2 Polyvinyl Chloride (PVC) Pipe Specifications

3.2.1 All aboveground PVC process piping is related to clean water discharge only and is constructed of Schedule 80 wrapped in metallic backed insulation.

3.2.2 All pipe joints are to be glued using PVC primer and PVC solvent cement.

3.2.3 PVC pipe was not used for above ground or underground compressed air service, or for high temperature applications.

3.3 Galvanized Pipe Specifications

3.3.1 Galvanized pipe is Schedule 40 hot-dip galvanized (HDG) steel per ASTM A53.

3.3.2 Galvanized pipe has not been used to convey soil vapor.

3.4 Stainless Steel Pipe Specifications

3.4.1 Stainless steel pipe of Type 304 or 316 was used for construction where steel pipe was specified.

3.4.2 All connections made using stainless steel were flange connections with Buna-N gaskets and NPT threaded connections.

3.4.3 All threaded connections were made using pipe thread sealant tape specifically made for use with stainless steel pipe.

3.4.4 Stainless steel was used prior to the catalytic oxidizer (CatOx) discharge. The CatOx vendor (Intellishare Inc.) was consulted for appropriate piping material use prior to installing the oxidizer.

3.5 Flexible Hoses/ Tubing

3.5.1 Flexible hoses and tubing were rated for chemical compatibility, and the operating pressures and temperatures at which they are used.

3.5.2 Connections to fittings and components have been made with hose barbs and clamps, metal camlocks with locking clips, and compression fittings. Plastic camlocks have not been used.

3.5.3 Hose clamps (used in conjunction with hose barb fittings) are roll-over, center punch (banded) or T-Bar type clamps.

3.6 High Density Polyethylene (HDPE) Pipe

3.6.1 The CONTRACTOR used black standard dimension ration (SDR) 11 HDPE pipe for all vapor and groundwater conveyance lines.

3.6.2 Groundwater conveyance pipe was 1-inch diameter HDPE continuous length roll pipe contained within 3-inch diameter extrusion welded HDPE pipe.

3.6.3 The groundwater conveyance secondary containment lines were covered in ¾ inch thick metallic backed insulation.

3.7 Pressure Testing

3.7.1 All process piping was pressure tested and witnessed by the ENGINEER representative. Testing was not conducted through instruments or equipment.

3.7.2 All HDPE lines were tested at 5 pounds per square inch (psi) for a period of 15 minutes.

4.0 Portland Cement Concrete Pavement

4.1 General

4.1.1 Finished concrete surfaces have been verified as true and even. The finished concrete is free of voids, mounds, ridges, depressions, cracks, and other irregularities.

4.1.2 Concrete was thoroughly mixed to assure uniform mixture of components within the mass.

4.2 Concrete Materials

4.2.1 Portland Cement was ASTM C-150 Type II.

4.2.2 Water was potable and free of acids, alkalis, and organic materials.

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	2/28/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: PETER J. CAMPBELL
Professional Engineer's No.: WA 45051
State: WA | Date Signed: 5/10/18 | Project Mgr.: SZ
Designed by: PC | Drawn by: RO/VS | Checked by: SW

PETER J CAMPBELL STATE OF WASHINGTON 45051 REGISTERED PROFESSIONAL ENGINEER Exp 5/11/20

ARCADIS Design & Consultancy for natural and built assets

ARCADIS U.S., INC.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY ● FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON
AS-BUILT SYSTEM DESIGN SPECIFICATION

CONSTRUCTION NOTES AND SPECIFICATIONS

ARCADIS Project No.
B0045362.0011

Date
MAY 2018

ARCADIS
6723 Towpath Road, Box 66
Syracuse, NY 13214
Tel: 315-446-9120

G-1A

4.2.3 The concrete mix was specified to pass a compressive strength test of 3,000 psi compressive strength.

4.2.4 The concrete mix had a minimum slump of 3-inches and a maximum slump of 4-inches.

4.3 Reinforcing Steel

4.3.1 Transverse reinforcing steel dowels were of Number 4 (#4, 1/2 inch diameter) Grade 60 rebar, spaced no more than 18-inches on center along the entire length of the trench. The reinforcing steel dowels were embedded at least 4-inches into the existing concrete at mid-height and secured in place using non-shrink epoxy to anchor the steel rebar in place.

All concrete reinforcement was as follows:

- No. 4 bars and larger
- All bars were clean of rust, grease or other materials likely to impair bond.
- All bends were made cold.
- Splicing of bars had a minimum 1'6" lap of 1'-6" in all concrete cases where appropriate.
- All reinforcing bars were accurately and securely placed before pouring concrete or applying grout and supported off the ground using steel or plastic cradles.
- Non-shrink epoxy materials were 100 percent solids, high-modulus, non-slag gel.
- Longitudinal reinforcing steel was at least #4 rebar and securely attached to all transverse reinforcing steel dowels using wire-ties.

4.4 Concrete Placement

4.4.1 The CONTRACTOR properly prepared the sub-grade. No concrete was poured on soft, saturated or pumping soil, frozen soil, ice, snow, or standing water.

4.4.2 Concrete was poured in accordance with commonly accepted industry practices.

- The CONTRACTOR prevented overworking and aggregate segregation.
- The concrete was adequately tamped or vibrated to prevent voids or honeycombing.
- Area between joints were cast as one continuous pour.
- The maximum allowable cold weather travel time was 2 hours. All deliveries were within allowable travel time.

4.5 Concrete Finishing

4.5.1 The CONTRACTOR finished the concrete in accordance with standard industry practices.

- After all the bleed water disappeared; the CONTRACTOR floated the flat surface by hand using a trowel.
- After floating, a soft concrete finish broom was used to finish the surface.

5.0 Electrical

5.1 General

5.1.1 Washington State L&I and national electric code (NEC), were used to dictate the specific type of electrical enclosures and raceways used in specific hazardous and non-hazardous locations.

5.1.2 All work was performed in accordance with the NEC. All work conformed to the regulations and specifications of Snohomish County Public Utility District (PUD) providing the service.

5.1.3 Electrical work was conducted by the ELECTRICAL CONTRACTOR.

5.2 Electrical Service

5.2.1 The ELECTRICAL CONTRACTOR installed a weather-tight main electrical breaker/disconnect panel located outside the equipment enclosure as shown on Drawing C-2. The main panel has a lockable disconnect/shut-off switch.

5.2.2 All service equipment is enclosed in a water-tight National Electrical Manufacturers Association [NEMA] enclosure where exposed to the elements.

5.2.3 The power meter was supplied and installed by Snohomish County PUD.

5.3 Electrical Service Disconnects

5.3.1 The ELECTRICAL CONTRACTOR installed all service disconnect switches necessary to safely shutdown and lockout the equipment.

5.3.2 The switches are contained in an appropriately rated water-tight NEMA panel.

5.3.3 The SYSTEM VENDOR provided an emergency stop switch on the exterior of each door of the compound.

5.4 Electrical Above Ground Conduits and Enclosures

5.4.1 All threaded joints were installed per local code with at least five threads fully engaged.

5.4.2 All couplings, unions, junction boxes, device boxes, and conduit bodies have tight joints that were inspected by the ENGINEER and ELECTRICAL CONTRACTOR.

5.5 Electrical Grounding

5.5.1 The conduit system and neutral conductors have been grounded in accordance with local code and L&I requirements. Ground testing was documented prior to system startup.

6.0 Construction Details

6.1 Equipment Enclosure

6.1.1 The equipment enclosure is located as shown on Drawing C-1

6.1.2 CONTRACTOR has installed the following signage on all sides of the remediation equipment room and the inside door of the remediation equipment room:

- Danger High Voltage
- No Smoking
- 24-hour contact numbers
- PPE requirements

7.0 CONTRACTOR Safety Requirements

7.0.1 The CONTRACTOR was responsible for the safety of their personnel and subcontractor personnel. The CONTRACTOR conformed to the ENGINEER's and CHEVRON'S Behavior Based Safety Program requirements following the below specifications:

- Develop and have available site-specific Health and Safety Plan (HASP) and Journey Management Plan (JMP) which conforms to the ENGINEER's and CHEVRON standards.
- Develop and have available on-site Job Loss Analysis (JLA) forms outlining the tasks to be performed, the job steps, the hazards, and the mitigating procedures to minimize risk and maximize safety.
- Complete the CHEVRON Permit-to-Work processes and procedures.
- Conduct and document a tailgate safety meeting each morning and afternoon when site work is to be performed.
- Ensure compliance with all Federal and State Occupational Safety and Health Administration (OSHA) and local safety regulations.
- Meet requirements of CHEVRON Short Service Employee (SSE) process.
- Ensure the appropriate personnel have received Defensive Driving training.

7.0.2 The CONTRACTOR had sufficient quantities and quality of hard hats, goggles, safety glasses, reflective vests, and gloves on site to outfit all CONTRACTOR workers, and provide for a secure work area.

7.0.3 The CONTRACTOR secured all work areas with barricades and snow fence to protect the work area from intrusion by unauthorized vehicles or pedestrians. When conditions warranted, the CONTRACTOR provided traffic flaggers in addition to barricades to control ingress and egress from the work area. A traffic control plan was included in the ENGINEERS HASP.

7.0.4 A pre-construction safety meeting was held at the site prior to the anticipated start of construction. The pre-construction safety meeting was attended by CHEVRON, the ENGINEER, the CONTRACTOR, and other interested parties.

7.0.5 The CONTRACTOR provided one 20-pound dry chemical type-ABC fire extinguisher per vehicle and work zone, with current inspection tags, during all construction activities.

7.0.6 The CONTRACTOR was responsible for containing loose debris and construction materials on a daily basis, and made sure that the work area was clean and orderly prior to departure from the site.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY ● FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON
AS-BUILT SYSTEM DESIGN SPECIFICATION

CONSTRUCTION NOTES AND SPECIFICATIONS

G-1B

Soil Vapor Extraction

Item	Equipment Description	Quantity	Detail No.	Drawing	Equipment ID
1	140 gallons Vapor Liquid Separator Newterra model VLW-140	1		P-1	A-1
2	Moyno model 34401 progressive cavity transfer pump with a 1 HP 230/460V/3P motor (12 gpm @ 25 psi)	1		P-1	
3	Busch model MM 1502 AV rotary claw vacuum pumps, each with a 20 HP 208-230/460V/3P	3		P-1	B-1
4	Integral discharge silencer	3		P-1	
5	Integral vacuum relief valve	3		P-1	
6	Solberg inlet filter/silencer	2		P-1	
7	4" Oxidizer dilution assembly (controlled by oxidizer) inlcudes vacuum transmitter and Solberg filter/silencer	1			
8	Intellishare Model ECO500 Flameless Electric Catalytic Oxidizer	1		P-1	S-1

Groundwater Extraction Pumps

Item	Equipment Description	Quantity	Detail No.	Drawing	Equipment ID
9	Grundfos model SPE electric submersible well pumps, each with ½ HP 230V/1P motor, 12 gpm at depth of 50 feet	14		C-1, P-1	P-1 through P-14
10	Grundfos VFD	14	1	C-5	
11	High level alarm switch	14		C-5	

Groundwater Treatment

Item	Equipment Description	Quantity	Detail No.	Drawing	Equipment ID
12	Goulds NPE model CAT NO. 3ST1TJ9G4W9 centrifugal transfer pump with a 3 HP 208-230/460V/3P motor, 110 GPM at 60' TDH	1		P-1	TP-1
13	Pentair model L88302NAC10 number two size bag filter housings in parallel	2		P-1	
14	Liquid Phase Carbon Filtration Units, newterra vessel # 1502968 HPLPC3000 contactor vessels	2		P-1	G-1, G-2

System Enclosure

Item	Equipment Description	Quantity	Detail No.	Drawing	Equipment ID
15	8' x 40' used high cube modified shipping container that will serve as process room, with double access doors to connect to additonal shipping container	1		C-2	
16	8' x 40' used high cube modified shipping container divided into two rooms - control room and process room, with double access doors to connect to additonal shipping container	1		C-2	
17	Ventilation fan with thermostat and sound attenuating hood				
18	Heater with thermostat				
19	Passive vent louvers with sound attenuating hood				
20	Sump with high level alarm switch				
21	Emergency stop switch				
22	LEL transmitter (with calibration kit)				
23	Fire extinguisher	2			
24	First aid kit				
25	Eye wash bottles				

Control System

Item	Equipment Description	Quantity	Detail No.	Drawing	Equipment ID
26	NEMA 1 lockable panel enclosure	1		C-2	
27	NEMA 3R Fused main disconnect	1			
28	Allan Bradley MicroLogix 1400	1			
29	Programmable 6" user display/touch screen	1			
30	Duplex 15 Amp GFI receptacle	1			
31	HOA switches (contained within touchscreen)				
32	Red alarm indicator light	1			
33	Newterra Site Link Basic Wireless Service	1			

Well ID	Well Type	Casing Diameter	Top of Screen Depth	Bottom of Screen Depth	Sump Length	Total Well Depth	Submersible Pump Installed	Pump Type Configuration
	DPE / PZ / SVE	inch	ft bgs	ft bgs	ft	ft bgs	Yes/No	Top/Bottom Loading1
DPE-1	DPE	4	5.0	25.0	5.0	30.0	Yes	Top
DPE-2	DPE	4	5.0	25.0	5.0	30.0	Yes	Top
DPE-3	DPE	4	5.0	18.0	4.0	22.0	Yes	Top
DPE-4 (PZ-3)	DPE2	4	5.0	18.0	4.0	22.0	Yes	Top
DPE-5	DPE	4	7.0	19.0	5.0	24.0	Yes	Top
DPE-6	DPE	4	4.0	19.0	5.0	24.0	Yes	Top
DPE-7	DPE	4	6.5	19.0	5.0	24.0	Yes	Top
DPE-8	DPE	4	4.0	19.0	5.0	24.0	Yes	Top
DPE-9	DPE	4	4.0	19.0	5.0	24.0	Yes	Top
DPE-10	DPE	4	4.0	19.0	5.0	24.0	Yes	Top
DPE-11	DPE	4	5.0	19.0	5.0	24.0	Yes	Top
DPE-12	DPE	4	8.0	19.0	5.0	24.0	Yes	Top
DPE-12R	DPE	4	6.0	19.0	5.0	24.0	Yes	Top
DPE-13	DPE	4	5.0	19.0	5.0	24.0	Yes	Top
DPE-14	DPE	4	6.5	19.0	5.0	24.0	Yes	Top
SVE-1	SVE	4	4.0	8.0	0.0	8.0	No	NA
SVE-2	SVE	4	4.0	8.0	0.0	8.0	No	NA
PZ-1	PZ	2	5.0	25.0	0.0	25.0	No	NA
PZ-2	PZ	2	5.0	25.0	0.0	25.0	No	NA
PZ-4	PZ	1	4.0	19.0	0.0	19.0	No	NA
PZ-5	PZ	1	4.0	19.0	0.0	19.0	No	NA
PZ-6	PZ	1	4.0	19.0	0.0	19.0	No	NA
PZ-7	PZ	1	4.0	19.0	0.0	19.0	No	NA
PZ-8	PZ	1	4.0	19.0	0.0	19.0	No	NA
PZ-9	PZ	1	4.0	19.0	0.0	19.0	No	NA
PZ-10	PZ	1	4.0	19.0	0.0	19.0	No	NA

Table Notes:

DPE = Dual Phase Extraction (DPE) Well: remediation well used for both groundwater and soil vapor extraction

SVE = Soil Vapor Extraction (SVE) Well: remediation well used for soil vapor extraction

PZ = piezometer: observation well used for DPE System monitoring

1. Grundfos Redi-flo 4 top loading electric submersible pump.

2. During the 2015 DPE pilot test, DPE-4 was used as an observation well named PZ-3. DPE-4 is used as a remediation well since DPE System Startup on 12/01/17.

3. Shaded cells show decommissioned well.

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: PETER J. CAMPBELL
Professional Engineer's No.: WA 45051
State: WA | Date Signed: 5/10/18 | Project Mgr.: SZ
Designed by: PC | Drawn by: RO/VS | Checked by: SW

PETER J. CAMPBELL STATE OF WASHINGTON 45051 REGISTERED PROFESSIONAL ENGINEER
Exp. 3/1/20

ARCADIS Design & Consultancy for natural and built assets
ARCADIS U.S., INC.

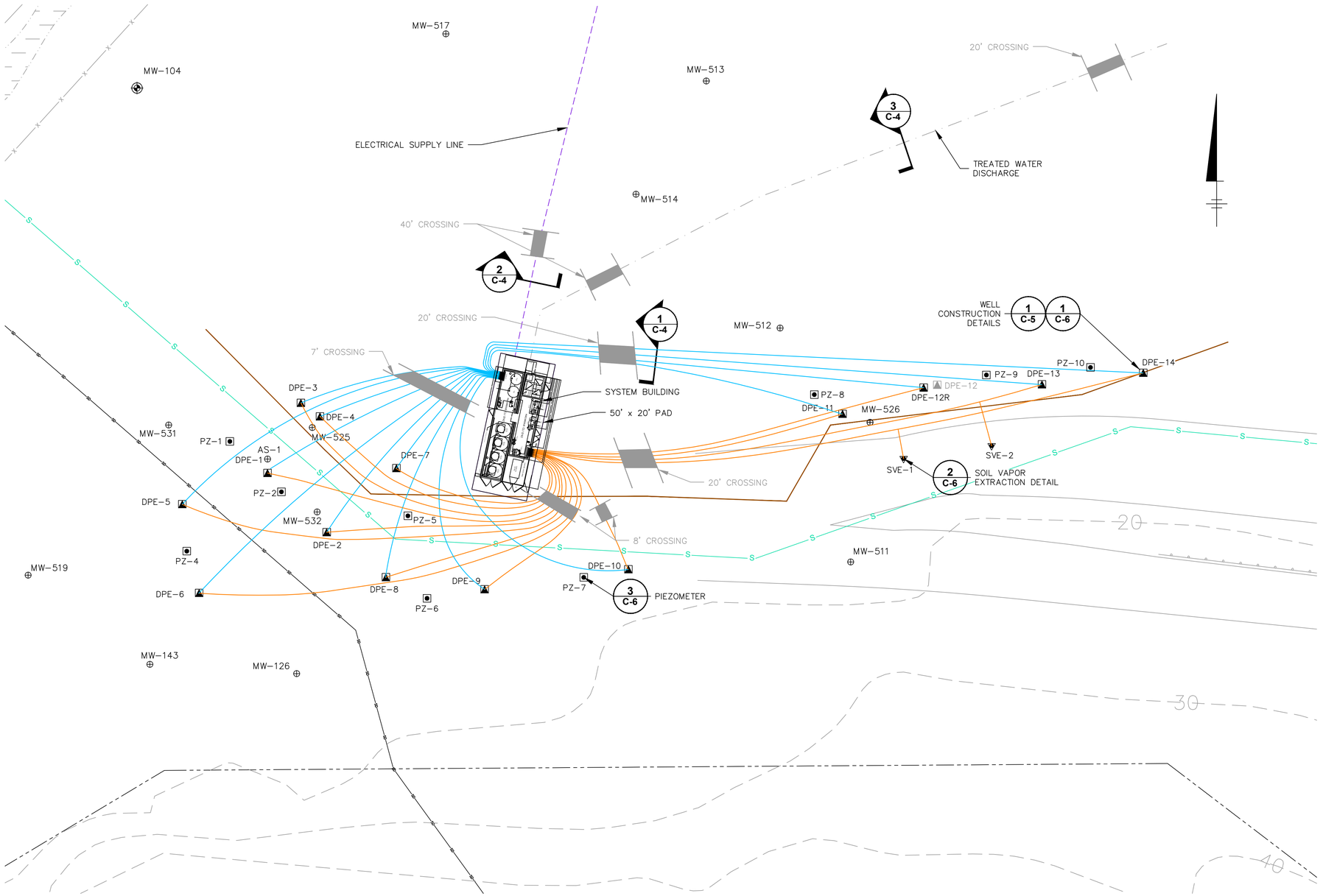
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY ● FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON
AS-BUILT SYSTEM DESIGN SPECIFICATION

MAJOR EQUIPMENT AND INSTRUMENT LIST

ARCADIS Project No.: B0045362.0011
Date: MAY 2018

ARCADIS
6723 Towpath Road, Box 66
Syracuse, NY 13214
Tel: 315-446-9120

G-2



LEGEND:

- FORMER UNOCAL EDMONDS BULK FUEL TERMINAL PROPERTY BOUNDARY
- MW-515 ⊕ INTERIOR MONITORING WELL LOCATION
- MW-518 ⊕ PERIMETER MONITORING WELL LOCATION
- PZ-1 ⊙ PIEZOMETER LOCATION
- AS-1 ⊕ AIR SPARGE WELL LOCATION
- DPE-10 ⧋ DUAL PHASE EXTRACTION (DPE) WELL LOCATION
- SVE-1 ⧩ SOIL VAPOR EXTRACTION (SVE) WELL LOCATION
- DPE-12 ⧋ DECOMMISSIONED DPE WELL
- WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) STORMWATER LINE
- POINT EDWARDS STORM DRAIN LINE
- 20-MIL POLYETHYLENE SHEETING
- ELECTRICAL CONDUIT
- TREATED GROUNDWATER DISCHARGE LINE
- GROUNDWATER CONVEYANCE PIPING
- VAPOR CONVEYANCE PIPING

NOTES:

1. BUILDING AND ROAD INFORMATION DIGITIZED FROM GOOGLE EARTH AERIAL PHOTO. TOPOGRAPHIC CONTOURS WERE OBTAINED FROM AN UNKNOWN SOURCE. ALL LOCATIONS ARE APPROXIMATE AND SHALL BE VERIFIED IN THE FIELD BY CONTRACTOR PRIOR TO CONSTRUCTION.
2. HORIZONTAL DATUM: WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE (NORTH AMERICAN DATUM OF 1983 AND 1998).
   VERTICAL DATUM: NORTH AMERICAN DATUM OF 1988
   UNITS: U.S. SURVEY FEET
   HORIZONTAL AND VERTICAL CONTROL ESTABLISHED BY GLOBAL POSITIONING SYSTEM VIA VERTICAL REFERENCE STATION NETWORK.
3. SOUTHEAST PORTION OF WSDOT STORMWATER LINE HAS NOT BEEN SURVEYED.
4. LOCATION OF EXISTING POWER SUPPLY PANEL HAS NOT BEEN SURVEYED
5. DPE-4 WAS ORIGINALLY INSTALLED AS PZ-3 PRIOR TO THE 2015 PILOT TEST AND CONVERTED TO A DPE WELL DURING SYSTEM CONSTRUCTION.

CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC: P. CAMPBELL PM: TM: A. PATEL LYR:ON=*;OFF=*REF*
D:\PROJECTS\33. Edmond Figures\E-Drawings\DPE\DPE SYSTEM AS BUILT REPORT\45362C01.dwg LAYOUT: C-1 SAVED: 5/7/2018 12:33 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 5/7/2018 1:29 PM BY: ANJANEYAKUMAR, PAVAN KUMAR
XREFS:
IMAGES: PROJECTNAME: ----
45362X00c
45362X02
45362X03

1" = 20' (20' 0 20' 40')

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: **PETER J. CAMPBELL**
Professional Engineer's No.: WA 45051

State	Date Signed	Project Mgr.
WA	5/10/18	SZ

Designed by	Drawn by	Checked by
PC	RO/VS	SW

PETER J. CAMPBELL — STATE OF WASHINGTON — 45051 — REGISTERED PROFESSIONAL ENGINEER

ARCADIS Design & Consultancy for natural and built assets
ARCADIS U.S., INC.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY ● FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON
AS-BUILT SYSTEM DESIGN SPECIFICATION

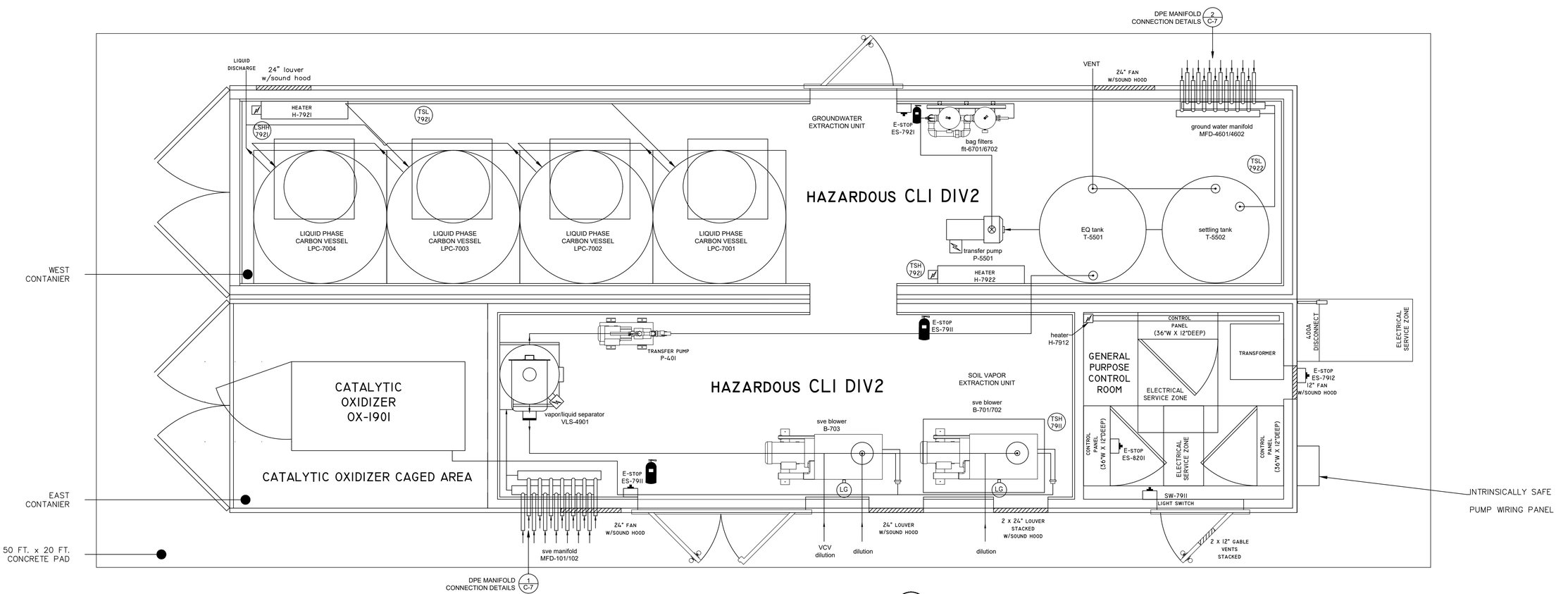
DPE SYSTEM PIPING LAYOUT

ARCADIS Project No.
B0045362.0011

Date
MAY 2018

ARCADIS
6723 Towpath Road, Box 66
Syracuse, NY 13214
Tel: 315-446-9120

C-1



SYSTEM LAYOUT 1

0 2' 4'

SCALE: 1" = 2'-0"

NOTE:

1. CATOx = CATALYTIC OXIDIZER
   DPE = DUAL-PHASE EXTRACTION
   FT. = FEET
   GAC = GRANULAR ACTIVATED CARBON
   IN. = INCH
   W = WIDTH
   CLI DIV2 = CLASS I DIVISION 2 ENVIRONMENT

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: ____ USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: **PETER J. CAMPBELL**
Professional Engineer's No.: WA 45051

State	Date Signed	Project Mgr.
WA	5/10/18	SZ
Designed by	Drawn by	Checked by
PC	RO/VS	SW

Exp. 3/14/20

ARCADIS U.S., INC.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY ● FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON
AS-BUILT SYSTEM DESIGN SPECIFICATION

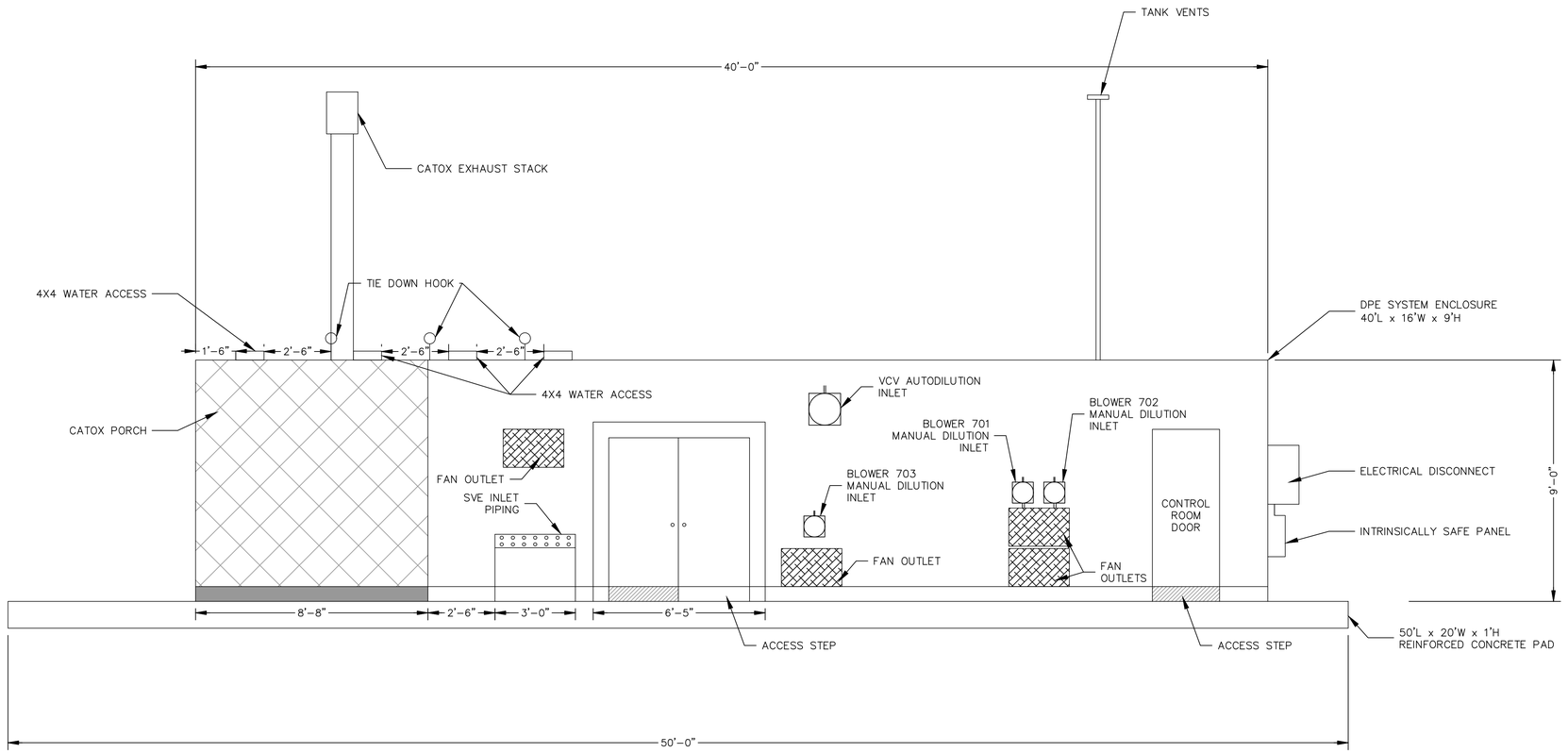
DPE SYSTEM ENCLOSURE LAYOUT DETAIL

ARCADIS Project No. B0045362.0011

Date MAY 2018

ARCADIS
6723 Towpath Road, Box 66
Syracuse, NY 13214
Tel: 315-446-9120

C-2



ELEVATION

SYSTEM ENCLOSURE LAYOUT (1)

0 2' 5'

SCALE: 3/8" = 1'–0"

NOTES:

DPE	DUAL–PHASE EXTRACTION
SVE	SOIL VAPOR EXTRACTION
CATOX	CATALYTIC OXIDIZER
VCV	VAPOR CONTROL VALVE
L	LENGTH
W	WIDTH
H	HEIGHT
"	INCH
'	FOOT

CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC: P. CAMPBELL PM: TM: A. PATEL LYR:ON=*;OFF=*REF*
D:\PROJECTS\33. Edmond Figures\E-Drawings\DPE\DPE SYSTEM AS BUILT REPORT\45362C02.dwg LAYOUT: C-3 SAVED: 5/7/2018 12:29 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 5/7/2018 1:30 PM BY: ANJANEYAKUMAR, PAVAN KUMAR
XREFS: IMAGES: PROJECTNAME: ----
45362X00c

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: **PETER J. CAMPBELL**
Professional Engineer's No.: WA 45051

State	Date Signed	Project Mgr.
WA	5/10/18	SZ
Designed by: PC	Drawn by: RO/VS	Checked by: SW

Exp. 10 3/14/20

ARCADIS U.S., INC.

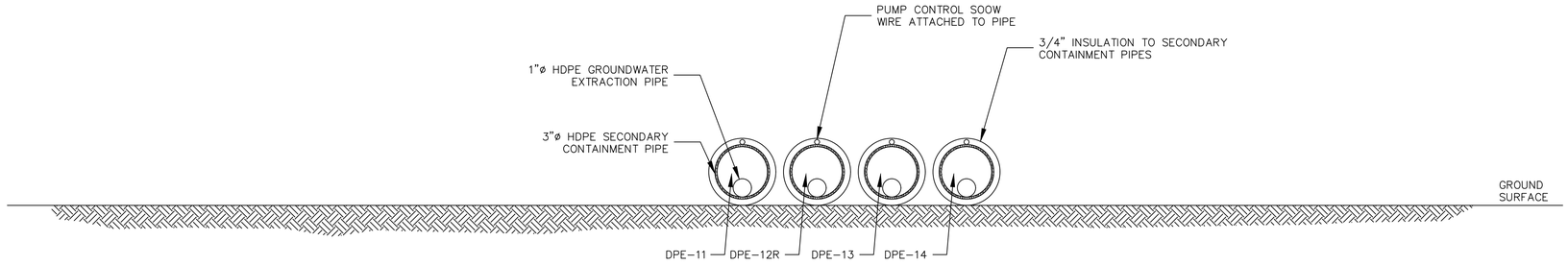
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY • FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON
AS-BUILT SYSTEM DESIGN SPECIFICATION

DPE SYSTEM ENCLOSURE ELEVATION LAYOUT DETAIL

ARCADIS Project No.: B0045362.0011
Date: MAY 2018

ARCADIS
6723 Towpath Road, Box 66
Syracuse, NY 13214
Tel: 315-446-9120

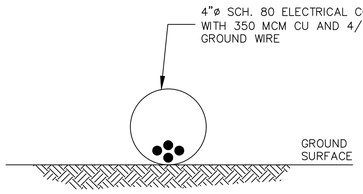
C-3



PIPING CROSS-SECTION 1

0 3" 6"

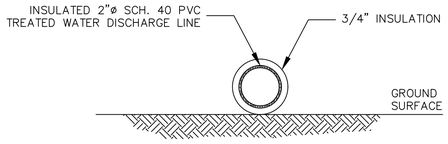
SCALE: 3"=1'-0"



ELECTRICAL CONDUIT CROSS-SECTION 2

0 3" 6"

SCALE: 3"=1'-0"



DISCHARGE LINE CROSS-SECTION 3

0 3" 6"

SCALE: 3"=1'-0"

NOTES:

1. GROUNDWATER CONVEYANCE SECONDARY CONTAINMENT LINE INSULATED WITH 3/4 INCH CLOSED CELL FOAM JACKETED INSULATION.
2. HDPE PIPES ARE STANDARD DIMENSION RATIO (SDR) 11
3. MCM AND 4/ CU ARE WIRE CONFIGURATIONS

DEFINITIONS:

PVC	POLYVINYL CHLORIDE
HDPE	HIGH DENSITY POLYETHYLENE
CU	COPPER
SCH	SCHEDULE
"	INCH
SOOW WIRE	SERVICE COLD, OIL RESISTANT JACKET, OIL RESISTANT INSULATION AND WEATHER/WATER RESISTANT
ø	DIAMETER

CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC: P. CAMPBELL PM: TM: A. PATEL LYR:ON=*;OFF=*REF*
D:\PROJECTS\33. Edmond Figures\E-Drawings\DPE\DPE SYSTEM AS BUILT REPORT\45362C04.dwg LAYOUT: C-4 SAVED: 3/1/2018 2:35 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 5/7/2018 1:49 PM BY: ANJANEYAKUMAR, PAVAN KUMAR
XREFS: IMAGES: PROJECTNAME: ----
45362X00c

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: **PETER J. CAMPBELL**

Professional Engineer's No.: WA 45051

State	Date Signed	Project Mgr.
WA	5/10/18	SZ
Designed by	Drawn by	Checked by
PC	RO/VS	SW

PETER J CAMPBELL STATE OF WASHINGTON 45051 REGISTERED PROFESSIONAL ENGINEER Exp. 10 3/1/20

ARCADIS Design & Consultancy for natural and built assets

ARCADIS U.S., INC.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY • FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON

AS-BUILT SYSTEM DESIGN SPECIFICATION

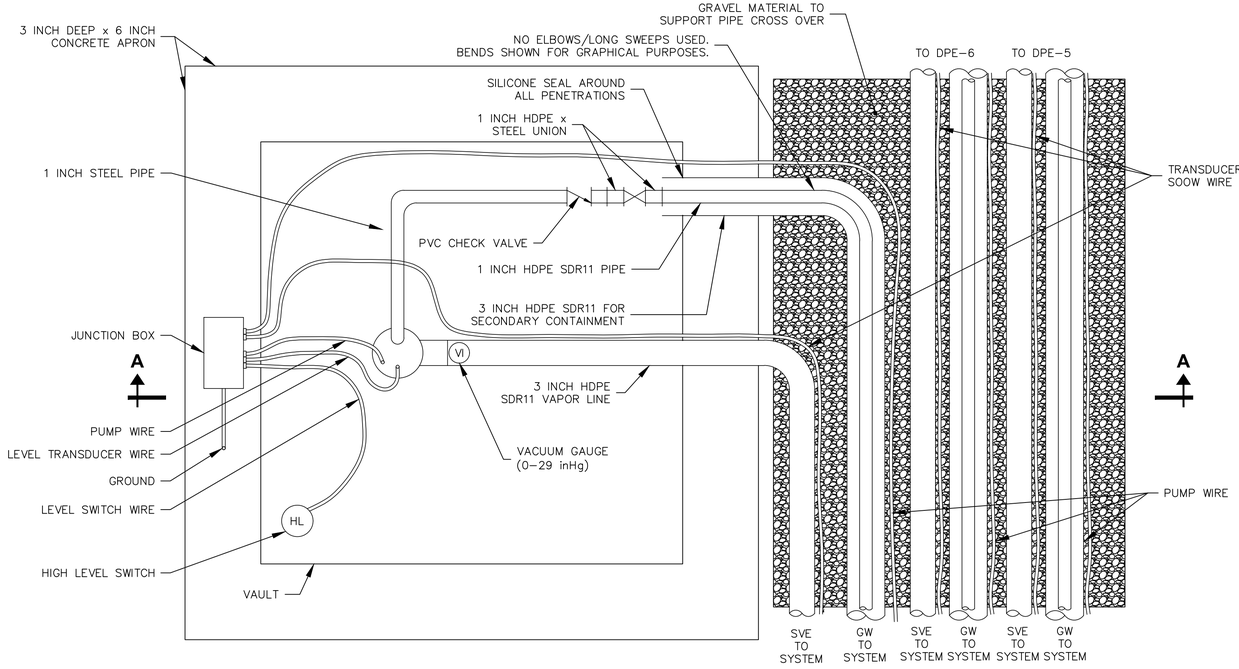
PIPING CROSS-SECTIONS

ARCADIS Project No.
B0045362.0011

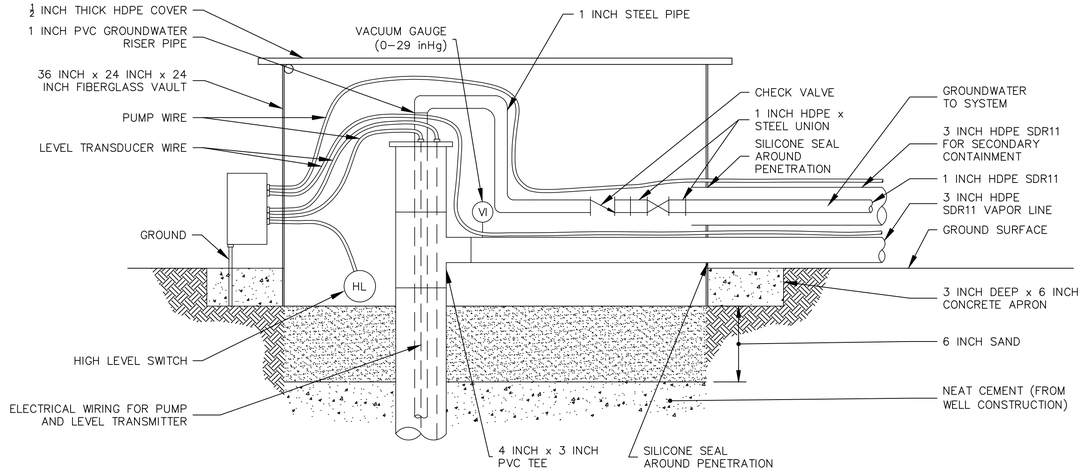
Date
MAY 2018

ARCADIS
6723 Towpath Road, Box 66
Syracuse, NY 13214
Tel: 315-446-9120

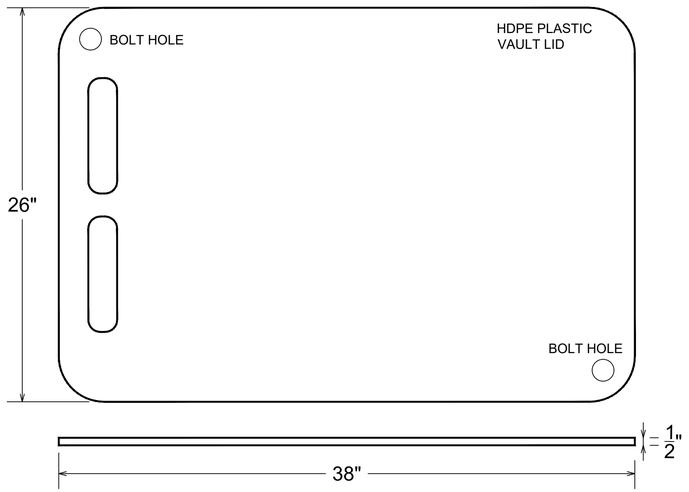
C-4



PLAN



SECTION A-A



WELL VAULT DETAIL

DPE WELLHEAD DETAIL 1

NOT TO SCALE

DEFINITIONS:

DPE	DUAL-PHASE EXTRACTION
GW	GROUNDWATER CONVEYANCE LINE
HDPE	HIGH DENSITY POLYETHYLENE
inHg	INCHES OF MERCURY
PVC	POLYVINYL CHLORIDE
SCH	SCHEDULE
SDR	STANDARD DESIGN RATIO
SOOW	SERVICE, OIL-RESISTANT JACKET, OIL-RESISTANT INSULATION, AND WEATHER-RESISTANT
SVE	SOIL VAPOR EXTRACTION LINE

LEGEND:

- CHECK VALVE
- (VI) VACUUM GAUGE 0-29 inHg
- 1 INCH STEEL GATE VALVE
- (HL) HIGH LEVEL SWITCH

CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC: P. CAMPBELL PM: TM: A. PATEL LYR:ON=*;OFF=*REF*
D:\PROJECTS\33. Edmond Figures\E-Drawings\DPE\DPE SYSTEM AS BUILT REPORT\45362C04.dwg LAYOUT: C-5 SAVED: 3/1/2018 2:35 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 5/7/2018 1:49 PM BY: ANJANEYAKUMAR, PAVAN KUMAR
XREFS: IMAGES: PROJECTNAME: ----
45362X00c

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: PETER J. CAMPBELL
Professional Engineer's No.: WA 45051
State: WA | Date Signed: 5/10/18 | Project Mgr.: SZ
Designed by: PC | Drawn by: RO/VS | Checked by: SW

PETER J CAMPBELL STATE OF WASHINGTON 45051 REGISTERED PROFESSIONAL ENGINEER Exp 10 3/14/20

ARCADIS Design & Consultancy for natural and built assets
ARCADIS U.S., INC.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY ● FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON
AS-BUILT SYSTEM DESIGN SPECIFICATION

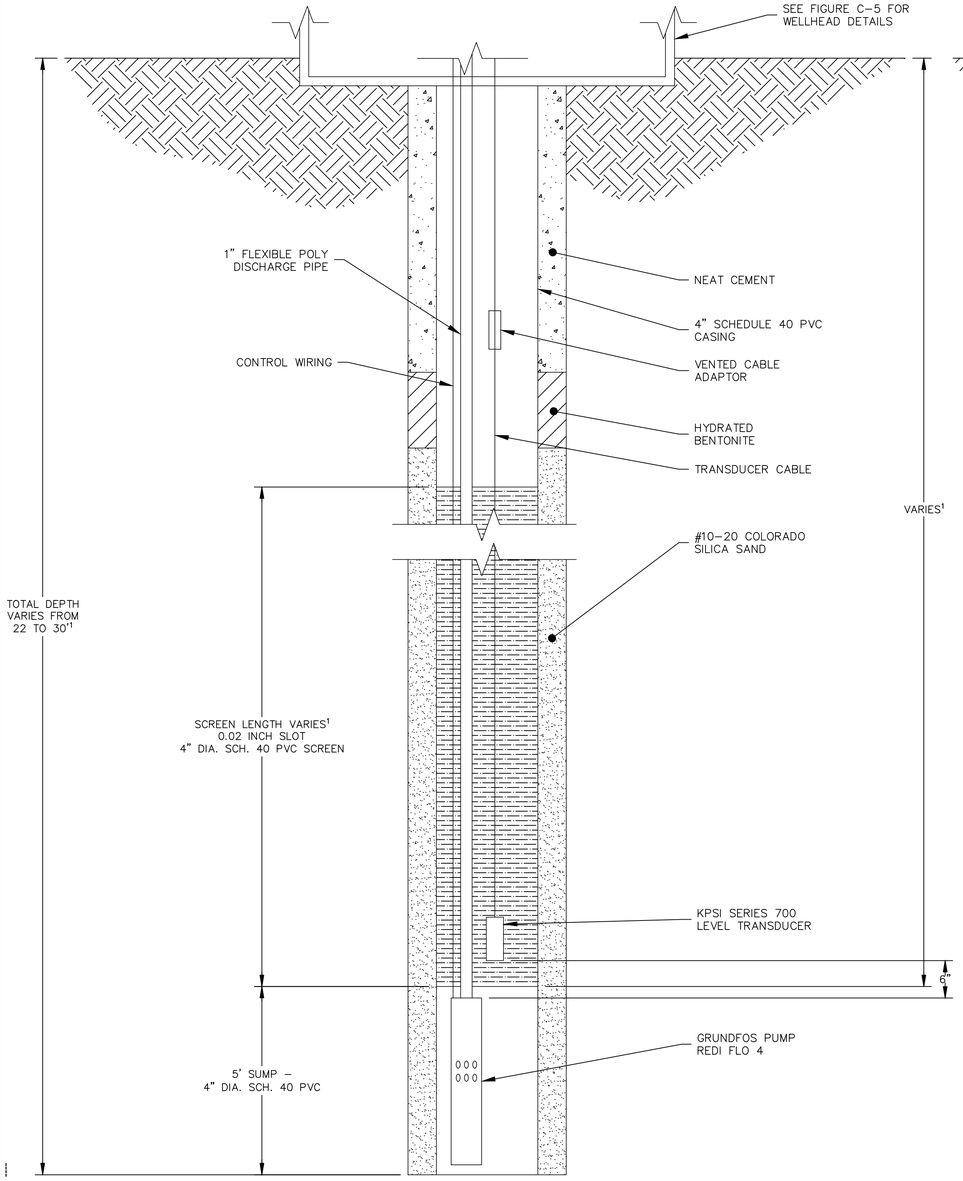
DPE SYSTEM WELLHEAD CONNECTION CONSTRUCTION DETAILS

ARCADIS Project No.
B0045362.0011

Date
MAY 2018

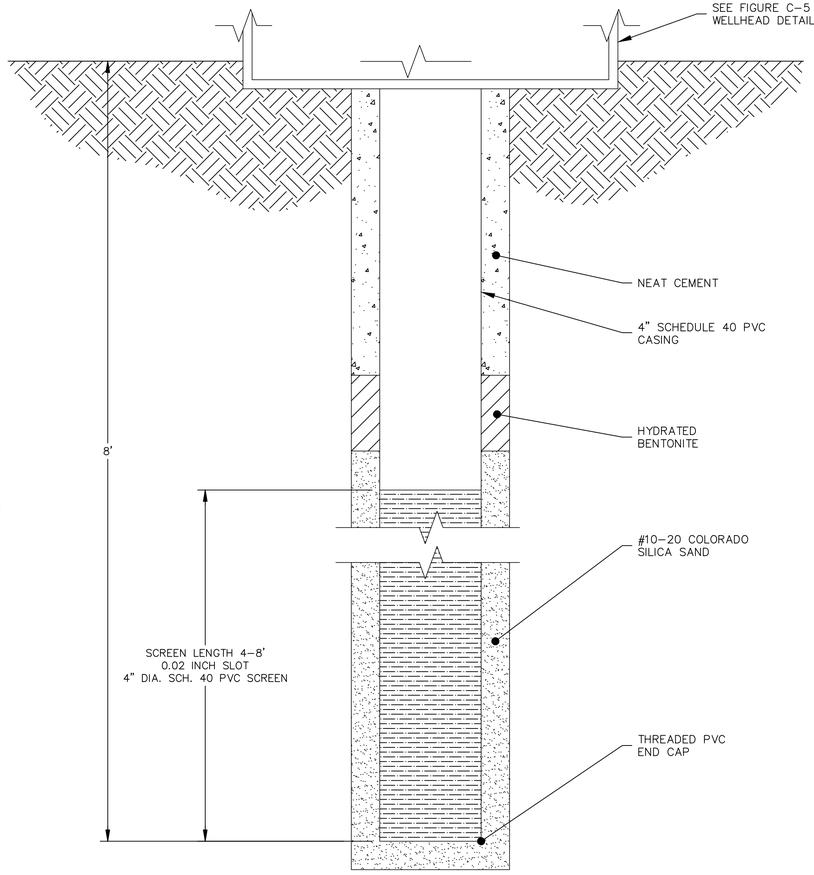
ARCADIS
6723 Towpath Road, Box 66
Syracuse, NY 13214
Tel: 315-446-9120

C-5



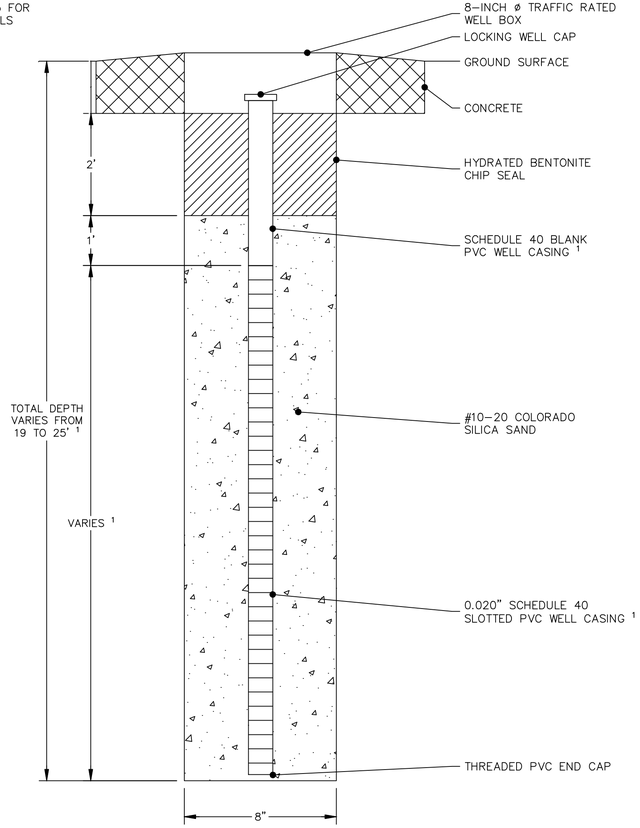
DUAL PHASE EXTRACTION (DPE) WELL CONSTRUCTION DETAIL 1

NOT TO SCALE



SOIL VAPOR EXTRACTION (SVE) WELL CONSTRUCTION DETAIL 2

NOT TO SCALE



PIEZOMETER CONSTRUCTION DETAIL 3

NOT TO SCALE

NOTE:

1. SEE TABLE PROVIDED ON G-2 FOR WELL SPECIFIC INFORMATION

CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC: P. CAMPBELL PM: TM: A. PATEL LYR:ON=*;OFF=*REF*
D:\PROJECTS\33. Edmond Figures\E-Drawings\DPE\DPE SYSTEM AS BUILT REPORT\45362C04.dwg LAYOUT: C-6 SAVED: 3/1/2018 2:35 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 5/7/2018 1:50 PM BY: ANJANEYAKUMAR, PAVAN KUMAR
XREFS: IMAGES: PROJECTNAME: ----
45362X00c

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: **PETER J. CAMPBELL**
Professional Engineer's No.: WA 45051

State	Date Signed	Project Mgr.
WA	5/10/18	SZ
Designed by	Drawn by	Checked by
PC	RO/VS	SW

PETER J. CAMPBELL STATE OF WASHINGTON 45051 REGISTERED PROFESSIONAL ENGINEER
Exp 05 3/14/20

ARCADIS Design & Consultancy for natural and built assets
ARCADIS U.S., INC.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY • FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON
AS-BUILT SYSTEM DESIGN SPECIFICATION

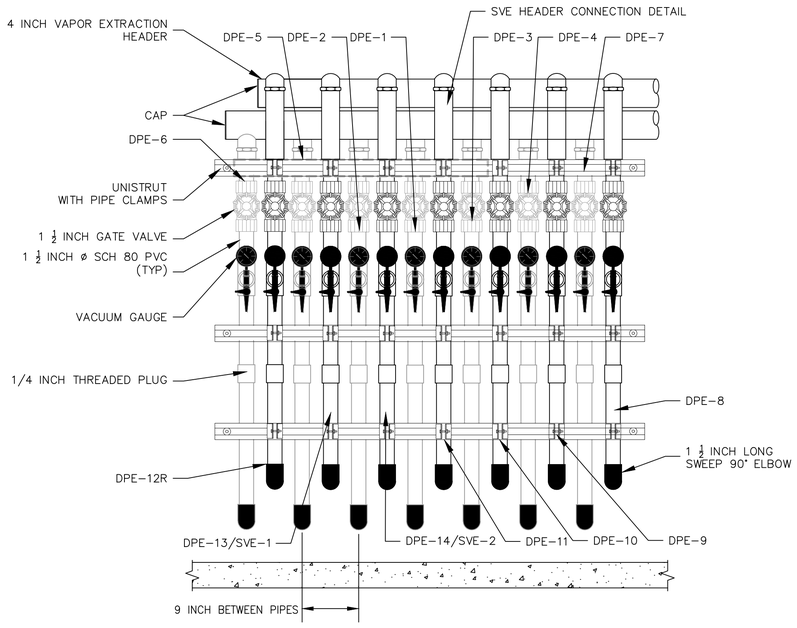
WELL CONSTRUCTION DETAILS

ARCADIS Project No.
B0045362.0011

Date
MAY 2018

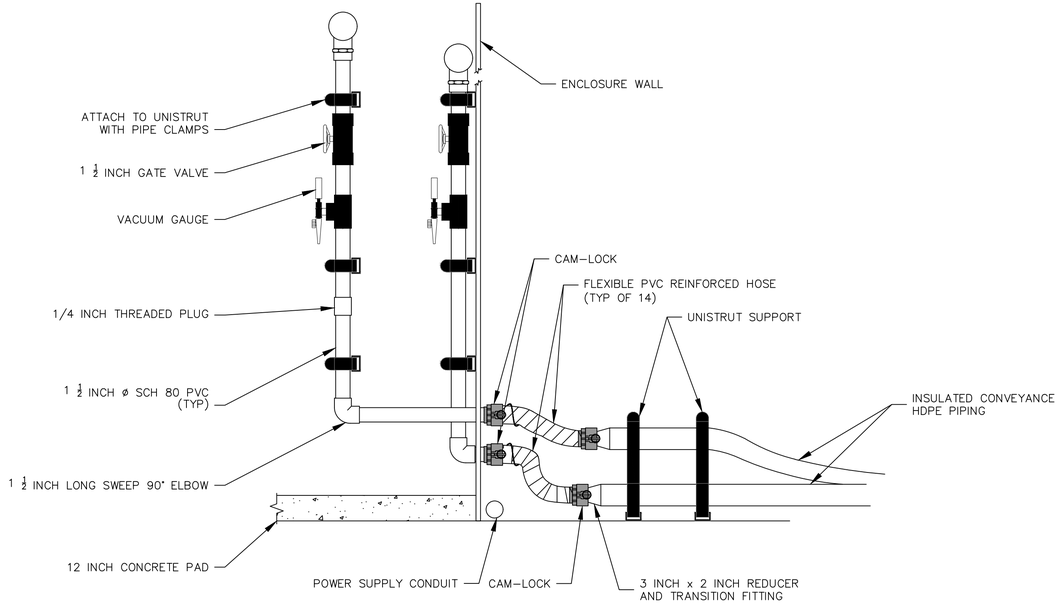
ARCADIS
6723 Towpath Road, Box 66
Syracuse, NY 13214
Tel: 315-446-9120

C-6



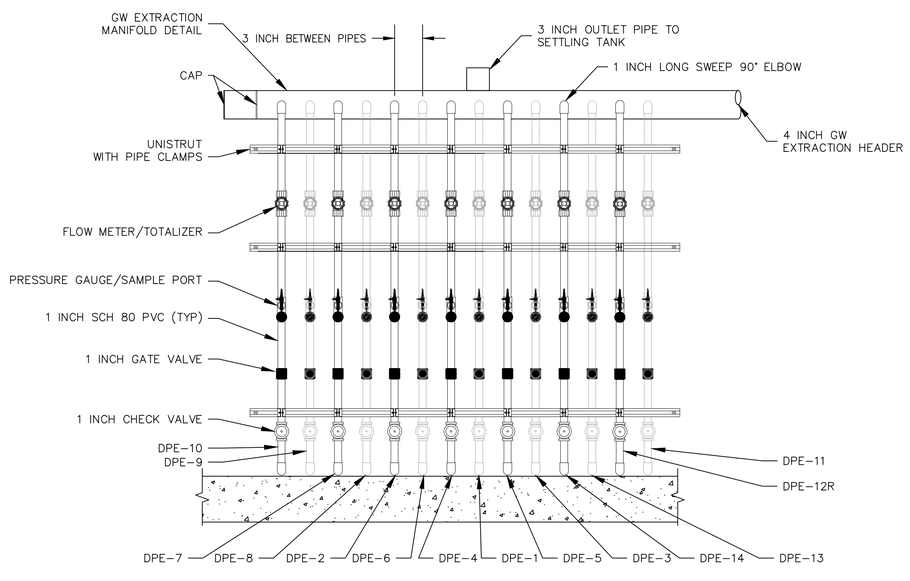
SVE PIPE MANIFOLD 1

NOT TO SCALE



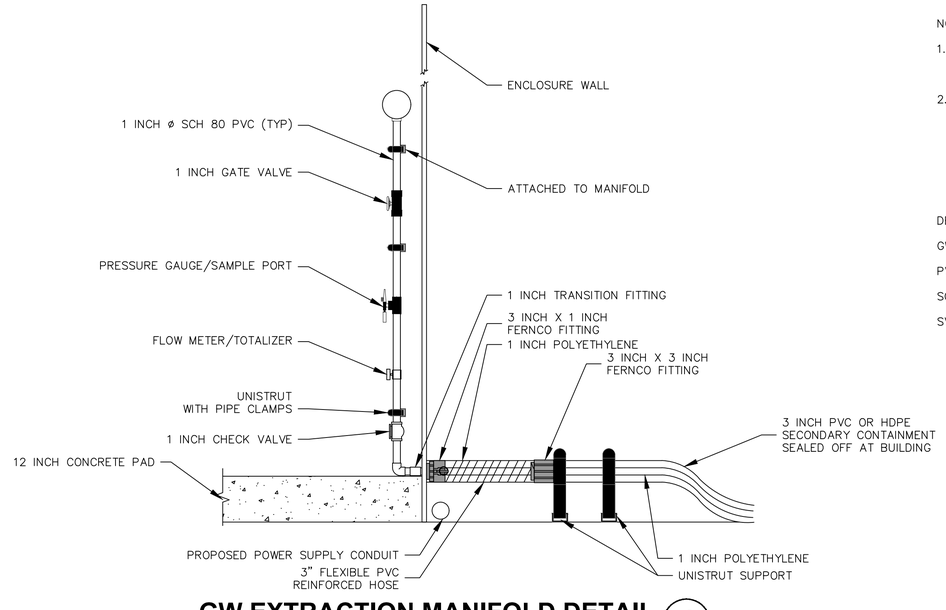
SVE MANIFOLD CONNECTION DETAIL 2

NOT TO SCALE



GW EXTRACTION PIPE MANIFOLD 3

NOT TO SCALE



GW EXTRACTION MANIFOLD DETAIL 4

NOT TO SCALE

NOTES:

1. GW AND SVE PIPE MANIFOLDS WILL BE CONSTRUCTED AT THE EQUIPMENT VENDORS FACILITY PRIOR TO SHIPMENT OF EQUIPMENT TO THE SITE.
2. POWER SUPPLY CONDUIT LOCATION MAY CHANGE BASED ON PUBLIC UTILITY SUPPLY LOCATION.

DEFINITIONS:

GW	GROUNDWATER CONVEYANCE LINE
PVC	POLYVINYL CHLORIDE
SCH	SCHEDULE
SVE	SOIL VAPOR EXTRACTION LINE

CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC: P. CAMPBELL PM: TM: A. PATEL LYR:ON=*;OFF=*REF*
D:\PROJECTS\33. Edmond Figures\E-Drawings\DPE\DPE SYSTEM AS BUILT REPORT\45362C07.dwg LAYOUT: C-7 SAVED: 3/1/2018 2:26 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 5/7/2018 2:25 PM BY: ANJANEYAKUMAR, PAVAN KUMAR
XREFS: IMAGES: PROJECTNAME: ----
45362X00c

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name		
PETER J. CAMPBELL		
Professional Engineer's No.		
WA 45051		
State	Date Signed	Project Mgr.
WA	5/10/18	SZ
Designed by	Drawn by	Checked by
PC	RO/VS	SW

PETER J CAMPBELL STATE OF WASHINGTON 45051 REGISTERED PROFESSIONAL ENGINEER
Exp 10 9/19/20

ARCADIS Design & Consultancy for natural and built assets

ARCADIS U.S., INC.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY ● FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON

AS-BUILT SYSTEM DESIGN SPECIFICATION

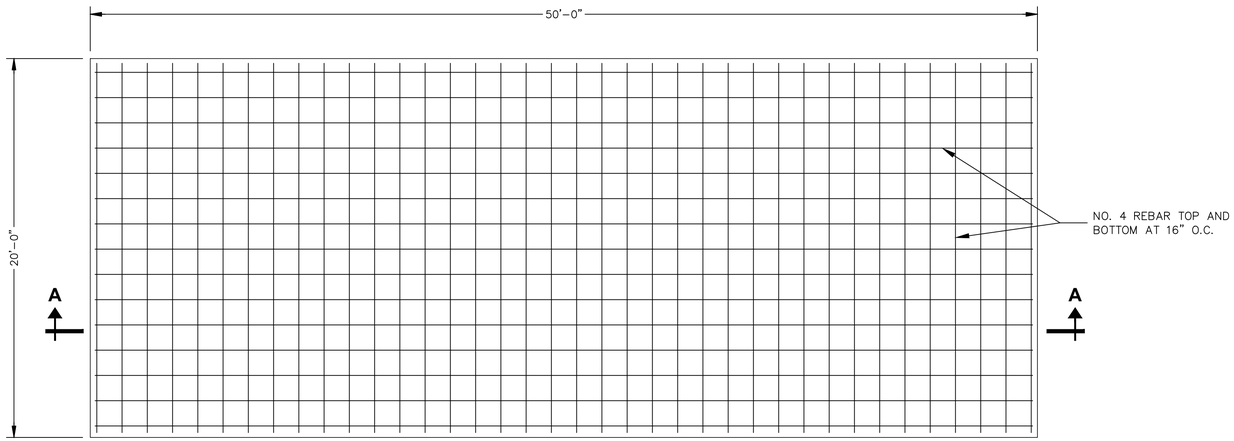
DPE SYSTEM MANIFOLD CONNECTION DETAILS

ARCADIS Project No.
B0045362.0011

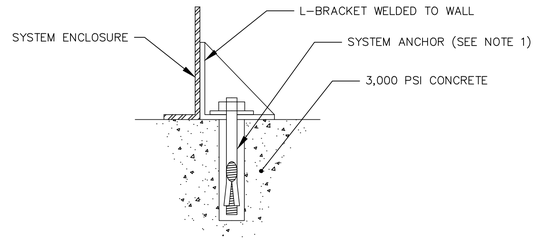
Date
MAY 2018

ARCADIS
6723 Towpath Road, Box 66
Syracuse, NY 13214
Tel: 315-446-9120

C-7



PLAN

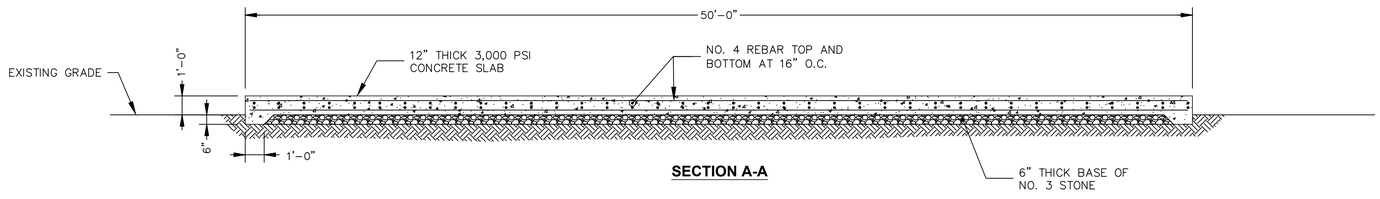


NOTE:

1. ANCHORS IS 3/8" DIAMETER SIMPSON STRONG-TIE WEDGE ALL ANCHORS, 3" MINIMUM EMBEDDED DEPTH.

SYSTEM ANCHOR DETAIL 2

NOT TO SCALE



SECTION A-A

NOTES:

1. 12" THICK 3,000 POUNDS PER SQUARE (PSI) CONCRETE.
2. 3/4" MAXIMUM AGGREGATE SIZE.
3. NO.4 REBAR AT 16" ON CENTER (O.C.) TOP AND BOTTOM OF PAD, MINIMUM 3" COVER.
4. '= FEET
5. "= INCH

CONCRETE PAD DETAIL 1

0 4' 8'

SCALE: 1/4"=1'-0"

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:

USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: **PETER J. CAMPBELL**

Professional Engineer's No.: WA 45051

State	Date Signed	Project Mgr.
WA	5/10/18	SZ
Designed by	Drawn by	Checked by
PC	RO/VS	SW

PETER J CAMPBELL STATE OF WASHINGTON 45051 REGISTERED PROFESSIONAL ENGINEER

Exp 5/11/20

ARCADIS Design & Consultancy for natural and built assets

ARCADIS U.S., INC.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY ● FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON

AS-BUILT SYSTEM DESIGN SPECIFICATION

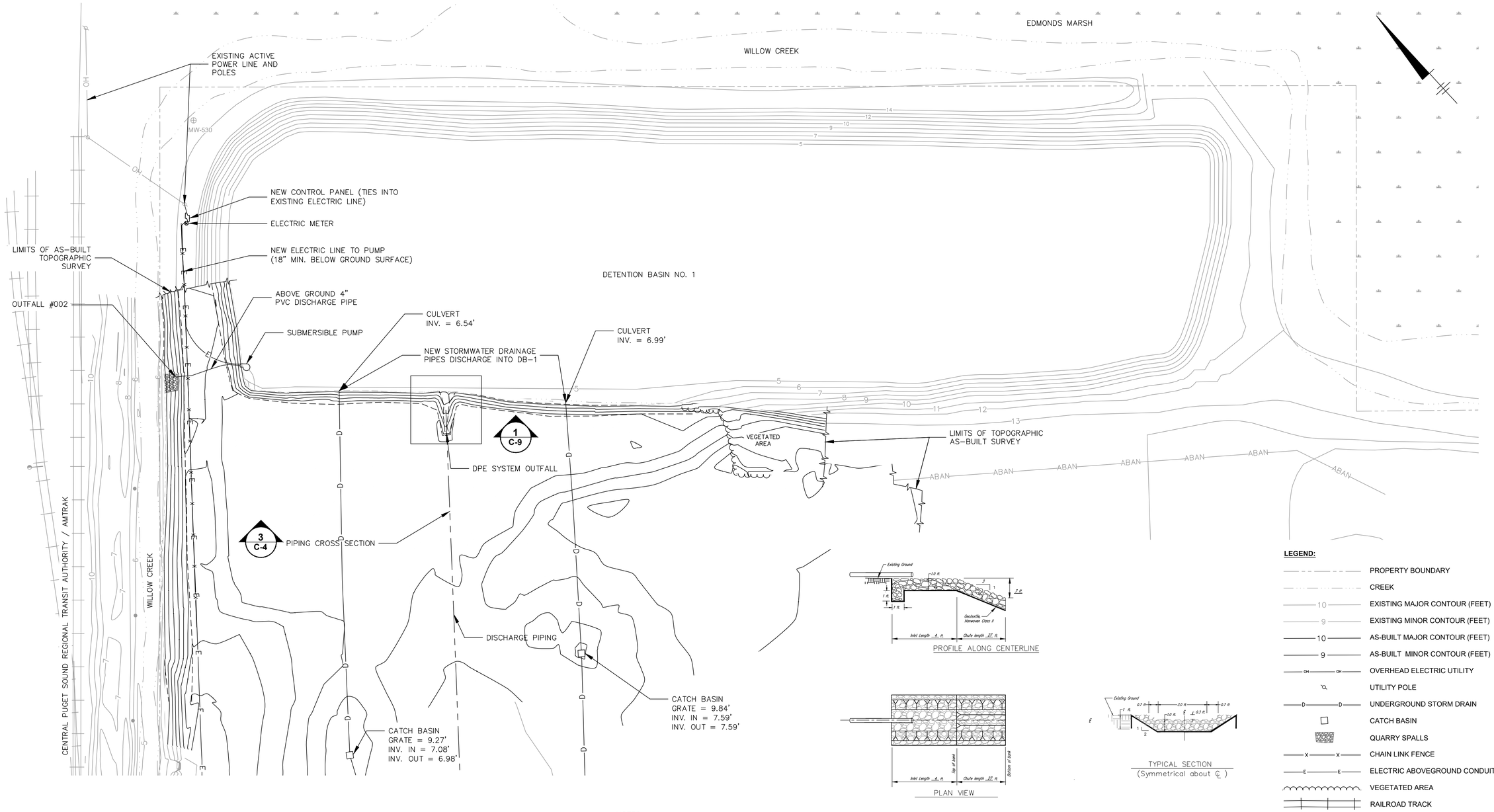
DPE SYSTEM PAD DETAILS

ARCADIS Project No.
B0045362.0011

Date
MAY 2018

ARCADIS
6723 Towpath Road, Box 66
Syracuse, NY 13214
Tel: 315-446-9120

C-8



NOTES:

1. AS-BUILT TOPOGRAPHY BASED ON POINT FILE 31281BJAJ171121 edit.csv SUPPLIED BY OTAK, INC, RECEIVED 12/11/2017 AND 31281BJAJ171222.csv SUPPLIED BY OTAK, INC, RECEIVED 1/8/2018.
2. HORIZONTAL COORDINATE SYSTEM IS WASHINGTON STATE PLANE COORDINATE SYSTEM, NORTH ZONE (NAD 89/98) VERTICAL DATUM IS N.A.V.D. 88.

(1) DPE SYSTEM OUTFALL DETAIL

LEGEND:

- PROPERTY BOUNDARY
- CREEK
- 10 — EXISTING MAJOR CONTOUR (FEET)
- 9 — EXISTING MINOR CONTOUR (FEET)
- 10 — AS-BUILT MAJOR CONTOUR (FEET)
- 9 — AS-BUILT MINOR CONTOUR (FEET)
- OH — OVERHEAD ELECTRIC UTILITY
- UTILITY POLE
- D — UNDERGROUND STORM DRAIN
- CATCH BASIN
- QUARRY SPALLS
- X — CHAIN LINK FENCE
- E — ELECTRIC ABOVEGROUND CONDUIT
- VEGETATED AREA
- RAILROAD TRACK
- INV. — INVERT ELEVATION IN FEET N.A.V.D. 99
- DISCHARGE PIPING

CITY:SYRACUSE-NY DIV/GROUP:ENVCAD DB:G.STEINBERGER LD: PIC:M.FLEISCHNER PM:S.ZORN TM:R.KILKENNY LYR:(OptION="OFF"*REF*
G:\PROJECTS\33_Edmond Figures\E-Drawings\DPE\DPE SYSTEM AS BUILT REPORT\45362C009.dwg LAYOUT: C-9 SAVED: 3/1/2018 2:53 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS-EDMONDS.CTB PLOTTED: 5/7/2018 2:23 PM BY: ANJANEYAKUMAR, PAVAN
XREFS: IMAGES: PROJECTNAME: ----
45362X00c
RECORD-INT-ACT-X-BASEMAP
RECORD-INT-ACT-X-RECORDTOPO

30' 0 30' 60'
1"=30'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: **PETER J. CAMPBELL**
Professional Engineer's No.: WA 45051

State	Date Signed	Project Mgr.
WA	5/10/18	SZ
Designed by	Drawn by	Checked by
PC	RO/VS	SW

PETER J CAMPBELL STATE OF WASHINGTON 45051 REGISTERED PROFESSIONAL ENGINEER Exp 3/1/20

ARCADIS Design & Consultancy for natural and built assets
ARCADIS U.S., INC.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY ● FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON
AS-BUILT SYSTEM DESIGN SPECIFICATION

RIPRAP DESIGN AT DETENTION BASIN 1

ARCADIS Project No. B0045362.0011
Date MAY 2018
ARCADIS 6723 Towpath Road, Box 66 Syracuse, NY 13214 Tel: 315-446-9120

C-9

cap for cleaning/expansion
FERNCO
MANIFOLD = VACUUM INLET (MFD-101)
MANIFOLD SIZE = 4"
MANIFOLD MATERIAL = STEEL
NUMBER OF LEGS = 7
SIZE OF LEGS = 1-1/2"
(ONE LEG SHOWN AS TYPICAL)
1/4" PLUG FOR FLOW MEASUREMENT
PROVIDE 8 DIA. OF STRAIGHT
PIPE BEFORE AND 3 DIA. AFTER
30-0"HG
PI 101
1-1/2" FNPT
INLET PORTS
ON LEGS TYPICAL
(THROUGH WALL)
1-1/2" PVC SCH80
brass
brass
S
cap for cleaning/expansion
FERNCO
MANIFOLD = VACUUM INLET (MFD-102)
MANIFOLD SIZE = 4"
MANIFOLD MATERIAL = STEEL
NUMBER OF LEGS = 7
SIZE OF LEGS = 1-1/2"
(ONE LEG SHOWN AS TYPICAL)
1/4" PLUG FOR FLOW MEASUREMENT
PROVIDE 8 DIA. OF STRAIGHT
PIPE BEFORE AND 3 DIA. AFTER
30-0"HG
PI 108
1-1/2" FNPT
INLET PORTS
ON LEGS TYPICAL
(THROUGH WALL)
1-1/2" PVC SCH80
brass
brass
S
6" PVC SCH80
30-0"HG
PI 401
6" PVC SCH80
DRAIN PIPED TO
OUTSIDE W/ 1" FNPT
FITTING
6" CLEAN-OUT
VAPOR/LIQUID
SEPARATOR
VLS-401
pvc
pvc
pvc
pvc
pvc
LG 401
LSL 401
LSH 401
LSHH 401
LAHH 401
LAHL 401
2" PVC SCH80
SHEET 2
VLS DISCHARGE TO EQ TANK
LINE 1
1-1/2" PVC SCH80
0-60PSI
PI 402
brass
brass
S
pvc
RE-CIRCULATION
50 PSI
1" PVC SCH80
1-1/2" BLACK
P 401
2" BLACK
INLET FILTER /SILENCER
TERMINATE OUTSIDE W/ 4" FNPT FITTING
4" PVC SCH80
0-10"WC
PDI 701
0-15 PSIA
PT 701
CONTROLLED BY OXIDIZER
MV 1901
FERNCO
30-0"HG
PI 701
IN-LINE FILTER /SILENCER
FERNCO
6" PVC SCH80
brass
S
6" PVC SCH80
SET @ 21"HG
brass
3" PVC SCH80
30-0"HG
PI 702
brass
S
SET @ 20.5" HG
PAH 702
0-1"WC
PDI 702
0-400SCFM
FT 702
0-15 PSIA
PT 702
32-212 F
TT 701
6" PVC SCH80
2" PVC SCH80
SET @ 21"HG
brass
2" PVC SCH80
3" PVC SCH80
30-0"HG
PI 703
brass
S
INLET FILTER /SILENCER
INLET FILTER /SILENCER
INLET FILTER /SILENCER
TERMINATE OUTSIDE W/ 2" FNPT FITTING
TERMINATE OUTSIDE W/ 2" FNPT FITTING
TERMINATE OUTSIDE W/ 2" FNPT FITTING
SET @ 21"HG
brass
2" PVC SCH80
3" PVC SCH80
30-0"HG
PI 704
brass
S
BLOWER IS REMOVABLE SO INLET SCREEN CAN BE CLEANED
LABEL TO BE ADDED:
ENSURE INTEGRAL INLET SCREEN IS CLEANED PER MANUFACTURERS RECOMMENDATIONS
OIL
FG 701
SV 701
brass
brass
VFDA 701
VFD 701
1/4" PLUGGED PORT
BLOWER IS REMOVABLE
3"
B 701
DISCHARGE SILENCER
2"
brass
OIL
FG 702
SV 702
brass
brass
VFDA 702
VFD 702
1/4" PLUGGED PORT
BLOWER IS REMOVABLE
3"
B 702
DISCHARGE SILENCER
2"
brass
OIL
FG 703
SV 703
brass
brass
VFDA 703
VFD 703
1/4" PLUGGED PORT
3"
B 703
DISCHARGE SILENCER
2"
brass
SET @ 290 F
TAH 701
0-60"WC
TSH 701
PI 705
50-500F
TI 701
brass
brass
S
ss
2" BLACK
SET @ 290 F
TAH 702
0-60"WC
TSH 702
PI 706
50-500F
TI 702
brass
brass
S
ss
1/4" copper
2" BLACK
SET @ 290 F
TAH 703
0-60"WC
TSH 703
PI 707
50-500F
TI 703
brass
brass
S
ss
1/4" copper
2" BLACK
TERMINATE OUTSIDE W/ 4" FNPT FITTING
ALL CONDENSATE LINES ENTER THE HEADER AT THE TOP OF HEADER AS AN INDEPENDENT LINE. HEADER GRAVITY DRAINS TO VLS INLET
1/4" copper
4" BLACK
4" BLACK
1" PVC SCH80
piped to vls inlet
1" PVC
SET @ 45"WC
0-3"WC
PDI 701
FT 701
SET @ 10"WC
PAH 703
PAL 703
0-50"WC
PT 703
0-60"WC
PI 708
SET @ 290 F
TAH 704
122-482 F
TT 704
TI 704
50-500F
brass
S
4" BLACK
put on 24" copper line to dissipate heat

DESIGN NOTE:
Never use braided black hose with hose barbs and zip ties for pressure connection in liquid service. Use appropriate compression fittings.

BUILDING EQUIPMENT AND CONTROL PANEL

CONTROL PANEL

LOCATED ON BUILDING. PANEL A MINIMUM OF 36" FROM ANY HAZARDOUS PROCESS EQUIPMENT, AND A MINIMUM OF 36" ABOVE GRADE.

border defines limits of the enclosure (BLD-7910)
SVE room
CL1 DIV2 area
TAHH 7911
TSHH 7911
ES 7911
TSH 7911
F 7911
ES 7912
GTA 7911
GT 7911

WIRING AND SPECIAL PROJECT NOTES

IS INPUT WIRING WIRED FOR INDOORS, ACCORDING NEC FOR HAZARDOUS LOCATIONS.

WIRING IS CLASS 1 DIVISION 2, AS PER THE NEC.

NOTES FOR PROGRESSIVE CAVITY PUMPS:
- CHECK VALVE ON DISCHARGE LOCATED DOWNSTREAM OF RE-CIRCULATION LINE
- OVERSIZE INLET PIPING TO REDUCE SUCTION LOSSES

POTENTIALLY HAZARDOUS CLASS 1 DIV 2 AREA

BORDER DEFINES LIMITS OF THE ENCLOSURE (BLD-7910)

PIPE NOTE: NO GALVANIZED STEEL IS TO BE USED IN THE INLET OR OUTLET OF THE SVE BLOWER PROCESS LINE WHEN AN OXIDIZER IS USED. USE PVC AND BLACK STEEL ONLY.

border defines limits of the enclosure (BLD-7910)
control panel room
GP area
integral thermostat
TSL 7911
TSH 7912
ES 8201
H 7912
F 7912

TERMINATE OUTSIDE W/ 4" FNPT FITTING

border defines limits of the caged area
ELECTRIC CATALYTIC OXIDIZER
OX-1901
SYSA 1901
SYS 1901
RDY 1901
TT 1901
TT 1902
NOTE: OXIDIZER MUST BE INSTALLED OUTDOORS.

SVE BLOWER:
TAG = B-701/703
MAKE/MODEL = BUSCH MM 1502 AV
FLOWRATE & VACUUM = 300 ACFM @ 20"HG (900 ACFM @ 20" HG COMBINED = 298 SCFM)
DISCHARGE PRESSURE = 1.5 PSI
DISCHARGE TEMPERATURE = 275 F
HORSEPOWER & MOTOR TYPE = 20, TEFC CL 1 DIV 2
VARIABLE FREQUENCY DRIVE = YES (60-100%)
VOLTAGE & PHASE = 460V/3P
HOUR METER/AMP METER = YES (HMI)/NO
HAND-OFF-AUTO = YES (HMI)
LOCAL DISCONNECT = NO

SOLENOID VALVE:
TAG = SV-701/702
MAKE/MODEL = ASCO (EF8262H22)
MAX PRESSURE = 90PSI OIL, NORMALLY CLOSED
TIMER = YES (PLC)
VOLTAGE & PHASE = 115V/1P
HAND-OFF-AUTO = YES (HMI)

ELECTRIC CATALYTIC OXIDIZER:
TAG = OX-1901
MAKE/MODEL = INTELLISHARE / ECO500
FLOWRATE = 500 SCFM
WATTS = 50,000
VOLTAGE & PHASE = 480V/3P

VENTILATION FAN:
TAG = F-7911
MAKE/MODEL = CANARM 24"
FLOWRATE & PRESSURE = 5,100 CFM @ 0.25"WC
HORSEPOWER & MOTOR TYPE = 1/3 , EXP
VOLTAGE & PHASE = 230V/1P

VENTILATION FAN:
TAG = F-7912
MAKE/MODEL = CANARM 12"
FLOWRATE & PRESSURE = 1,390 CFM @ 0.25"WC
HORSEPOWER & MOTOR TYPE = 1/4, GP
VOLTAGE & PHASE = 120V/1P

ENCLOSURE HEATER:
TAG = H-7912
MAKE/MODEL = Ouellet OFM2004BL
WATTS = 2000
VOLTAGE & PHASE = 460V/1P

NOTE:

SEE DRAWING P-3 FOR INSTRUMENT AND EQUIPMENT DESIGNATION

** SAFETY DEVICE

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:

USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: PETER J. CAMPBELL
Professional Engineer's No.: WA 45051
State: WA | Date Signed: 5/10/18 | Project Mgr.: SZ
Designed by: PC | Drawn by: RO/VS | Checked by: SW

PETER J CAMPBELL STATE OF WASHINGTON 45051 REGISTERED PROFESSIONAL ENGINEER
Exp 3/19/20

ARCADIS Design & Consultancy for natural and built assets
ARCADIS U.S., INC.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY ● FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON
AS-BUILT SYSTEM DESIGN SPECIFICATION

DPE SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM (VAPOR)

ARCADIS Project No.
B0045362.0011

Date
MAY 2018

ARCADIS
6723 Towpath Road, Box 66
Syracuse, NY 13214
Tel: 315-446-9120

P-1

ELECTRIC SUBMERSIBLE WELL PUMP:
TAG = P-4001
MAKE/MODEL = GRUNDFOS/ REDI-FLO4
FLOWRATE & PRESSURE = 12 GPM @ 50'TDH
HORSEPOWER & MOTOR TYPE = 1/2, ENVIRONMENTAL
VOLTAGE & PHASE = 240V/3P
HOUR METER/AMP METER = YES (HMI)/NO
HAND-OFF-AUTO = YES (HMI)

TRANSFER PUMP:
TAG = P-5501
MAKE/MODEL = GOULDS 3ST (IMPELLER G)
FLOWRATE & PRESSURE = 120 GPM @ 90' TDH
HORSEPOWER & MOTOR TYPE = 5, TEFC CL 1 DIV 2
VOLTAGE & PHASE = 460V/3P
HOUR METER/AMP METER = YES (HMI)/NO
HAND-OFF-AUTO = YES (HMI)
LOCAL DISCONNECT = NO

VENTILATION FAN:
TAG = F-7921
MAKE/MODEL = CANARM 24"
FLOWRATE & PRESSURE = 5,100 CFM @ 0.25"WC
HORSEPOWER & MOTOR TYPE = 1/3 , EXP
VOLTAGE & PHASE = 230V/1P

ENCLOSURE HEATER:
TAG = H-7921/7922
MAKE/MODEL = INDEECO 254
WATTS = 3600
VOLTAGE & PHASE = 460V/3P

PRV 7002 1/4" brass
0-60PSI PI 7002
4" SS
LIQUID PHASE CARBON LPC-7002
REGEN 4" SS 3000LB
brass
PRV 7001 1/4" brass
0-60PSI PI 7001
4" SS
LIQUID PHASE CARBON LPC-7001
REGEN 4" SS 3000LB
brass
2" spiral clear hose w/ camlock and locking handles (15' length) typical 6
PRV 7004 1/4" brass
0-60PSI PI 7004
4" SS
LIQUID PHASE CARBON LPC-7004
REGEN 4" SS 3000LB
brass
PRV 7003 1/4" brass
0-60PSI PI 7003
4" SS
LIQUID PHASE CARBON LPC-7003
REGEN 4" SS 3000LB
brass
SET @ 30 PSI PAH 7001
0-50PSI PT 7001
0-60PSI PI 6705
3" PVC SCH80
brass
pvc
0-60PSI PI 6702
0-60PSI PI 6701
pvc
2" PVC SCH80
SET @ 40 PSI PAH 6701
FILTER FLT-6701
25-100 MICRON
BV-6703
BV-6704
1/2" drain
2" PVC SCH80
0-50PSI PT 6701
SEE MLEE STANDARD ASSEMBLY
BV-6702
BV-6709
BV-6705
0-60PSI PI 6704
0-60PSI PI 6703
5-50 MICRON
FILTER FLT-6702
BV-6707
BV-6706
BV-6708
2" PVC SCH80
0-60PSI PI 6706
0-60PSI PI 6705
2" PVC SCH80
FILTER FLT-6703
25-100 MICRON FILTER
BV-6710
BV-6711
1/2" drain
2" PVC SCH80
MOC ADDITION
BV-6712
0-60PSI PI 6708
0-60PSI PI 6707
FILTER FLT-6704
5-50 MICRON FILTER
BV-6714
BV-6713
BV-6715
2" PVC SCH80
HIGHEST POINT IN PROCESS LINE
SIPHON BREAK
TEE IN CHECK VALVE ABOVE MAXIMUM LEVEL IN TANK OR VESSEL
vent stack terminated with screened tee 10 ft above enclosure
LAH 7001
LSH 7001
2" PVC SCH80 DISCHARGE TO POND
2" PVC SCH80
3" PVC SCH80
pvc
FT 7001
SET @ 20 PSI PAH 7002
0-50PSI PT 7002
pvc
brass
3" PLUG
3" PVC SCH80
LINE 1 VLS DISCHARGE TO EQ TANK SHEET 1
TERMINATE OUTSIDE W/ 2" FNPT FITTING
2" PVC SCH80
2" blind flange
2" PVC SCH80
2" PVC SCH80
POTENTIALLY HAZARDOUS CLASS I DIV 2 AREA
BORDER DEFINES LIMITS OF THE ENCLOSURE (BLD-7920)
MANIFOLD = WATER INLET (MFD-4601)
MANIFOLD SIZE = 2"
MANIFOLD MATERIAL = PVC
NUMBER OF LEGS = 7
SIZE OF LEGS = 1-1/2"
(ONE LEG SHOWN AS TYPICAL)
3" PVC SCH80
VENT TO OUTSIDE
1-1/2" PVC SCH80
LAHH 4001
LSHH 4001
TO GROUNDWATER INLET MANIFOLD
WELL CAP
LAL 4001
LT 4001
VFDA 4001
VFD 4001
P 4001
SUBMERSIBLE WELL PUMPS:
TOTAL WELL ASSEMBLIES = 14
WELL PUMPS ASSEMBLED = YES
WELL PROBES ASSEMBLED = by others
WATER DISCHARGE HOSE = by others
POWER CABLES = by others
SUPPORT CABLES = by others
1" FNPT INLET PORTS ON LEGS TYPICAL
FQI 4601
0-60PSI PI 4601
brass
1-1/2" PVC SCH80
pvc
brass
2" blind flange
3" PVC SCH80
pvc
LAHH 5502
LSHH 5502
settling tank T-5502
500 GALLON
4" PVC SCH80
gravity over flow line
16" NON VENTED LID & GASKET
500 GALLON EQ TANK T-5501
0.85 x H
LAHH 5501
LSHH 5501
0.5 X H
LSH 5501
0.2 X H
LSL 5501
3" SS
P 5501
3" PVC SCH80
NOTES FOR BAG FILTER:
- MOUNT UPSTREAM PRESSURE GAUGES, IN SIDE, NOT TOP
3" PVC SCH80
MANIFOLD = WATER INLET (MFD-4602)
MANIFOLD SIZE = 2"
MANIFOLD MATERIAL = PVC
NUMBER OF LEGS = 7
SIZE OF LEGS = 1-1/2"
(ONE LEG SHOWN AS TYPICAL)
2" PVC SCH80
1" PVC SCH80
FQI 4608
0-60PSI PI 4608
1" FNPT INLET PORTS ON LEGS TYPICAL
brass
1-1/2" PVC SCH80
pvc
brass
LAHH 7921
LSHH 7921
BUILDING SUMP SWITCH
SET @ 40 PSI PAH 5501
0-50PSI PT 5501
0-60PSI PI 5501
brass
brass BV-6701
3" PVC SCH80
BORDER DEFINES LIMITS OF THE ENCLOSURE (BLD-7920)
WATER TREATMENT ROOM CLI DIV2 AREA
TSL 7921
TSL 7922
TSH 7921
ES 7921
H 7921
H 7922
F 7921
DRAIN PIPED TO OUTSIDE W/ 1" FNPT FITTING

XREFS: 45362X00c
IMAGES: PROJECTNAME: ----
CITY: MINNEAPOLIS, MN DIV/GROUP: ENV/CAD DB: R. OBERLANDER LD: R. OBERLANDER PIC: P. CAMPBELL PM: TM: A. PATEL LYR:ON=*;OFF=*REF*
D:\PROJECTS\33. Edmond Figures\E-Drawings\DPE\DPE SYSTEM AS BUILT REPORT\45362P-123.dwg LAYOUT: P-2 SAVED: 3/1/2018 2:24 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 5/7/2018 2:20 PM BY: ANJANEYAKUMAR, PAVAN KUMAR

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: PETER J. CAMPBELL
Professional Engineer's No.: WA 45051
State: WA | Date Signed: 5/10/18 | Project Mgr.: SZ
Designed by: PC | Drawn by: RO/VS | Checked by: SW

PETER J CAMPBELL STATE OF WASHINGTON 45051 REGISTERED PROFESSIONAL ENGINEER Exp 10 3/1/20

ARCADIS Design & Consultancy for natural and built assets
ARCADIS U.S., INC.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY ● FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON
AS-BUILT SYSTEM DESIGN SPECIFICATION

DPE SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM (GROUNDWATER)

ARCADIS Project No. B0045362.0011
Date MAY 2018
ARCADIS 6723 Towpath Road, Box 66 Syracuse, NY 13214 Tel: 315-446-9120

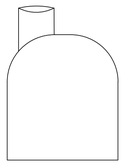
P-2

VALVES AND PIPING

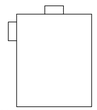
NO NC

- BALL VALVE -
- GATE VALVE -
- GLOBE VALVE -
- NEEDLE VALVE -
- SLIDE VALVE -
- SOLENOID VALVE -
- BUTTERFLY VALVE -
- SWING CHECK VALVE -
- WAFER CHECK VALVE -
- SPRING CHECK VALVE -
- WYE STRAINER -
- SAMPLE PORT -
- PRESSURE RELIEF VALVE -
- VACUUM RELIEF VALVE -
- CAMLOCK CONNECTION -
- FERNCO COUPLING - FERNCO
- FLEXIBLE CONNECTION -
- FLANGED CONNECTION -
- REDUCER -
- UNION -
- FILTER, SILENCER -
- BANDED TRANSITION FITTING - BTF
- TYPICAL OF OTHERS -
- NORMALLY OPEN - NO
- NORMALLY CLOSE - NC

EQUIPMENT

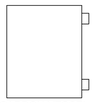


EQUALIZATION TANK

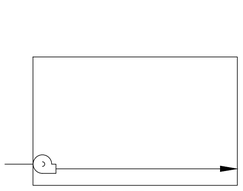


VAPOR/LIQUID, SEAL FLUID SEPARATOR

BAG FILTER



CARBON VESSEL



OXIDIZER

STANDARD, CONICAL-BOTTOM TANK

VIBRATION ISOLATOR

EQUIPMENT

- CENTRIFUGAL PUMP -
- PROGRESSIVE-CAVITY PUMP -
- CENTRIFUGAL, REGENERATIVE BLOWER -
- ROTARY-CLAW BLOWER -
- HEATER -
- MOTOR DRIVEN FAN - F
- ELECTRIC SUBMERSIBLE PUMP - P

EQUIPMENT

BLD - BUILDING, TRAILER OR SKID
FLT - FILTER VESSEL
LPC - LIQUID-PHASE CARBON VESSEL
MFD - MANIFOLD
OX - OXIDIZER
TNK - TANK
VLS - VAPOR/LIQUID SEPARATOR

FLOW MEASUREMENT

- AVERAGING PITOT TUBE - RANGE PDI 101 H L
- VENTURI - RANGE PDI 101 H L
- WATER FLOW METER - FQI 101
- DIGITAL WATER FLOW METER -

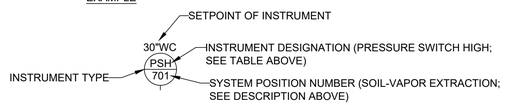
INSTRUMENT DESIGNATION

	INPUT	1st MODIFIER	2nd MODIFIER	3rd MODIFIER	OUTPUT	1st MODIFIER	
A			ALARM				A
B						BLOWER	B
C	CYCLE					COMPRESSOR	C
D		DIFFERENTIAL				AIR DRYER	D
E							E
F	FLOW					FAN	F
G	GAS (LEL)		GAUGE				G
H				HIGH	HAND	HEATER	H
I	CURRENT		INDICATOR				I
J							J
K							K
L	LEVEL			LOW			L
M					MOTORIZED		M
N							N
O							O
P	PRESSURE				PNEUMATIC	PUMP	P
Q		QUANTITY					Q
R							R
S	SPEED		SWITCH		SOLENOID		S
T	TEMPERATURE		TRANSMITTER				T
U							U
V						VALVE	V
W							W
X							X
Y							Y
Z	POSITION						Z

INSTRUMENT IDENTIFICATION

- INDICATING INSTRUMENT
- DIGITAL INPUT TO CONTROL PANEL
- DIGITAL INPUT CAUSING ALARM
- DIGITAL INPUT CAUSING SYSTEM SHUTDOWN ALARM
- ANALOG INPUT TO CONTROL PANEL
- ANALOG OUTPUT FROM CONTROL PANEL
- CRITICAL DEVICE

EXAMPLE



SYSTEM POSITION DESIGNATION

100 - VACUUM INLET MANIFOLD
400 - VAPOR/LIQUID SEPARATOR
500 - VAPOR/LIQUID SEPARATOR - 2
700 - SOIL-VAPOR EXTRACTION
1900 - OXIDIZER
2500 - SPARGE HEAT EXCHANGER
4000 - SUBMERSIBLE WELL PUMPS
4600 - GROUNDWATER INLET MANIFOLD
5500 - INLET TANK
6700 - PRE-CARBON BAG FILTER
7000 - LIQUID-PHASE CARBON
7900 - BUILDING,TRAILER OR SKID
8200 - CONTROL PANEL
8500 - ELECTRICAL PARTS
9900 - EXTRAS

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	5/10/18	FINAL AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	OE
1	3/1/18	AS-BUILT SYSTEM DESIGN SPECIFICATION	PC	SW
0	3/8/16	PRELIMINARY SYSTEM DESIGN SPECIFICATION	PC	SZ

Professional Engineer's Name: PETER J. CAMPBELL
Professional Engineer's No.: WA 45051

State	Date Signed	Project Mgr.
WA	5/10/18	SZ

Designed by	Drawn by	Checked by
PC	RO/VS	SW

PETER J CAMPBELL STATE OF WASHINGTON 45051 REGISTERED PROFESSIONAL ENGINEER Exp no 5/11/20

ARCADIS U.S., INC.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY ● FORMER UNOCAL EDMONDS BULK FUEL TERMINAL, EDMONDS, WASHINGTON
AS-BUILT SYSTEM DESIGN SPECIFICATION

DPE SYSTEM INSTRUMENT DESIGNATION

ARCADIS Project No.
B0045362.0011

Date
MAY 2018

ARCADIS
6723 Towpath Road, Box 66
Syracuse, NY 13214
Tel: 315-446-9120

P-3

APPENDIX B

Permits

Issuance Date: September 28, 2016
Effective Date: November 1, 2016
Expiration Date: October 31, 2021

National Pollutant Discharge Elimination System
Waste Discharge Permit No. WA0991007

State of Washington
DEPARTMENT OF ECOLOGY
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1342 et seq.

Former Unocal Edmonds Bulk Terminal
Chevron Environmental Management Company
6001 Bollinger Canyon Road
San Ramon, CA 94583

is authorized to discharge in accordance with the Special and General Conditions that follow.

Facility Location:
11720 Unoco Road
Edmonds, WA 98020

Excavation Activities:
Collection tank, chitosan injection, sand filtration, and GAC beds.

Dual-phase Extraction System:
Sediment settling tank, equalization tank, bag filter, and GAC beds.

Receiving Water:
Willow Creek, which ultimately discharges to Puget Sound

Discharge Locations:
Outfall 002 : Latitude: 47.80698°N
Longitude: 122.389484°W

SIC Code:
4959, Groundwater Site Remediation Devices

Kevin C. Fitzpatrick
Water Quality Section Manager
Northwest Regional Office
Washington State Department of Ecology

Table of Contents

Summary of Permit Report Submittals

Refer to the Special and General Conditions of this permit for additional submittal requirements.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A	Discharge Monitoring Report	Monthly	December 28, 2016
S3.E	Reporting Permit Violations	As necessary	
S3.F	Other Reporting	As necessary	
S4.A	Updated Operations and Maintenance Manual	1/permit cycle, updates submitted as necessary	March 31, 2017
S4.B	Reporting Bypasses	As necessary	
S5	Application for Permit Renewal	1/permit cycle	April 30, 2021
S6	Annual Groundwater Quality Evaluation	Annually	November 1, 2017
G1	Notice of Change in Authorization	As necessary	
G4	Permit Application for Substantive Changes to the Discharge	As necessary	
G5	Engineering Report for Construction or Modification Activities	As necessary	
G7	Notice of Permit Transfer	As necessary	
G10	Duty to Provide Information	As necessary	
G13	Payment of Fees	As assessed	
G21	Compliance Schedules	As necessary	

Special Conditions

S1. Discharge limits

S1.A. Treated groundwater discharge

All discharges and activities authorized by this permit must be consistent with the terms and conditions of this permit.

The discharge of any of the following pollutants more frequently than, or at a level in excess of that identified and authorized by this permit violates the terms and conditions of this permit.

Beginning on the effective date of this permit, the Permittee is authorized to discharge treated groundwater to Willow Creek at Outfall 002 subject to complying with the following limits:

Effluent Limitations at Point of Compliance (after treatment): Monitoring Point 2 Latitude: 47.80698°N Longitude: 122.389484°W	
Parameter	**Maximum Daily Effluent Limit [a]**
Flow1 (dewatering from excavation, DE1)	15 gpm
Flow2 (from Dual Phase Extraction, DPE)	100 gpm
pH	Between 6 and 9 standard units
Benzene	16 µg/L
TPH-G [b]	800 µg/L
TPH-D [c]	500 µg/L
Total cPAHs [d]	0.00013 µg/L [e]
Chitosan Acetate	0.2 mg/L
[a] The maximum daily effluent limitation is defined as the highest allowable daily discharge except for pH and Dissolved Oxygen. The daily discharge means the discharge of a pollutant measured during a calendar day.	
[b] TPH-G is defined as total petroleum hydrocarbons-gasoline range organics.	
[c] TPH-D is defined as total petroleum hydrocarbons-diesel range organics.	
[d] cPAHs means carcinogenic polycyclic aromatic hydrocarbons. Total cPAHs is the sum of benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene concentrations that are adjusted using toxicity equivalency factors to represent a total benzo(a)pyrene concentration. The toxicity equivalency factors published in WAC 173-340-900, Table 708-2 are to be used for making the adjustments.	
[e] The daily maximum effluent limit for total cPAHs is 0.00013 µg/L. The quantitation level (QL) for PAHs is 0.05 µg/L, greater than the effluent limit, using the approved analytical test method EPA 625. Therefore, the QL will be used for assessment of compliance with the effluent limit. This QL will be referred to as enforcement limit in this permit.	

S2. Monitoring requirements

S2.A. Monitoring schedule

The Permittee must monitor the wastewater according to the following schedule. The Permittee must use the specified analytical methods unless the method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136. If the Permittee uses an alternative method, not specified in the permit, it must report the test method, Detection Limit (DL), and Quantitation Level (QL) on the discharge monitoring report or in the required report. If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit and a QL to Ecology with appropriate laboratory documentation.

Parameter [b]	Units	Minimum Sampling Frequency	Sample Type	Analytical Method
Flow1 (dewatering from excavation, DE1)	gpm	Batch	Metered	N/A
Flow2 (from Dual Phase Extraction, DPE)	gpm	Weekly	Metered	N/A
pH	Standard Units	Weekly	Grab	pH meter [a]
Chitosan acetate [d]	µg/L	Weekly	Grab	Chitosan Field Screening Test (must show concentration below 0.2 mg/L)
Benzene	µg/L	Weekly	Grab	**EPA 624 (with DL and QL less than 1 µg/L)**
TPH-G	µg/L	Weekly	Grab	NWTPH-G_x
TPH-D	µg/L	Weekly	Grab	NWTPH-Dx
cPAH	µg/L	Weekly	Grab	**EPA 625 (with DL and QL equal to or less than 0.05 µg/L) [c]**
Benzo(a)anthracene	µg/L	Weekly	Grab	**EPA 625 (with DL and QL equal to or less than 0.05 µg/L) [c]**
Benzo(b)fluoranthene	µg/L	Weekly	Grab	**EPA 625 (with DL and QL equal to or less than 0.05 µg/L) [c]**
Benzo(k)fluoranthene	µg/L	Weekly	Grab	**EPA 625 (with DL and QL equal to or less than 0.05 µg/L) [c]**
Chrysene	µg/L	Weekly	Grab	**EPA 625 (with DL and QL equal to or less than 0.05 µg/L) [c]**
Benzo(a)pyrene	µg/L	Weekly	Grab	**EPA 625 (with DL and QL equal to or less than 0.05 µg/L) [c]**
Dibenzo(a,h)anthracene	µg/L	Weekly	Grab	**EPA 625 (with DL and QL equal to or less than 0.05 µg/L) [c]**
Indeno(1,2,3-c,d)pyrene	µg/L	Weekly	Grab	**EPA 625 (with DL and QL equal to or less than 0.05 µg/L) [c]**

[a] pH can be measured using a pH meter in the field, equivalent to SM4500-H^+B. The calibration frequency specifications and method must be followed in accordance with the manufacturer's recommendations.

[b] The final effluent sample point is defined as the nearest accessible point after final treatment and prior to discharge to Willow Creek.

[c] The approved analytical test methods for benzene and cPAHs are EPA 624 and EPA 625, respectively. The detection limit and quantitative level for benzene ***must be less than 1 µg/L***, and the detection limit and quantitative level for cPAHs ***must be equal to or less than 0.05 µg/L*** , for each component.

[d] Chitosan-enhanced sand filtration technologies and use designations are also listed in Ecology website http://www.ecy.wa.gov/programs/wq/stormwater/newtech/technologies.html

S2.B. Sampling and analytical procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions affecting effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136 (or as applicable in 40 CFR subchapters N [Parts 400–471] or O [Parts 501-503]) unless otherwise specified in this permit. Ecology may only specify alternative methods for parameters without limits and for those parameters without an EPA approved test method in 40 CFR Part 136.

S2.C. Laboratory accreditation

The Permittee must ensure that all monitoring data required by Ecology for permit-specified parameters is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories*. Flow, temperature, settleable solids, conductivity, pH, chitosan acetate, and internal process control parameters are exempt from this requirement.

S3. Reporting and recording requirements

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

S3.A. Reporting

The first monitoring period begins on the effective date of the permit. The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on the electronic Discharge Monitoring Report (DMR) form provided by Ecology within WAWebDMR. Include data for each of the parameters tabulated in Special Condition S2 and as required by the form. Report a value for each day sampling occurred (unless specifically exempted in the permit) and for the summary values (when applicable) included on the electronic form.

   To find out more information and to sign up for WAWebDMR go to: http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html

   If unable to submit electronically (for example, if you do not have an internet connection), the Permittee must contact Ecology to request a waiver and obtain instructions on how to obtain a paper copy DMR.

2. Enter the "no discharge" reporting code for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate, if the Permittee did not discharge wastewater or a specific pollutant during a given monitoring period.

3. Report single analytical values below the detection level as "less than the detection level (DL) by entering " <" followed by the numeric value of the detection level (e.g. "< 2.0") on the DMR. If the method used did not meet the minimum DL and quantitation level (QL) identified in the permit, report the actual QL and DL in the comments or in the location provided.
4. Report the test method used for analysis in the comments if the laboratory used an alternative method not specified in the permit and as allowed in S2.
5. Calculate average values (unless otherwise specified in the permit) using:
   a. The reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value.
   b. One-half the detection value (for values reported below detection) if the laboratory detected the parameter in another sample for the reporting period.
   c. Zero (for values reported below the detection level) if the laboratory did not detect the parameter in another sample for the reporting period.
6. If the Permittee has obtained a waiver from electronic reporting or if submitting prior to the compliance date, the Permittee must submit a paper copy of the laboratory report providing the following information: date sampled, sample location, date of analysis, parameter name, CAS number, analytical method/number, detection level (DL), laboratory quantitation level (QL), reporting units, and concentration detected.

   The contract laboratory reports must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.
7. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.
8. Submit DMRs for parameters with the monitoring frequencies specified in S2 at the reporting schedule identified below. The Permittee must:
   a. Submit **monthly** DMRs by the 28th day of the following month.
9. Submit reports to Ecology online using Ecology's electronic WAWebDMR submittal forms (electronic DMRs) as required above. Send paper reports to Ecology at:

   Water Quality Permit Coordinator
   Department of Ecology
   Northwest Regional Office
   3190 - 160th Avenue SE
   Bellevue, WA 98008-5452

S3.B. Records retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

S3.C. Recording of results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement.
2. The individual who performed the sampling or measurement.
3. The dates the analyses were performed.
4. The analytical techniques or methods used.
5. The results of all analyses.

S3.D. Additional monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Special Condition S2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR unless otherwise specified by Special Condition S2.

S3.E. Reporting permit violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.
2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

a. Twenty-four-hour reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at (425) 649-7078, within 24 hours from the time the Permittee becomes aware of any of the following circumstances:

1. Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.
2. Any unanticipated bypass that causes an exceedance of any effluent limit in the permit (See Part S4.B., "Bypass Procedures").
3. Any upset that causes an exceedance of an effluent limit in the permit (See G.15, "Upset").
4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.
5. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limit in the permit.

b. Report within five days

The Permittee must also submit a written report within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above. The report must contain:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times, if known.
3. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.
4. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
5. If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

c. Waiver of written reports

Ecology may waive the written report required in S3.E.c, above, on a case-by-case basis upon request if the Permittee has submitted a timely oral report.

d. All other permit violation reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hour reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in S3.E.c, above. Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

S3.F. Other reporting

1. Spills of oil or hazardous materials

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280 and chapter 173-303-145. The Permittee can obtain further instructions at the following website: http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm .

2. Failure to submit relevant or correct facts

When the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to Ecology, it must submit such facts or information promptly.

S3.G. Maintaining a copy of this permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S4. Operation and maintenance

The Permittee must, at all times, properly operate and maintain all facilities or systems of treatment and control (and related appurtenances), which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes keeping a daily operation logbook (paper or electronic), adequate laboratory controls, and appropriate quality assurance procedures. This provision of the permit requires the Permittee to operate backup or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of this permit.

The Permittee must schedule any facility maintenance, which might require interruption of wastewater treatment and degrade effluent quality, during non-critical water quality periods and carry this maintenance out in a manner approved by Ecology.

S4.A. Operations and maintenance (O&M) manual

1. O&M manual submittal and requirements

The Permittee must:

a. Prepare the O&M Manual that meets the requirements of 173-240-150 WAC and submit it to Ecology for review by March 31, 2017. The Permittee must submit a paper copy and an electronic copy (preferably in a portable document format (PDF)).

b. Review the O&M Manual at least annually and update the manual as needed.

c. Submit to Ecology for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual. The Permittee must submit a paper copy and an electronic copy (preferably as a PDF).

d. Keep the approved O&M Manual at the permitted facility.

e. Follow the instructions and procedures of this manual.

2. O&M manual components

In addition to the requirements of WAC 173-240-150, the O&M Manual must include:

a. Emergency procedures for plant shutdown and cleanup in the event of a wastewater system upset or failure.

b. A review of system components which in the event of failure could pollute surface water or could impact human health. Provide a procedure for a routine schedule for checking the function of these components.

c. Wastewater system maintenance procedures related to the generation of process wastewater.

d. Any directions to maintenance staff when cleaning, or maintaining other equipment or performing other tasks which are necessary to protect the operation of the wastewater system (for example, defining maximum allowable discharge rate for draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine.)

e. Wastewater sampling protocols and procedures for compliance with the sampling and reporting requirements in the wastewater discharge permit.

f. Specification for minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.

g. Treatment plant process control monitoring schedule.

h. Specify other items on case-by-case basis such as O&M for any pump stations, lagoon liners, etc.

3. Treatment system operating plan

The Permittee must summarize the following information in the initial chapter of the O&M Manual entitled the "Treatment System Operating Plan." For the purposes of this permit, a Treatment System Operating Plan (TSOP) is a concise summary of specifically defined elements of the O&M Manual.

The TSOP must not conflict with the O&M Manual and must include the following information:

a. A baseline operating condition, which describes the operating parameters and procedures, used to meet the effluent limits of S1 at the production levels used in developing these limits.

b. In the event of production rates, which are below the baseline levels used to establish these limits, the plan must describe the operating procedures and conditions needed to maintain design treatment efficiency. The monitoring and reporting must be described in the plan.

c. In the event of an upset, due to plant maintenance activities, severe stormwater events, startups or shut downs, or other causes, the plan must describe the operating procedures and conditions employed to mitigate the upset. The monitoring and reporting must be described in the plan.

d. A description of any regularly scheduled maintenance or repair activities at the facility which would affect the volume or character of the wastes discharged to the wastewater treatment system and a plan for monitoring and treating/controlling the discharge of maintenance-related materials (such as cleaners, degreasers, solvents, etc.).

This plan must be updated and submitted, as necessary, to include requirements for any major modifications of the treatment system.

S4.B. Bypass procedures

This permit prohibits a bypass, which is the intentional diversion of waste streams from any portion of a treatment facility.

Ecology may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   This permit authorizes a bypass if it allows for essential maintenance and does not have the potential to cause violations of limits or other conditions of this permit, or adversely impact public health as determined by Ecology prior to the bypass. The Permittee must submit prior notice, if possible, at least ten (10) days before the date of the bypass.

2. Bypass is unavoidable, unanticipated, and results in noncompliance of this permit.

   This permit authorizes such a bypass only if:

   a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

   b. No feasible alternatives to the bypass exist, such as:
      - The use of auxiliary treatment facilities.
      - Retention of untreated wastes.
      - Stopping production.
      - Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass.
      - Transport of untreated wastes to another treatment facility or preventative maintenance, or transport of untreated wastes to another treatment facility.

   c. The Permittee has properly notified Ecology of the bypass as required in Special Condition S3.E of this permit.

3. If bypass is anticipated and has the potential to result in noncompliance of this permit.

   a. The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain:
      - A description of the bypass and its cause.
      - An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.

- A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
- The minimum and maximum duration of bypass under each alternative.
- A recommendation as to the preferred alternative for conducting the bypass.
- The projected date of bypass initiation.
- A statement of compliance with SEPA.
- A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedance of any water quality standard is anticipated.
- Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during preparation of the engineering report or facilities plan and plans and specifications and must include these to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.

c. Ecology will consider the following prior to issuing an administrative order for this type of bypass:

- If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.
- If feasible alternatives to bypass exist, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.
- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve or deny the request. Ecology will give the public an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Ecology will approve a request to bypass by issuing an administrative order under RCW 90.48.120.

S5. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this permit by April 30, 2021. The Permittee must submit a paper copy and an electronic copy (preferably as a PDF).

The Permittee must also submit a new application or supplement at least sixty (60) days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

S6. Annual groundwater quality evaluation

The Permittee must submit a groundwater quality report to Ecology by November 1, 2017, and annually thereafter. The report must include, but is not limited to, the following:

- A discussion and evaluation of the effectiveness of the groundwater remediation system.
- The data should be presented on drawings by mapping the distribution (sample date and measured concentration) in groundwater for each containment. One map for each containment should be presented.
- The groundwater quality data for TPH-GRO, TPH-DRO, TPH-HO, cPAHs, and benzene concentrations collected during the previous calendar year from wells distributed across the site.
- The volume of groundwater pumped through the groundwater treatment plant.
- A plan view of monitoring well locations.

For the purpose of meeting this requirement, groundwater quality monitoring and reporting results required by the Agreed Order may be submitted.

S7. Stormwater Pollution Prevention Plan

The Permittee must prepare and properly implement an adequate Stormwater Pollution Prevention Plan (SWPPP) for construction activity in accordance with the requirements of this permit beginning with initial soil disturbance and until final stabilization. A copy of the SWPPP must be kept on-site and made available for geology inspector.

S7.A. The Permittee's SWPPP must meet the following objectives:

1. To implement best management practices (BMPs) to prevent erosion and sedimentation, and to identify, reduce, eliminate, or prevent stormwater contamination and water pollution from construction activity. BMPs are listed in the *Stormwater Management Manual for Western Washington* (most recent edition).
2. To prevent violations of surface water quality, ground water quality, or sediment management standards.
3. To control peak volumetric flow rates and velocities of stormwater discharges.

S7.B. General requirements

1. The SWPPP must include a narrative and drawings. All BMPs must be clearly referenced in the narrative and marked on the drawings. The SWPPP narrative must include documentation to explain and justify the pollution prevention decisions made for the project. Documentation must include:
   a. Information about existing site conditions (topography, drainage, soils, vegetation, etc.).
   b. Potential erosion problem areas.
   c. The actions to be taken if BMP performance goals are not achieved, for example, a contingency plan for additional treatment and/or storage of stormwater that would violate the water quality standards if discharged.
   d. Document BMP implementation and maintenance in the site logbook.

   The Permittee must modify the SWPPP whenever there is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

S7.C. SWPPP – Narrative contents and requirements

The Permittee must include each of the elements below in the narrative of the SWPPP and implement them unless site conditions render the element unnecessary and the exemption from that element is clearly justified in the SWPPP.

1. Preserve Vegetation/Mark Clearing Limits
   a. Before beginning land-disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area.
   b. Retain the duff layer, native top soil, and natural vegetation in an undisturbed state to the maximum degree practicable.
2. Establish Construction Access
   a. Limit construction vehicle access and exit to one route, if possible.
   b. Stabilize access points with a pad of quarry spalls, crushed rock, or other equivalent BMPs, to minimize tracking sediment onto roads.
   c. Locate wheel wash or tire baths on-site, if the stabilized construction entrance is not effective in preventing tracking sediment onto roads.
   d. If sediment is tracked off-site, clean the affected roadway thoroughly at the end of each day, or more frequently as necessary (for example, during wet weather). Remove sediment from roads by shoveling, sweeping, or pickup and transport of the sediment to a controlled sediment disposal area.
   e. Conduct street washing only after sediment removal. Control street wash wastewater by pumping back on-site or otherwise preventing it from discharging into systems tributary to waters of the State.

3. Control Flow Rates

   a. Protect properties and waterways downstream of development sites from erosion and the associated discharge of turbid waters due to increases in the velocity and peak volumetric flow rate of stormwater runoff from the project site, as required by local plan approval authority.

4. Install Sediment Controls

   The Permittee must design, install, and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants. At a minimum, the Permittee must design, install, and maintain such controls to:

   a. Construct sediment control BMPs (sediment ponds, traps, filters, etc.) as one of the first steps in grading. These BMPs must be functional before other land disturbing activities take place.

   b. Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.

   c. Direct stormwater runoff from disturbed areas through a sediment pond or other appropriate sediment removal BMP, before the runoff leaves a construction site or before discharge to an infiltration facility.

5. Stabilize Soils

   a. The Permittee must stabilize exposed and unworked soils by application of effective BMPs that prevent erosion. Applicable BMPs include, but are not limited to, temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base on areas to be paved, and dust control.

   b. The Permittee must control stormwater volume and velocity within the site to minimize soil erosion.

   c. The Permittee must control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.

   d. The Permittee must stabilize soils at the end of the shift before a holiday or weekend if needed based on the weather forecast.

   e. The Permittee must stabilize soil stockpiles from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

   f. The Permittee must minimize the amount of soil exposed during construction activity.

   g. The Permittee must minimize the disturbance of steep slopes.

h. The Permittee must minimize soil compaction and, unless infeasible, preserve topsoil.

6. Protect Drain Inlets

a. Protect all storm drain inlets made operable during construction so that stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment.

b. Clean or remove and replace inlet protection devices when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer).

7. Control Pollutants

Design, install, implement, and maintain effective pollution prevention measures to minimize the discharge of pollutants. The Permittee must:

a. Handle and dispose of all pollutants, including waste materials and demolition debris that occur on-site in a manner that does not cause contamination of stormwater.

b. Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the volume contained in the largest tank within the containment structure. Double-walled tanks do not require additional secondary containment.

c. Conduct maintenance, fueling, and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident.

d. Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, such as closed-loop recirculation or upland land application, or to the sanitary sewer with local sewer district approval.

e. Apply fertilizers and pesticides in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Follow manufacturers' label requirements for application rates and procedures.

f. Use BMPs to prevent contamination of stormwater runoff by pH-modifying sources. The sources for this contamination include, but are not limited to, bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping and mixer washout waters. (Also refer to the definition for "concrete wastewater" in Appendix A--Definitions.)

g. Adjust the pH of stormwater if necessary to prevent violations of water quality standards.

h. Assure that washout of concrete trucks is performed off-site or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams. Do not dump excess concrete on-site, except in designated concrete washout areas. Concrete spillage or concrete discharge to surface waters of the State is prohibited.

i. Obtain written approval from Ecology before using chemical treatment other than CO_2 or dry ice to adjust pH.

8. Control Dewatering

a. Permittees may discharge clean, non-turbid dewatering water, such as well-point ground water, to systems tributary to, or directly into surface waters of the State provided the dewatering flow does not cause erosion or flooding of receiving waters. Do not route clean dewatering water through stormwater sediment ponds. Note that "surface waters of the State" may exist on a construction site as well as off-site; for example, a creek running through a site.

b. Other treatment or disposal options may include:

i. Infiltration.

ii. Transport off-site in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters.

iii. Ecology-approved on-site chemical treatment or other suitable treatment technologies.

iv. Sanitary or combined sewer discharge with local sewer district approval, if there is no other option.

v. Use of a sedimentation bag with discharge to a ditch or swale for small volumes of localized dewatering.

c. Permittees must handle highly turbid or contaminated dewatering water separately from stormwater.

9. Maintain BMPs

a. Permittees must maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to assure continued performance of their intended function in accordance with BMP specifications.

b. Permittees must remove all temporary erosion and sediment control BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.

S7.D. SWPPP – Map contents and requirements

The Permittee's SWPPP must also include a vicinity map or general location map (for example, a USGS quadrangle map, a portion of a county or city map, or other appropriate map) with enough detail to identify the location of the construction site and receiving waters within one mile of the site.

The SWPPP must also include a legible site map (or maps) showing the entire construction site. The following features must be identified, unless not applicable due to site conditions:

1. The direction of north, property lines, and existing structures and roads.
2. Cut and fill slopes indicating the top and bottom of slope catch lines.
3. Approximate slopes, contours, and direction of stormwater flow before and after major grading activities.
4. Areas of soil disturbance and areas that will not be disturbed.
5. Locations of structural and nonstructural controls (BMPs) identified in the SWPPP.
6. Locations of off-site material, stockpiles, waste storage, borrow areas, and vehicle/equipment storage areas.
7. Locations of all surface water bodies, including wetlands.
8. Locations where stormwater or non-stormwater discharges off-site and/or to a surface water body, including wetlands.
9. Location of water quality sampling station(s), if sampling is required by state or local permitting authority.
10. Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

General Conditions

G1. Signatory requirements

1. All applications, reports, or information submitted to Ecology must be signed and certified.

   a. In the case of corporations, by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

   - A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or
   - The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
   - In the case of a partnership, by a general partner.
   - In the case of sole proprietorship, by the proprietor.
   - In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

   Applications for permits for domestic wastewater facilities that are either owned or operated by, or under contract to, a public entity must be submitted by the public entity.

2. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to Ecology.

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph G1.2, above, is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph G1.2, above, must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section must make the following certification:

   "I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G2. Right of inspection and entry

The Permittee must allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law:

1. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit.
2. To have access to and copy, at reasonable times and at reasonable cost, any records required to be kept under the terms and conditions of this permit.
3. To inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.
4. To sample or monitor, at reasonable times, any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G3. Permit actions

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person (including the Permittee) or upon Ecology's initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

1. The following are causes for terminating this permit during its term, or for denying a permit renewal application:
   a. Violation of any permit term or condition.
   b. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.
   c. A material change in quantity or type of waste disposal.
   d. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination.

e. A change in any condition that requires either a temporary or permanent reduction, or elimination of any discharge or sludge use or disposal practice controlled by the permit.

f. Nonpayment of fees assessed pursuant to RCW 90.48.465.

g. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.

2. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:

a. A material change in the condition of the waters of the state.

b. New information not available at the time of permit issuance that would have justified the application of different permit conditions.

c. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.

d. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.

e. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.

f. Ecology has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.

g. Incorporation of an approved local pretreatment program into a municipality's permit.

3. The following are causes for modification or alternatively revocation and reissuance:

a. When cause exists for termination for reasons listed in 1.a through 1.g of this section, and Ecology determines that modification or revocation and reissuance is appropriate.

b. When Ecology has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer (General Condition G7) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. Reporting planned changes

The Permittee must, as soon as possible, but no later than one hundred eighty (180) days prior to the proposed changes, give notice to Ecology of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in:

1. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b).

2. A significant change in the nature or an increase in quantity of pollutants discharged.

3. A significant change in the Permittee's sludge use or disposal practices. Following such notice, and the submittal of a new application or supplement to the existing application, along with required engineering plans and reports, this permit may be

modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G5. Plan review required

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with chapter 173-240 WAC. Engineering reports, plans, and specifications must be submitted at least one hundred eighty (180) days prior to the planned start of construction unless a shorter time is approved by Ecology. Facilities must be constructed and operated in accordance with the approved plans.

G6. Compliance with other laws and statutes

Nothing in this permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. Transfer of this permit

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which must be forwarded to Ecology.

1. Transfers by Modification

   Except as provided in paragraph (2) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

2. Automatic Transfers

   This permit may be automatically transferred to a new Permittee if:

   a. The Permittee notifies Ecology at least thirty (30) days in advance of the proposed transfer date.

   b. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.

   c. Ecology does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G8. Reduced production for compliance

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. Removed substances

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. Duty to provide information

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. Other requirements of 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. Additional monitoring

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology.

G14. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof must punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit may incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. Upset

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the Permittee can identify the cause(s) of the upset.
2. The permitted facility was being properly operated at the time of the upset.
3. The Permittee submitted notice of the upset as required in Special Condition S3.E.
4. The Permittee complied with any remedial measures required under S3.E of this permit.

In any enforcement action the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. Property rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. Toxic pollutants

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. Penalties for tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two (2) years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment must a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

G20. Reporting requirements applicable to existing manufacturing, commercial, mining, and silvicultural dischargers

The Permittee belonging to the categories of existing manufacturing, commercial, mining, or silviculture must notify Ecology as soon as they know or have reason to believe:

1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in this permit, if that discharge will exceed the highest of the following "notification levels:"
   a. One hundred micrograms per liter (100 µg/L).
   b. Two hundred micrograms per liter (200 µg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony.
   c. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7).
   d. The level established by the Director in accordance with 40 CFR 122.44(f).
2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in this permit, if that discharge will exceed the highest of the following "notification levels:"
   a. Five hundred micrograms per liter (500 µg/L).
   b. One milligram per liter (1 mg/L) for antimony.
   c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7).
   d. The level established by the Director in accordance with 40 CFR 122.44(f).

G21. Compliance schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than fourteen (14) days following each schedule date.

Fact Sheet for NPDES Permit WA0991007

Former Unocal Edmonds Bulk Terminal

Effective Date: November 1, 2016

Purpose of this fact sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for Former Unocal Edmonds Bulk Fuel Terminal No. 0178, in Edmonds, WA.

This fact sheet complies with Section 173-220-060 of the Washington Administrative Code (WAC), which requires Ecology to prepare a draft permit and accompanying fact sheet for public evaluation before issuing an NPDES permit.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for former Unocal Edmonds Bulk Terminal No. 0178 (Chevron Environmental Management Company assumes the responsibility for this cleanup site), NPDES permit WA0991007, were available for public review and comment from August 5, 2016, to September 6, 2016. For more details on preparing and filing comments about these documents, please see *Appendix A – Public Involvement Information.*

Chevron Environmental Management Company (Chevron) has reviewed the draft permit and fact sheet for factual accuracy. Ecology has corrected any errors or omissions regarding the facility's location, history, discharges, or receiving water prior to publishing this draft fact sheet for public notice.

After the public comment period closes, Ecology will summarize substantive comments and provide responses to them.

Summary

Chevron is proposing to conduct remedial cleanup activities to clean up petroleum contamination at the former Unocal Edmonds site beginning late 2016. Cleanup will consist of excavation of Detention Basin 2, and operation of a dual-phase extraction system to clean up contaminated groundwater, soil, and soil vapor in the area along a Washington State Department of Transportation (WSDOT) stormwater pipe which crosses the site. Past and current interim action cleanup activities and groundwater monitoring are being conducted at the site under Agreed Order No. DE 4460 with Ecology's Toxic Cleanup Program.

The treated excavation dewatering water and groundwater will be discharged through Outfall 002 to Willow Creek. The treatment system for the soil excavation activity and the dual phase extraction system is designed to operate at a maximum flow rate of 15 gpm, and 100 gpm, respectively.

The parameters proposed for the discharge include flow, pH, Benzene, TPH-G, TPH-D, and Total cPAH (consists of seven specific congeners). Chevron monitors for these pollutants under the Agreed Order.

Treated soil vapor will be discharged to the atmosphere under a Puget Sound Clean Air Agency permit.

Table of Contents

I. Introduction

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the state of Washington to manage the NPDES permit program in our state. Washington State legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The Legislature defined Ecology's authority and obligations for administration of the wastewater discharge permit program in 90.48 RCW (Revised Code of Washington).

The following regulations apply to industrial NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (Chapter 173-220 WAC).
- Water quality criteria for surface waters (Chapter 173-201A WAC).
- Water quality criteria for ground waters (Chapter 173-200 WAC).
- Whole effluent toxicity testing and limits (Chapter 173-205 WAC).
- Sediment management standards (Chapter 173-204 WAC).
- Submission of plans and reports for construction of wastewater facilities (Chapter 173-240 WAC).

These rules require any industrial facility owner/operator to obtain an NPDES permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for performance requirements imposed by the permit.

Under the NPDES permit program and in response to a completed and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days (WAC 173-220-050). (See *Appendix A – Public Involvement Information* for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft NPDES permit in response to comment(s). Ecology will summarize the responses to comments and any changes to the permit in *Appendix E.*

II. Background Information

Table 1. General facility information

Facility information	
Applicant	Chevron Environmental Management Company
Facility name and location	Former Unocal Edmonds Bulk Fuel Terminal No. 0178 Edmonds, WA
Contact at facility	Name: Kim Jolitz Project Manager Telephone #: (925) 842-4707
Industry type	Soil Excavation, and Groundwater Extraction and Treatment
Type of treatment	Chitosan Polymer, sand filtration, granular activated carbon, and dual-phase pump and treat system for the groundwater
SIC code	4959, Groundwater Site Remediation Devices
Facility location (NAD83/WGS84 reference datum)	Latitude: 47.806263°N Longitude: 122. 389455°W
Discharge waterbody name and location (NAD83/WGS84 reference datum)	Willow Creek Outfall 002: Latitude: 47. 806976°N Longitude: 122.274722°W

Permit Status	
Application for permit submittal date	April 6, 2015
Date of Ecology acceptance of application	July 17, 2015

Inspection Status	
Date of last non-sampling inspection	July 16, 2015

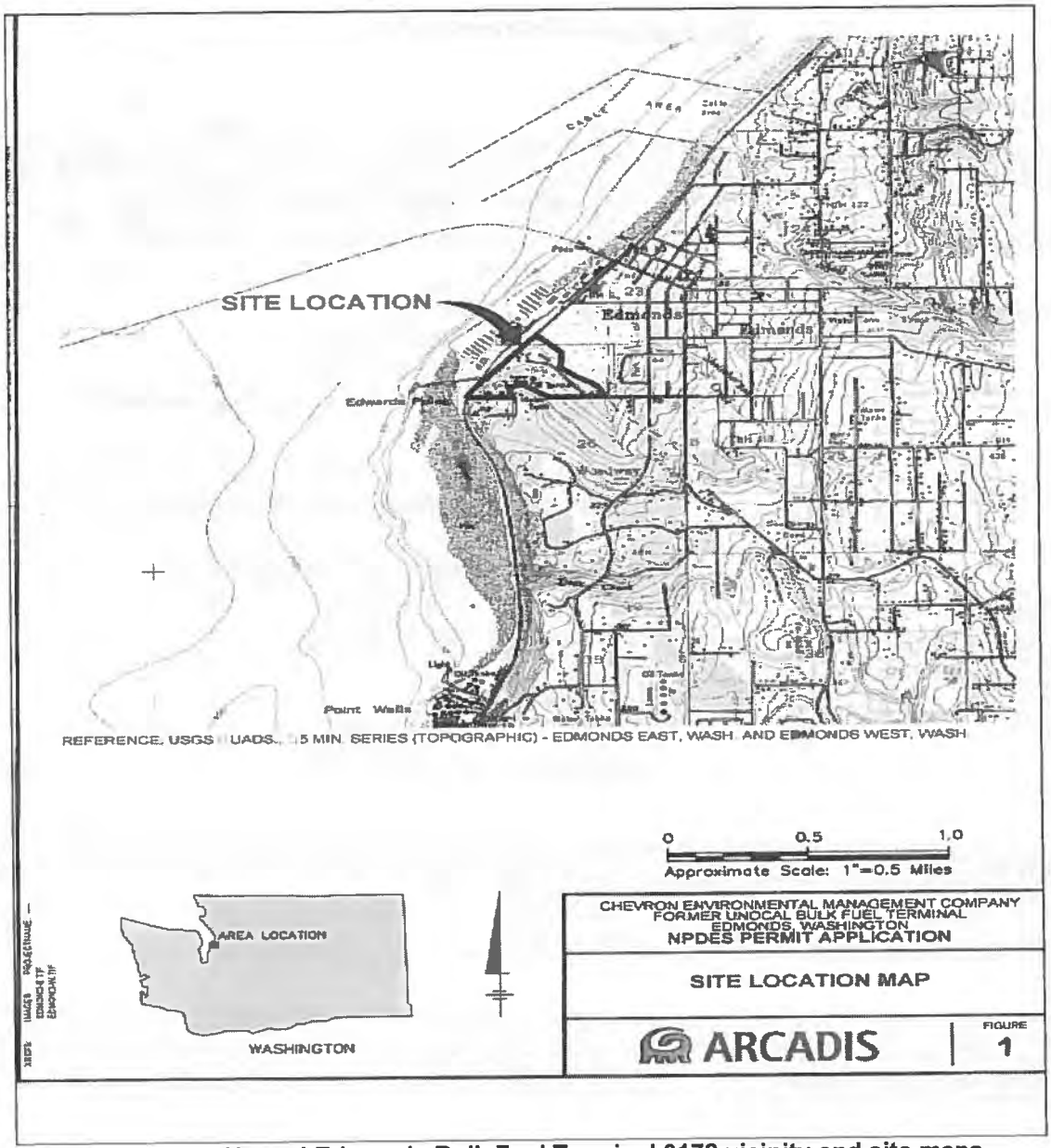


Figure 1. Former Unocal Edmonds Bulk Fuel Terminal 0178 vicinity and site maps

A. Facility description

Background

Unocal operated the terminal from 1923 to 1991 at the site. Historical operations at the site conducted by Unocal included storage and distribution of petroleum products, including gasoline, diesel fuel, and bunker fuel. An asphalt plant was also operated on the site between 1953 and the late 1970s. The terminal consisted of a dock and an Upper and a Lower Yard. Petroleum products were pumped from marine vessels moored at the dock to storage tanks in the Upper Yard, which was on a hill above the Lower Yard. Products were gravity-fed and pumped to loading racks in the Lower Yard for transport by truck and train to customers.

Chevron completed purchase of Unocal Corporation in 2005 and has assumed responsibility for cleanup activities for this former Unocal Edmonds terminal.

Cleanup actions and site investigations have been ongoing at this site since 1994. In 1993, Unocal entered into Agreed Order No. DE-92TC-N828, which was superseded in 2007 by Agreed Order No. DE 4460. In accordance with the 2007 Agreed Order. Unocal conducted interim action cleanup activities at the Upper and Lower Yards. Details of these cleanup activities completed in 2007/2008 have been documented in the Interim Action Work Plan (ARCADIS 2014).

Cleanup remediation has been completed in the Upper Yard. Ecology certified the Upper Yard to be suitable for residential use in 2003 and the Point Edwards Condominiums were subsequently constructed.

The remaining areas of contamination include the stormwater Detention Basin 2 area and the vicinity of a Washington State Department of Transportation (WSDOT) storm drain crossing the site in the Lower Yard.

Detention Basins (DB) 1 and 2, and WSDOT stormwater line

This site has two stormwater detention basins (DB-1 and DB-2). They are located in the northern part of the Lower Yard. Stormwater collected on-site is drained into DB-2 by means of gravity flow. DB-2 serves as a stormwater collection area, which drains into Willow Creek via Outfall 002.

DB-1 serves as a retention pond for overflow from DB-2 during storm events. DB-1 is an unlined pond with an aboveground pump and a piping system connected to Outfall 002 on the bank of Willow Creek. DB-2 has an impermeable liner, two submersible pumps, and a piping system to the DB-2 Outfall.

The WSDOT stormwater line runs across the Lower Yard, along lower Unoco Road and out to Puget Sound. During the 2007/2008 interim action excavation activities, the soil along the WSDOT stormwater line was found to exceed the cleanup levels. However, the contaminated area was unable to be excavated without compromising the integrity of the line. Polyethylene sheeting was left in place to demarcate the excavation limits adjacent to the WSDOT stormwater line.

Proposed remediation work

Chevron proposes to remove petroleum-contaminated soil in the area of DB-2 and haul it off-site for disposal. Soil excavation is expected to result in cleanup of groundwater. This excavation activity will include placing temporary dams in Willow Creek to protect it during excavation. Following excavation, the coffer dams will be removed and Willow Creek will be restored to its original stream bed.

Contaminated water produced from the excavations will be treated and discharged to Willow Creek.

Petroleum-contaminated soil and groundwater in the WSDOT storm drain vicinity will be cleaned up by a Dual-Phase Extraction system. Extraction wells will be used to pump contaminated water and vapor for treatment and discharge. Water will be treated and discharged to Willow Creek.

All wastewater produced during these cleanup activities will be discharged to Willow Creek, and regulated by the National Pollutant Discharge Elimination System (NPDES) Permit. Soil vapor will be treated and discharged to the atmosphere under a Puget Sound Clean Air Agency permit.

The cleanup of Detention Basin 2 area is expected to occur in the summer of 2017. It will require heavy equipment to excavate the soil and trucks to haul excavated soil away. Air monitoring and dust control measures will be performed.

The Dual-Phase Extraction System installation is expected to begin in late 2016. Drill rigs will be employed to install extraction wells, conveyance piping will be laid, and an equipment building will be brought onsite. The system is expected to operate for about six years.

Pollutants of concern

The pollutants expected to be present in the water generated from the excavation include total petroleum hydrocarbons (TPHs), total carcinogenic polycyclic aromatic hydrocarbons (cPAHs), benzene, and pH.

Wastewater treatment system

DB-2 area excavation: The treatment for dewatering water generated during excavation activities for DB-2 includes collecting and storing recovered water in a holding tank. From the holding tank, water will be treated with chitosan polymer, followed by sand filtration to remove entrained solids, then with granular activated carbon to polish and remove organic carbons in the water. The sand filter will be equipped with a back-pressure controlled automatic back-wash system.

Dual Phase Extraction (DPE): The preliminary design consists of an array of 11 groundwater extraction wells spaced approximately 40 to 60 feet apart, oriented along the alignment of the WSDOT stormwater line (See Figure 2). The water table in this area is encountered at approximately 5 feet below ground surface. Extraction wells are assumed to be approximately 24 feet deep and pump at a rate between 2 and 3 gpm each. Groundwater is pumped to a remediation treatment compound which houses a sediment settling tank, equalization tank, bag filter, and four granular activated carbon vessels for treatment prior to discharge to Willow Creek (see Figures 3 and 4).

Groundwater flow directions

The estimated shallow groundwater flow directions are to the northwest in the western part of the site, toward Detention Basin No. 1 in the central part of the Lower Yard, and to the northeast in the eastern part of the site. Groundwater flows toward Willow Creek (to the north) in the northeast part of the site, and radially into Detention Basin No. 1.

Perched groundwater occurs beneath the Upper Yard in isolated, laterally discontinuous zones surrounded by unsaturated soil.

Willow Creek and tidal basin

Willow Creek receives all stormwater from this site. Willow Creek also collects runoff from off-site areas northeast and east of the site (wetlands area, hatchery, and State Route 104) and from the southern off-site residential area which abuts the east half of the site's south edge.

The creek flows west from the site's northwest edge through an underground pipe into Puget Sound.

The site is located on the eastern side, within 1,000 feet of Puget Sound. Tides in the Edmonds part of Puget Sound range from approximately -3 to 13 feet relative to MLLW. The site is bounded on the northwest and northeast by Willow Creek, which carries surface runoff from areas east of the site to Puget Sound. North of Willow Creek lies a 23-acre freshwater and brackish water marsh (aka the Union Oil Marsh), owned by the City of Edmonds now, known as the Edmonds Marsh. The marsh is tidally influenced. Small creeks and ditches drain the upland areas to the east of the site.

Willow Creek and the tidal basin are saltwater influenced and vegetation is dominated by seashore saltgrass and Baltic rush, with oracle and seaside plantain as associated species.

The relative proportions of upgradient groundwater and surface water present in Willow Creek vary throughout the tidal cycle, as the relative hydraulic head difference between the surface water and upgradient groundwater fluctuates with the tide.

Discharge outfall (aka Outfall 002)

DB-2 is currently a stormwater collection system. Once excavation is complete, DB-2 will no longer exist. Prior to excavation, the stormwater collection system will be rerouted around the proposed excavation area and discharged directly into DB-1 through above ground hoses under the NPDES permit. Existing piping will be initially capped and then removed during excavation activities. After completion of DB-2 excavation, above-grade piping will be installed in DB-1 for discharge through outfall #002. Stormwater catch basins will be permanently routed to DB-1. Treated groundwater from the DPE system will also be discharged directly to DB-1. DB-1 discharges to Willow Creek via Outfall 002.

B. Description of the receiving water

Willow Creek runs along the east, northeast, north, and northwest boundaries of the site's Lower Yard. Willow Creek is approximately 10 feet wide and is underlain by silt and sand material. The creek banks on the property boundary are sloped (up to approximately 35%) and vegetated with native and non-native vegetation. Water depths in Willow Creek vary from 0 to 4 feet, depending on season and tidal cycles (ARCADIS 2012a). Willow Creek is tidally influenced, and it flows into a tidal basin. Edmonds Marsh is located to the northeast of the Lower Yard and is connected to Willow Creek. Willow Creek runs in a man-made drainage ditch and an underground piped culvert between Edmonds Marsh and Puget Sound.

The designated uses and criteria for Willow Creek are listed in WAC 172-201A-200 (fresh water designated uses and criteria). The designated uses listed in WAC 173-201A-200 include the following: aquatic life uses; primary contact for recreational uses; water supply uses; aquatic life uses; wildlife habitat; harvesting; commerce/navigation; boating and aesthetic enjoyment. Fish which have been observed in Willow Creek include Pacific Salmon, and ground fish.

C. Wastewater characterization

The concentration of pollutants in the discharge has been reported in the permit application. The tabulated data represents the anticipated flow and quality of the wastewater effluent under optimal conditions once the treatment system is in place. The wastewater effluent is reported to have the following characteristics:

Table 2. Effluent characterization

Parameter	Units	Average Value	Maximum Value
Wastewater from excavation			
Total Petroleum Hydrocarbons (TPH)	µg/L	5.61	250.9
Total carcinogenic polycyclic aromatic hydrocarbons (cPAHs)	µg/L	0.00049	0.00149
pH	Standard Units	7.9	8.8
Turbidity	NTU	16.8	125
Treated water from Dual Phase Extraction System			
TPH	µg/L	9.09	234.16
cPAHs [1]	µg/L	0.00012	0.001195
Benzene	µg/L	1.52	59

[1] cPAHs means carcinogenic polycyclic aromatic hydrocarbons. Total cPAHs is the sum of benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene concentrations.

D. State environmental policy act (SEPA) compliance

To meet the intent of SEPA, new discharges must undergo SEPA review during the permitting process. Chevron has filed a SEPA checklist with Ecology for the Interim Action at the Lower Yard of Unocal Edmonds Bulk Fuel Terminal. The Ecology Toxic Cleanup Program approved the SEPA checklist and issued the Determination of Non-significance (DNS) for this proposed work on July 6, 2015.

III. Proposed Permit Limits

Federal and state regulations require that effluent limits in an NPDES permit must be either technology- or water quality-based.

Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and Chapter 173-220 WAC).

Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC), Model Toxics Control Act Cleanup Levels (Chapter 173-340 WAC), or the National Toxics Rule (40 CFR 131.36).

Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described below.

The limits in this permit reflect information received in the application and from supporting reports (engineering, hydrogeology, etc.). Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Ecology does not usually develop limits for pollutants not reported in the permit application but which may be present in the discharge. The permit does not authorize discharge of the non-reported pollutants. During the five-year permit term, the facility's effluent discharge conditions may change from those conditions reported in the permit application. The facility must

notify Ecology if significant changes occur in any constituent [40 CFR 122.42(a)]. Until Ecology modifies the permit to reflect additional discharge of pollutants, a permitted facility could be violating its permit.

A. Design criteria/outfalls flow rates

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Chevron submitted the Draft Interim Action Work Plan to Ecology on July 6, 2015. The draft work plan described the proposed remediation for the Lower Yard which contains petroleum hydrocarbon concentrations above the soil remediation levels and cleanup levels. Those areas in the Lower Yard include the vicinity of DB-2, and the WSDOT stormwater line.

B. Technology-based effluent limits

Ecology must ensure that facilities provide all known, available, and reasonable methods of prevention, control, and treatment (AKART) when it issues a discharge permit. The technology-based effluent limits proposed in this permit are as follows:

Table 3. Technology-based limits

Parameter	Maximum Daily Limit
Flow1 (dewatering water from excavation)	15 gpm
Flow2 (flow from Dual Phase Extraction)	100 gpm
Oily Sheen	No visible sheen
Chitosan Acetate	0.2 mg/L

Parameter	Daily Minimum	Daily Maximum
pH	6.0 standard units	9.0 standard units

C. Surface water quality-based effluent limits

The Washington State surface water quality standards (Chapter 173-201A WAC) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin-wide total maximum daily load study (TMDL).

Numerical criteria for the protection of aquatic life and recreation

Numerical water quality criteria are listed in the Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the maximum levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numerical criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits. The proposed effluent limits are listed in Section J (on page 15) of this fact sheet.

Numerical criteria for the protection of human health

The U.S. EPA has published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State (EPA, 1992). These criteria

are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 2006) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200, 2006) and of all marine waters (WAC 173-201A-210, 2006) in the state of Washington.

Antidegradation

Description--The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2006) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions. Tier II ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

A facility must prepare a Tier II analysis when all three of the following conditions are met:

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.
- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone.

Facility specific requirements— Ecology has determined that this facility must prepare a Tier II analysis. A Tier II analysis focuses on evaluating feasible alternatives that would eliminate or significantly reduce the level of degradation. The analysis also includes a review of the benefits and costs associated with alternative to lowering of water quality.

New discharges and facility expansions are prohibited from lowering water quality without providing overriding public benefits.

Ecology proposes to issue a new NPDES Permit for this facility which will authorize a new discharge. Therefore, the facility must comply with Tier II requirements of the anti-degradation policy. Under Tier II (WAC 173-201A-320), a new or expanded action is allowed if the action will not result in a "measurable change" in the quality of the receiving water, or if there is an overriding public interest that makes the action necessary.

After reviewing the facility's Interim Action Work Plan, Ecology has made a finding of overriding public interest. The basis for this finding includes the following: 1) data collected in detention basin 2 and along the WSDOT stormwater drain line in the south-central portion of the Site indicates concentrations exceeding Site Cleanup levels; 2) there is hydraulic continuity between groundwater and surface water, and contamination will eventually migrate to surface water if it is not contained or removed promptly; 3) there is a greater benefit to the environment if the Permittee addresses the contamination by employing AKART (all known, available, reasonable treatment technologies) to treat the contaminated soil and water (utilizing soil excavation and dual phase extraction system) before reaching surface water; 4) the treated water will meet surface water standards prior to discharge to Willow Creek. This decision is made as allowed under Chapter 173-201A-320.

The finding that the benefits of undertaking the pump/treat/discharge to surface water option exceed the costs, is based on the following facts:

- If Ecology does not issue a discharge permit to authorize the discharge of treated water (meeting surface water standards) resulting from the proposed cleanup activity, the contamination in the soil will reach groundwater and contaminate groundwater. Through hydraulic continuity, the contaminated groundwater will migrate into surface water; thus, polluting the receiving water body and causing surface water quality standards to be exceeded.
- If Ecology issues this discharge permit to authorize the discharge of treated water resulting from the proposed cleanup activity, the source of the contamination in the soil will be removed, which results in preventing or reducing the contamination from reaching groundwater. The contamination in groundwater will be contained and removed through the remediation pump and treat system, and reduce the transport of pollutants to reaching surface water. Thus, the groundwater quality will be improved and surface water quality will be better, than would be achieved if the cleanup option were not undertaken. The environmental net benefit is greater if the discharge permit is issued to allow the cleanup activity to proceed because the resulting treated water meet water quality standards.
- By undertaking this project, the property values and the recreational values are more likely to be enhanced than if the project were not to be undertaken.
- Social benefits related to recreational uses are likely to be accrued. This project will improve and promote a healthy environment and waterbody for the area and community.

Mixing zones

A mixing zone is the defined area in the receiving water surrounding the discharge port(s), where wastewater mixes with receiving water. Within mixing zones the pollutant concentrations may exceed water quality numeric standards, so long as the discharge doesn't interfere with designated uses of the receiving water body (for example, recreation, water supply, and aquatic life and wildlife habitat, etc.) The pollutant concentrations outside of the mixing zones must meet water quality numeric standards.

State and federal rules allow mixing zones because the concentrations and effects of most pollutants diminish rapidly after discharge, due to dilution. Ecology defines mixing zone sizes to limit the amount of time any exposure to the end-of-pipe discharge could harm water quality, plants, or fish.

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART). Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and must not use more than 25% of the available width of the water body for dilution [WAC 173-201A-400 (7)(a)(ii-iii)].

Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derives any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur (see Ecology's *Permit Writer's Manual*). Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

There is no mixing zone granted in this permit for Former Unocal Edmonds Bulk Fuel Terminal's discharge.

D. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in Chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). The tables included below summarize the criteria applicable to this facility's discharge. Due to the fact that Willow Creek is tidally influenced, and groundwater beneath the Lower Yard is hydraulically connected to Puget Sound (a marine water), which is not suitable for domestic water supply, Willow Creek is treated as a marine water body. Thus, marine aquatic life uses and associated criteria are presented below.

- Aquatic Life Uses are designated based on the presence of, or the intent to provide protection for the key uses. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species. The Aquatic Life Uses for this receiving water are identified below.

Table 4. Marine aquatic life uses and associated criteria

Excellent Quality	
Temperature Criteria – Highest 1Day MAX	16°C (60.8°F)
Dissolved Oxygen Criteria – Lowest 1 Day Minimum	6.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU
pH Criteria	pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

- The *recreational uses* for this receiving water are identified below.

Table 5. Recreational uses and associated criteria

Recreational Use	Criteria
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies /100 mL.

- The miscellaneous marine water uses are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

E. Water quality impairments

Ecology has not documented any water quality impairments in the receiving water in the vicinity of the outfall.

F. Evaluation of surface water quality-based effluent limits for numeric criteria

Ecology has not authorized a mixing zone in the permit.

G. Human health

Washington's water quality standards include 91 numeric human health-based criteria that Ecology must consider when writing NPDES permits. These criteria were established in 1992 by the U.S. EPA in its National Toxics Rule (40 CFR 131.36). The National Toxics Rule allows states to use mixing zones to evaluate whether discharges comply with human health criteria.

Ecology has determined the effluent contains chemicals of concern for human health, based on data or information indicating the discharge contains regulated chemicals. The effluent limits are listed in Section J of this fact sheet.

H. Sediment quality

The aquatic sediment standards (Chapter 173-204 WAC) protect aquatic biota and human health. Under these standards Ecology may require a facility to evaluate the potential for its discharge to cause a violation of sediment standards (WAC 173-204-400). Additional information about sediments can be obtained at the Aquatic Lands Cleanup Unit website. http://www.ecy.wa.gov/programs/tcp/smu/sediment.html

Through a review of the discharger characteristics and of the effluent characteristics, Ecology has determined that this discharge has no reasonable potential to violate the sediment management standards.

I. Groundwater quality limits

The groundwater quality standards (Chapter 173-200 WAC) protect beneficial uses of groundwater. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100).

The former Unocal Edmonds Bulk Fuels Terminal does not discharge wastewater to the ground. No permit limits are required to protect groundwater.

J. Effluent limits based on the Original and Amended Agreed Order No. 4460

The effluent limits proposed in this permit are consistent with those treatment/discharge limits listed in the Interim Action Work Plan as part of the Agreed Order No. 4460. Those limits are based on the most stringent of state and federal groundwater, surface water, and water quality standards. The limits and basis for these limits are listed in Table 6 below:

Table 6. Surface water cleanup levels

Parameter	Effluent Limits (µg/L)
TPH-G [1]	800 µg/L
TPH-D [1]	500 µg/L
Benzene [2]	16 µg/L
Total cPAHs [2,3]	0.00013 µg/L [4]

Notes:

[1] Method A (WAC 173-340-900, Table 720-1).

[2] National Recommended Ambient Water Quality Criteria (NRAWQC) for human-health (for consumption of organisms only as opposed to water + organisms) (USEPA 2002).

[3] Total cPAHs is the sum of benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene concentrations that are adjusted using toxicity equivalency factors to represent a total benzo(a)pyrene concentration. The toxicity equivalency factors published in WAC 173-340-900, Table 708-2 are to be used for making the adjustments.

[4] The daily maximum effluent limit for total cPAHs is 0.00013 µg/L. The quantitation level (QL) for PAHs is 0.05 µg/L, greater than the effluent limit, using the approved analytical test method EPA 625. Therefore, the QL will be used for assessment of compliance with the effluent limit. This QL will be referred to as enforcement limit in this permit.

The effluent limits above are surface-water cleanup levels (CULs) which represent the lowest of the Water Quality Standard (WQS) in WAC 173-201A-240, National Recommended Water Quality Criteria (NRAWQC), and NTR in 40 CFR 131.36. The most stringent CULs for benzene and cPAHs are the NRAWQC human health (organisms only). The NRAWQC human health (organisms only) for benzene (16 µg/L) is associated with a cancer risk of 2×10^{-6}, and the NRAWQC for cPAHs (0.00013 µg/L) is associated with a cancer risk of 6×10^{-7} (Amended Agreed Order 4460). Under the MTCA, standards are considered sufficiently protective if the cancer risk for those standards is less than 1×10^{-5}. Therefore, the NRAWQC for benzene and cPAHs are appropriate surface water CULs [WAC 173-340-730(5)(b)]. (ARCADIS 2015).

WQSs and NRAWQC are not established for TPH mixtures. The MTCA regulations allow the use of Method A groundwater CULs (WAC 173-340-900, Table 720-1) to calculate surface water CULs for petroleum mixtures [WAC 173-340-730(3)(b)(iii)(C)]. (ARCADIS 2015). Thus, for the purpose of this permit, MTCA Method A CULs for TPH as presented in WAC 173-340-900, Table 720-I are used to establish effluent limits for TPH-diesel range organics, and TPH-gasoline range organics. This permit does not contain an effluent limit based on cleanup level for Heavy Oil. The CLUs for TPH-G and TPH-D are proposed below:

800 = Method A groundwater CUL for GRO (µg/L)

500 = Method A groundwater CUL for DRO and HO (µg/L)

K. Whole effluent toxicity

The water quality standards for surface waters forbid discharge of effluent that has the potential to cause toxic effects in the receiving waters. Many toxic pollutants cannot be measured by commonly available detection methods. However, laboratory tests can measure toxicity directly by exposing living organisms to the wastewater and measuring their responses. These tests measure the aggregate toxicity of the whole effluent, so this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

Using the screening criteria in Chapter 173-205-040 WAC, Ecology determined that toxic effects caused by unidentified pollutants in the effluent are unlikely. Therefore, this permit does not require WET testing. Ecology may require WET testing in the future if it receives information indicating that toxicity may be present in this effluent.

IV. Monitoring Requirements

Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's effluent limits.

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the approved analytical methods which meet or exceed the method detection levels required by the permit. The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects. When a facility uses an alternative method as allowed by the permit, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

A. Wastewater monitoring

The monitoring schedule is detailed in the proposed permit under Special Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

V. Other Permit Conditions

A. Reporting and record keeping

Ecology based Special Condition S3 on its authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges (WAC 173-220-210).

B. Operation and maintenance manual

Ecology requires industries to take all reasonable steps to properly operate and maintain their wastewater treatment system in accordance with state and federal regulations [40 CFR 122.41(e) and WAC 173-220-150 (1)(g)]. The facility will submit an updated operation and maintenance manual as required by state regulation for the construction of wastewater treatment facilities (WAC 173-240-150). Implementation of the procedures in the operation and maintenance manual would increase the facility's compliance with the terms and limits in the permit.

C. Stormwater pollution prevention plan requirements

In accordance with 40 CFR 122.44(k) and 40 CFR 122.44 (s), the permit includes requirements for the development and implementation of SWPPPs along with BMPs to minimize or prevent the discharge of pollutants to waters of the state. The BMPs in the proposed permit constitute:

- Best Practicable Control Technology Currently Available (BPT), (40 CFR §450.21).
- Best Conventional Pollutant Control Technology (BCT), (40 CFR §450.22).
- Best Available Technology Economically Achievable (BAT), 40 CFR §450.23). New Source Performance Standards representing the degree of effluent reduction attainable by application of the best available demonstrated control technology (NSPS), (40 CFR §450.24).

The objectives of the SWPPP are to:

1. Implement BMPs to prevent erosion and sedimentation, and to identify, reduce, eliminate, or prevent stormwater contamination and water pollution from construction activity.
2. Prevent violations of surface water quality, ground water quality, or sediment management standards.
3. Prevent adverse water quality impacts, including impacts to beneficial uses of the receiving water by controlling peak flow rates and volumes of stormwater runoff at the Permittee's outfalls and downstream of the outfalls during the construction phase of a project.

Condition S7 outlines specific requirements to prepare, implement, and modify the SWPPP. Permittees must prepare and fully implement the SWPPP, including narrative and drawings, in accordance with this permit. The SWPPP must address all phases of the construction project, beginning with initial soil disturbance until final site stabilization. All BMPs used or planned for a project (or specific phase of a project) must be clearly referenced in the SWPPP narrative and marked on the drawings.

D. General conditions

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual industrial NPDES permits issued by Ecology.

VI. Permit Issuance Procedures

A. Permit modifications

Ecology may modify this permit to impose numerical limits, if necessary, to comply with water quality standards for surface waters, with sediment quality standards, or with water quality standards for groundwater, after obtaining new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

Ecology may also modify this permit to comply with new or amended state or federal regulations.

B. Proposed permit issuance

This proposed permit includes all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of 5 years.

VII. References for Text and Appendices

Former Union Oil Company of California (Unocal) Edmonds Bulk Fuel Terminal

2015. National Pollutant Discharge Elimination System Waste Discharge Permit Application, EPA forms 1 and 2C.

2015. Public Review Draft Interim Action Work Plan for Former Unocal Edmonds Bulk Fuel Terminal Edmonds, WA.

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington, D.C.

1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

1983. *Water Quality Standards Handbook.* USEPA Office of Water, Washington, D.C.

Tsivoglou, E.C., and J.R. Wallace.

1972. *Characterization of Stream Reaeration Capacity*. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

December 2011. *Permit Writer's Manual.* Publication Number 92-109 (https://fortress.wa.gov/ecy/publications/SummaryPages/92109.html)

Laws and Regulations (http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information (http://www.ecy.wa.gov/programs/wq/permits/guidance.html)

February 2007. *Focus Sheet on Solid Waste Control Plan, Developing a Solid Waste Control Plan for Industrial Wastewater Discharge Permittees*, Publication Number 07-10-024. http://www.ecy.wa.gov/pubs/0710024.pdf

Wright, R.M., and A.J. McDonnell.

1979. *In-stream Deoxygenation Rate Prediction*. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

Appendix A--Public Involvement Information

Ecology proposes to issue a discharge permit to Chevron Environmental Management Company (Chevron) for the Former Unocal Edmonds Buk Fuel Terminal. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology placed a public notice of application on July 20, 2015, in the *Everett Herald* to inform the public about the submitted application and to invite comment on the reissuance of this permit.

Ecology placed a public notice of the draft permit on August 5, 2016, in the *Everett Herald* to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Told where copies of the draft permit and fact sheet were available for public evaluation (a local public library, the closest Regional or Field Office, posted on our website).
- Offered to provide the documents in an alternate format to accommodate special needs.
- Urged people to submit their comments, in writing, before the end of the Comment Period.
- Told how to request a public hearing of comments about the proposed NPDES permit.
- Explained the next step(s) in the permitting process.

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting* which is available on our website at https://fortress.wa.gov/ecy/publications/SummaryPages/0307023.html.

You may obtain further information from Ecology by telephone at (425) 649-7201, or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

The primary author of this permit and fact sheet is Jeanne Tran, P.E.

Appendix B--Your Right to Appeal

You have a right to appeal this permit to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of the final permit. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2) (see glossary).

To appeal you must do the following within 30 days of the date of receipt of this permit:

- File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	Department of Ecology Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW STE 301 Tumwater, WA 98501	Pollution Control Hearings Board PO Box 40903 Olympia, WA 98504-0903

Appendix C--Glossary

1-DMax or 1-day maximum temperature -- The highest water temperature reached on any given day. This measure can be obtained using calibrated maximum/minimum thermometers or continuous monitoring probes having sampling intervals of thirty minutes or less.

7-DADMax or 7-day average of the daily maximum temperatures -- The arithmetic average of seven consecutive measures of daily maximum temperatures. The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date.

Acute toxicity -- The lethal effect of a compound on an organism that occurs in a short time period, usually 48 to 96 hours.

AKART -- The acronym for "all known, available, and reasonable methods of prevention, control and treatment." AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and 520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

Alternate point of compliance -- An alternative location in the groundwater from the point of compliance where compliance with the groundwater standards is measured. It may be established in the groundwater at locations some distance from the discharge source, up to, but not exceeding the property boundary and is determined on a site specific basis following an AKART analysis. An "early warning value" must be used when an alternate point is established. An alternate point of compliance must be determined and approved in accordance with WAC 173-200-060(2).

Ambient water quality -- The existing environmental condition of the water in a receiving water body.

Ammonia -- Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Annual average design flow (AADF) -- The average of the daily flow volumes anticipated to occur over a calendar year.

Average monthly (intermittent) discharge limit -- The average of the measured values obtained over a calendar month's time taking into account zero discharge days.

Average monthly discharge limit -- The average of the measured values obtained over a calendar month's time.

Background water quality -- The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity, [WAC 173-200-020(3)]. Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

Best management practices (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and

practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD5 -- Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD_5 is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass -- The intentional diversion of waste streams from any portion of a treatment facility.

Categorical pretreatment standards -- National pretreatment standards specifying quantities or concentrations of pollutants or pollutant properties, which may be discharged to a POTW by existing or new industrial users in specific industrial subcategories.

Chlorine -- A chemical used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic toxicity -- The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean water act (CWA) -- The federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Compliance inspection-without sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance inspection-with sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations. In addition it includes as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Ecology may conduct additional sampling.

Composite sample -- A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction activity -- Clearing, grading, excavation, and any other activity, which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

Continuous monitoring -- Uninterrupted, unless otherwise noted in the permit.

Critical condition -- The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Date of receipt -- This is defined in RCW 43.21B.001(2) as five business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

Detection limit -- The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the pollutant concentration is above zero and is determined from analysis of a sample in a given matrix containing the pollutant.

Dilution factor (DF) -- A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Distribution uniformity -- The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

Early warning value -- The concentration of a pollutant set in accordance with WAC 173-200-070 that is a percentage of an enforcement limit. It may be established in the effluent, groundwater, surface water, the vadose zone or within the treatment process. This value acts as a trigger to detect and respond to increasing contaminant concentrations prior to the degradation of a beneficial use.

Enforcement limit -- The concentration assigned to a contaminant in the groundwater at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a groundwater criterion will not be exceeded and that background water quality will be protected.

Engineering report -- A document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal coliform bacteria -- Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab sample -- A single sample or measurement taken at a specific time or over as short a period of time as is feasible.

Groundwater -- Water in a saturated zone or stratum beneath the surface of land or below a surface water body.

Industrial user -- A discharger of wastewater to the sanitary sewer that is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial wastewater -- Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

- Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
- Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Local limits -- Specific prohibitions or limits on pollutants or pollutant parameters developed by a POTW.

Major facility -- A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum daily discharge limit -- The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Maximum day design flow (MDDF) -- The largest volume of flow anticipated to occur during a one-day period, expressed as a daily average.

Maximum month design flow (MMDF) -- The largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.

Maximum week design flow (MWDF) -- The largest volume of flow anticipated to occur during a continuous 7-day period, expressed as a daily average.

Method detection level (MDL) -- See Method Detection Level.

Minor facility -- A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing zone -- An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The permit specifies the area of the authorized mixing zone that Ecology defines following procedures outlined in state regulations (Chapter 173-201A WAC).

National pollutant discharge elimination system (NPDES) -- The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable

waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

pH -- The pH of a liquid measures its acidity or alkalinity. It is the negative logarithm of the hydrogen ion concentration. A pH of 7 is defined as neutral and large variations above or below this value are considered harmful to most aquatic life.

Pass-through -- A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

Peak hour design flow (PHDF) -- The largest volume of flow anticipated to occur during a one-hour period, expressed as a daily or hourly average.

Peak instantaneous design flow (PIDF) -- The maximum anticipated instantaneous flow.

Point of compliance -- The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards. Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the groundwater as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

Potential significant industrial user (PSIU) --A potential significant industrial user is defined as an Industrial User that does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day; or

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) -- Also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer (64 FR 30417).
ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency, December 2007).

Reasonable potential -- A reasonable potential to cause a water quality violation, or loss of sensitive and/or important habitat.

Responsible corporate officer -- A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Significant industrial user (SIU) --

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; and

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

Slug discharge -- Any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge to the POTW. This may include any pollutant released at a flow rate that may cause interference or pass through with the POTW or in any way violate the permit conditions or the POTW's regulations and local limits.

Solid waste -- All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

Soluble BOD_5 -- Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD_5 test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD_5 test is sufficient to remove the particulate organic fraction.

State waters -- Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater -- That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based effluent limit -- A permit limit based on the ability of a treatment method to reduce the pollutant.

Total coliform bacteria -- A microbiological test, which detects and enumerates the total coliform group of bacteria in water samples.

Total dissolved solids -- That portion of total solids in water or wastewater that passes through a specific filter.

Total maximum daily load (TMDL) -- A determination of the amount of pollutant that a water body can receive and still meet water quality standards.

Total suspended solids (TSS) -- Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset -- An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water quality-based effluent limit -- A limit imposed on the concentration of an effluent parameter to prevent the concentration of that parameter from exceeding its water quality criterion after discharge into receiving waters.

Appendix D--Site Maps

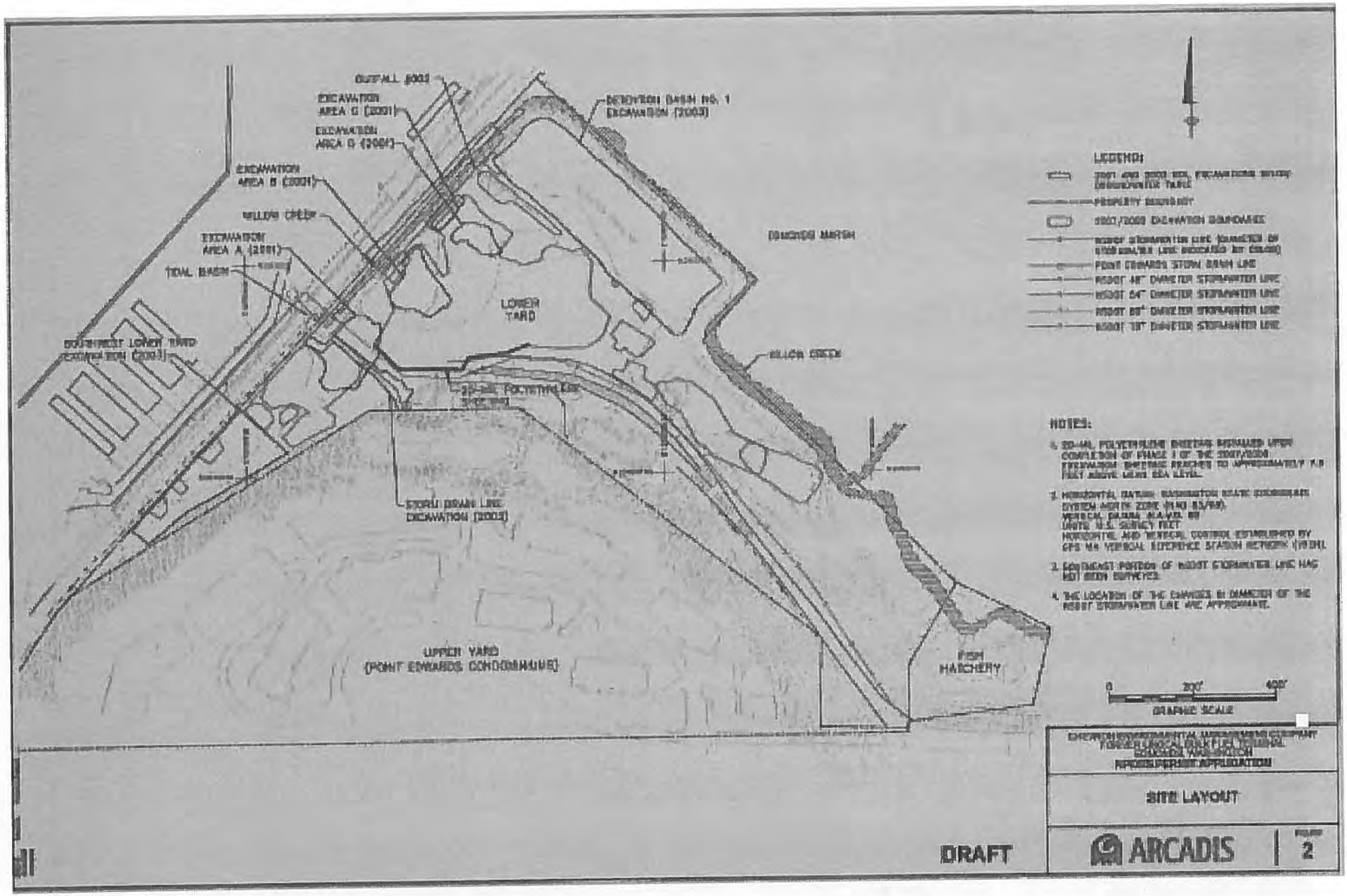


Figure 2. Site plan

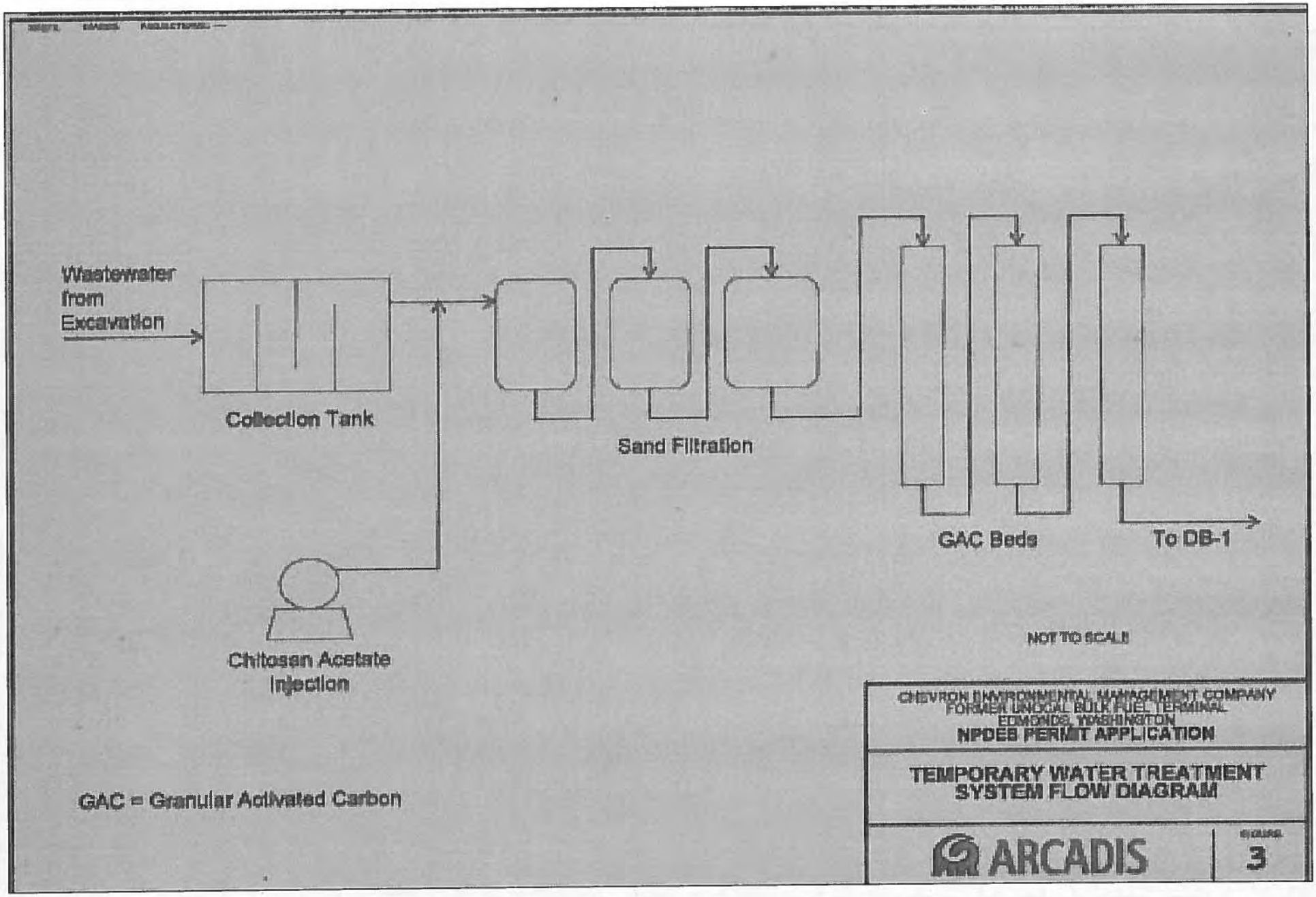


Figure 3. NPDES engineering report process flow diagram

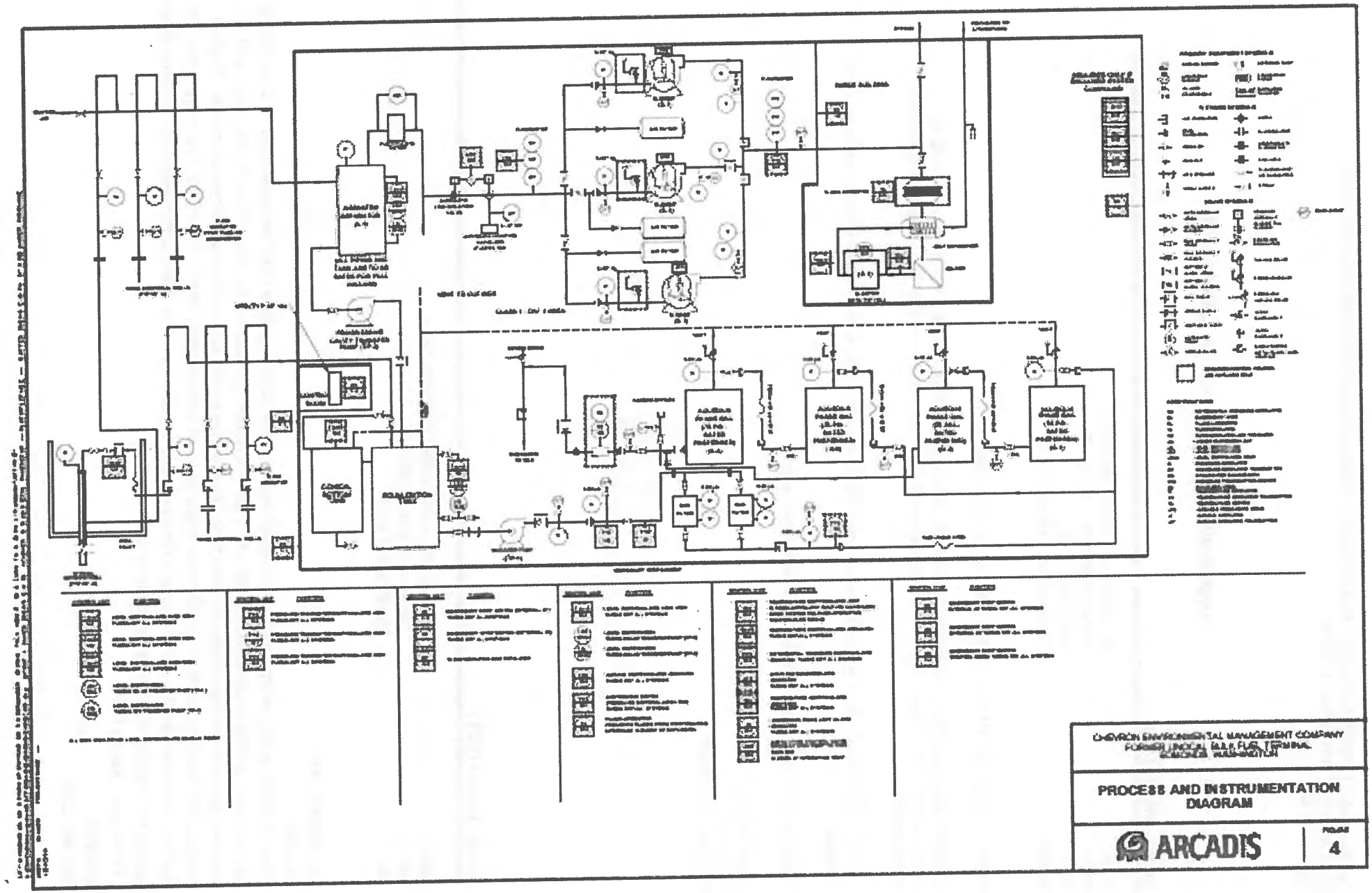


Figure 4. Process and instrumentation diagram

Appendix E--Response to Comments

South, David (ECY)

From: Marjorie Fields <mvfields@me.com>
Sent: Sunday, August 07, 2016 5:22 PM
To: South, David (ECY)
Subject: Edmonds Unocal Cleanup Site

Progress in clean up at the Edmonds Unocal site is good news.

However, pumping petroleum-contaminated water into Willow Creek and then into the Sound could be dangerous for water quality, even after water treatment. Please be certain all possible safeguards are in place for this process.

Similarly, the contaminated soil extraction process requires extreme care to keep dangerous contaminants from escaping.

Thank you for your efforts to make this cleanup successful.

Marjorie Fields
327 2nd Ave N.
Edmonds, WA 98020

South, David (ECY)

From: Dawna Lahti <edmondite1@hotmail.com>
Sent: Tuesday, August 23, 2016 11:18 AM
To: South, David (ECY)

Mr. David South
Dear Sir:
I am availing myself of the privilege of weighing in on the Edmonds Bulk Fuel Terminal 0178 cleanup during the comment period ending September 6th. I am a resident of Edmonds for more than 30 years and and am increasingly aware of the successful efforts to clean and preserve the remaining Edmonds marsh. To allow cleanup pollutants to leach in would undo many years of conservation effort. Therefore, I strongly agree with the Draft Amendment Agreed Order to abate benzene products prior to release and with NPDES which would uphold the highest standards available to us.
Thank you. Kindly RSVP.
Sincerely
Mrs. Jim Lahti

South, David (ECY)

From:	dmm98020@comcast.net
Sent:	Tuesday, August 09, 2016 9:24 AM
To:	South, David (ECY)
Subject:	Unocal Edmonds Cleanup Site

David South
Toxic Cleanup Program Site Manager

As an Edmonds resident, my comment is appreciation to the Dept. of Ecology for their follow-up to protect the water quality, require polluting
entities to be responsible for cleanup.

With the major federal, state and local funds proposed to daylight Willow Creek, the water quality is of particular importance to returning fish, salmon,
among them. We are most fortunate that this area of the Edmonds Marsh was not filled and developed and each of these steps to protect the natural
environment have such significant and long term consequences.

Thank you,

Dianna Maish
Edmonds

South, David (ECY)

From: Tran, Jeanne (ECY)
Sent: Wednesday, September 21, 2016 8:07 AM
To: South, David (ECY)
Subject: FW: Comments on National Pollutant Discharge Elimination System Waste Discharge Permit No. WA0991007

From: joe scordino [mailto:joe.scordino@yahoo.com]
Sent: Tuesday, September 06, 2016 4:24 PM
To: Tran, Jeanne (ECY) <JTRA461@ECY.WA.GOV>
Subject: Comments on National Pollutant Discharge Elimination System Waste Discharge Permit No. WA0991007

To: Jeanne Tran, Dept. of Ecology.

The following are my comments on the Draft National Pollutant Discharge Elimination System (NPDES) Permit application from the Chevron Environmental Management Company for the Unocal Edmonds Bulk Fuel Terminal Site to address contaminated soil and groundwater.

The permit should clarify that discharges into Willow Creek will ultimately discharge into the Edmonds Marsh AND/OR Puget Sound dependent on tide levels. During periods of higher tides (greater than about six to seven feet), Willow Creek DOES NOT flow into Puget Sound; the creek either backs up into the Edmonds Marsh (when tide gate is functioning in fall/winter months) or is mixed with incoming saltwater from Puget Sound and flows into the Edmonds Marsh (when tide gate is secured open in spring/summer months). Thus, UnoCal cleanup discharges into Willow Creek do affect the Edmonds Marsh and discharged contaminants may deposit in the sediments in the Edmonds Marsh. The Edmonds Marsh has likely been contaminated by groundwater infusion and runoff from past UnoCal operations and additional contaminant discharges, even if at low levels, may increase the contaminant load in the sediments in the Edmonds Marsh.

The tide gate downstream of the UnoCal property is secured open by the City of Edmonds between about March 15 and October 15 of each year to allow tidal influx into the Edmonds Marsh. In the late fall/winter months (mid-October to mid-March), the tidegate is returned to functioning to prevent saltwater from entering the Edmonds Marsh due to winter flooding concerns. This tide gate and tidal height will affect the flow of discharges of treated/contaminated water from the UnoCal site.

The permit should take into account potential adverse affects to the Edmonds Marsh due to flow conditions. One approach would be to restrict discharges to only those periods when the tide is below six feet to ensure that discharges will be flowing into Puget Sound and not settling into the sediments in the Edmonds Marsh.

I would also recommend that the permit require some sort of independent monitoring. Self-monitoring, although more cost efficient, does not provide the level of certainty that the public expects in clean-up of petroleum-compound contaminated areas. There are negative repercussions of oil industry self-monitoring as evidenced by the Deepwater Horizon situation in the Gulf, and they can only be addressed through independent monitoring. The permittee should pay the costs of such monitoring, but there should be no contractual arrangements or otherwise between the permittee and the independent monitors. Public funded agencies also should not have to pay for the monitoring. The permit could require that the Dept. of Ecology would contract for independent monitoring and then bill the permittee for the contractor and administrative costs (so there is no expenditure of public funds for the monitoring).

The reporting requirements in the permit appear adequate, but it is not clear that the reports will be made easily accessible for the public (without having to go through

public disclosure procedures). I don't know if it needs to be a permit condition, but there needs to be a mechanism for the public to access all reports and data through an internet portal or something. One approach is for Ecology to set-up a publicly accessible site and have a permit condition requiring the permittee to post all reports and data to such site. The City of Edmonds had a citizen group (the ECAC) that oversaw previous UnoCal cleanup operations and although the group has disbanded, there are still a number of Edmonds citizens who are interested in overseeing and tracking the clean-up operation. Many of us are disappointed that potential impacts of the UnoCal operations on the Edmonds Marsh and the need for sediment sampling in the Marsh have been dismissed by Department of Ecology and we want to track cleanup operations to ensure the Edmonds Marsh is not further impacted even by low contaminant levels.

Lastly, section G.2 of the permit pertains to site entry and inspection. Would it be possible for Department of Ecology to designate the 'Edmonds Stream Team' as an authorized representative to access the site for the purpose of collecting water quality measurements and water samples in Willow Creek and the ditch along the UnoCal property? The 'Edmonds Stream Team' is a citizen science project, recognized by the City of Edmonds, that collects water quality data in three Edmonds streams and the Edmonds Marsh with high school students. I can provide more details on the 'Edmonds Stream Team' and work out details if Ecology would be willing to help authorize access to the UnoCal property for monitoring waters along the southern edge of the Marsh/Willow Creek.

Sincerely,

Joe Scordino

South, David (ECY)

From: Sharon Sneddon <sksneddon@frontier.com>
Sent: Monday, August 22, 2016 11:44 AM
To: South, David (ECY)
Subject: Unocal Edmonds Cleanup Site

I concur that the Interim Action Work Plan should proceed as amended. Increasing the cleanup levels for benzo(a)pyrene and benzene will contribute to a more healthy environment once the cleanup is finally finished.

Sharon Sneddon
Edmonds

South, David (ECY)

From: Tran, Jeanne (ECY)
Sent: Wednesday, September 21, 2016 8:07 AM
To: South, David (ECY)
Subject: FW: Unocal Edmonds Cleanup Site

-----Original Message-----
From: Sharon Sneddon [mailto:sksneddon@frontier.com]
Sent: Monday, August 22, 2016 11:55 AM
To: Tran, Jeanne (ECY) <JTRA461@ECY.WA.GOV>
Subject: Unocal Edmonds Cleanup Site

The National Pollutant Discharge Elimination System Permit should not be granted to Chevron Environmental Management. Washington State Water Pollution Control regulations and the Federal Clean Water Act may not be strict enough to keep some of the latent chemicals remaining in the treated wastewater from disrupting optimal stream chemistry that allows aquatic creatures to flourish. The treated wastewater should not be allowed to flow into Willow Creek.

Sharon Sneddon
Edmonds

From: South, David (ECY)
Sent: Tuesday, September 27, 2016 9:53 AM
To: Sharon Sneddon <sksneddon@frontier.com>; Dawna Lahti <edmondite1@hotmail.com>; joe.scordino@yahoo.com; dmm98020@comcast.net; Marjorie Fields <mvfields@me.com>
Cc: Jolitz, Kim S <kjolitz@chevron.com>; Boortz, Marielle (MJBoortz) <MJBoortz@chevron.com>; Zorn, Scott <Scott.Zorn@arcadis.com>; Tran, Jeanne (ECY) <JTRA461@ECY.WA.GOV>; Lui, Nancy (ECY) <nlui461@ECY.WA.GOV>; Svoboda, Patrick <SvobodP@wsdot.wa.gov>
Subject: Unocal Edmonds cleanup site - response to comments

This email responds to comments received during the August 2016 public comment period on cleanup of contamination at the Unocal Edmonds Bulk Fuel Terminal Site. The comment period was on making cleanup levels for benzo(a)pyrene and benzene more strict and on the Draft National Pollution Discharge Elimination System (NPDES) Permit for the Site. The NPDES Permit requires treatment of contaminated water produced during cleanup to a quality protective of human health and the environment prior to discharge to Willow Creek.

Comments were received via email from five people. These emails, which are public record documents, are in the attached file **Compiled_Comments.pdf**. Ecology considered each comment. No changes were made to the Amendment to the Consent Decree setting stricter cleanup levels or to the NPDES Permit as a result of the comments. Specific points are addressed below.

Several commenters expressed agreement with setting stricter cleanup levels for benzo(a)pyrene and benzene. The lower concentrations are a result of changes made to the federal National Recommended Water Quality Criteria for the protection of human health.

One commenter said the NPDES Permit should not be issued to Chevron Environmental Management Company (Chevron). The commenter indicated treated wastewater should not be allowed to flow into Willow Creek because state and federal standards may not be strict enough to protect aquatic life. As mentioned above, the stricter standards are based on protection of human health. This is based on people eating fish (or other aquatic organisms). There are no federal or state standards for the protection of aquatic life for the chemicals of interest at this Site. Testing performed as part of investigations at the Site indicate the concentrations protective of human health will be protective of aquatic life.

One commenter expressed concern that cleanup of contaminated soil be done with extreme care to keep contaminants from escaping. Cleanup is done using strict health and safety protocols to keep contaminants for re-entering the environments. Dust control measures are employed (e.g., fugitive dust will be controlled with water spray from an on-site water tank), truckloads of excavated soil are covered, and truck wheels are washed prior to leaving the Site. Two dust monitors will be installed during work hours, one upwind of the work area and one downwind of the work area.

Willow Creek is a tidally-influenced stream, and at high tides greater than six feet water flows from Puget Sound up Willow Creek into Edmonds Marsh. One commenter indicated that the permit should clarify that discharges into Willow Creek will ultimately discharge into the Edmonds Marsh or Puget Sound, depending on the tide levels. This commenter suggested that discharges be restricted to periods when the tide level is below six feet to ensure that discharges flow into Puget Sound and not Willow Creek. Discharge limits in the NPDES permit are protective of both Puget Sound and Edmonds Marsh.

On commenter recommended that the NPDES Permit require independent monitoring by a contractor independent of Chevron, but paid by Chevron. The Washington State Department of Ecology is the regulatory agency charged with overseeing the discharge monitoring required the NPDES Permit. Self-monitoring by the Permittee is the basic approach used by the NPDES Permit system nationwide. The permit contains language (Section S3 of the permit) that requires that the contract laboratory be accredited by Ecology's Manchester Laboratory in order to perform the analysis. The contract laboratory reports must include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter. The permittee is required to monitor and report in accordance with the conditions set forth in the permit. Falsification of information submitted to Ecology is a violation of the terms and conditions of the permit. If Ecology identifies issues regarding the monitoring, Ecology will take appropriate measures, including sampling the discharge, as necessary.

One commenter asked about the public availability of the monitoring results. Monitoring results will be available on Ecology's Permitting and Reporting Information System (PARIS) web site. A member of the public can click on Access PARIS and enter the permit number (WA0991007) to obtain the data. no information will be available until the discharge actually starts.

One commenter asked if it would be possible for Ecology to designate the Edmonds Stream Team as an authorized representative to access the site. Ecology authorized representatives are under contract to Ecology, are working at the direction of Ecology, and must have legally-required health and safety training for working on hazardous waste sites. It would not be possible for Ecology to authorize the Edmonds Stream Team to access the Site.

pscleanair.org
Puget Sound Clean Air Agency

Puget Sound Clean Air Agency

Notice of Construction No. **11189**

HEREBY ISSUES AN ORDER OF APPROVAL TO CONSTRUCT, INSTALL, OR ESTABLISH

Registration No. **29892**

Date DEC 19 2016

Soil and groundwater remediation at the former Unocal terminal in Edmonds using dual phase extraction and Intellishare Environmental ECO500 electric catalytic oxidizer.

APPLICANT

Chevron Environmental Management Company
Arcadis US Inc., 6001 Bollinger Canyon Rd
San Ramon, CA 94583

OWNER

Chevron Environmental Management Company
Arcadis US Inc., 6001 Bollinger Canyon Rd
San Ramon, CA 94583

INSTALLATION ADDRESS

Chevron Environmental Management Company, 11720 Unoco Rd, Edmonds, WA 98020

THIS ORDER IS ISSUED SUBJECT TO THE FOLLOWING RESTRICTIONS AND CONDITIONS

1. Approval is hereby granted as provided in Article 6 of Regulation I of the Puget Sound Clean Air Agency to the applicant to install or establish the equipment, device or process described hereon at the INSTALLATION ADDRESS in accordance with the plans and specifications on file in the Engineering Division of the Puget Sound Clean Air Agency.
2. This approval does not relieve the applicant or owner of any requirement of any other governmental agency.
3. All vapors from the vapor extraction system shall be vented to the catalytic oxidizer, until the inlet concentrations are less than 14 ppm of TPH and less than 0.3 ppm of benzene for at least two consecutive months.
4. The control efficiency of the catalytic oxidizer shall be at least 98.5% for inlet concentrations greater than or equal to 2000 ppm, 97% for inlet concentrations greater than or equal to 200 ppm, 90% for inlet concentrations less than 200 ppm, and shall not exceed 10 ppm for inlet concentrations less than 100 ppm. Compliance with this limit shall be determined on a monthly basis by EPA Method 21. (If the oxidizer is not operated during an entire calendar month, the period of inactivity shall be recorded instead.)
5. The catalyst inlet temperature shall be at least 600°F and shall not exceed 1200°F. Compliance with this limit shall be recorded on a monthly basis. (If the oxidizer is not operated during an entire calendar month, the period of inactivity shall be recorded instead.)
6. Records of the monitoring required by this Order of Approval shall be kept for at least two years from the date of generation and be made available to Puget Sound Clean Air Agency personnel upon request.

Order of Approval for NC No. 11189

DEC 1 9 2016

APPEAL RIGHTS

Pursuant to Puget Sound Clean Air Agency's Regulation I, Section 3.17 and RCW 43.21B.310, this Order may be appealed to the Pollution Control Hearings Board (PCHB). To appeal to the PCHB, a written notice of appeal must be filed with the PCHB and a copy served upon Puget Sound Clean Air Agency within 30 days of the date the applicant receives this Order.

Gerry Pade
Reviewing Engineer

Carole Cenci PE
Compliance Manager

APPENDIX C

Photograph Logs

PHOTOGRAPH LOG

Chevron Environmental Management Company
Former Unocal Edmonds Bulk Fuel Terminal
Edmonds, Washington

DUAL-PHASE EXTRACTION SYSTEM INSTALLATION ACTIVITIES

Photograph: 1

Description:

Dual-Phase Extraction (DPE) system being tested at the Newterra Facility.

Location:
Newterra Facility
Brockville, Ontario, Canada

Photograph taken by: Arcadis U.S., Inc.

Date: 12/20/2016

Photograph: 2

Description:
Concrete pad construction.

Location:
Former Unocal Edmonds Bulk Fuel Terminal

Photograph taken by: Arcadis U.S., Inc.

Date: 03/2017

PHOTOGRAPH LOG

Chevron Environmental Management Company
Former Unocal Edmonds Bulk Fuel Terminal
Edmonds, Washington

A

B

C

Photographs:
3 A, B & C

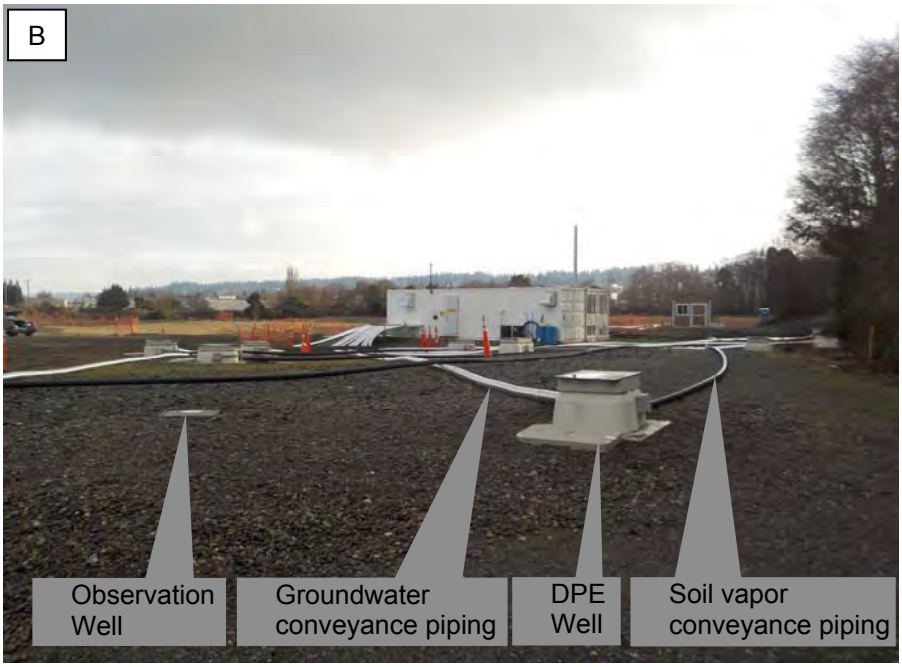
Description:

DPE system enclosure delivery (A) and placement onto the concrete pad of the east container (B) and west container (C) constituting the DPE system enclosure.

Location:
Former Unocal Edmonds Bulk Fuel Terminal

Photograph taken by: Arcadis U.S., Inc.

Date: 4/12/2017



Photographs:
4 A & B

Description:

DPE system, conveyance piping and groundwater discharge line (A); DPE system, conveyance piping and DPE vault (B)

Location:
Former Unocal Edmonds Bulk Fuel Terminal

Photograph taken by: Arcadis U.S., Inc.

Date: 2/15/2018

Photograph: 5

Description:

DPE wellhead connection.

Location:
Former Unocal Edmonds Bulk Fuel Terminal

Photograph taken by: Arcadis U.S., Inc.

Date: 12/14/2017

Photograph: 6 A & B

Description:

Outfalls: Outfall #002 (A) into Willow Creek and DPE System Outfall into DB-1 (B)

Location:
Former Unocal Edmonds Bulk Terminal

Photograph taken by: Arcadis U.S., Inc.

Date: 12/14/2018

APPENDIX D

Well Boring Logs

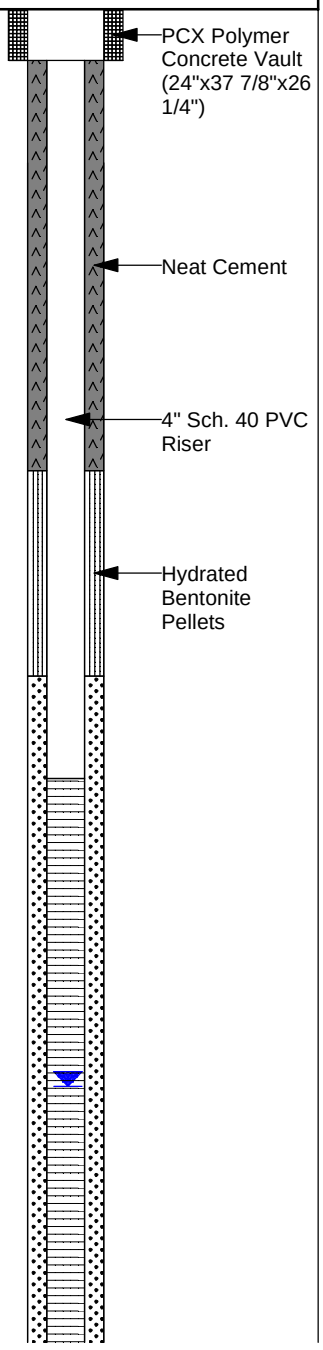
Date Start-Finish: 10/16/17-10/19/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Spoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Sam Miles

Well/Boring ID: DPE-5
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50°F, Overcast

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										
2										
3	HA	2.5-3	6	NA	NA	0.0	NA	SP/SG		SAND with Gravel, poorly graded medium grained sand, medium, poorly graded, subrounded gravel; brown, dry.
4										
5	HA	5-5.5	6	NA	NA	0.0	NA	SP/SG		SAND with Gravel, poorly graded, medium grained sand, medium, poorly graded, subrounded gravel; brown, dry.
6										Liner encountered at 6.0 ft.
7	HA	7-7.5	6	NA	NA	6.0	NA	SP/SG		Same as above.
8										
9										
10	1	10-11.5	18	4 4 4	8	332.8	NA	SP		SAND with gravel; poorly graded medium grained sand; small, poorly graded, subrounded gravel; brown; wet; HCLO. At 11 ft color change from brown to gray.
11										
12										

Well/Boring Construction



REMARKS:
ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

ARCADIS Design & Consultancy for natural and built assets

Project Number: B0045362.0008
Data File: DPE-5.dat
Date: 12/21/2017

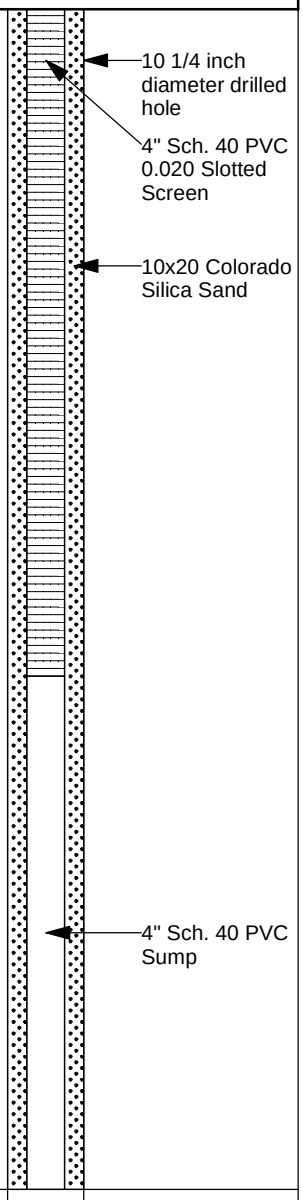
Date Start-Finish: 10/16/17-10/19/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Spoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Sam Miles

Well/Boring ID: DPE-5
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50°F, Overcast

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
13										
14										
15	2	15-16.5	12	2 2 4	6	285.1	NA	SP		SAND with little gravel; poorly graded, medium grained sand; small, poorly graded, sub-rounded gravel; gray; wet; HCLO.
16										
17										
18										
19										
20	3	20-21.5	18	4 5 6	11	66.3	NA	SP		SAND with little gravel; poorly graded medium grained sand; small, poorly graded, subrounded gravel; gray; wet; HCLO. At 21.5ft Encountered wood debris lense.
21										
22										
23	4	22.5-24	18	6 12 15	27	151.6	NA	SP		Same as above.
24										End of Boring at 24.0 ft bgs.
25										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS:
ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

Project Number: B0045362.0008
Data File: DPE-5.dat
Date: 12/21/2017

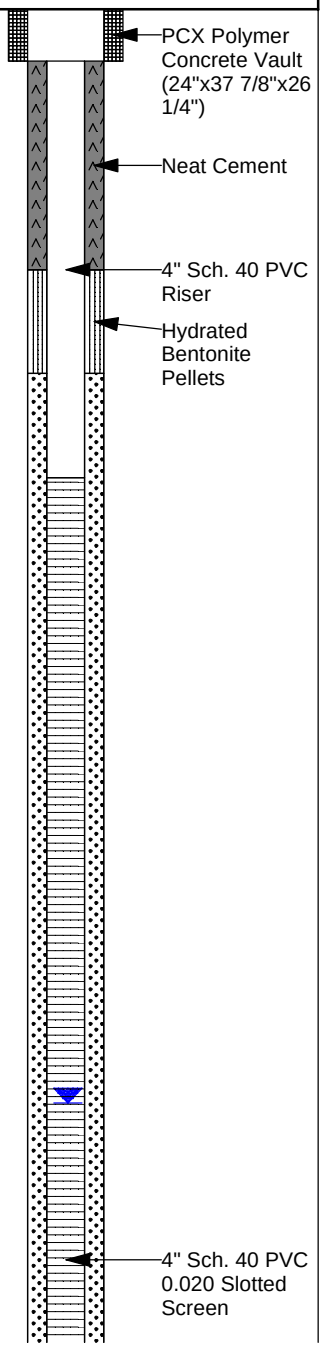
Date Start-Finish: 10/12/17-10/19/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Alex Pink

Well/Boring ID: DPE-6
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: Overcast

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										
2										
3										Asphalt encountered at 2.5 ft.
4										
5	HA	5-5.5	6	NA	NA	13.7	NA	SP/SG		SAND with gravel, medium grained sand, subrounded gravel; gray/ brown, moist.
6										
7	HA	7-7.5	6	NA	NA	7.1	NA	SP/SG		Same as above; woody debris and increased gravel; gray/ brown, moist.
8										
9										
10	1	10-11.5	12	2 2 2	4	7.4	NA	SP		SAND with gravel, poorly graded, medium grained sand, small, poorly graded, subrounded gravel; gray; wet.
11										
12										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level

Project Number: B0045362.0008
Data File: DPE-6.dat
Date: 12/21/2017

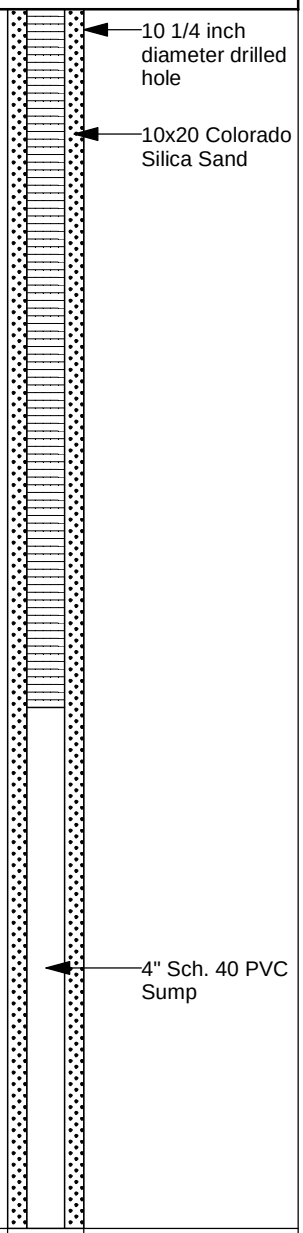
Date Start-Finish: 10/12/17-10/19/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Alex Pink

Well/Boring ID: DPE-6
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: Overcast

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
13										
14										
15										
16	2	15-16.5	18	3 2 2	4	1.6	NA	SP		SAND with gravel, poorly graded, medium grained sand, small, poorly graded, subrounded gravel; gray; wet. Encountered wood debris layer at 16.5 ft bgs.
17										
18										
19										
20										
21	3	20-21.5	18	3 3 4	7	0.4	NA	SP		SAND with little gravel, poorly graded, fine to medium grained sand, small, poorly graded, subrounded gravel; gray; wet.
22										
23	4	22.5-23	6	3 4 5	9	0.5	NA	SP		Same as above.
24										End of Boring at 24.0 ft bgs.
25										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level

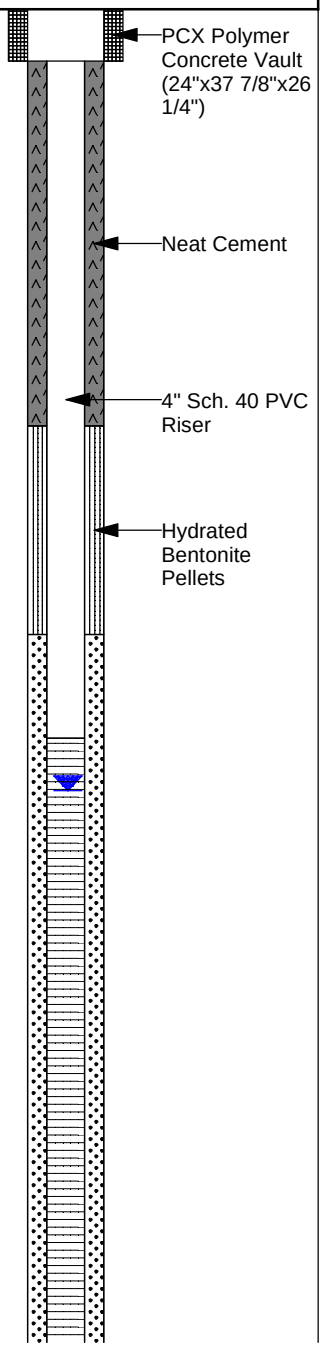
Date Start-Finish: 10/10/17-10/12/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Jason Little

Well/Boring ID: DPE-7
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50°F, Overcast

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										
2										
3	HA	2.5-3	6	NA	NA	0.0	NA	SP/SG		SAND and gravel, poorly graded, medium grained sand; small, poorly graded, subrounded gravel; dry; brown. At 3 ft gravel increases.
4										
5	HA	5-5.5	6	NA	NA	784.7	NA	CH		CLAY with some gravel, high plasticity clay; small, poorly graded, subrounded gravel; moist; gray; HCLO. encountered black plastic liner at 5 ft bgs.
6										
7										
8	HA	7.5-8	6	NA	NA	8.5	NA	SP		SAND and gravel, little silt, very fine to medium grained sand, small to medium subrounded gravel; wet.
9										
10										
11	1	10-11.5	6	2 3 4	7	45.3	NA	SP/SG		SAND with some gravel, fine to medium grained, poorly graded sand; small, subrounded, poorly graded gravel; wet; grayish brown; HCLO.
12										

Well/Boring Construction



REMARKS:
ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

ARCADIS Design & Consultancy for natural and built assets

Project Number: B0045362.0008
Data File: DPE-7.dat
Date: 12/21/2017

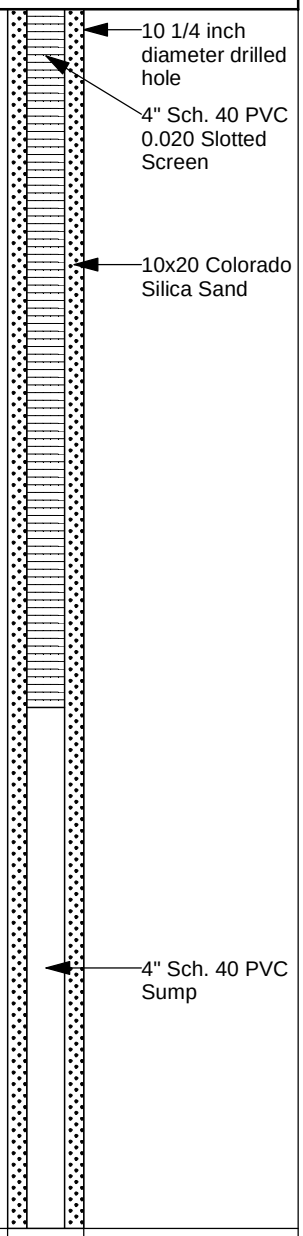
Date Start-Finish: 10/10/17-10/12/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Jason Little

Well/Boring ID: DPE-7
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50°F, Overcast

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
13										
14										
15										
16	2	15-16.5	0	2 2 2	4	NA	NA	NA		No recovery.
17										
18										
19										
20										
21	3	20-21.5	18	5 7 9	16	46.4	NA	SP/SG		SAND with little gravel; poorly graded, medium grained sand; small, subrounded, poorly graded gravel; trace woody debris; wet; gray; slight HCLO.
22										
23	4	22.5-24	6	8 10 10	20	50.5	NA	SP/SG		Same as above.
24										End of Boring at 24.0 ft bgs.
25										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS:
ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

Project Number: B0045362.0008
Data File: DPE-7.dat
Date: 12/21/2017

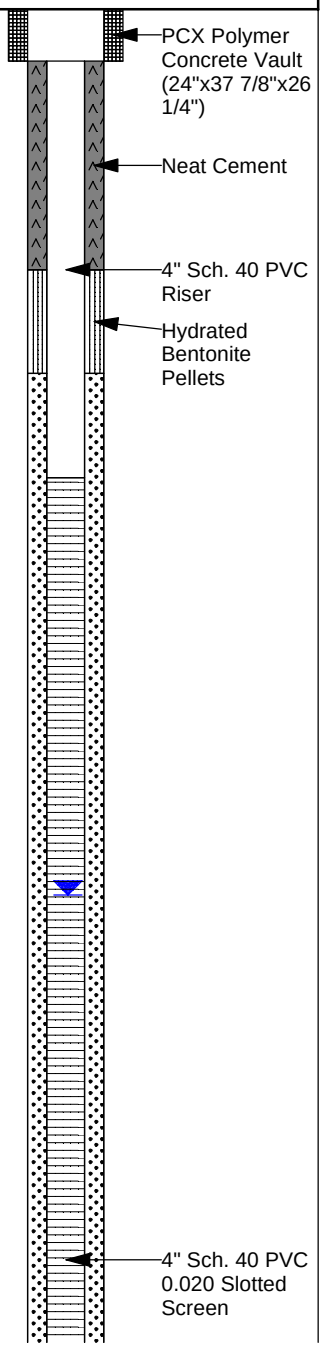
Date Start-Finish: 10/10/17-10/11/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: DPE-8
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50° F, Overcast

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										Asphalt (2 ft bgs to 2.3 ft bgs)
2										
3	HA	2.5-3	6	NA	NA	0.5	NA	SP		SAND and gravel, poorly graded, medium to coarse grained sand; small, poorly graded, subrounded gravel; dry; brown.
4										
5	HA	5-5.5	6	NA	NA	15.1	NA	SP		SAND with trace gravel, poorly graded, medium grained sand; small, poorly graded, subrounded gravel; moist; brown, slight HCLO.
6										
7										
8	HA	7.5-8	6	NA	NA	13.8	NA	SP		Same as above.
9										Boring cleared to 8.4 ft bgs via air knife/vac.
10	1	10-11.5	12	8 9 10	19	0.4	NA	SP		SAND, poorly graded, medium grained sand; wet; brown.
11										
12										

Well/Boring Construction



REMARKS:
ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

ARCADIS Design & Consultancy for natural and built assets

Project Number: B0045362.0008
Data File: DPE-8.dat
Date: 12/21/2017

Date Start-Finish: 10/10/17-10/11/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: DPE-8
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50° F, Overcast

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
13										
14										
15										
16	2	15-16.5	18	9 12 24	36	0.7	NA	SP		SAND, poorly graded, fine to medium grained sand; wet; brown.
17										
18										
19										
20	3	20-21.5	18	4 9 10	19	0.8	NA	SP/SG		SAND with some gravel; poorly graded, fine to medium grained sand; small, poorly graded, subrounded gravel; wet; brown.
21						0.1		CH		CLAY, high plasticity clay; dense;wet; grayish brown.
22										
23	4	22.5-24	18	4 9 14	23	1.8	NA	SP		SAND, poorly graded, medium to fine grained sand; wet; brown.
24										End of Boring at 24.0 ft bgs.
25										

Well/Boring Construction:
- 10 1/4 inch diameter drilled hole
- 10x20 Colorado Silica Sand
- 4" Sch. 40 PVC Sump

ARCADIS Design & Consultancy for natural and built assets

REMARKS:
ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

Project Number: B0045362.0008
Data File: DPE-8.dat
Date: 12/21/2017

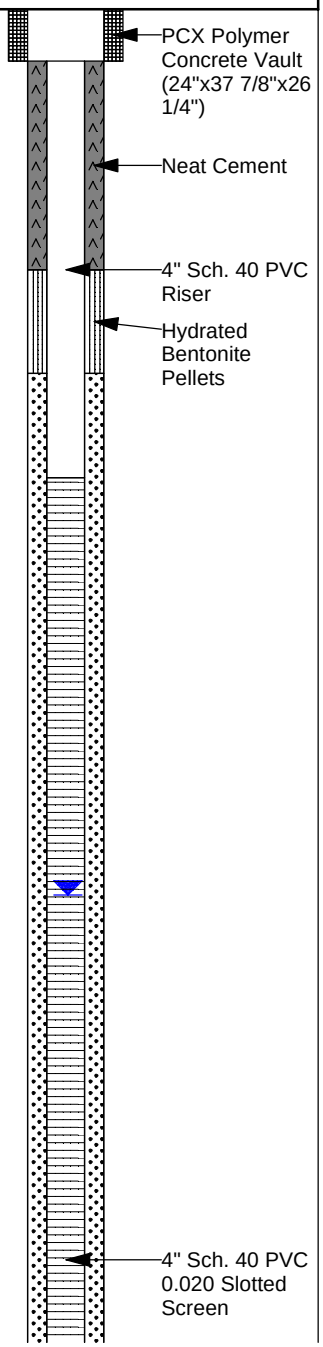
Date Start-Finish: 10/10/17-10/11/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: **DPE-9**
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA.
Former Unocal Edmonds
Bulk Fuel Terminal.
Weather Conditions: 50° F, Partly cloudy

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
										Asphalt (at 0.5 ft bgs-1.2 ft bgs)
1										
2										
	HA	2.5-3	6	NA	NA	2.3	NA	SP		SAND, poorly graded, medium grained sand; dry; gray.
3										
4										
5	HA	5-5.5	6	NA	NA	1.7	NA	SP		SAND, poorly graded, medium grained sand; moist; gray.
6										
7										
	HA	7.5-8	0	NA	NA	NA	NA	SP		No sample; too wet for Hand Auger
8										
9										Boring closed to 8.4 ft bgs via air knife and vacuum.
10										
	1	10-11.5	12	4 9 11	21	7.4	NA	SP		SAND with trace gravel, poorly graded, medium grained sand; small, poorly graded, subrounded gravel; wet; brown.
11										
12										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level

Project Number: B0045362.0008
Data File: DPE-9.dat
Date: 12/21/2017

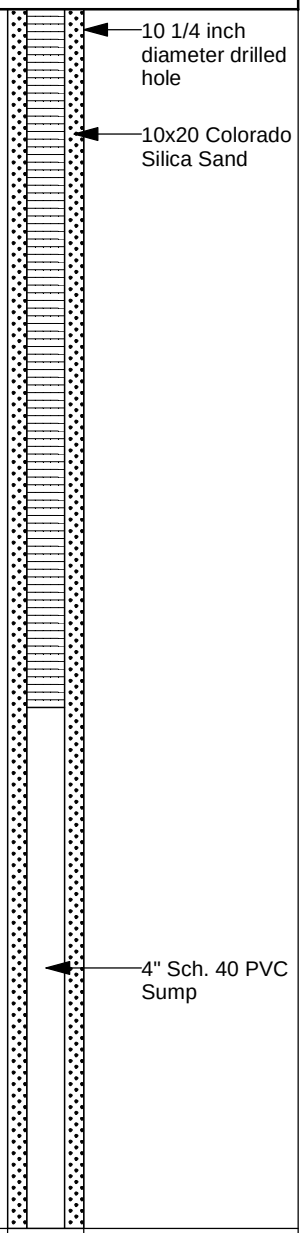
Date Start-Finish: 10/10/17-10/11/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: **DPE-9**
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50° F, Partly cloudy

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
13										
14										
15										
16	2	15-16.5	18	3 4 7	11	0.7	NA	SM		SAND with some silt, poorly graded, medium grained sand; low plasticity silt; wet; brown.
17										
18										
19										
20										
21	3	20-21.5	18	3 5 5	10	4.7	NA	SP		SAND with trace gravel; poorly graded, medium grained sand; small, poorly graded, subrounded gravel; wet; brown.
22										
23	4	22.5-24	18	3 4 5	9	10.1	NA	SP		Same as above.
24										End of Boring at 24.0 ft bgs.
25										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level

Project Number: B0045362.0008
Data File: DPE-9.dat
Date: 12/21/2017

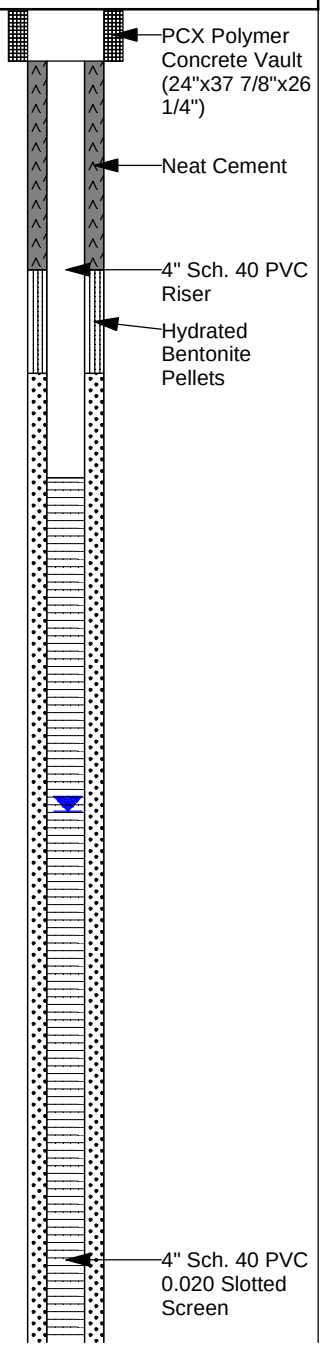
Date Start-Finish: 10/12/17-10/13/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Alex Pink

Well/Boring ID: DPE-10
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50° F, Partly cloudy

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										Asphalt (0.5 ft bgs to 1.1 ft bgs)
2										
3	HA	2.5-3	6	NA	NA	0.0	NA	SP		SAND, poorly graded; fine to medium grained sand; dry; light brown.
4										
5	HA	5-5.5	6	NA	NA	0.0	NA	SP		SAND, poorly graded; fine to medium grained sand; dry; light brown.
6										
7	HA	7-7.5	6	NA	NA	1.7	NA	SP		Same as above - wet; grayish brown.
8										Boring cleared to 8 ft bgs via air knife and vacuum.
9										
10	1	10-11.5	12	4 7 10	17	5.3	NA	SP		SAND with trace gravel, poorly graded, medium grained sand; small, poorly graded, subrounded gravel; wet; grayish brown.
11										
12										

Well/Boring Construction



REMARKS: ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level

ARCADIS Design & Consultancy for natural and built assets

Project Number: B0045362.0008
Data File: DPE-10.dat
Date: 12/21/2017

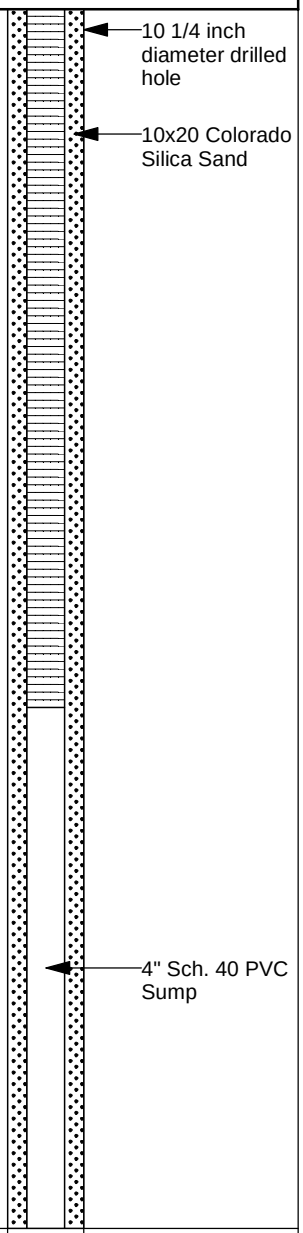
Date Start-Finish: 10/12/17-10/13/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Alex Pink

Well/Boring ID: DPE-10
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50° F, Partly cloudy

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
13										
14										
15										
16	2	15-16.5	18	4 4 7	11	5.6	NA	SP		Same as above.
17										
18										
19										
20										
21	3	20-21.5	18	8 10 10	20	4.7	NA	SP/SG		SAND with some gravel; poorly graded, medium grained sand; small, poorly graded, subrounded gravel; wet; grayish brown. Color change from grayish brown to brown at 21.5 ft bgs.
22										
23	4	22.5-24	18	6 6 8	14	2.4	NA	SP		SAND; poorly graded, medium grained sand; wet; brown.
24										End of Boring at 24.0 ft bgs.
25										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level

Project Number: B0045362.0008
Data File: DPE-10.dat
Date: 12/21/2017

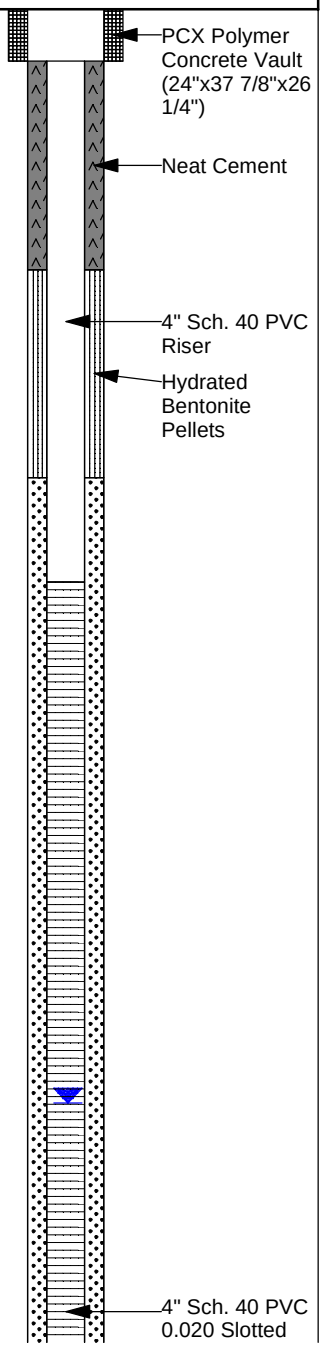
Date Start-Finish: 10/11/17-10/18/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Jason Little

Well/Boring ID: DPE-11
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 52° Sunny

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										
2										
3	HA	2.5-3	6	NA	NA	0.3	NA	SP		SAND with trace gravel, very fine to medium grained sand; small, fine to medium, poorly graded gravel; dry; brown.
										Encountered black liner at 3.6 ft bgs.
4										
5	HA	5-5.5	6	NA	NA	103.0	NA	SP-SM		SAND with some silt, very fine to fine grained sand; low plasticity silt; dry; gray.
6										
7	HA	7-7.5	6	NA	NA	2.0	NA	SP		SAND with trace silt, very fine to medium grained; dry; brown.
8										
9										
10	1	10-11.5	18	8 9 8	17	4.8	NA	SP/SM		SAND with some silt, poorly graded, fine grained sand; low plasticity silt; wet; brown.
11										
12										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level

Project Number: B0045362.0008
Data File: DPE-11.dat
Date: 12/21/2017

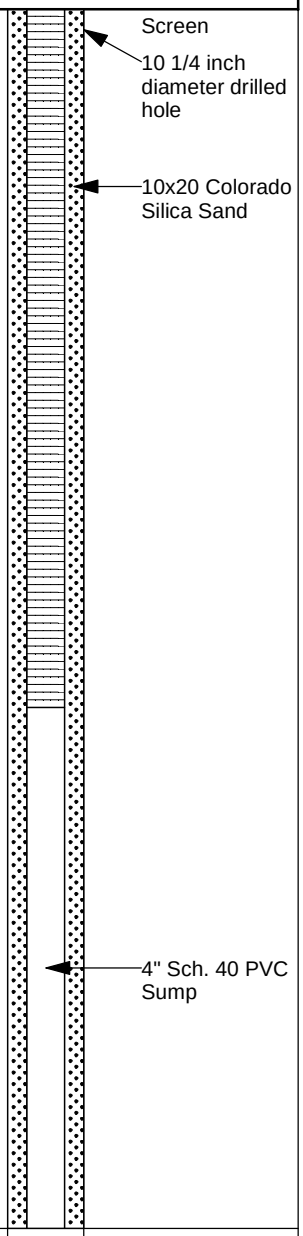
Date Start-Finish: 10/11/17-10/18/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Jason Little

Well/Boring ID: DPE-11
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 52° Sunny

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
13										
14										
15										
16	2	15-16.5	18	12 15 20	25	6.1	NA	SP		SAND, poorly graded, fine grained; wet; brown.
17										
18										
19										
20										
21	3	20-21.5	18	4 5 12	17	12.7	NA	SP		SAND with trace gravel; poorly graded, fine grained sand; gravel, small, poorly graded, subrounded gravel; wet; brown.
22										
23	4	22.5-24	18	7 8 20	28	7.1	NA	SP		Same as above.
24										End of Boring at 24.0 ft bgs.
25										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level

Project Number: B0045362.0008
Data File: DPE-11.dat
Date: 12/21/2017

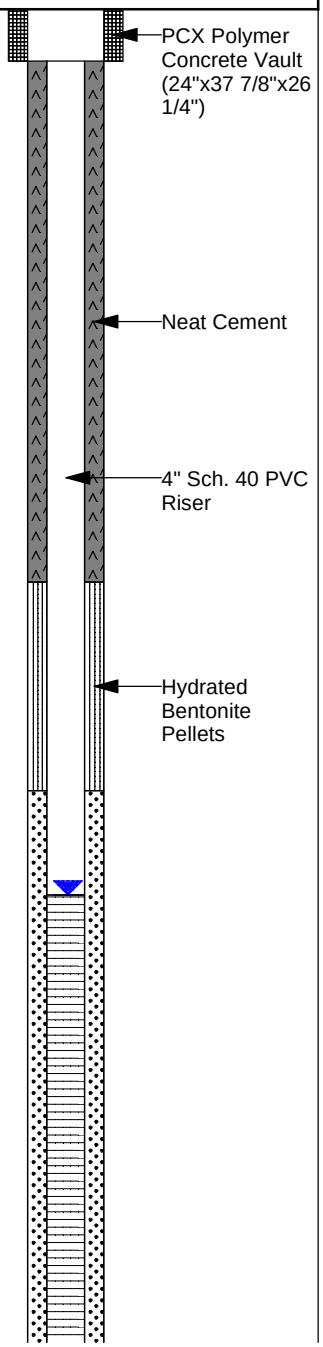
Date Start-Finish: 10/9/17-10/16/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: DPE-12
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 60° F Sunny

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										
2										
3	HA	2.5-3	6	NA	NA	0.1	NA	SP		SAND with some gravel and cobble, poorly graded, medium grained sand; subrounded gravel; 2 to 4" sub-angular cobbles; dry; brown.
4										At 4 ft encountered gravel.
5	HA	5-5.5	6	NA	NA	0.0	NA	GP		GRAVEL, poorly graded, sub-rounded; dry.
6										
7										Encountered black liner at 7 ft bgs.
8	HA	7.5-8	4	NA	NA	1,001	NA	GP		GRAVEL with some sand, poory graded, subrounded gravel; poorly graded, medium grained sand; moist; brown; HCLO.
	HA	8-8.5	6	NA	NA	100.6	NA	SP		SAND with little gravel, poorly graded, medium grained sand; poorly graded, subrounded gravel; wet; brown; HCLO.
9										Boring closed at 8.5 ft bgs via air knife/vacuum.
10	1	10-11.5	18	9 9 10	19	46.6	NA	SP		SAND with little gravel, poorly graded, medium to coarse grained sand; small, poorly graded, subrounded gravel; wet; brown; HCLO
11										
12										

Well/Boring Construction



REMARKS:
ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

ARCADIS Design & Consultancy for natural and built assets

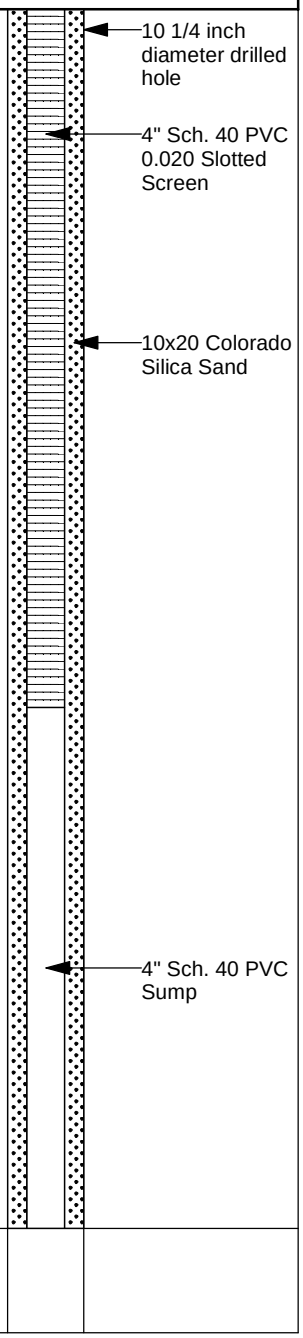
Project Number: B0045362.0008
Data File: DPE-12.dat
Date: 12/21/2017

Date Start-Finish: 10/9/17-10/16/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: DPE-12
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 60° F Sunny

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
13										
14										
15										
16	2	15-16.5	18	12 15 20	25	19.3	NA	SP		SAND with little gravel, poorly graded, medium to coarse grained sand; small, poorly graded, subrounded gravel; wet; brown; HCLO
17										
18										
19										
20										
21	3	20-21.5	18	4 5 9	14	45.1	NA	SP		SAND, poorly graded, medium to coarse grained; wet; brown; HCLO.
22										
23	4	22.5-24	18	10 15 20	25	4.0	NA	SP		Same as above.
24										End of Boring at 24.0 ft bgs.
25										



Well/Boring Construction

ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

Project Number: B0045362.0008
Data File: DPE-12.dat
Date: 12/21/2017

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT

Notice of Intent No. AE47095, RE15476

Construction/Decommission

☐ Construction

☒ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

☒ Resource Protection

☐ Geotechnical Soil Boring

Consulting Firm: **Arcadis**

Unique Ecology Well ID Tag No. _____

Property Owner: **Chevron**

Site Address: **11720 Unoco Road**

City: **Edmonds** County: **Snohomish**

EWM

Location: 1/4 **NW** 1/4 **NE** Sec **26** TWN **27N** R **3E** or WWM

Lat/Long (s,t,r still Required) Lat Deg **n/a** Lat Min/Sec **n/a** Long Deg **n/a** Long Min/Sec **n/a**

Tax Parcel No. **27032600102400**

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Trainee Name (Print) **Kyle Ceruti**

Driller/Trainee Signature _____

Driller/Trainee License No. **3200**

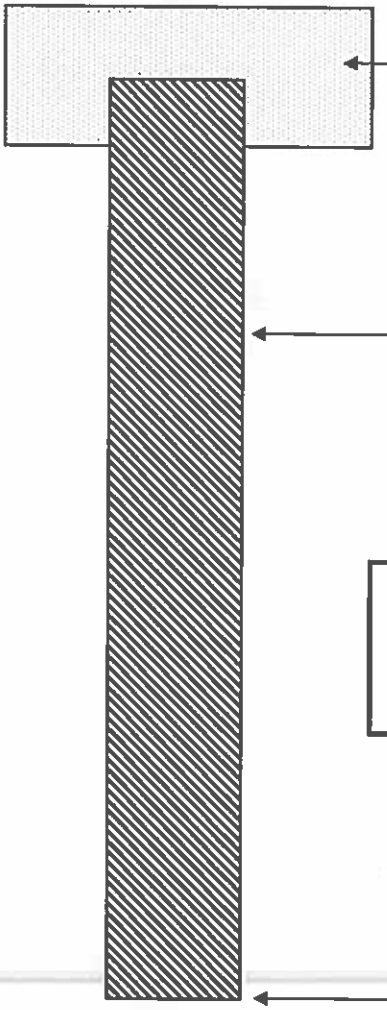
If trainee, licensed drillers' Signature and License No. _____

Cased or Uncased Diameter 10 '4" Static Level N/A

Work/Decommision Start Date 3-10-18

Work/Decommision Completed Date 3-22-18

Construction/Design | Well Data 103-WARR | Formation Description



CONCRETE SURFACE SEAL 4 FT — 0 - FT — Didn't Log Soil

BACKFILL 20 FT — 0 - FT — Bentonite Chips

DEPTH OF BORING 24 FT

REQUIRED INFORMATION

(Must get one or both if available)

DEPT OF ECOLOGY WELL TAG # : _____

CLIENT WELL ID #: DPE-12

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rev 2/01)

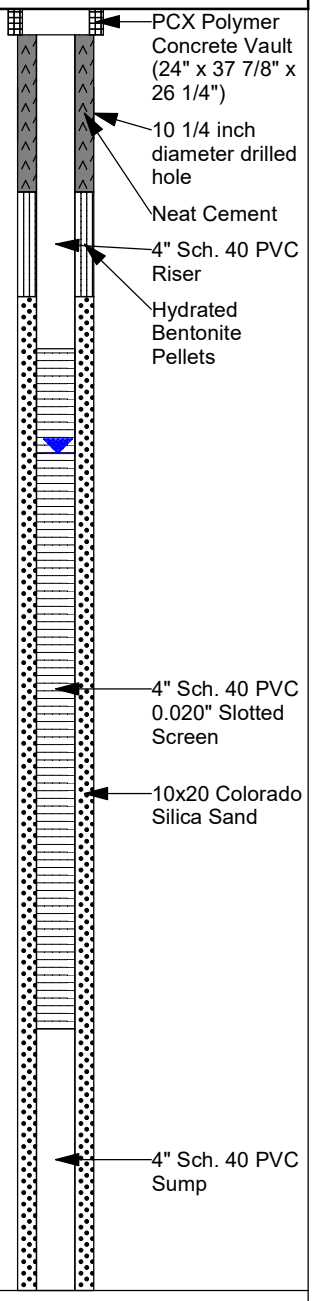
Date Start-Finish: 3/22/18-3/22/18
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: **DPE-12R**
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA.
Former Unocal Edmonds
Bulk Fuel Terminal.
Weather Conditions: 40° F Rain

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										
2										
3	HA	3-3.5	6	NA	NA	0.0	NA	SP		SAND, poorly graded, fine grained; soft; moist; brown.
4										At 4.5' bgs. Change to GRAVEL, small to medium sized; sub-rounded.
5								GP		At 5.0' bgs. Black linner encountered.
6	HA	5.5-6	6	NA	NA	466.4	NA	SP		SAND and GRAVEL, poorly graded, fine grained sand; small to medium sized, subrounded gravel; soft; moist; brown; HCLO.
7										
8										Boring cleared to 8.0 ft bgs via air knife and vacuum techniques.
9										No samples taken from 8.0-24.0' bgs- Wood plug inserted into lead auger to combat heaving sands.
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										End of Boring at 24.0 ft bgs.
25										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: '/ft=Feet
"=Inch
bgs=Below ground surface
NA=Not Applicable/Available
ppm=Parts per million
▼ = Groundwater level
°F=Degrees Fahrenheit
HA=Hand Auger
HCLO=Hydrocarbon like odor
PVC=Polyvinyl Chloride
PID=Photoionization detector

Project Number:B0045362.0012.00002
Data File: DPE-12.dat Date: 4/2/2018

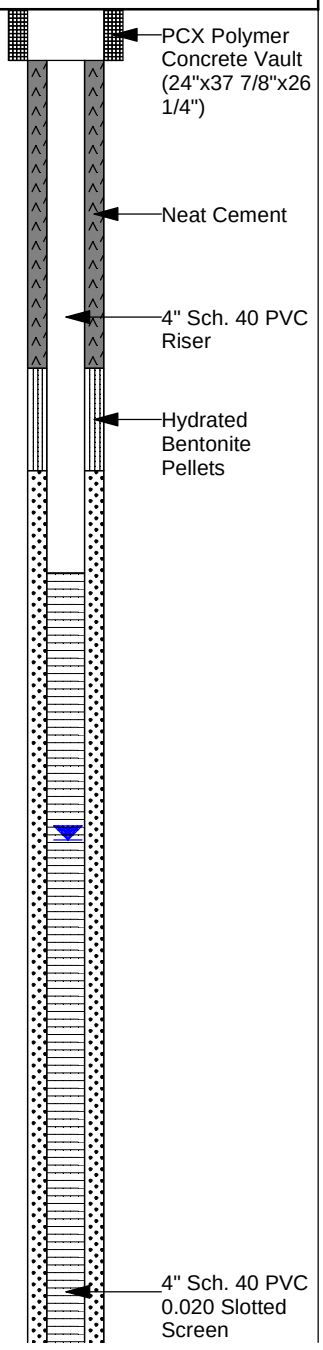
Date Start-Finish: 10/9/17-10/16/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: DPE-13
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50° F Partly Cloudy

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										
2										
3	HA	2.5-3	6	NA	NA	5.3	NA	SP		SAND, poorly graded, medium grained; dry; brown.
										Encountered black plastic liner at 4 ft bgs.
4										
5	HA	5-5.5	6	NA	NA	110.7	NA	SP		SAND, poorly graded, medium grained; moist; brown; slight HCLO.
6										
7										
8	HA	7.5-8	6	NA	NA	63.9	NA	SP		SAND, poorly graded, medium grained; moist to wet; brown; slight HCLO.
										Boring cleared at 8 ft bgs via air knife/vacuum.
9										
10										
11	1	10-11.5	18	3 5 13	18	47.9	NA	SP		SAND with little gravel, poorly graded, medium grained sand; small, poorly graded, subrounded gravel; wet; brown; sight HCLO.
12										

Well/Boring Construction



REMARKS: ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

ARCADIS Design & Consultancy for natural and built assets

Project Number: B0045362.0008
Data File: DPE-13.dat
Date: 12/21/2017

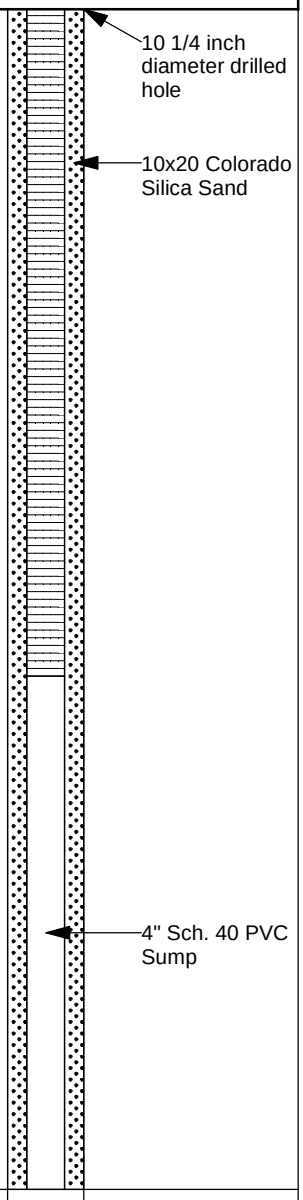
Date Start-Finish: 10/9/17-10/16/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: DPE-13
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50° F Partly Cloudy

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
13										
14										
15	2	15-16.5	18	10 13 15	23	26.9	NA	SP		SAND with little gravel, poorly graded, medium grained sand; small, poorly graded, subrounded gravel; wet; brown; sight HCLO.
16										
17										
18										
19										
20	3	20-21.5	18	3 4 5	9	43.0	NA	SP		SAND with little gravel, poorly graded, medium to coarse grained sand; small, poorly graded, subrounded gravel; wet; brown; slight HCLO.
21										
22										
23	4	22.5-24	18	5 6 6	12	40.1	NA	SP		Same as above - trace gravel.
24										End of Boring at 24.0 ft bgs.
25										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS:
ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

Project Number: B0045362.0008
Data File: DPE-13.dat
Date: 12/21/2017

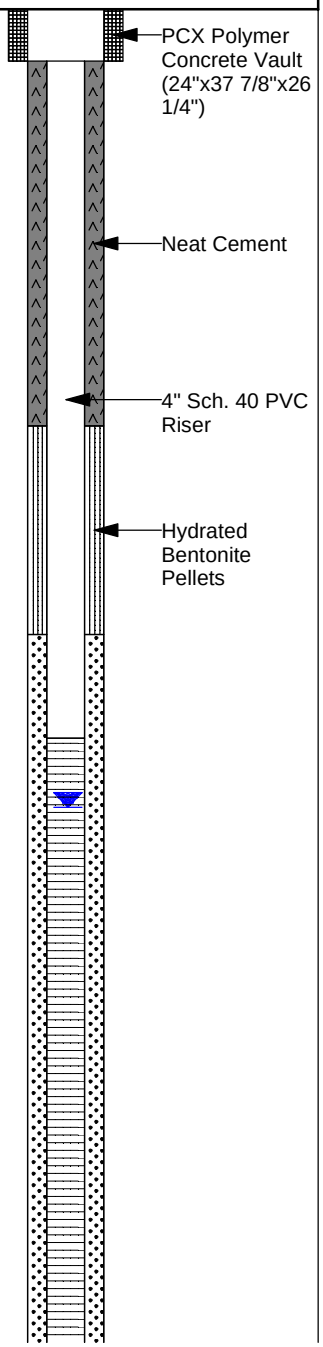
Date Start-Finish: 10/12/17-10/13/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Jason Little

Well/Boring ID: DPE-14
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 47° F Partly Cloudy

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										
2	HA	2-2.5	6	NA	NA	0.0	NA	SP		SAND with trace gravel and cobble, fine to medium grained, poorly graded sand; small to medium gravel; dry; brown.
3										
4										
5	HA	4.6-5.1	6	NA	NA	0.5	NA	GP		GRAVEL with trace sand, fine grained sand; dry; brown.
6										Encountered black Liner at 5.4 ft bgs.
7										
8	HA	7.5-8	6	NA	NA	86.5	NA	SP		SAND with trace silt, very fine to fine grained sand; poorly graded; wet; brown.
9										
10	1	10-11.5	18	11 10 14	24	6.4	NA	SP		SAND with trace gravel, poorly graded, fine grained sand; small, poorly graded, subrounded gravel; wet; brown.
11										
12										

Well/Boring Construction



REMARKS:
ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

ARCADIS Design & Consultancy for natural and built assets

Project Number: B0045362.0008
Data File: DPE-14.dat
Date: 12/21/2017

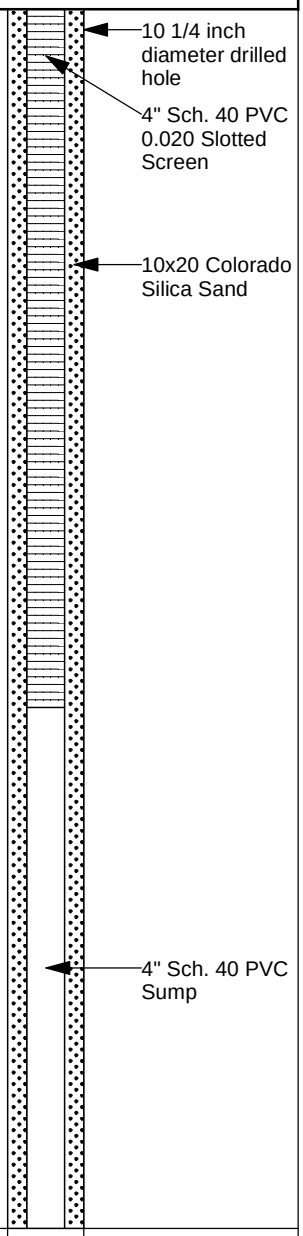
Date Start-Finish: 10/12/17-10/13/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 10 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Sspoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 24.0 ft bgs.
Surface Elevation: NA
Descriptions By: Jason Little

Well/Boring ID: DPE-14
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 47° F Partly Cloudy

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
13										
14										
15										
16	2	15-16.5	18	4 4 8	12	17.5	NA	SM		SAND with some silt and trace gravel, poorly graded,fine grained sand; low plasticity silt; small, poorly graded, subrounded gravel; wet; brown.
17										
18										
19										
20										
21	3	20-21.5	18	14 15 20	25	34.1	NA	SP		SAND with trace gravel, poorly graded, medium to coarse grained sand; small, poorly graded, subrounded gravel; wet; brown; slight HCLO.
22										
23	4	22.5-24	18	12 17 22	39	10.5	NA	SP		SAND, poorly graded,medium to coarse grained sand; wet; brown.
24										End of Boring at 24.0 ft bgs.
25										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS:
ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

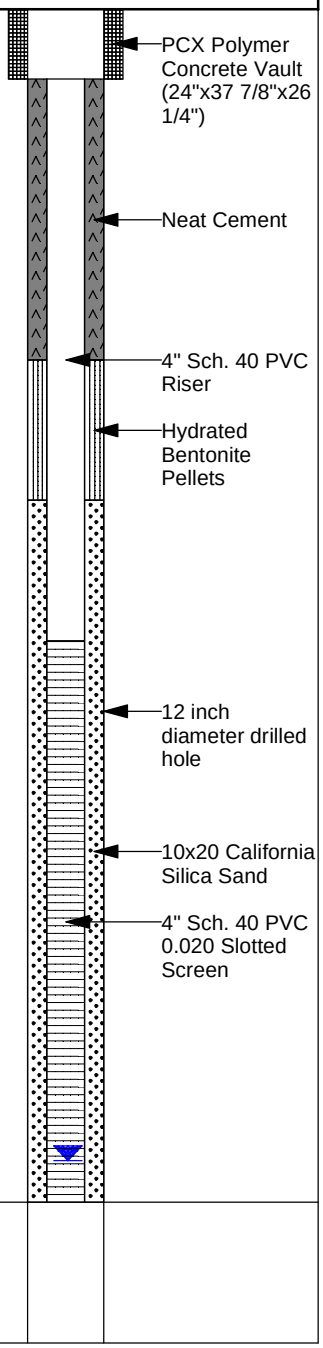
Project Number: B0045362.0008
Data File: DPE-14.dat
Date: 12/21/2017

Date Start-Finish: 10/21/17-10/21/17
Drilling Company: Cascade Drilling
Driller's Name: Wesley Kennedy
Drilling Method: Air Knife/VACCUM
Auger Size: NA
Rig Type: NA
Sampling Method: Hand Auger

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 8.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: SVE-1
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50°F, Rain

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
										0 ft - 0.6 ft - Asphalt.
1										
2										
	1	HA	6	NA	NA	2.4	NA	SP		SAND with little gravel, Poorly graded, medium grained sand. small, poorly graded, subrounded gravel, gray, dry.
3										
4										
5										
	2	HA	6	NA	NA	1.8	NA	SP		SAND, poorly graded, medium grained, gray, dry.
6										
7										
	3	HA	6	NA	NA	0.5	NA	SP		Same as above - wet.
8										
										End of Boring at 8.0 ft bgs.
9										



Well/Boring Construction

ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level

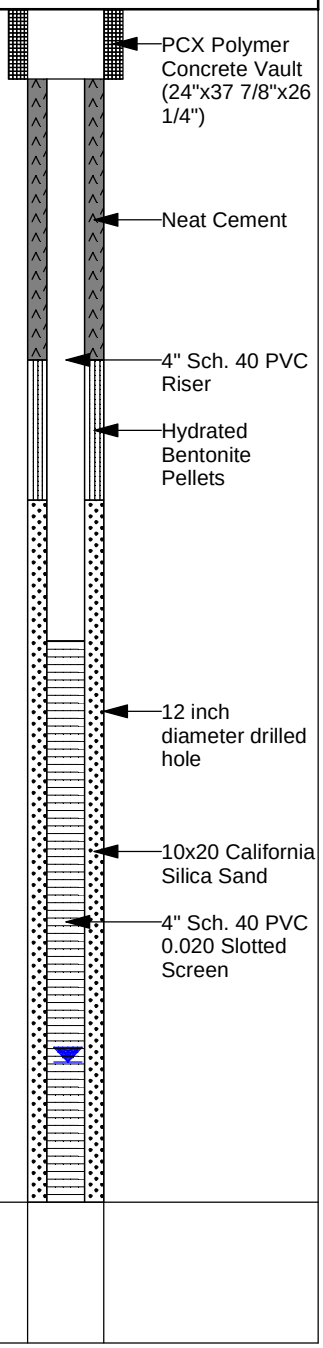
Project Number: B00453620008
Data File: SVE-1.dat
Date: 12/21/2017

Date Start-Finish: 10/21/17-10/21/17
Drilling Company: Cascade Drilling
Driller's Name: Wesley Kennedy
Drilling Method: Air Knife/VACCUM
Auger Size: NA
Rig Type: NA
Sampling Method: Hand Auger

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 8.0 ft.bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: SVE-2
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50°F, Rain

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
										0 ft - 0.6 ft - Asphalt.
1										
2										
	1	HA	6	NA	NA	742	NA	SP		SAND with little gravel, Poorly graded, medium grained sand. small, poorly graded, subrounded gravel, dry, brown, HCLO.
3										
4										
5										
	2	HA	6	NA	NA	81.1	NA	SP		SAND, poorly graded, medium grained, gray, dry, HCLO.
6										
7										
	3	HA	6	NA	NA	62.2	NA	SP		Same as above.
8										
										End of Boring at 8.0 ft bgs.
9										



Well/Boring Construction

ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft=Feet
"= Inch
bgs=Below ground surface
NA=Not Applicable/Available
PID=Photoionization detector
ppm=Parts per million
°F=Degrees Fahrenheit
HA=Hand Auger
▼ = Groundwater level
HCLO=Hydrocarbon like odor

Project Number: B00453620008
Data File: SVE-2.dat
Date: 12/21/2017

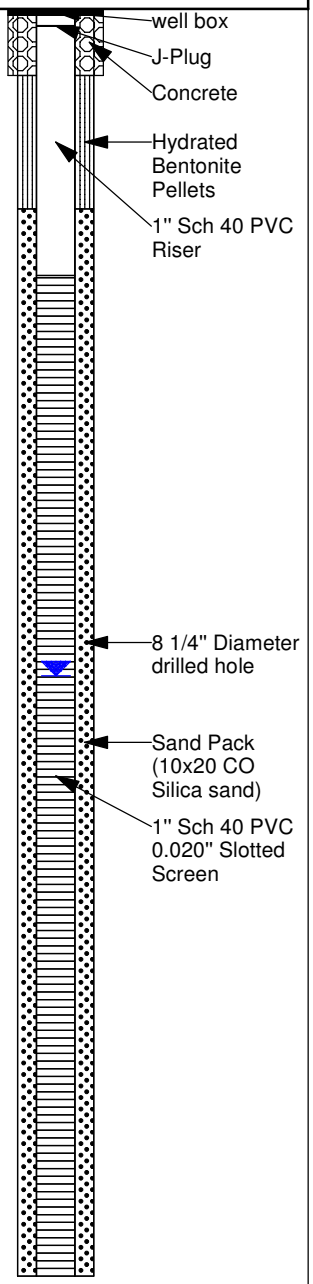
Date Start-Finish: 10/11/17-10/18/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Asveus
Drilling Method: Hollow-stem Auger
Auger Size: 8 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Spoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 19.0 ft bgs.
Surface Elevation: NA
Descriptions By: Jason Little

Well/Boring ID: PZ-4
Client: BP
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50°F Rain

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										
2										
3										Encountered asphalt at 2.5 ft bgs.
4										
5	HA	5-5.5	6	NA	NA	14.9	NA	SG		SAND with Gravel, medium grained sand, medium subrounded gravel, gray/brown
6										Black liner at 6.5 ft bgs.
7	HA	7-7.5	6	NA	NA	3.0	NA	SG		Same As Above
8										Boring cleared to 8 ft bgs via air knife/vac
9										
10	1	10-11.5	18	3 3 5	8	1.3	NA	SP		SAND, fine grained; poorly graded; gray; wet. Wood debries encountered at 11 ft bgs.
11										
12										
13										
14										
15	2	15-16.5	18	5 11 12	23	0.6	NA	SP		Same As Above
16										
17										
18	3	17.5-19	18	4 4 3	7	0.2	NA	SP		Same As Above, trace Gravel, poorly graded, small, subrounded gravel. Wood debris encountered at 19 ft bgs.
19										End of Boring at 19.0 ft bgs.
20										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft= Feet " = Inch °F= Degrees Fahrenheit
bgs = Below ground surface HA= Hand Auger
NA = Not Applicable/Available ▼ = Groundwater level
PID = Photoionization detector
ppm= Parts Per Million
PVC= Polyvinyl Chloride

Project Number:1330453640008
Data File: PZ-4.dat Date: 21-12-2017

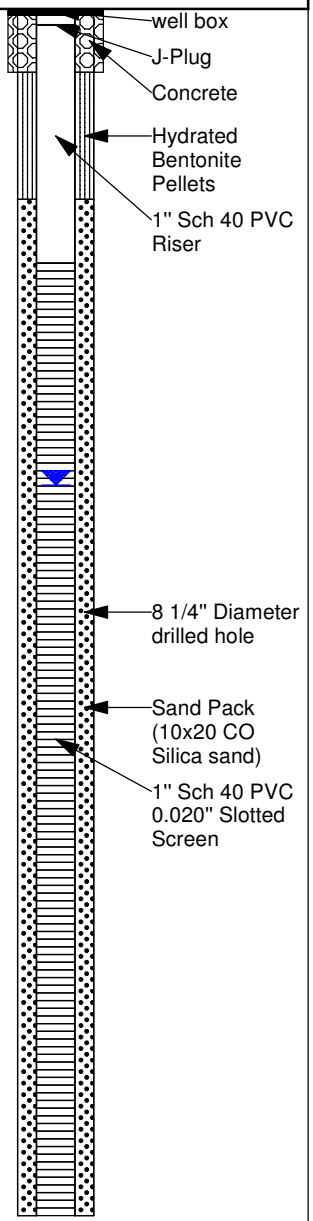
Date Start-Finish: 10/10/17-10/12/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 8 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Spoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 19.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: PZ-5
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50° F Overcast

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										Asphalt (1.2 ft bgs to 2.8 ft bgs)
2										
3	HA	2.8-3.3	6	NA	NA	0.0	NA	SP		SAND, poorly graded, fine to medium grained sand, brown, dry.
4										
5	HA	5-5.5	6	NA	NA	5.5	NA	SP		Same As Above, grayish brown, slight HCLO.
6										
7										
8	HA	7.5-8	0	HA	NA	NA	NA	SP		No sample, too wet for hand auger.
9										Boring cleared to 8 ft bgs via air knife/vac
10										
11	1	10-11.5	18	3 4 4	8	5.9	NA	SM		SAND with little silt, poorly graded, fine grained sand, low plasticity silt, grayish brown, wet, slight hydrocarbon linked odor.
12										
13										
14										
15										
16	2	15-16.5	18	4 8 10	18	10.1	NA	SP		SAND- poorly graded, fine grained sand, gray, wet, slight HCLO.
17										
18	3	17.5-19	18	30 50/6	80	8.8 2.2	NA	SP SG		Same As Above. SAND with some gravel-poorly graded, fine to medium grained sand, small, sub-rounded gravel, poorly graded, brown, wet.
19										
20										End of boring at 19.0 ft bgs.
21										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft= Feet " = Inch °F= Degrees Fahrenheit
bgs = Below ground surface HA= Hand Auger
NA = Not Applicable/Available = Groundwater level
PID = Photoionization detector HCLO= Hydrocarbon like odor
ppm= Parts Per Million
PVC= Polyvinyl Chloride

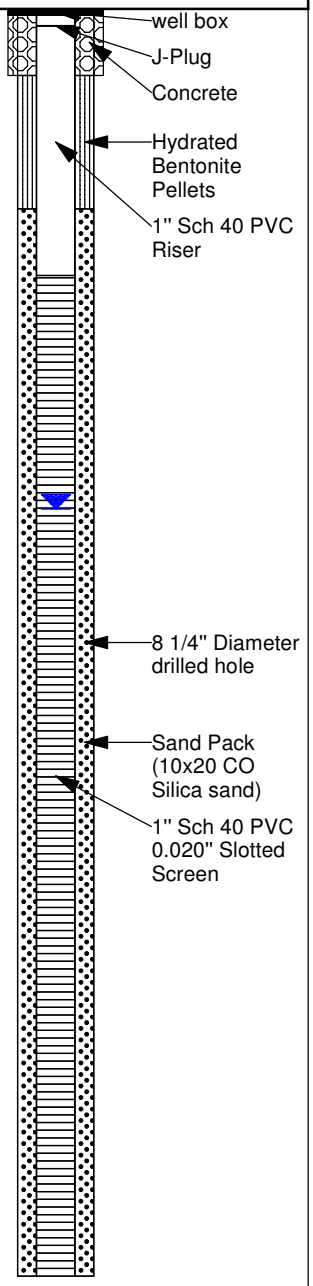
Project Number:1330453640008
Data File: PZ-5.dat Date: 21-12-2017

Date Start-Finish: 10/10/17-10/12/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 8 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Spoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 19.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: PZ-6
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50° F Overcast

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										Asphalt (0.8 ft bgs to 1.5 ft bgs).
2										
3	HA	2.5-3	6	NA	NA	0.0	NA	SP		SAND- poorly graded, medium graded sand, brown, dry.
4										
5	HA	5-5.5	6	NA	NA	0.1	NA	SP		Same As Above, moist.
6										
7										
8	HA	7.5-8	0	NA	NA	NA	NA	SP		No sample, too wet for hand auger.
9										Boring cleared to 8 ft bgs via air knife/vac.
10										
11	1	10-11.5	18	3 7 10	17	1.9	NA	SP		SAND- poorly graded, fine to medium grained, brown, wet.
12										
13										
14										
15										
16	2	15-16.5	18	12 15 20	35	0.6 1.1	NA	SP SG		Same As Above. SAND with some gravel, poorly graded, fine to medium grained sand, small poorly graded, sub rounded gravel, brown, wet.
17										
18	3	17.5-19	18	50/6	50	0.5	NA	SG		Same As Above.
19										End of boring at 19.0 ft bgs.
20										



REMARKS: ft= Feet " = Inch °F= Degrees Fahrenheit
bgs = Below ground surface HA= Hand Auger
NA = Not Applicable/Available = Groundwater level
PID = Photoionization detector
ppm= Parts Per Million
PVC= Polyvinyl Chloride

ARCADIS Design & Consultancy for natural and built assets

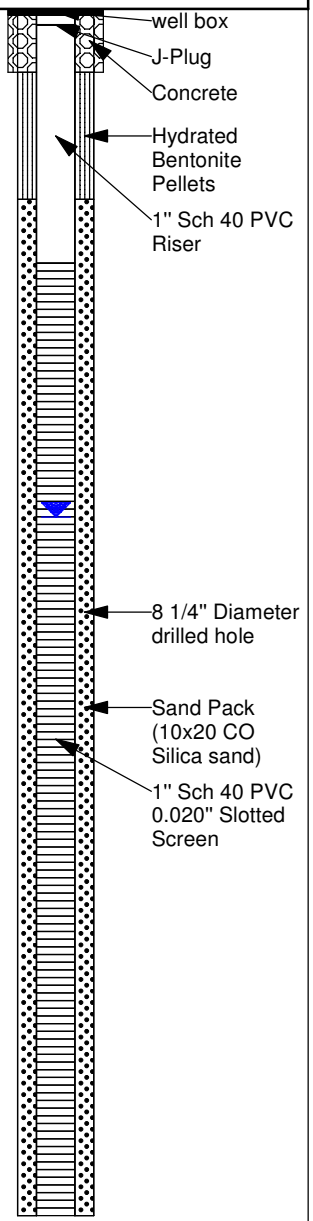
Project Number:1330453640008
Data File: PZ-6.dat Date: 21-12-2017

Date Start-Finish: 10/12/17-10/13/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 8 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Spoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 19.0 ft bgs.
Surface Elevation: NA
Descriptions By: Alex Pink

Well/Boring ID: PZ-7
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 50° F Overcast

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										Encountered asphalt at 0.5 ft bgs.
3	HA	2.5-3	6	NA	NA	0.0	NA	SP		SAND, poorly graded, fine to medium grained, light brown, dry.
5	HA	5-5.5	6	NA	NA	88.9	NA	SP		Same As Above, light brown to gray, HCLO
7	HA	7-75	6	NA	NA	20.8	NA	SP		Same As Above, gray, saturated
11	1	10-11.5	18	7 7 9	16	0.9	NA	SP		SAND, poorly graded, fine to medium grained, gray, wet.
16	2	15-16.5	18	4 10 12	22	2.9	NA	SP		Same As Above
18	3	17.5-19	18	19 20 24	44	2.8 0.2	NA	SP SG		Same As Above SAND with gravel - poorly graded, fine to medium grained sand, small, poorly grained, sub rounded, brown, wet.
19										End of boring at 19.0 ft bgs.



Well/Boring Construction

ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft= Feet " = Inch °F= Degrees Fahrenheit
bgs = Below ground surface HA= Hand Auger
NA = Not Applicable/Available HCLO= Hydrocarbon like odor
PID = Photoionization detector ▼ = Groundwater level
ppm= Parts Per Million
PVC= Polyvinyl Chloride

Project Number:B0045362.0008
Data File: PZ-7.dat Date: 21-12-2017

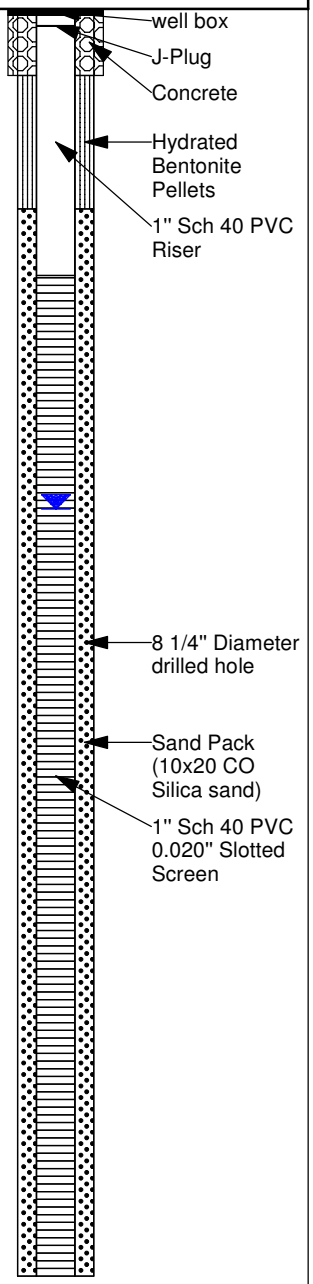
Date Start-Finish: 10/11/17-10/17/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 8 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Spoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 19.0 ft bgs.
Surface Elevation: NA
Descriptions By: Jason Little

Well/Boring ID: PZ-8
Client: BP
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 51°F Partly Cloudy

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										
2										
3	HA	2.5-3	NA	NA	NA	6.5	NA	SP		SAND, very fine to medium grained sand, trace gravel, small,poorly graded, brown, dry.
4										Encountered Cobble at 4.9 ft bgs.
5	HA	5-5.5	NA	NA	NA	1.8	NA	GP		GRAVEL some sand, fine gravel, very fine medium grained sand.
6	HA	6-6.5	NA	NA	NA	495	NA	SP		SAND, very fine to medium grained sand, trace gravel, small, gray, moist.
7										
8	HA	7.5-8	NA	NA	NA	67.8	NA	SP		Same As Above
9										Boring cleared to 8.2 ft bgs via air knife/vac.
10	1	10-11.5	18	3 4 3	7	37.3	NA	SP		SAND, poorly graded, fine to medium grained sand, gray, wet, HCLO.
11										
12										
13										
14										
15	2	15-16.5	18	7 10 13	23	40.8	NA	SP		Same As Above, trace, small, poorly graded, subrounded gravel.
16										
17										
18	3	17.5-19	18	10 19 20	39	26.0	NA	SP		Same As Above
19										End of boring at 19.0 ft bgs.
20										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft= Feet " = Inch °F= Degrees Fahrenheit
bgs = Below ground surface HA= Hand Auger
NA = Not Applicable/Available HCLO= Hydrocarbon like odor
PID = Photoionization detector ▼ = Groundwater level
ppm= Parts Per Million
PVC= Polyvinyl Chloride

Project Number:B0045362.0008
Data File: PZ-8.dat Date: 21-12-2017

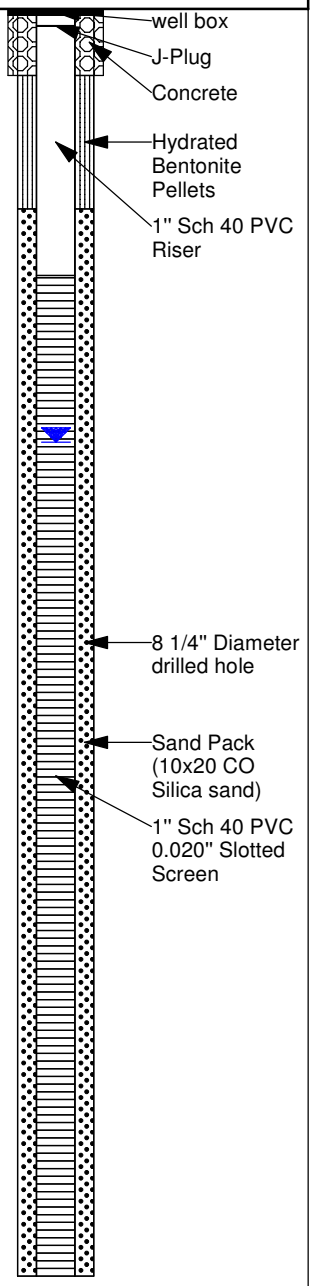
Date Start-Finish: 10/09/17-10/17/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 8 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Spoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 19.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: PZ-9
Client: BP
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 60° F Sunny

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										
2										
3	HA	2.5-3	6	NA	NA	0.2	NA	SP		SAND, poorly graded, medium to coarse grained sand, brown, dry.
4										Encountered Gravel at 4.5 ft bgs.
5	HA	5-5.5	6	NA	NA	0.2	NA	GP		GRAVEL, poorly graded, subrounded gravel, dry.
6	HA	6-6.5	6	NA	NA	454.4	NA	SM		SAND and SILT, poorly graded, medium grained sand, low plasticity silt, gray wet, HCLO. Encountered black liner at 6 ft bgs.
7										
8	HA	7.5-8	6	NA	NA	129.7	NA	SM		SAND, with trace silt, poorly graded, medium grained sand, low plasticity silt, brown, wet, HCLO.
9										Boring cleared to 8' bgs via air knife/vac.
10	1	10-11.5	18	10 10 16	26	12.0	NA	SP		SAND with trace gravel, poorly graded, fine to medium grained sand, small, poorly graded, subrounded gravel, gray, wet.
11										
12										
13										
14										
15	2	15-16.5	18	9 10 12	22	6.6	NA	SP		Same As Above
16										
17	3	17.5-19	18	6 18 14	32	4.5	NA	SP		Same As Above, no gravel.
18										End of Boring at 19.0 ft bgs.
19										
20										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft= Feet " = Inch °F= Degrees Fahrenheit
bgs = Below ground surface HA= Hand Auger
NA = Not Applicable/Available HCLO= Hydrocarbon like odor
PID = Photoionization detector ▼ = Groundwater level
ppm= Parts Per Million
PVC= Polyvinyl Chloride

Project Number:B0045362.0008
Data File: PZ-9.dat Date: 21-12-2017

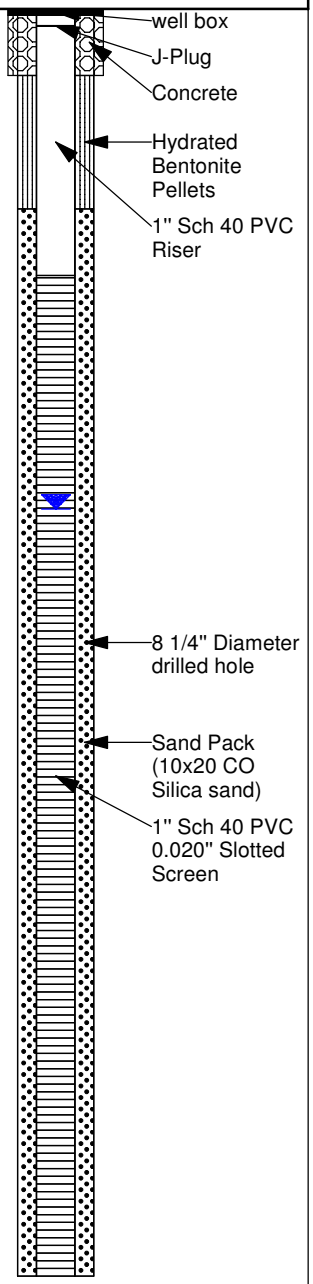
Date Start-Finish: 10/09/17-10/17/17
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow-stem Auger
Auger Size: 8 1/4"
Rig Type: NA
Sampling Method: Hand Auger/Split Spoon Sampler

Northing : NA
Easting: NA
Casing Elevation: NA
Borehole Depth: 19.0 ft bgs.
Surface Elevation: NA
Descriptions By: Eric Krueger

Well/Boring ID: PZ-10
Client: Chevron EMC
Location: 11720 Unoco Rd, Edmonds, WA. Former Unocal Edmonds Bulk Fuel Terminal.
Weather Conditions: 60° F Sunny

DEPTH (ft.)	Sample Run Number	Sample/Int/Type	Recovery (")	Blow Counts	N-Value	PID (ppm)	Anatylical Sample	USGS Class	Geologic Column	Stratigraphic Description
0										
1										
2										
3	HA	2.5-3	6	NA	NA	2.8	NA	SP		SAND, poorly graded, medium grained sand, brown, dry.
4										
5	HA	5-5.5	6	NA	NA	0.8	NA	SP		Same As Above
6										
7										
8	HA	7.5-8	6	NA	NA	45.3	NA	SP		SAND and GRAVEL, poorly graded, medium grained sand, poorly graded, subrounded gravel, brown, moist to wet. Encountered black plastic liner at 7.6 ft bgs.
9										Boring cleared to 8' bgs via air knife/vac.
10	1	10-11.5	18	10 12 13	25	18.1	NA	SP		SAND with trace gravel- poorly graded, fine to medium grained sand, small, poorly graded, subrounded gravel, gray, wet.
11										
12										
13										
14										
15	2	15-16.5	18	19 20 20	40	1.5	NA	SP		Same As Above
16										
17										
18	3	17.5-19	18	7 10 15	25	0.5	NA	SP		Same As Above
19										End of boring at 19.0 ft bgs.
20										

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

REMARKS: ft= Feet " = Inch °F= Degrees Fahrenheit
bgs = Below ground surface HA= Hand Auger
NA = Not Applicable/Available HCLO= Hydrocarbon like odor
PID = Photoionization detector ▼ = Groundwater level
ppm= Parts Per Million
PVC= Polyvinyl Chloride

Project Number:B0045362.0008
Data File: PZ-10.dat Date: 21-12-2017

Date Start/Finish: 2/10/2015
Drilling Company: Cascade Drilling
Driller's Name: Curtis A.
Drilling Method: Hollow Stem Auger
Auger Size: 10" Outer Diameter
Rig Type: Truck Mounted
Sampling Method: Split Spoon

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 30' bgs
Surface Elevation: NE

Descriptions By: SLM

Well/Boring ID: **DPE-1**

Client: Chevron EMC

Location: Edmonds Terminal, 11720 Unoco Rd, Edmonds, WA

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0										Topsoil	18 inch well box
											Fill	J-Plug
												Concrete
			2-2.5	0	NA	NA	NA				No recovery, 12 inches of asphalt	
												Riser Sch. 40 PVC - 4 inch diameter
												Bentonite
		HA	4.5 - 5	.5	NA	NA	162.9		SM		Silty Sand, medium to fine sand, trace small gravel, well graded, dark brown, wet, HCLO	Water first encountered
5	-5											
		HA	7-7.5	0	NA	NA	NA				No recovery, too wet for hand auger	
		1	8.5 -10	1.0	1 1 1	2	730.1				Sand, medium grain, poorly graded, dark brown, wet, HCLO	
10	-10											
		2	11-12.5	0	NA	NA	NA				Sample interval missed by driller	
									SP			
		3	13.5 -15	1.5	1 2 1	3	296				Same As Above at the 10 foot interval	
15	-15											0.020 Slot Screen Sch. 40 PVC

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks: bgs = below ground surface
NA = Not Available
ppm = parts per million
NE = Not Established
HA = Hand Auger
HCLO = Hydrocarbon like odor

Project Number:B0045362
Data File:

Date: 5/20/2015 Created/Edited by:RwL

Date Start/Finish: 2/10/2015 **Drilling Company:** Cascade Drilling **Driller's Name:** Curtis A. **Drilling Method:** Hollow Stem Auger **Auger Size:** 10'' Outer Diameter **Rig Type:** Truck Mounted **Sampling Method:** Split Spoon	**Northing:** NE **Easting:** NE **Casing Elevation:** NE **Borehole Depth:** 30' bgs **Surface Elevation:** NE **Descriptions By:** SLM	**Well/Boring ID:** **DPE-1** **Client:** Chevron EMC **Location:** Edmonds Terminal, 11720 Unoco Rd, Edmonds, WA

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
		4	16-17.5	1.5	1 1 1	2	463				Same As Above	
		5	18.5-20	1.5	1 2 2	4	343		SP		Sand, medium to fine grain, poorly graded, silt seam at 19 feet, dark brown, wet, HCLO	#2/12 Sand
20	-20											
		6	21-22.5	1.5	2 2 1	3	421		SP		Sand, medium to fine grain, poorly graded, dark brown, wet, HCLO, noticible sheen	
		7	23.5-25	1.5	1 1 1	2	359				Same As Above	
25	-25											
		8	26-27.5	0	NA	NA	NA				No recovery due to well heaving - the driller inserted a well plug	
		9	27.5-29	1.5	NA	NA	582		CM		Clay and Silt, dense, woody debris, dark brown, wet, no odor	Sump Sch. 40 PVC
		10	29-30	1.0	NA	NA	582				Same as Above, the bottom two intervals were combined and screened	
30	-30											

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks: bgs = below ground surface
NA = Not Available
ppm = parts per million
NE = Not Established
HA = Hand Auger
HCLO = Hydrocarbon like odor

Date Start/Finish: 2/10/2015
Drilling Company: Cascade Drilling
Driller's Name: Curtis A.
Drilling Method: Hollow Stem Auger
Auger Size: 10" Outer Diameter
Rig Type: Truck Mounted
Sampling Method: Split Spoon

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 30' bgs
Surface Elevation: NE

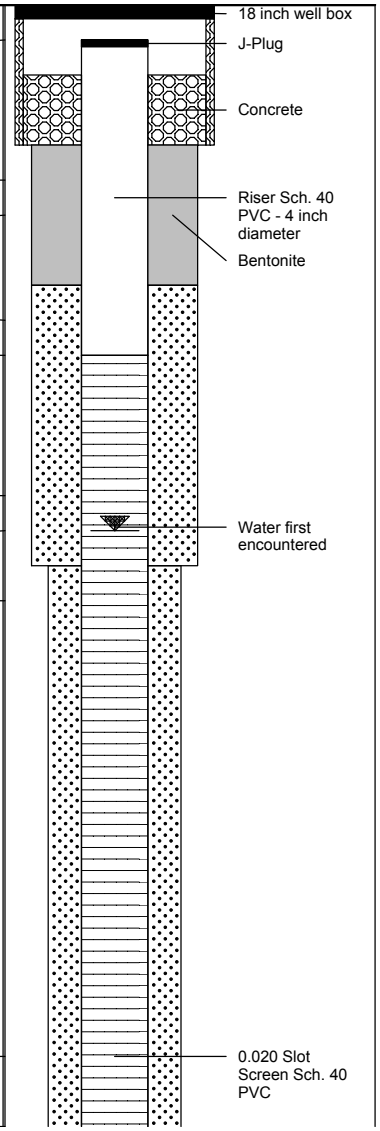
Descriptions By: SLM

Well/Boring ID: **DPE-2**

Client: Chevron EMC

Location: Edmonds Terminal, 11720 Unoco Rd, Edmonds, WA

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description
0	0										Topsoil
		HA	2.5-3	.5	NA	NA	0.7		SG		Sand, small Gravel, fine to course grain size, well graded, brown, no HCLO
		HA	4.5 - 5	.5	NA	NA	77.7		SP		Sand, medium to fine grain, poorly graded, grey, no HCLO
5	-5										
		HA	7-7.5	.5	NA	NA	20.5		SG		Sand, coarse to medium grain, trace small gravel, grey, wet
		1	8.5 -10	1.5	1 2 1	3	4.3		SP		Sand, medium grain, poorly graded, grey, wet, no HCLO
10	-10										
		2	11-12.5	1.5	2 5 4	9	1.4		SP		Same As Above
		3	13.5 -15	1.5	4 7 2	9	13.4		SP		Same As Above
15	-15										



Well/Boring Construction

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks: bgs = below ground surface
NA = Not Available
ppm = parts per million
NE = Not Established
HA = Hand Auger
HCLO = Hydrocarbon like odor

Project Number:B0045362
Data File:

Date: 5/20/2015 Created/Edited by:RwL

Date Start/Finish: 2/10/2015 **Drilling Company:** Cascade Drilling **Driller's Name:** Curtis A. **Drilling Method:** Hollow Stem Auger **Auger Size:** 10'' Outer Diameter **Rig Type:** Truck Mounted **Sampling Method:** Split Spoon	**Northing:** NE **Easting:** NE **Casing Elevation:** NE **Borehole Depth:** 30' bgs **Surface Elevation:** NE **Descriptions By:** SLM	**Well/Boring ID:** **DPE-2** **Client:** Chevron EMC **Location:** Edmonds Terminal, 11720 Unoco Rd, Edmonds, WA

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
		4	16-17.5	1.5	7 9 10	19	12.7				Sand, medium grain, porrly graded, brown, no HCLO, wet	
		5	18.5 -20	1.5	6 8 9	17	7.1		SP		Same As Above	#2/12 Sand
20	-20											
		6	21-22.5	1.5	7 9 10	19	3.5				Same As Above	
		7	23.5 -25	1.5	16 20 20	40	7.4		SP		Sand, medium to fine grain, poorly graded, dark grey, no HCLO, wet	
25	-25											
		8	26-27.5	1.5	11 16 25	41	5.6		SM		Silty Sand, medium to fine grain, poorly graded, brown, no HCLO, wet	Sump Sch. 40 PVC
		9	28.5 -30	1.5	6 10 15	25	4.5		SM		Silty Sand, medium grain, poorly graded, brown, No HCLO, wet	
30	-30											

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks: bgs = below ground surface
NA = Not Available
ppm = parts per million
NE = Not Established
HA = Hand Auger
HCLO = Hydrocarbon like odor

Date Start/Finish: 3/23/15 - 3/24/15
Drilling Company: Cascade Drilling
Driller's Name: James G.
Drilling Method: Hollow Stem Auger
Auger Size: 10" Outer Diameter
Rig Type: Truck Mounted
Sampling Method: Split Spoon

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 22' bgs
Surface Elevation: NE

Descriptions By: RL/RB

Well/Boring ID: **DPE-3**

Client: Chevron EMC

Location: Edmonds Terminal, 11720 Unoco Rd, Edmonds, WA

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0										Topsoil and gravel/cobbles	18 inch well box
											Fill	J-Plug
												Concrete
		HA	2.5-3	.5	NA	NA	132.8		SP		Sand fill - poorly graded medium sand, loose, brown, dry, HCLO	Riser Sch. 40 PVC - 4 inch diameter
											Cleared past 20-Mil Polyethylene sheeting at 4.5 feet bgs, which delineates Phase I 2007/2008 excavation and un-excavated soils around the WSDOT Stormwater Line	Bentonite
5	-5	HA	5-5.5	.5	NA	NA	807		CH		Clay with trace Organics - clay has medium to high plasticity, organics are woody debris, thick black substance with sheen, dark brown to grey and black color, moist, HCLO	
		HA	7.5-8	.5	NA	NA	1,035		SC		Sand with Clay and Organics - Sand fine to coarse, well graded, clay has low plasticity, organics are roots, grey, wet, HCLO	
											cleared hole with air knife and vacuum to 8.5 feet bgs	Water first encountered
10	-10	1	10-11.5	1.5	6 6 9	15	1,267				Sand with little Gravel and trace Silt - well graded, sand is fine to coarse, gravel is small to medium and subrounded, grey, wet, HCLO	
									SG			0.020 Slot Screen Sch. 40 PVC

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks:
bgs = below ground surface
NA = Not Available
ppm = parts per million
NE = Not Established
HA = Hand Auger
HCLO = Hydrocarbon like odor

Project Number:B0045362
Data File:

Date: 5/20/2015 Created/Edited by:RwL

Date Start/Finish: 3/23/15 - 3/24/15 **Drilling Company:** Cascade Drilling **Driller's Name:** James G. **Drilling Method:** Hollow Stem Auger **Auger Size:** 10" Outer Diameter **Rig Type:** Truck Mounted **Sampling Method:** Split Spoon	**Northing:** NE **Easting:** NE **Casing Elevation:** NE **Borehole Depth:** 22' bgs **Surface Elevation:** NE **Descriptions By:** RL/RB	**Well/Boring ID:** **DPE-3** **Client:** Chevron EMC **Location:** Edmonds Terminal, 11720 Unoco Rd, Edmonds, WA

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
		2	12.5 -14	1.5	9 12 14	26	981				Same as Above - Chunck of wood found at 14 feet bgs	#2/12 Sand
15	-15	3	15- 16.5	1.5	10 11 11	22	563		SW		Sand with trace Gravel - sand is fine to coarse, gravel is very small and subrounded, wood chunck found at 16 feet bgs, grey, wet, HCLO	
		4	17.5 -19	1.5	12 16 18	34	594				Same as Above - small lenses of woody debris, decreasing gravel content	
20	-20	5	20- 21.5	1.5	6 12 10	22	346				Same as Above - woody debris throughout with a large chunck at 21.5 feet bgs	Sump Sch. 40 PVC

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks: bgs = below ground surface
NA = Not Available
ppm = parts per million
NE = Not Established
HA = Hand Auger
HCLO = Hydrocarbon like odor

Date Start/Finish: 2/10/2015
Drilling Company: Cascade Drilling
Driller's Name: Curtis A.
Drilling Method: Hollow Stem Auger
Auger Size: 10" Outer Diameter
Rig Type: Truck Mounted HSA
Sampling Method: Split Spoon

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 25 feet bgs
Surface Elevation: NE

Descriptions By: SLM

Well/Boring ID: **PZ-1**

Client: Chevron EMC

Location: Edmonds Terminal, 11720 Unoco Rd, Edmonds, WA

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0										Topsoil	10 inch well box J-Plug Concrete
		HA	2-2.5	.5	NA	NA	NA				No Recovery, Asphalt removed	
		HA	4.5 - 5	.5	NA	NA	377		SP		Sand, medium, poorly graded, brown, HCLO, dry	Riser Sch. 40 PVC - 2 inch diameter Bentonite
5	-5											
		HA	7-7.5	.5	NA	NA	740		SP		Sand, medium grain, trace small gravel, poorly graded, wet	
		1	8.5 -10	1.5	1 1 2	3	721				Sand, medium grain, poorly graded, dark grey, wet, HCLO	Water first encountered
10	-10											
		2	11-12.5	1.5	1 2 2	4	136.4				Same As Above	

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks:
bgs = below ground surface
NA = Not Available
ppm = parts per million
NE = Not Established
HA = Hand Auger
HCLO = Hydrocarbon like odor

Project Number:B0045362
Data File:

Date: 5/20/2015 Created/Edited by:RwL

Date Start/Finish: 2/10/2015
Drilling Company: Cascade Drilling
Driller's Name: Curtis A.
Drilling Method: Hollow Stem Auger
Auger Size: 10" Outer Diameter
Rig Type: Truck Mounted HSA
Sampling Method: Split Spoon

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 25 feet bgs
Surface Elevation: NE

Descriptions By: SLM

Well/Boring ID: **PZ-1**

Client: Chevron EMC

Location: Edmonds Terminal, 11720 Unoco Rd, Edmonds, WA

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
		3	13.5 -15	1.5	2 2 4	6	347.0		SP		Same As Above	
15	-15											0.020 Slot Screen Sch. 40 PVC
		4	16- 17.5	1.5	5 4 3	7	374.6				Same As Above	#2/12 Sand
		5	18.5 -20	1.5	5 4 4	8	327				Same As Above	
20	-20											
		6	21- 22.5	1.5	5 10 9	19	165.1		SW		Sand, medium to fine grain, small gravel, well graded, dark grey, HCLO	
		7	23.5 -25	1.5	10 14 11	25	10.5		SM		Silty Sand, very fine to fine grain, poorly graded, no HCLO, wet	
25	-25											

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks:
bgs = below ground surface
NA = Not Available
ppm = parts per million
NE = Not Established
HA = Hand Auger
HCLO = Hydrocarbon like odor

Date Start/Finish: 2/10/2015
Drilling Company: Cascade Drilling
Driller's Name: Curtis A.
Drilling Method: Hollow Stem Auger
Auger Size: 10" Outer Diameter
Rig Type: Truck Mounted HSA
Sampling Method: Split Spoon

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 25 feet bgs
Surface Elevation: NE

Descriptions By: SLM

Well/Boring ID: **PZ-2**

Client: Chevron EMC

Location: Edmonds Terminal, 11720 Unoco Rd, Edmonds, WA

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0										Topsoil	10 inch well box J-Plug Concrete
		HA	2-2.5	.5	NA	NA	NA				No Recovery, Asphalt removed	
		HA	4.5 - 5	.5	NA	NA	98.1		SP		Sand, medium to fine grain, poorly graded, brown, no HCLO, wet	Riser Sch. 40 PVC - 2 inch diameter Bentonite
5	-5											Water first encountered
		HA	7-7.5	.5	NA	NA	583		SP		Sand, fine grain, poorly graded, brown, HCLO, wet	
		1	8.5 -10	1.5	0 1 1	2	419				Sand, medium grain, poorly graded, dark grey, HCLO, wet	
10	-10								SP			
		2	11-12.5	1.5	4 5 6	11	122				Same As Above	

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks:
bgs = below ground surface
NA = Not Available
ppm = parts per million
NE = Not Established
HA = Hand Auger
HCLO = Hydrocarbon like odor

Project Number:B0045362
Data File:

Date: 5/20/2015 Created/Edited by:RwL

Date Start/Finish: 2/10/2015
Drilling Company: Cascade Drilling
Driller's Name: Curtis A.
Drilling Method: Hollow Stem Auger
Auger Size: 10" Outer Diameter
Rig Type: Truck Mounted HSA
Sampling Method: Split Spoon

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 25 feet bgs
Surface Elevation: NE

Descriptions By: SLM

Well/Boring ID: **PZ-2**

Client: Chevron EMC

Location: Edmonds Terminal, 11720 Unoco Rd, Edmonds, WA

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
		3	13.5 -15	1.5	2 2 2	4	34.8		SP		Sand, medium to coarse grain, poorly graded, dark grey to brown, HCLO, wet	
15	-15											0.020 Slot Screen Sch. 40 PVC
		4	16- 17.5	1.5	5 4 5	9	69.1				Same As Above	#2/12 Sand
									SP			
		5	18.5 -20	1.5	5 5 5	10	44.8				Same As Above	
20	-20											
		6	21- 22.5	1.5	7 9 40	49	34.7		SM		Silty Sand, medium grain, poorly graded, brown, HCLO, wet	
		7	23.5 -25	0	50/5	100	NA		OP		Recovery limited to wood chuncks seen in split spoon	
25	-25											

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks: bgs = below ground surface
NA = Not Available
ppm = parts per million
NE = Not Established
HA = Hand Auger
HCLO = Hydrocarbon like odor

Date Start/Finish: 3/23/15
Drilling Company: Cascade Drilling
Driller's Name: James G.
Drilling Method: Hollow Stem Auger
Auger Size: 10" Outer Diameter
Rig Type: Truck Mounted
Sampling Method: Split Spoon

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 22' bgs
Surface Elevation: NE

Descriptions By: RL/RB

Well/Boring ID: **PZ-3 / DPE-4**

Client: Chevron EMC

Location: Edmonds Terminal, 11720 Unoco Rd, Edmonds, WA

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0										Topsoil and sand/gravel/cobbles	18 inch well box
											Fill - Sand/gravel/cobbles	J-Plug
												Concrete
											Cleared past 20-Mil Polyethylene sheeting at 3.5 feet bgs, which delineates Phase I 2007/2008 excavation and un-excavated soils around the WSDOT Stormwater Line	Riser Sch. 40 PVC - 4 inch diameter
		HA	3.5 -4	.5	NA	NA	98.3		SG		Sand with Gravel - sand is medium to very coarse grain, gravel is small to large with trace cobbles, angular to subrounded, well graded, brown, moist, HCLO	Bentonite
5	-5	HA	5-5.5	.5	NA	NA	322.6		CH		Clay with trace Gravel and Organic material - clay has high plasticity, gravel is medium and sub angular, organic material comprised of woody debris, grey, moist, HCLO	
											At 5.5 feet bgs, encountered plastic fabric debris - brittle and weak	
		HA	7.5 -8	.5	NA	NA	919.2				Sand with little Silt and Organics - sand is well graded, silt has low plasticity, woody debris comprised of small roots and sticks, grey, very moist, strong HCLO	
												Water first encountered
											cleared hole with air knife and vacuum to 9.5 feet bgs	
10	-10	1	10-11.5	1.5	5 7 7	14	889				Sand with little Silt, trace Gravel and Organics, sand well graded, silt low plasticity, gravel subangualr, organics comprised of bark pieces, grey, wet, HCLO	
									SW			0.020 Slot Screen Sch. 40 PVC

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks:
bgs = below ground surface
NA = Not Available
ppm = parts per million
NE = Not Established
HA = Hand Auger
HCLO = Hydrocarbon like odor

Project Number:B0045362
Data File:

Date: 5/20/2015 Created/Edited by:RwL

Date Start/Finish: 3/23/15
Drilling Company: Cascade Drilling
Driller's Name: James G.
Drilling Method: Hollow Stem Auger
Auger Size: 10" Outer Diameter
Rig Type: Truck Mounted
Sampling Method: Split Spoon

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 22' bgs
Surface Elevation: NE

Descriptions By: RL/RB

Well/Boring ID: **PZ-3 / DPE-4**

Client: Chevron EMC

Location: Edmonds Terminal, 11720 Unoco Rd, Edmonds, WA

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
		2	12.5 -14	1.5	6 6 6	12	391				Same as above	#2/12 Sand
15	-15	3	15-16.5	1.5	9 10 10	20	469				Same as above with a lense of brown high plasticity clay at 16 feet bgs, lense less than one inch thick. Decreasing amount of woody debris and silt	
		4	17.5 -19	1.5	9 12 10	22	432		SP		Sand - medium to coarse grain, little woody debris that appears to be a chunck of a larger piece of wood, wet, grey, HCLO	
20	-20	5	20-21.5	1.5	8 10 9	19	160				Same as above - thin high plasticity, borwn clay lense at 21 feet bgs, lense is less than one quarter inch thick with consistent lithology on either side, grey, HCLO	Sump Sch. 40 PVC

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks: bgs = below ground surface
NA = Not Available
ppm = parts per million
NE = Not Established
HA = Hand Auger
HCLO = Hydrocarbon like odor

Arcadis U.S., Inc.

1100 Olive Way

Suite 800

Seattle, Washington 98101

Tel 206 325 5254

Fax 206 325 8218

www.arcadis.com