

Mr. Ron Timm  
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Subject:  
Former Unocal Edmonds Bulk Fuel Terminal (Site) – Final Additional Dual Phase  
Extraction Well Installation Work Plan

ENVIRONMENT

Date:  
May 29, 2019

Dear Mr. Timm:

Contact:  
Samuel Miles

As of the fourth quarter 2018, groundwater samples collected from perimeter groundwater monitoring wells MW-101, MW-518, and MW-129-R, as well as, from interior monitoring well MW-E-R have occasionally contained total petroleum hydrocarbons (TPH) concentration above the groundwater site-specific cleanup level (CUL). In order to ensure groundwater in the vicinity of these wells meet the site-specific groundwater CUL, Chevron Environmental Management Company (Chevron) proposes to install dual phase extraction (DPE) wells in the vicinity of each of these four wells based on an observed average radius of influence (ROI) of 30 feet for the Site during the DPE pilot test and 2017-2019 DPE system operation<sup>1</sup>. Final DPE well locations may change depending on field constraints. Operation of these wells will be incorporated into the existing DPE system. The proposed locations of DPE-15 through DPE-18 are presented on Figure 1.

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206.726.4720

Email:  
Samuel.Miles@arcadis.com

Our ref:  
B0045362.0013

### Well Installation

A One Call Ticket will be submitted for this work. Wells will be pre cleared using a vacuum excavation truck to 8 feet below ground surface (ft. bgs). Cascade Drilling (Cascade) will then perform well installation using a 10¼-inch hollow stem auger to a depth of 24 feet below ground surface. Soil will be field screened

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<sup>1</sup> Arcadis. 2016. Engineering Design Report. Former Unocal Edmonds Bulk Fuel Terminal. March 8.  
Arcadis. 2019. 2018 Groundwater and Operation Report. Former Unocal Edmonds Bulk Fuel Terminal.  
April 1.

with a photo-ionization detector (PID) using a 2.5-foot split spoon on 5-foot intervals and logged using USGS soil classification. DPE wells will be installed in areas of the Site that have not been previously excavated and backfilled during the 2001 through 2017 remediation events (Figure 1). The well construction will consist of the following:

- 4-inch diameter, Schedule 40 polyvinyl chloride (PVC) riser from the ground surface to 4 ft. bgs,
- 4-inch diameter, Schedule 40 PVC 0.020-inch slotted screen from 4 to 19 ft. bgs,
- and a 5-foot, Schedule 40 PVC sump from 19 to 24 ft. bgs.

The annulus of the borehole will be filled with 10x20 Colorado silica sand from 3 to 24 ft. bgs, hydrated bentonite pellets from 1 to 2 ft. bgs, and neat cement from 1 ft. bgs to the ground surface. Final construction detail may change depending on field constraints. Cascade will then develop the DPE wells via surge and purge techniques. A minimum of 10 well volumes will be removed, or until the purge water is clear of sediment. A typical DPE well construction detail is shown on Figure 2.

## **Waste**

Analytical data will not be collected from soil borings associated with the proposed DPE well installation. Waste generated during the event will be drummed, labeled and stored on site while awaiting proper disposal.

## **Conveyance Piping and Well Vault and Manifold Details**

Soil confirmation sampling data indicate that DPE wells DPE-2, DPE-8, DPE-9 and DPE-10 were successful in reducing COC concentrations in soil to below the site-specific cleanup levels within their ROI. Arcadis will disconnect the conveyance piping from these wells and use the manifold locations and pump control inputs for operation of the proposed expansion wells. The infrastructure associated with the disconnected wells will be left in place for reconnection of these wells if required at a later date.

Following the completion of the DPE wells, the pump, vault and piping will be installed, connecting DPE-15, DPE-16, DPE-17 and DPE-18 to the existing DPE system. Manifold inputs will be updated with the corresponding well conveyance piping:

- DPE-2 will be changed to DPE-15
- DPE-8 will be change to DPE-16
- DPE-9 will be changed to DPE-17
- DPE-10 will be changed to DPE-18

Each DPE well will be completed with an aboveground weatherproof fiberglass vault similar to the existing DPE wells as shown on Figure 3. Clearcreek Contractors (Clearcreek) will then install 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 will be installed on grade. Conveyance piping will consist of vapor and extracted groundwater piping. All conveyance piping will be constructed with high-density polyethylene (HDPE) and will be pressure tested by Clearcreek and observed by an Arcadis representative to pass 5 pounds per square inch for 15 minutes without losing pressure. Secondary containment piping for groundwater conveyance will be wrapped in ¼ inch jacketed insulation. Additionally, insulation will be added within each fiberglass vault to protect the head-well piping from freezing temperatures. As needed, HDPE pipe

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will be covered with a minimum of 2 feet of sand and gravel for temporary crossover. Conveyance piping layout is shown on Figure 4.

### **Groundwater Monitoring**

Perimeter groundwater monitoring wells MW-101, MW-518, and MW-129-R, as well as interior monitoring well MW-E-R will continue to be monitored in accordance with the specifications of the Compliance Monitoring Plan (CMP), which is provided as Appendix B of the Draft Cleanup Action Plan<sup>2</sup> submitted to the Washington State Department of Ecology (Ecology) on July 31, 2017.

To ensure that conditions in the area of the compliance monitoring wells have equilibrated prior to implementing groundwater monitoring:

- the DPE system will be turned off at a minimum of 3 days prior to gauging.
- the DPE system will be turned off at a minimum of 5 days prior to sampling.

If you have any questions regarding the scope of this workplan please contact Sam Miles with Arcadis at 206.726.4720.

Sincerely,

Arcadis U.S., Inc.



Samuel Miles  
Project Manager

Copies:

Kim Jolitz, Chevron Environmental Management Company (electronic)  
Kevin Bartoy, Washington State Department of Transportation (electronic)

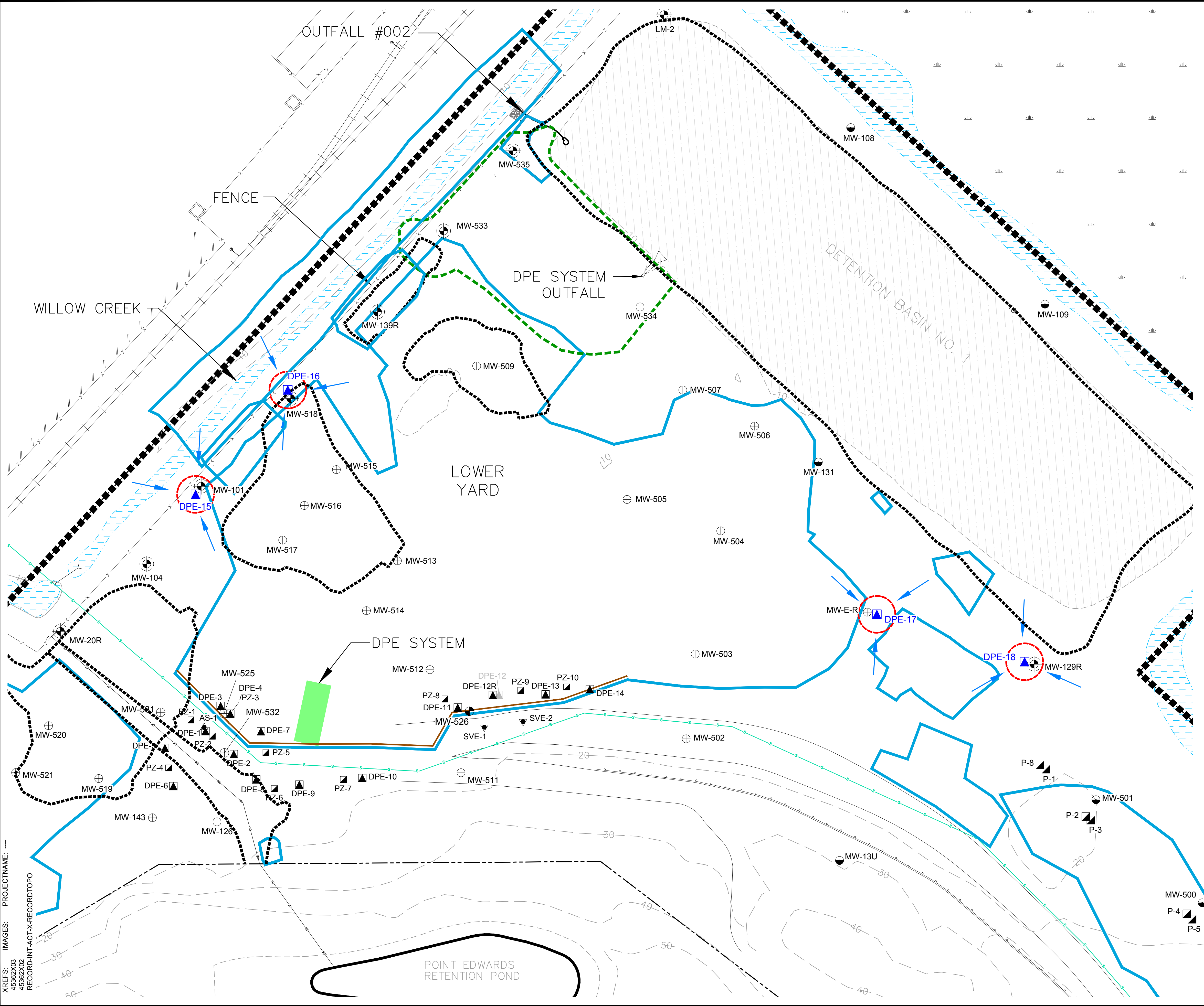
Enclosures:

Figure 1 – Proposed Additional Dual Phase Extraction Well Locations  
Figure 2 – Dual Phase Extraction Well Construction Details  
Figure 3 – Dual Phase Extraction System Wellhead Connection Construction Details  
Figure 4 – Dual Phase Extraction System Piping Layout

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<sup>2</sup> Arcadis. 2017. Draft Cleanup Action Plan. Former Unocal Edmonds Bulk Fuel Terminal. July 31.

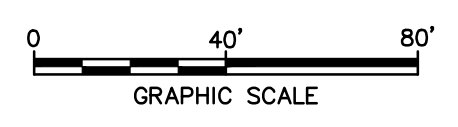
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 C:\BIM\pdrive - ARCADIS\BIM\_380 Docs\IANA - CHEVRON CORPORATION\Edmonds-Public Review Draft\2019\04\5362-Fig1-Proposed Addl DPE Well Locations.dwg LAYOUT: 1, PLOT: 1, PLOT DATE: 5/6/2019 3:28 PM, ACADVER: 23.05 (LMS TECH), PAGES: 1, PLOT STYLE TABLE: PLT\FULL.CTB, PLOTTED: 5/6/2019 3:28 PM, BY: OBERLANDER, ROSEANNE  
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**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
- AS-1 ▲ AIR SPARGE WELL LOCATION
- DPE-10 ▲ DUAL PHASE EXTRACTION (DPE) WELL LOCATION
- DPE-12 ▲ DECOMMISSIONED DPE WELL LOCATION
- SVE-1 ▼ SOIL VAPOR EXTRACTION (SVE) WELL LOCATION
- WSDOT STORMWATER LINE
- POINT EDWARDS STORM DRAIN LINE
- 20-MIL POLYETHYLENE SHEETING
- SITE BOUNDARY
- DPE-15 ▲ PROPOSED DPE WELL LOCATION
- ESTIMATED 3 FOOT DRAWDOWN INFLUENCE-15 FOOT RADIUS OF INFLUENCE
- ANTICIPATED INWARD GRADIENT
- 2001 AND 2003 SOIL EXCAVATIONS BOUNDARIES
- 2007/2008 EXCAVATION BOUNDARIES
- 2017 DETENTION BASIN 2 EXCAVATION BOUNDARY

- 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.

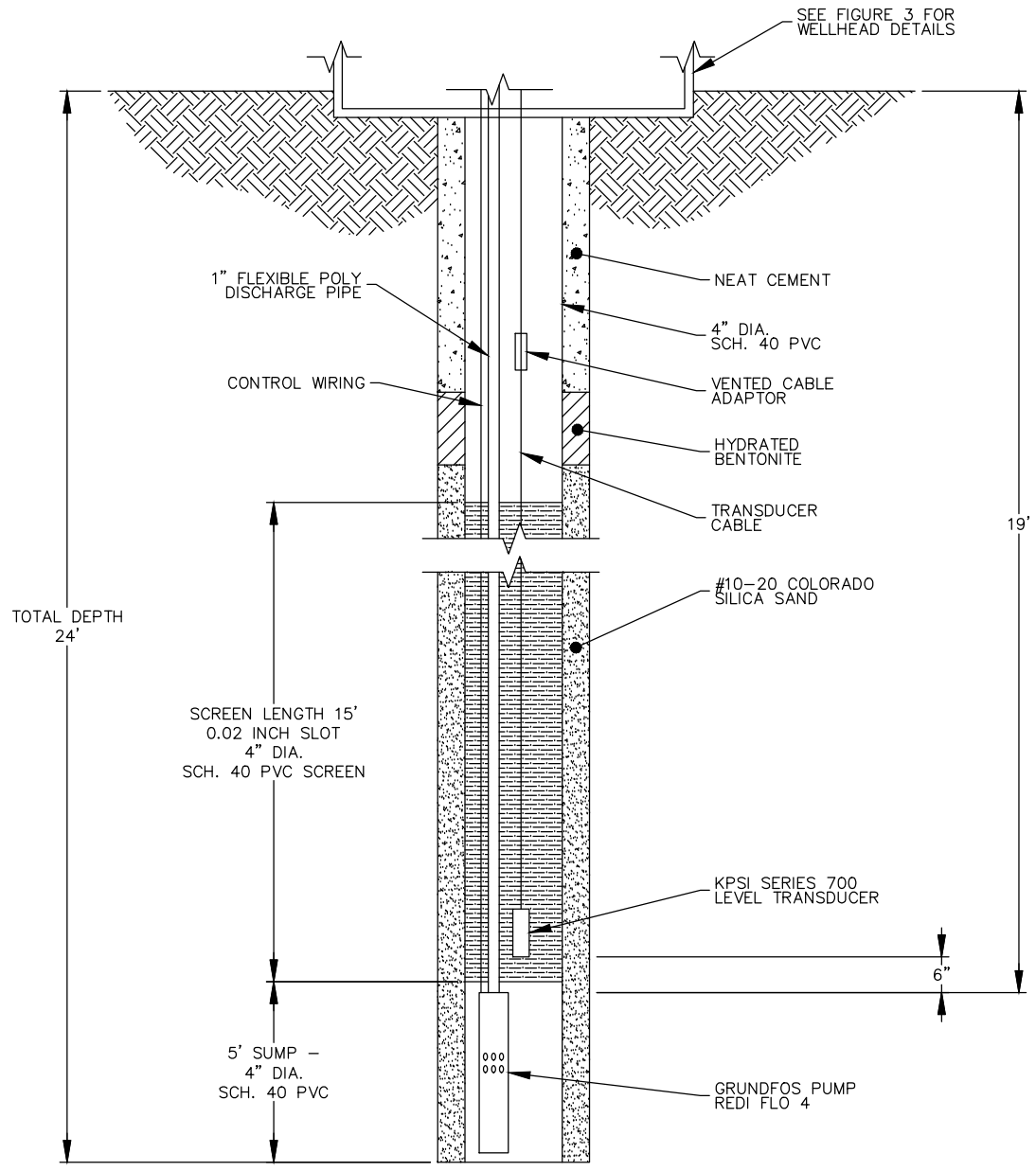


CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY  
 FORMER UNOCAL BULK FUEL TERMINAL  
 EDMONDS, WASHINGTON

**PROPOSED ADDITIONAL  
 DUAL-PHASE EXTRACTION WELL  
 LOCATIONS**

**ARCADIS** Design & Consultancy  
 for natural and built assets

FIGURE  
**1**

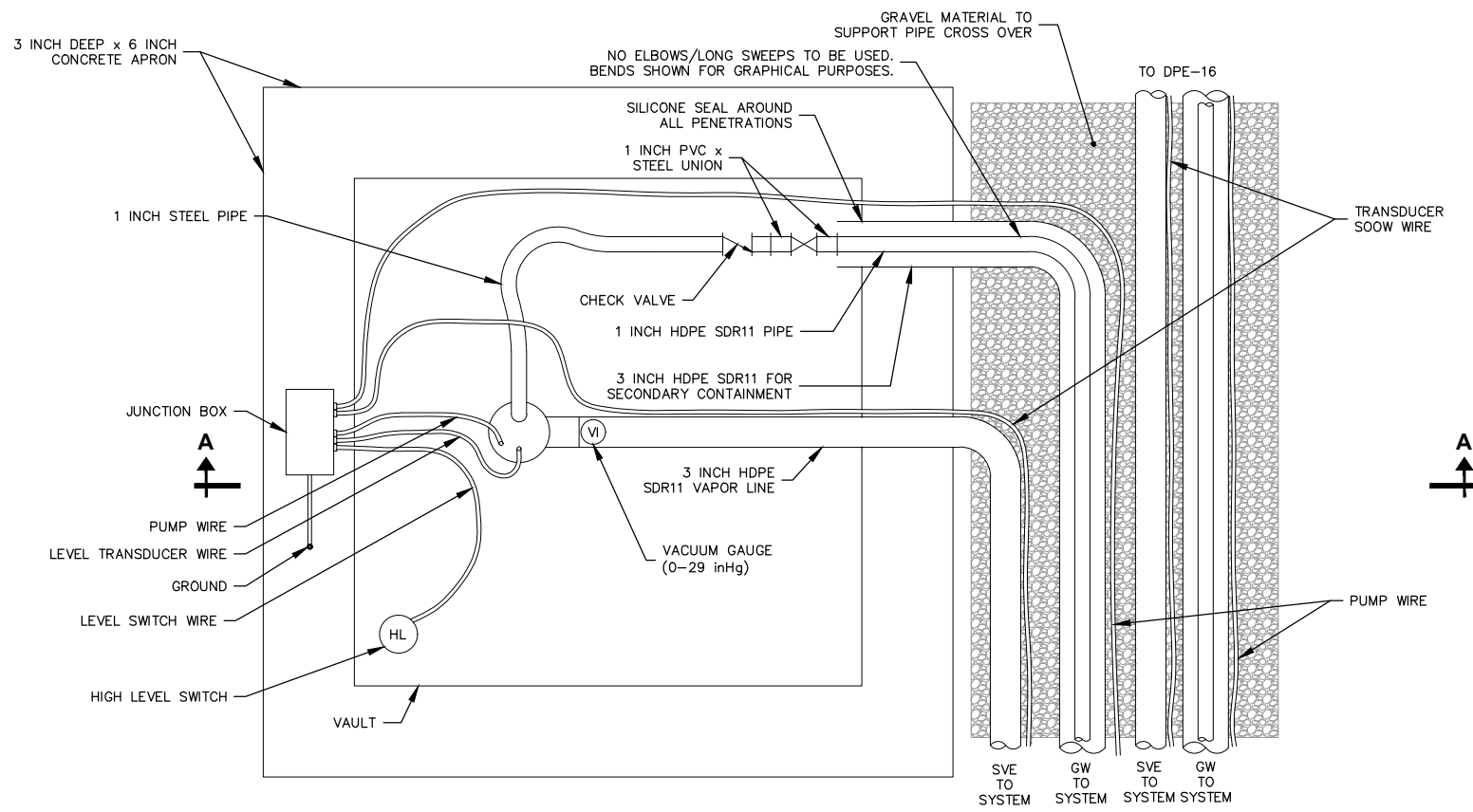


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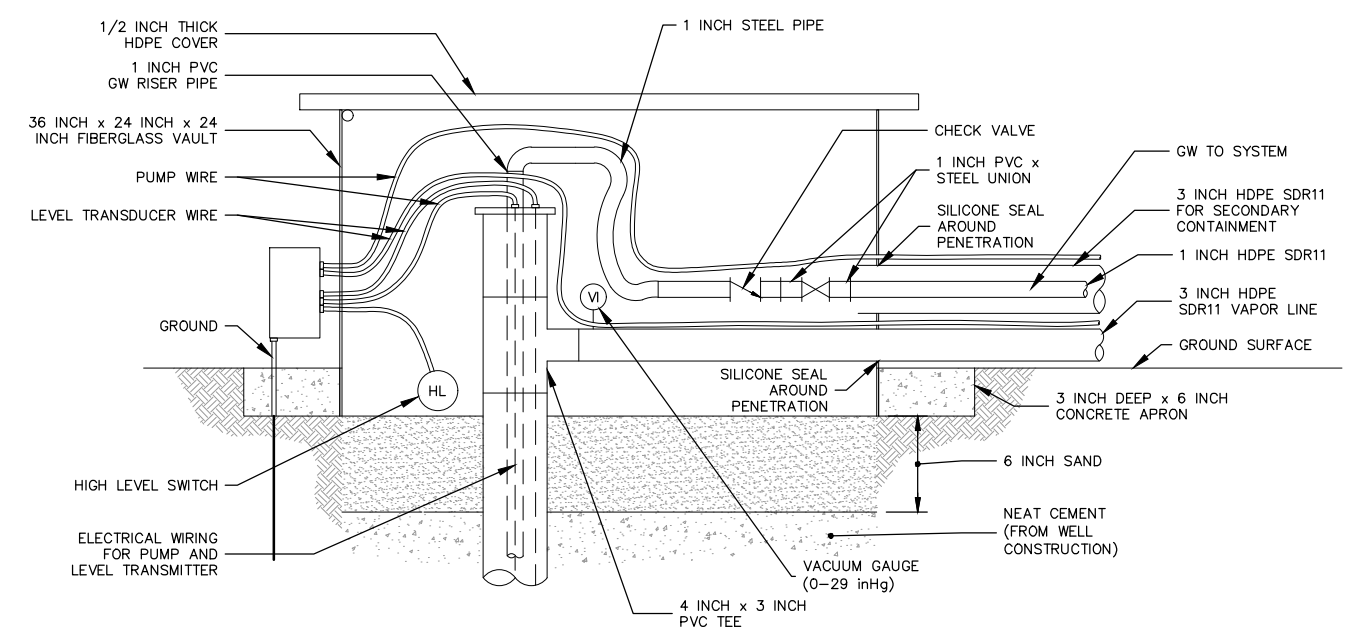
- DEFINITIONS:
- |      |                       |
|------|-----------------------|
| DPE  | DUAL-PHASE EXTRACTION |
| PVC  | POLYVINYL CHLORIDE    |
| SCH. | SCHEDULE              |
| DIA. | DIAMETER              |
| '    | FOOT                  |
| "    | INCH                  |
- NOTE:
- CONSTRUCTION DETAIL MAY CHANGE DEPENDING ON FIELD CONSTRAINTS.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY FORMER UNOCAL BULK FUEL TERMINAL EDMONDS, WASHINGTON	
<h2 style="margin: 0;">DUAL PHASE EXTRACTION WELL CONSTRUCTION DETAILS</h2>	
<span style="font-size: small; vertical-align: middle;">Design &amp; Consultancy for natural and built assets</span>	FIGURE <h1 style="margin: 0;">2</h1>

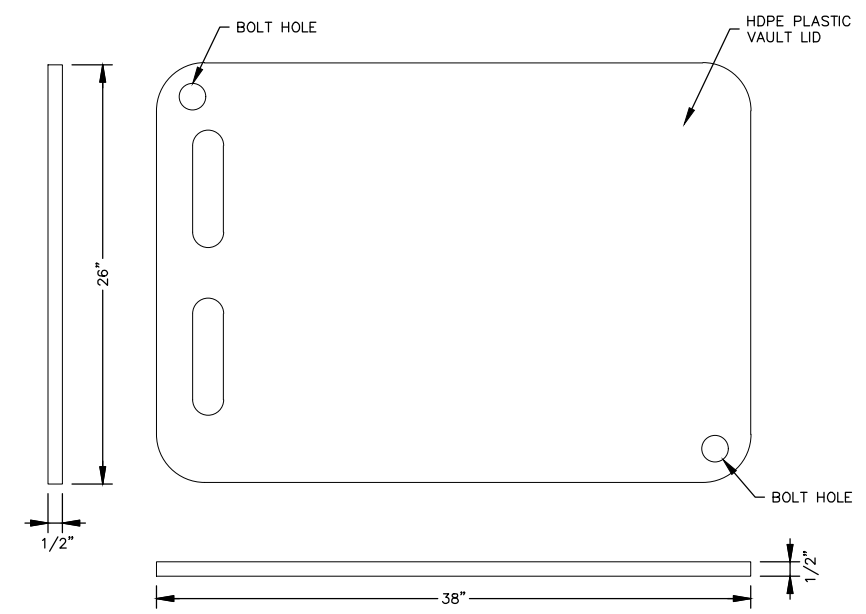
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**PLAN**



**SECTION A-A**



**WELL VAULT DETAIL**

**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
- VACUUM GAUGE 0-29 inHg
- 1 INCH STEEL GATE VALVE
- HIGH LEVEL SWITCH

NOT TO SCALE

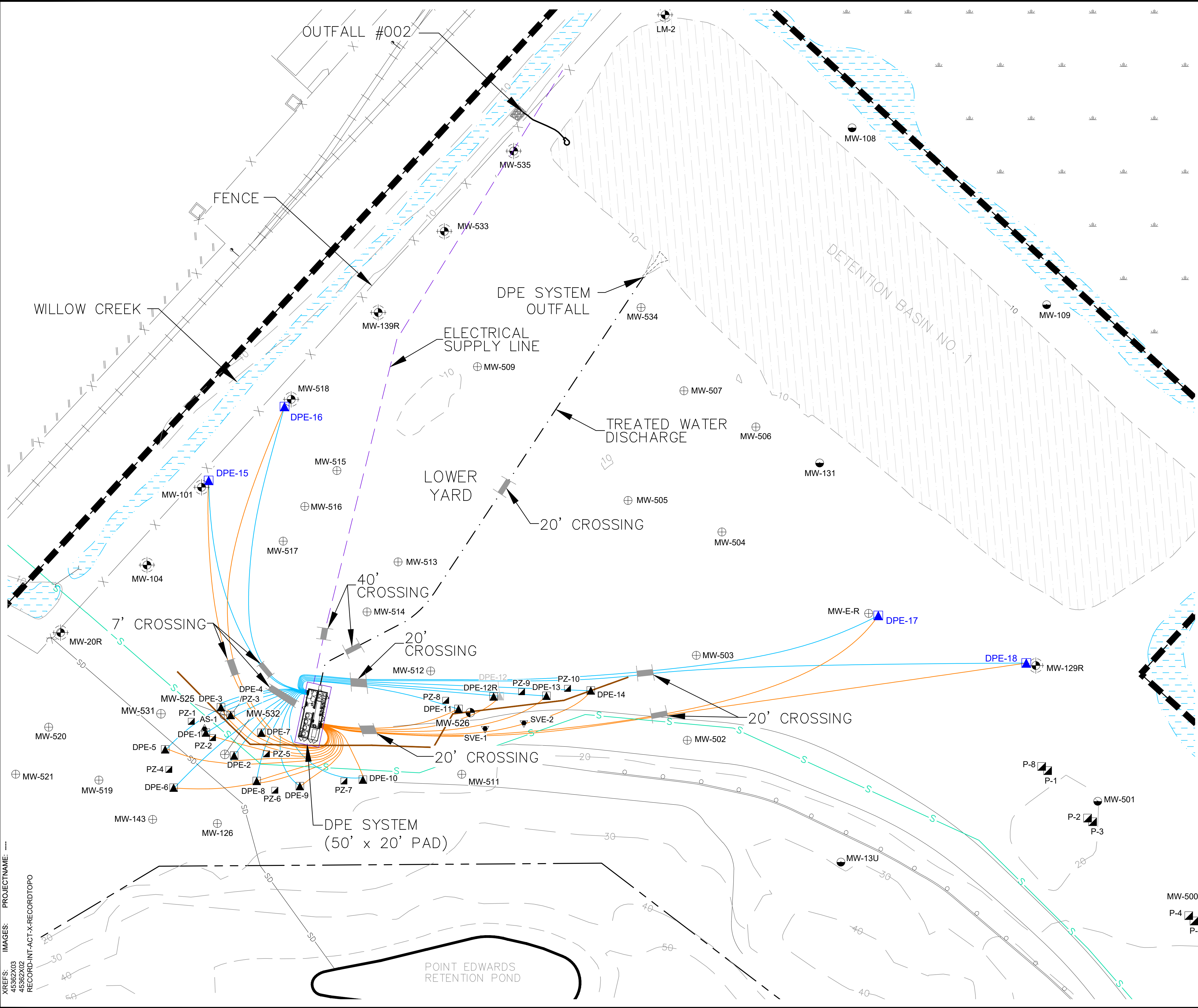
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY  
 FORMER UNOCAL BULK FUEL TERMINAL  
 EDMONDS, WASHINGTON

DUAL PHASE EXTRACTION SYSTEM  
 WELLHEAD CONNECTION  
 CONSTRUCTION DETAILS

Design & Consultancy  
 for natural and built assets

FIGURE  
 3

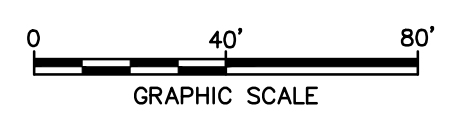
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  - S— WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) STORMWATER LINE
  - SD— POINT EDWARDS STORM DRAIN LINE
  - 20— 20-MIL POLYETHYLENE SHEETING
  - E— ELECTRICAL CONDUIT
  - - - TREATED GROUNDWATER DISCHARGE LINE
  - G— GROUNDWATER CONVEYANCE PIPING (APPROXIMATE LOCATION)
  - V— VAPOR CONVEYANCE PIPING (APPROXIMATE LOCATION)
  - SITE BOUNDARY
  - DPE-15 ▲ PROPOSED DPE WELL LOCATION



- 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.
  6. MONITORING WELL MW-E WAS RE-INSTALLED IN PLACE ON OCTOBER 20th, 2017 AND RENAMED MW-E-R.



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

**DUAL PHASE EXTRACTION SYSTEM  
 PIPING LAYOUT**

**ARCADIS** Design & Consultancy  
 for natural and built assets

FIGURE  
**4**