Chevron Environmental Management Company

Well Installation Work Plan

Former Unocal Seattle Marketing Terminal 0724
3001 Elliott Avenue
Seattle, Washington

Cleanup Site Identification No. 1428
Facility Site Identification No. 2208

December 10, 2021

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Acronyms and Abbreviations

Arcadis	Arcadis U.S., Inc.
ASTM	ASTM International
BNSF	Burlington Northern Santa Fe
Ecology	Washington State Department of Ecology
OSHA	Occupational Safety and Health Administration
PVC	polyvinyl chloride
ROW	right-of-way
SAM	Seattle Art Museum
site	Former Unocal Seattle Marketing Terminal located at 3001 Elliott Avenue in Seattle, Washington

1 Introduction

On behalf of Chevron Environmental Management Company, Arcadis U.S., Inc. (Arcadis) prepared this Well Installation Work Plan for the former Unocal Seattle Marketing Terminal 0724, located at 3001 Elliott Avenue, Seattle, Washington (site). A site location map is shown on Figure 1.

The site is formally known as Unocal Seattle Marketing Terminal in the Washington State Department of Ecology's (Ecology's) database. Identifiers are:

- Facility Site Identification Number: 2208
- Cleanup Site Identification Number: 1428.

Chevron is conducting cleanup of the site as required by Ecology pursuant to Order on Consent DE88-N223 and Amendments 1 through 5. The site is defined in Order on Consent DE88-N223 and is divided into four contiguous areas: Upper Yard, Elliott Avenue, Lower Yard, and Offsite Area. The Upper Yard consists of the approximate area between Elliott Avenue and Western Avenue to the east and west, and Bay Street and Broad Street to the north and south. The Elliott Avenue area includes the length of Elliott Avenue between Bay Street and Broad Street. The Lower Yard consists of the area between Elliott Avenue and the Burlington Northern Santa Fe (BNSF) railroad tracks to the east and west, and Bay Street and Broad Street to the north and south. The Offsite Area generally comprises the BNSF railroad track right-of-way (ROW) and Alaskan Way between Bay Street and Broad Street. A site plan is shown on Figure 2.

2 Site Description

This section describes the site, the groundwater monitoring activities and most recent well installation, and current groundwater conditions. A detailed site history is provided in Appendix A.

2.1 Site Description

The former Upper Yard and Lower Yard areas of the site have been owned since 1999 by the Trust for Public Land for the Seattle Art Museum (SAM). SAM redeveloped the property, including the Offsite Area (which is owned by the City of Seattle Parks and Recreation), as the Olympic Sculpture Park. Current site features include (from Elliott Bay to Western Avenue) a sea wall, graveled and paved walkways, landscaping areas containing trees and outdoors sculptures, a bike lane, flat and sloped grass areas with additional walkways, additional landscaping areas containing trees and outdoor sculptures, shoring and retaining walls, a bridge above the BNSF railroad tracks and the BNSF railroad tracks, additional shoring and retaining walls, landscaping areas with sculptures and grass areas, additional shoring and retaining walls, a bridge above Elliott Avenue and the avenue, additional retaining walls, landscaping areas with sculptures and grass areas, and a building.

2.2 Monitoring Well Network

The current groundwater monitoring well network consists of monitoring wells MW-30, MW-61A-R, MW-70R, MW-200 through MW-207, MW-209, MW-210, and MW-211. Wells construction details are presented in Table 1.

The most recent wells (installed in 2016) are MW-70R and MW-209, MW-210, and MW-211. The 2016 well installation activities are further described in the 2016 Monitoring Well Installation Report (Arcadis 2016). Two additional wells, MW-208 and MW-212, were planned to be installed during this event; however, site constraints described below and provided in Appendix B made their installation unfeasible.

The utility locate surveys identified subsurface utility lines that prevented drilling activities in the areas around proposed wells MW-208 and MW-212. Alternate locations for both proposed locations were infeasible due to the presence of subsurface utilities, the BNSF ROW, shoring and retaining walls, areas inaccessible to drilling equipment, and site terrain (i.e., steep slope).

The proposed location for well MW-208 was between two parallel utilities with inadequate linear distance from either utility for safe drilling. These utilities run parallel with the BNSF railroad tracks in an approximate north to south bearing, preventing the well from being moved in either of those directions. East to west replacement areas were investigated; however, to the east, additional subsurface utilities and the BNSF ROW are present. To the west, additional subsurface utilities and the shoring wall are present.

The proposed location for well MW-212 was on a narrow pedestrian path between a retaining wall and a steep grass hill. A utility was identified in the middle of the path. Lateral relocating of the well was impeded by the retaining wall and the grass hill, which contained additional utilities. An alternate location was investigated in the pathway at the bottom of the hill; however, the areas clear of utilities were already occupied by proposed well MW-70R.

3 Proposed Well Installation

Arcadis proposes to conduct a new attempt at installing monitoring well MW-212. This section discusses the proposed well installation and includes pre-installation activities, monitoring well installation, monitoring well development and groundwater sampling, and management of investigation-derived waste.

3.1 Monitoring Well Location

Monitoring well location may be adjusted in the field depending on site conditions; monitoring wells will not be installed within 5 feet laterally of marked utilities. No more than two attempts will be conducted.

After reviewing the information obtained during the 2016 monitoring well installation and two site visits, including one with Ecology, two locations were further investigated in an attempt to install monitoring well MW-212; one location south of MW-211 near the BNSF railroad tracks and one location east of MW-70R within the sloped grass area.

The location south of MW-211 near the BNSF railroad tracks is not feasible. Electric lines run parallel with the BNSF railroad tracks in an approximate north to south bearing (see Appendix B). East to west replacement areas were investigated; however, to the east, the BNSF ROW is present and to the west, the shoring wall is present. The space between the electric lines and the shoring wall is not sufficient to allow for a safe access of the drilling equipment.

The location east of MW-70R (see Figure 3) within the sloped grass area presents significant challenges but, may be successful pending favorable field conditions. Major constraints include the presence of known utility lines

running across the grass hill (see Appendix B), the slope inclination preventing direct access to the drill rig equipment, and the potential presence of unknown underground obstacles such as utilities and former structures associated with the Metro Trolley Barn (such as concrete ramp or trolley tracks).[1] Major drill rig access preparation work will be implemented (see Section 3.2.3) to allow for safe access of the drilling equipment. This intrusive work will require the approval and support of the current property owner.

3.2 Pre-Installation Activities

Due to the site constraints associated with the proposed well location, several pre-installation activities will be required. These activities include utility locate, utility clearance, and drill rig access preparation work.

3.2.1 Utility Locate

The Washington811 call center will be notified at least 48 hours prior to conducting subsurface activities to identify known public utilities within the work area. In addition, a private utility locating company will conduct a utility scan, including the use of ground-penetrating radar, to confirm that the proposed well location is clear of underground utilities or other features.

3.2.2 Utility Clearance

The proposed boring will be pre-cleared using a combination of air knife, vacuum truck, and/or hand auger to a minimum depth of 8 feet below historical ground surface (i.e., ground surface existing prior to construction of the grass hill and corresponding to today's bike lane ground surface). Historical boring logs for wells near the proposed location (MW-70, MW-70R, and MW-207) suggest the presence of asphalt fragments, wood planking, solid wood, and wood debris. Such material may limit the possibility to complete a satisfactory utility clearance to a minimum depth of 8 feet below historical ground surface. If a satisfactory utility clearance cannot be implemented, work will be stopped due to the potential risk that may be faced by the drilling crew such as an electric line or a stormwater line break. No more than two attempts will be conducted.

3.2.3 Drill Rig Access Preparation Work

To allow drill rig access and installation of the monitoring well through the slope, it will be necessary to prepare a horizontal surface for the drill rig to work on. This will require excavation into the slope using a sloping and benching approach that meets Occupational Safety and Health Administration (OSHA) requirements (per Code of Federal Regulations Title 29/Subtitle B/Chapter XVII/Part 1926/Subpart P) to ensure the excavation is performed safely and is protective of the general public and personnel working on site. The excavation contractor will be required to have a competent person familiar with OSHA requirements on site and to perform the excavation in accordance with federal regulations.

Prior to excavating to create the drill rig access area, the contractor shall remove surficial coverings such as grass and topsoil from the area to be excavated. Topsoil shall be stockpiled separate from other stockpiled materials.

[1] Arcadis requested information to the City of Seattle in 2016 however the information provided did not contain reliable historical information regarding utilities associated with the Metro Trolley Barn that may exist below the grass hill.

The horizontal surface for the drill rig will be created by using an excavator to cut into the toe of the slope, as shown on Figures 4 and 5. The contractor shall then excavate steps into the existing slope as shown on Figure 5 to create 3-foot-wide benches. Each step shall be approximately 2 feet high to create an overall slope that shall be no steeper than 1.5H:1V (1.5 horizontal to 1 vertical).

Following preparation of the slope for drill rig access, a temporary access ramp will be constructed for the drill rig, as shown on Figures 4 and 5. Concrete blocks ("ecology blocks") shall be used to protect the existing concrete wall at the toe of the slope. The concrete blocks shall be placed against the existing concrete wall to provide lateral support to the wall. Plywood shall be placed between the existing wall and temporary concrete blocks for protection of the existing wall.

Concrete blocks will also be used on the opposite side of the sidewalk/bike path to retain fill soil that will be placed to create the access ramp. The contractor shall place a nonwoven geotextile fabric prior to placing concrete blocks and fill materials on the existing surfaces to protect the asphalt and other surfaces. A 1-inch-thick steel plate shall be placed to serve as a bridge over the existing concrete wall and to protect the wall. The plate shall be supported by the concrete blocks and soil such that the plate will not touch the concrete wall while the drill rig moves into position and during drilling (see Figures 4 and 5).

Excavated materials shall be temporarily stockpiled on site. Stockpiles shall be protected against erosion and offsite transport of sediment. Protection shall consist of tarps or plastic sheeting placed over the stockpiles. Additionally, the contractor shall install straw waddles on asphalt surfaces at the construction area. A silt fence shall be installed downslope of the construction zone to prevent migration of sediment toward Puget Sound.

Topsoil shall be segregated from other fill soils and may be reused as topsoil for site restoration. The existing fill soils excavated from the slope may be used to create the temporary ramp for drill rig access. The contractor may import additional, predominantly granular fill material, if necessary for construction of the ramp.

3.3 Monitoring Well Drilling

After preclearance, the borehole will be advanced using direct-push drilling methods to a target depth of 18 feet below historical ground surface (i.e., ground surface existing prior to the construction of the grass hill and corresponding to the current bike lane ground surface), approximately 20 feet below the grass hill surface. Target depth is based on nearby boring logs (see Appendix C) and depth to water recorded at wells closest to the proposed boring (see Table 1).

The borehole will be logged using a combination of ASTM International (ASTM) standard method ASTM D2488, Wentworth scale, and the Unified Soil Classification System. The soil will also be screened using a photo ionization detector.

3.3.1 Monitoring Well Installation

Monitoring well MW-212 will be installed in accordance with the Washington Administrative Code by a Washington-licensed driller. The monitoring well will be advanced to the target depth with well screen set at the interval presented in Table 2, below. The well screen interval was determined based on depth to water recorded at wells closest to the proposed boring (see Table 1) to reduce the potential for a submerged well screen.

If the soil boring is advanced beyond the target depth, the boring will be backfilled to the base of the screened interval with hydrated bentonite chips.

Table 2. Proposed Monitoring Well Target Depth and Screened Interval

Location	Target Depth	Well Screen Length	Proposed Well Screen Interval
MW-212	18 feet below historical ground surface (approximately 20 feet below the grass hill surface)	15	5 to 20 feet below the grass hill surface

The well will be constructed using 2-inch-diameter Schedule 40 polyvinyl chloride (PVC) with 0.010-inch slotted screen. Blank PVC casing will be installed from the top of the screen to near surface grade. Sand filter pack will be placed in the annular space from the bottom of the boring to approximately 1 foot above the top of the well screen, followed by hydrated bentonite chips to approximately 2 feet below ground surface. The remaining annular space will be sealed with concrete. The wellhead will be completed with a locking well cap. The well lid will be installed slightly above the surrounding surface grade and finished with a concrete apron (see Figure 4).

Following the installation of proposed monitoring wells, well location, ground surface, and top-of-casing elevations will be surveyed by a professional Washington-licensed land surveyor.

3.3.2 Monitoring Well Development

The monitoring well will be developed following well installation to aid in the removal of fine-grained sediments from the sand pack and well screen. The well will be developed by surging the screen interval and purging.

3.4 Post-Installation Activities

3.4.1 Site Restoration

Following monitoring well installation, the soil excavated from the slope shall be reused as fill to restore the slope to its pre-construction condition (see Figure 6). During restoration of the slope, fill soils shall be placed and compacted in lifts. Prior to compaction, the fill shall be placed in loose lifts, not exceeding 10 inches in height. Each lift shall be compacted to 90 percent of its maximum dry density determined per ASTM D698. The moisture content of the fill shall be within +/- 2 percent of optimum moisture. The contractor shall moisture condition the fill, if necessary to meet the moisture content requirement. Proper compaction will require performing at least one Proctor test per ASTM D698 and in-situ density testing during backfilling and compacting of the fill, using a nuclear density gauge.

During initial reconstruction of the slope, fill shall be placed beyond the pre-construction slope surface to ensure the entire fill is properly compacted, including fill near the slope surface. Following initial placement and compaction, the contractor shall scrape the surface using the excavator bucket to shape the slope surface and match the adjacent slope.

All surfaces shall be restored to pre-construction/well installation conditions, including re-establishment of grass on the slope.

3.4.2 Management of Investigation-Derived Waste

Soil cuttings generated during the field activities will be contained in U.S. Department of Transportation approved 55-gallon steel drums. The drums will be appropriately labeled and temporarily stored on site pending analytical results and profiling. Such storage will require the approval and support of the current property owner. Once profiled, the drums will be transported to an appropriate off-site disposal facility.

3.5 Groundwater Sampling

Following well installation, the well will be integrated within the current groundwater monitoring program and be sampled as part of the groundwater monitoring event.

4 Reporting

Well installation activities will be documented in the Semiannual Progress Report and will include:

- Scaled site plan with installed well location and other relevant site features
- Documentation of well installation, including boring log.

5 References

Arcadis. 2016. Monitoring Well Installation Report. Former Unocal Seattle Marketing Terminal 0724, 3001 Elliott Avenue. Seattle, Washington. April 29.

Table

Table 1
Well Construction Details

Former Unocal Seattle Marketing Terminal
3001 Elliott Avenue
Seattle, Washington

Well Number	Installation Date	Depth to Groundwater[1] (feet btoc)			Groundwater Elevation (feet)[2]			Top of Casing Elevation (feet)[2]	Top of Screen Elevation[3] (feet)[2]
		Average	Minimum	Maximum	Average	Minimum	Maximum		
MW-30	03/2006	13.60	9.85	15.27	7.25	5.58	11.00	20.85	15.85
MW-61A-R	1989	14.11	10.62	15.58	8.33	6.86	11.82	22.44	--
MW-200	10/2006	9.15	5.89	10.35	5.21	4.01	8.47	14.36	9.36
MW-201	10/2006	9.65	6.59	10.91	5.21	3.95	8.27	14.86	9.86
MW-202	10/2006	9.46	6.61	18.86	5.12	-4.28	7.97	14.58	6.78
MW-203	10/2006	12.41	9.63	14.2	5.14	3.35	7.92	17.55	7.05
MW-204	10/2006	18.69	15.49	19.87	5.24	4.06	8.44	23.93	6.58
MW-205	10/2006	22.46	19.51	24	5.43	3.89	8.38	27.89	9.89
MW-206	10/2006	10.60	7.09	13.3	4.55	1.85	8.06	15.15	4.15
MW-207	10/2006	10.66	7.45	13.52	4.74	1.88	7.95	15.40	5.90
MW-209	09/2016	9.38	8.01	10.51	6.15	5.02	7.52	15.53	12.53
MW-210	09/2016	8.95	7.52	9.73	6.18	5.40	7.61	15.13	12.13
MW-211	09/2016	9.06	7.91	10.02	5.96	5.00	7.11	15.02	12.02
MW-70R	09/2016	11.05	7.82	13.01	4.56	2.60	7.79	15.61	11.61

Notes:

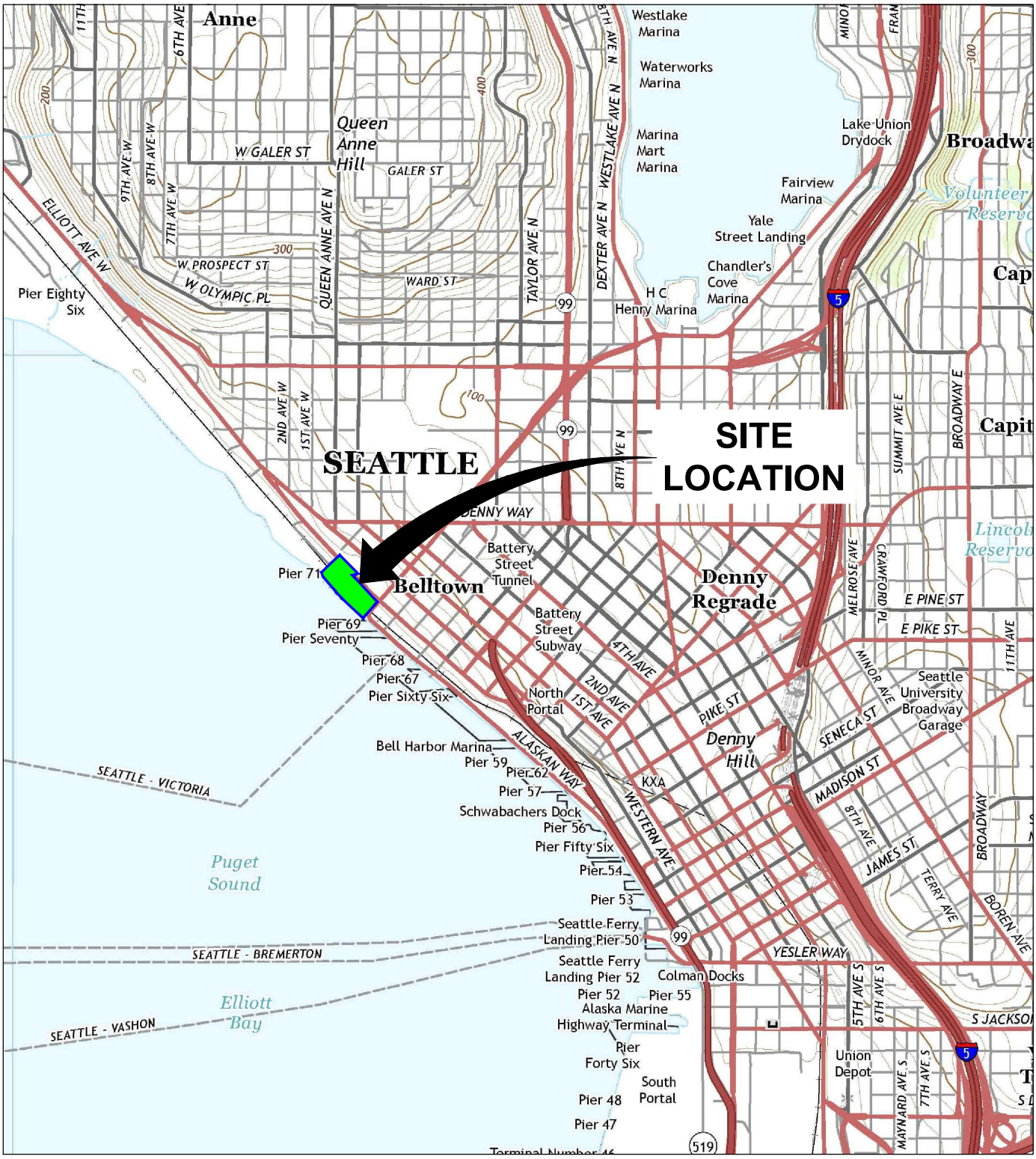
btoc = below top of casing.

[1]Calculated for the time period starting from the well installation date to 06/09/2021.

[2]Elevation referenced to city of Seattle datum.

[3]Top of well screen elevation data from historic records.

Figures



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., SEATTLE SOUTH AND SEATTLE NORTH, WASHINGTON, 2014.

N

WASHINGTON

0 2,000' 4,000'

Approximate Scale: 1 in. = 2,000 ft.

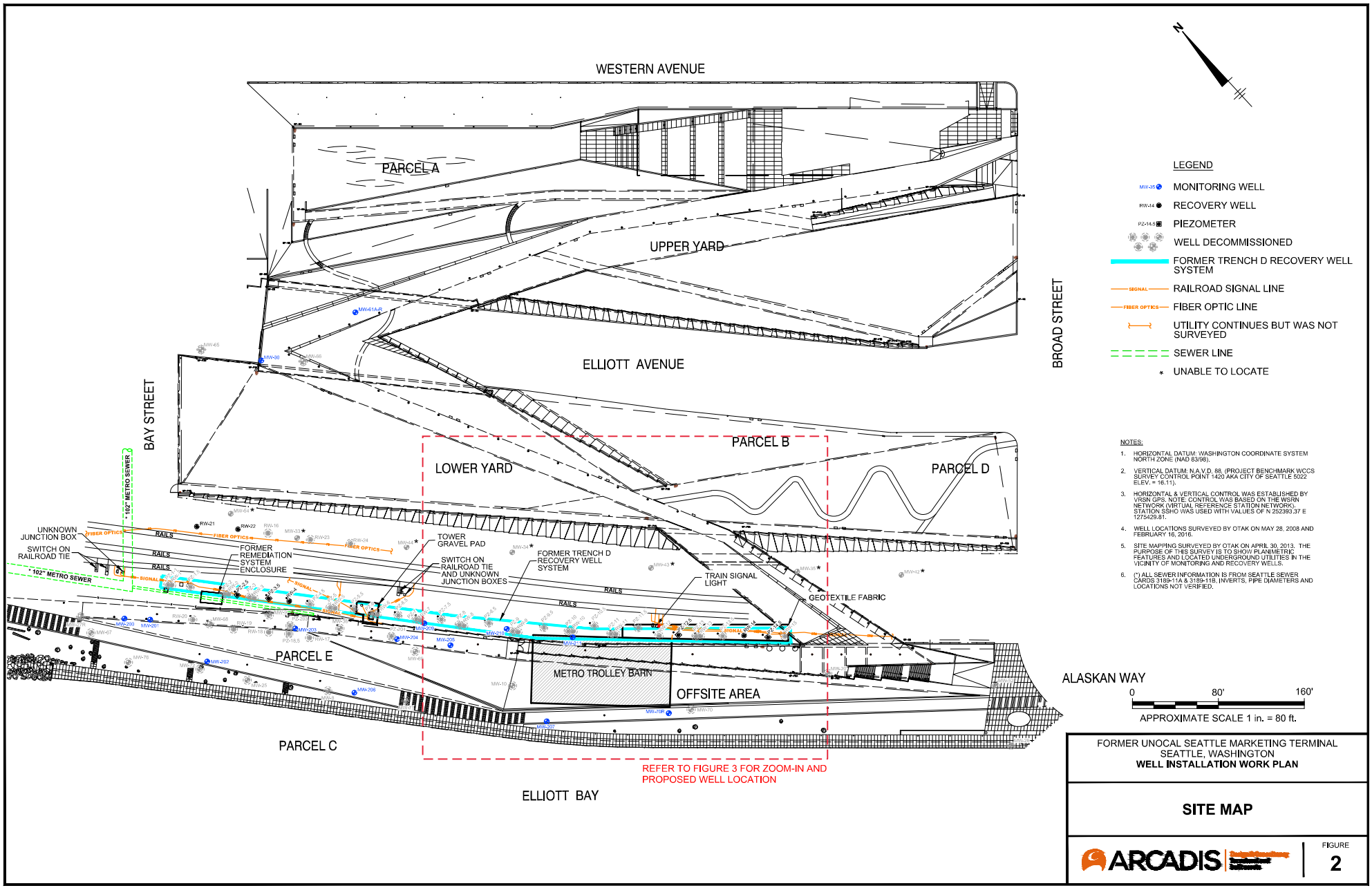
FORMER UNOCAL SEATTLE MARKETING TERMINA
LSEATTLE, WASHINGTON
WELL INSTALLATION WORK PLAN

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1

CITY: SAN RAFAEL, CA DIV/GROUP: ENVCAD DB: J. HARRIS
C:\Users\YMB2640\BIM 360\Arcadis\ANA - CHEVRON CORPORATION\Project Files\SEATTLE TERMINAL\2021\3006278\01-DWG\GEN-F01-SITE LOCATION MAP.dwg LAYOUT: 1 SAVED: 3/31/2021 2:55 PM ACADVER: 23.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 3/31/2021 2:58 PM BY: Y M. BABU

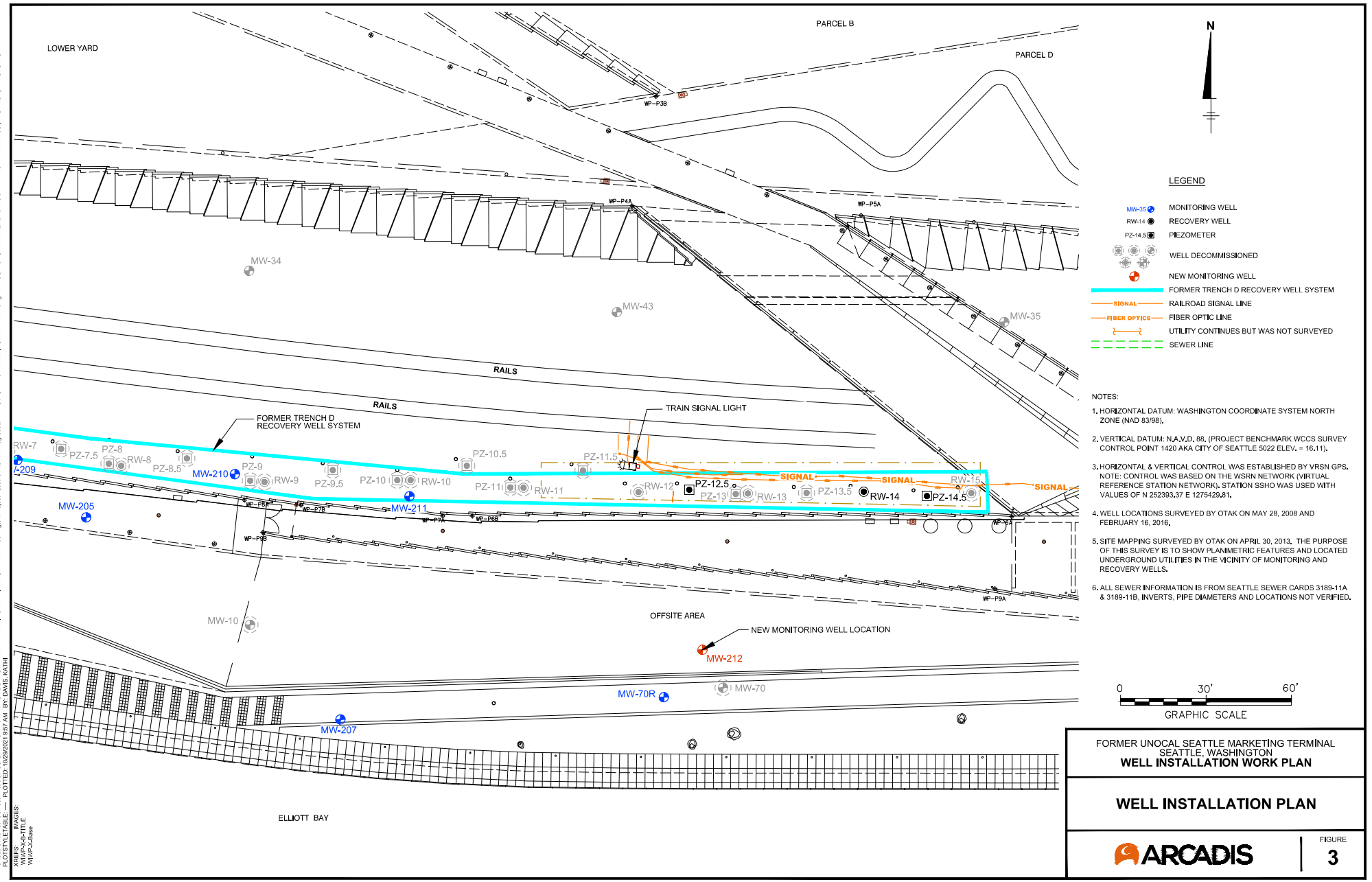


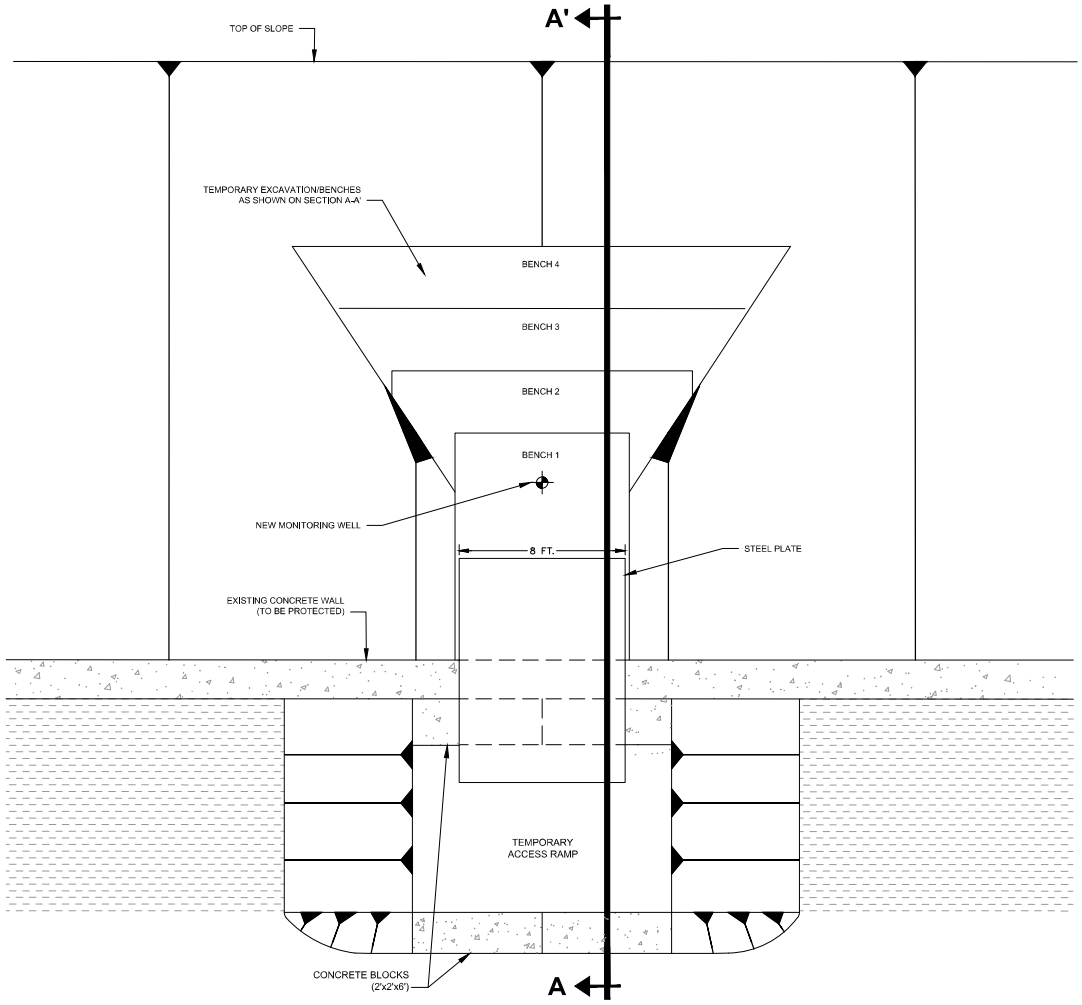
FORMER UNOCAL SEATTLE MARKETING TERMINAL
SEATTLE, WASHINGTON
WELL INSTALLATION WORK PLAN

SITE MAP

ARCADIS

FIGURE
2





PLAN VIEW - TEMPORARY EXCAVATION AND DRILL RIG ACCESS RAMP

NOT TO SCALE

NOTES:

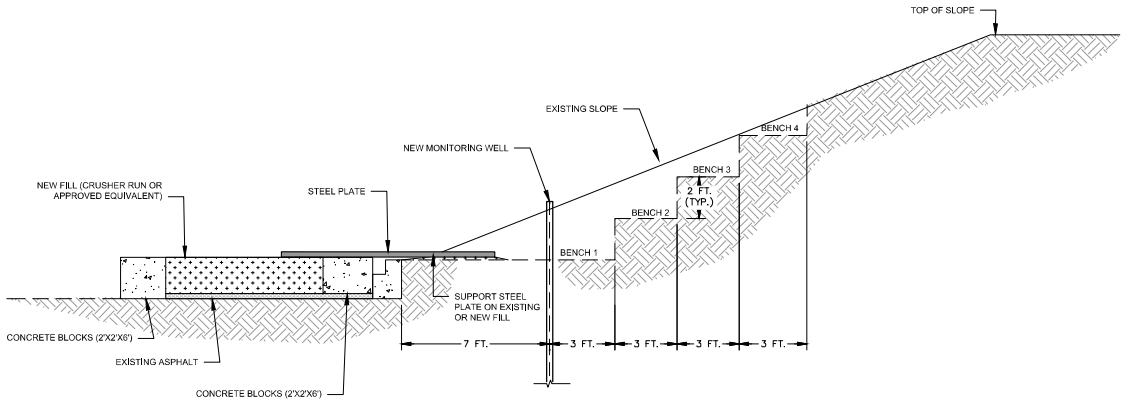
1. THIS FIGURE SHOWS THE EXCAVATION APPROACH FOR THE TEMPORARY EXCAVATION NEEDED FOR DRILL RIG ACCESS.
2. THE CONTRACTOR SHALL PERFORM THE EXCAVATION WORK, INCLUDING BENCHING AND SLOPING IN ACCORDANCE WITH OSHA REQUIREMENTS.
3. A TEMPORARY ACCESS RAMP WILL BE CONSTRUCTED FOR DRILL RIG ACCESS AND PROTECTION OF THE EXISTING CONCRETE WALL AT THE TOE OF THE EXISTING SLOPE.
4. REFER TO THE WORK PLAN TEXT FOR A DETAILED DESCRIPTION OF THE PLANNED WORK AND REQUIREMENTS ASSOCIATED WITH THE WORK TO BE PERFORMED.

FORMER UNOCAL SEATTLE MARKETING TERMINAL
SEATTLE, WASHINGTON
WELL INSTALLATION WORK PLAN

WELL INSTALLATION DETAILS (1 OF 2)

ARCADIS

FIGURE
4



SECTION A-A' - TEMPORARY EXCAVATION AND DRILL RIG ACCESS RAMP

NOT TO SCALE

NOTES:

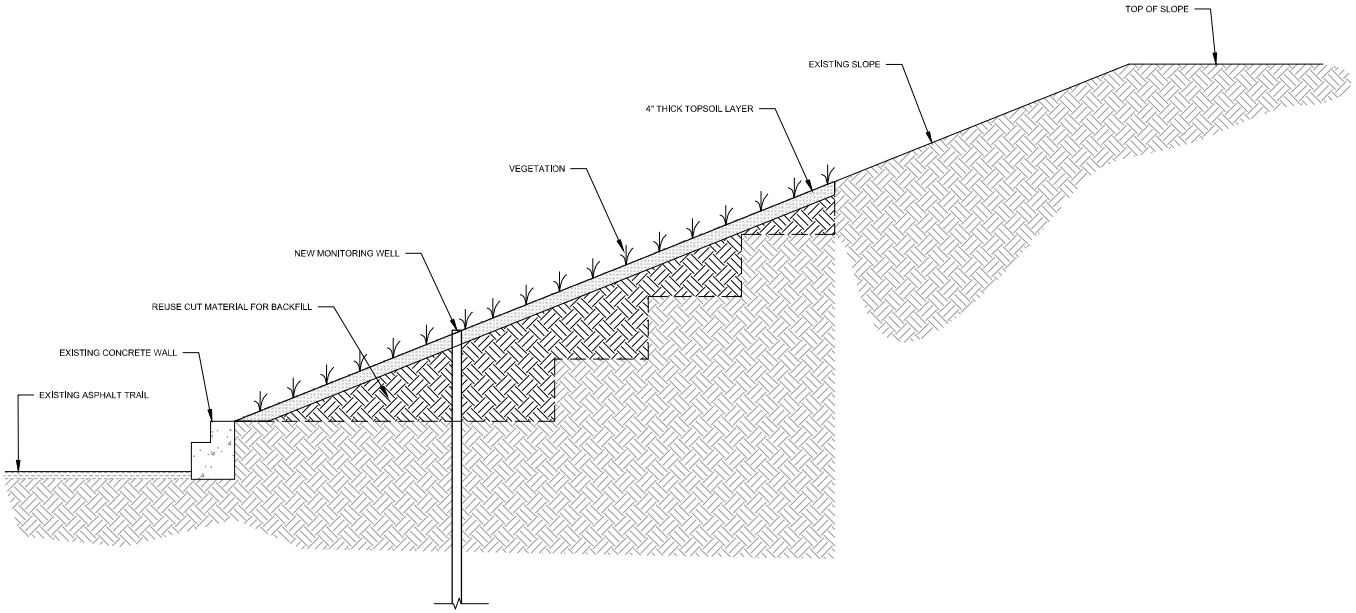
1. THIS FIGURE SHOWS THE EXCAVATION APPROACH FOR THE TEMPORARY EXCAVATION NEEDED FOR DRILL RIG ACCESS.
2. THE CONTRACTOR SHALL PERFORM THE EXCAVATION WORK, INCLUDING BENCHING AND SLOPING IN ACCORDANCE WITH OSHA REQUIREMENTS.
3. A TEMPORARY ACCESS RAMP WILL BE CONSTRUCTED FOR DRILL RIG ACCESS AND PROTECTION OF THE EXISTING CONCRETE WALL AT THE TOE OF THE EXISTING SLOPE.
4. REFER TO THE WORK PLAN TEXT FOR A DETAILED DESCRIPTION OF THE PLANNED WORK AND REQUIREMENTS ASSOCIATED WITH THE WORK TO BE PERFORMED.

FORMER UNOCAL SEATTLE MARKETING TERMINAL
SEATTLE, WASHINGTON
WELL INSTALLATION WORK PLAN

WELL INSTALLATION DETAILS (2 OF 2)

ARCADIS

FIGURE
5



BANK RESTORATION DETAIL

NOT TO SCALE

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SEATTLE, WASHINGTON
WELL INSTALLATION WORK PLAN

RESTORATION DETAILS

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FIGURE
6

Appendix A

Site History

SITE HISTORY

The site was operated by the Union Oil Company of California (Unocal) as a bulk fuel distribution facility from the early 1900s to approximately 1975. Leaded and unleaded gasoline, diesel, lube oil, motor oils and petroleum-based solvents (non-chlorinated) were stored at the site. In the 1980s, the above-ground site structures were demolished.

Chevron, on behalf of Unocal, is conducting cleanup of the site as required by Order on Consent DE88-N223 and Amendments 1 through 5. The initial Order on Consent was signed by Unocal and the Washington State Department of Ecology (Ecology) in December 1988. In July 1995, Amendment No. 4 was signed and contains cleanup targets and remedial action levels (RALs) for groundwater in the Upper Yard, Elliott Avenue, Lower Yard, and Offsite Area. Cleanup activities conducted by Unocal at the site included: an excavation with onsite treatment and offsite disposal of approximately 50,000 tons of soil from the Upper Yard; light non-aqueous phase liquid (LNAPL) recovery; and groundwater remediation (pump and treat) and excavation and disposal of approximately 45,000 tons of soil from Elliott Avenue and the Offsite Area.

In addition, Unocal excavated approximately 60,000 tons of soil exceeding the total petroleum hydrocarbon (TPH) RAL and removed and treated petroleum-containing groundwater (GeoEngineers, 1998). Petroleum-containing soils were typically excavated to depths of 15 to 20 feet below ground surface. The Lower Yard excavation was backfilled with clean fill material and moderately impacted petroleum-containing soils from the Upper and Lower Yards. The upper 95 percent confidence level of the mean for TPH concentrations remaining in these impacted Lower Yard soils used for backfill was below the RAL of 7,500 milligrams per kilogram (mg/kg) (GeoEngineers, 1998). Several feet of imported rock were placed at the base of the excavation. According to Unocal, the average TPH concentration in these backfill soils was approximately 1,000 mg/kg (SAM, 1999).

The Upper Yard and Lower Yard properties of the site were sold by Unocal to the Trust for Public Land for the Seattle Art Museum (SAM) in 1999. In 2004, SAM began construction for redevelopment of the property, including the Offsite Area (which is owned by the City of Seattle Parks and Recreation), as the Olympic Sculpture Park (OSP). SAM entered a Pre-Purchaser Agreement with Ecology prior to their purchase of the property. As part of the agreement, SAM submitted remediation design reports to Ecology for the OSP. As provided in a January 17, 2008, letter, Ecology indicated that the terms of the Pre-Purchaser Agreement were satisfied. A Stipulation and Order of Dismissal (No. 99-2-50226-4SEA) was issued on October 31, 2008.

In conjunction with the OSP construction in the Offsite Area, Unocal conducted a “hot spot” excavation from July to October of 2005. The goal of this remedial action was to remove a source area of petroleum hydrocarbons and LNAPL in soil. Approximately 4,435 tons of petroleum-impacted soils were removed during the “hot spot” excavation (GeoEngineers, January 2006). Following the soil removal, the excavation was backfilled and the surface was restored with asphalt pavement.

On October 4, 2009, Arcadis submitted the *Work Plan for LNAPL Mobility Assessment, Natural Attenuation Monitoring and Surfactant Application Pilot Testing* to Ecology (October 2009 Work Plan). The October 2009 Work Plan was prepared in response to a letter from Ecology to Chevron dated June 8, 2009, requesting that Chevron assess the monitoring well network, address options for active remediation in the Offsite Area, conduct several short-term multiphase extraction (MPE) events on monitoring well MW-204

and on wells where LNAPL is observed in the Elliott Avenue Area and the Offsite Area and to further evaluate unfiltered/filtered samples of carcinogenic polycyclic aromatic hydrocarbons (cPAHs). This October 2009 Work Plan outlined proposed activities to evaluate the monitoring well network, evaluate remedial alternatives for the site, and discussed the potential risk of cPAHs concentrations remaining in groundwater in the Offsite Area. Specific areas addressed included LNAPL located in the Elliott Avenue Area, LNAPL along the railroad tracks and dissolved-phase concentrations in the Offsite Area.

Ecology approved the October 2009 Work Plan, with specific comments, on November 16, 2009. Following meetings with stakeholders and Ecology, Arcadis submitted the *Revised Work Plan for LNAPL Mobility Assessment, Natural Attenuation Monitoring and Surfactant Application Pilot Testing* (January 2010 Revised Work Plan) to Ecology on January 19, 2010.

On December 8, 2009, Ecology submitted a letter to Chevron approving the cancellation of fourth quarter 2009 groundwater compliance monitoring. In addition, Ecology recommended conducting semi-annual groundwater compliance monitoring for 2010 and quarterly monitoring for visual inspection, measurement and removal (if applicable) at monitoring wells MW-30 and MW-61A-R and recovery wells RW-1 through RW-3 and RW-21. Monitoring well MW-61A-R is a replacement for well MW-61A, which was originally an Upper Yard monitoring well. However, MW-61A-R is located in the Elliott Avenue right-of-way (ROW) and is currently referred to as an Elliott Avenue Area monitoring well.

On March 19, 2010, Ecology approved the January 2010 Revised Work Plan with additional specific comments. Following additional meetings, Arcadis submitted the *Addendum to the Revised Work Plan for LNAPL Mobility Assessment, Natural Attenuation Monitoring and Surfactant Application Pilot Testing* (May 2010 Addendum to the Revised Work Plan) on May 3, 2010, to address the additional stakeholder and Ecology comments on the January 2010 Revised Work Plan. On May 18, 2010, Ecology approved the May 2010 Addendum to the Revised Work Plan via electronic mail. Field work to implement the May 2010 Addendum to the Revised Work Plan began in the summer of 2010.

Arcadis submitted the *2010 Summary Report and Risk Evaluation* on February 1, 2011 with the following recommendations and responses from Ecology:

- Continue quarterly gauging and semi-annual groundwater monitoring of wells MW-30, MW-61A-R, RW-3 and RW-21. Ecology concurred; both gauging and groundwater monitoring are ongoing for monitoring wells MW-30 and MW-61A-R. Recovery wells RW-3 and RW-21 were decommissioned with Ecology approval in June 2014 (discussed below).
- Continue semi-annual groundwater monitoring of wells MW-200 through MW-207. Ecology concurred: semi-annual groundwater monitoring is ongoing.
- Remove dissolved lead from the list of site constituents of concern. Dissolved lead has not been detected at the site since November 2007 and monitoring wells in the Offsite Area have at least 12 consecutive monitoring events without a dissolved-lead concentration exceedance. The few concentrations that were detected remained more than two orders of magnitude below the site RAL. Ecology concurred: effective second semi-annual 2011 monitoring event, lead is no longer a constituent of concern.
- Abandon piezometers PZ-61A-R, PZ-203, and PZ-204 in place. Ecology recommended maintaining and gauging piezometers through quarterly gauging during next two semi-annual monitoring events,

then to re-evaluate. Piezometers PZ-61A-R, PZ-203, and PZ-204 were decommissioned in June 2014 with the approval of Ecology (discussed below).

- Abandon Trench D extraction wells RW-1, RW-2, RW-5 through RW-13 and RW-15 in place. Ecology recommended maintaining and quarterly gauging of Trench D extraction wells through the next two semi-annual monitoring events, then to re-evaluate. Quarterly gauging of extraction wells RW-1, RW-2, RW-5 through RW-13 and RW-15 for two additional semi-annual monitoring events was fulfilled. The Trench D extraction wells were decommissioned in June 2014, as discussed below.
- The LNAPL occasionally observed in wells RW-3, RW-21 or MW-30 is not mobile. Arcadis does not recommend further remedial operations on these wells unless quarterly gauging activities indicates a change in the volume or type of LNAPL present in the wells compared to historical observations. Ecology concurred and recommended continuing quarterly gauging through two semi-annual monitoring events and then to re-evaluate. Quarterly gauging of RW-3, RW-21 and MW-30 for two semi-annual monitoring events was fulfilled. Recovery wells RW-3 and RW-21 were decommissioned in June 2014 with the approval of Ecology (discussed below).
- Add monitoring well MW-205 to the quarterly gauging program. Ecology concurred: MW-205 was gauged quarterly as part of the quarterly gauging program ending in 2014.
- If LNAPL is observed and is recoverable, submit a sample for chemical testing and possible mobility parameter analysis. Ecology concurred. Recoverable thicknesses of LNAPL were observed in Trench D wells PZ-4.5, PZ-6, PZ-10.5, PZ-11.5, and PZ-13 in February 2014. Samples of the LNAPL were submitted for chemical analysis and in some cases, mobility parameter analysis. The results of these analyses were submitted in the Trench D Recovery System Decommissioning Summary and Recommendation for Replacement Well Installation" (Arcadis July, 2014).

In December 2012, Chevron submitted a revised Draft Amendment to the Order to Ecology. The proposed Amendment, which was prepared with the input of the City of Seattle and the SAM, recommended abandonment of the Trench D recovery wells and piezometers, installation of up to five replacement wells along the Trench D area, and additional groundwater monitoring. At the request of Ecology, Arcadis submitted the "Work Plan for Decommissioning Trench D Recovery System and Three Piezometers Installed in 2010" (Arcadis, May 2013). This work plan describes a scope of work to decommission remaining wells and equipment associated with Trench D, as well as the piezometers installed as part of the 2010 site assessment activities. This work plan was approved by Ecology in email correspondence dated July 29, 2013.

The decommissioning work was conducted in two phases. Phase I was conducted from February 21 to 25, 2014 and included the following activities:

- Prepared the site to allow access for equipment and vehicles.
- Removed the remediation system compound and equipment.
- Attempted to locate missing piezometers and recovery wells.
- Gauged recovery wells and piezometers.
- Received variance approval for well abandonment.

Separate LNAPL sampling events were completed between the two phases of decommissioning work on February 26 and May 5, 2014.

Phase II was conducted from June 9 to 13, 2014 and included the following activities:

- Gauged recovery wells and piezometers.
- Vacuum extraction of fluids from each recovery well and piezometer located along Trench D.
- Decommissioned recovery wells, piezometers, 2-inch lateral remediation system piping, and a 6-foot long by 4-foot wide recovery vault where the piping entered the former remediation system.
- Decommissioned of piezometers installed in 2010 (PZ-61A-R, PZ-203, and PZ-204).
- Disposed of waste materials generated by the above activities.

A report of the Trench D decommissioning activities, LNAPL summary and work plan for the installation of the replacement monitoring wells was submitted under separate cover "Trench D Recovery System Decommissioning Summary and Recommendation for Replacement Well Installation" (Arcadis July, 2014).

At the request of Ecology, Arcadis submitted a work plan for the installation of up to six additional monitoring wells in the Offsite Area. The work plan was approved by Ecology in correspondence dated May 29, 2015. The work plan was implemented in January 2016. A report documenting installation activities was submitted to Ecology on April 29, 2016.

REMEDIAL ACTIVITIES

Offsite Area Remediation System

A groundwater extraction system was installed in the offsite area in 1989. The system included 24 extraction wells located along the BNSF right-of-way. In November and December 2006, the underground piping was severely damaged during the construction of the OSP, rendering the system inoperable.

From 1989 to November 2006, approximately 29,244,966 gallons of water and 4,809 gallons of LNAPL were recovered and treated by the groundwater extraction system. The extraction system last recovered LNAPL in fourth quarter 2004; no LNAPL was recovered during the last two years of operation. The associated Trench D recovery wells were gauged semi-annually until they were decommissioned in June 2014. The oil water separator was rehabilitated in May 2010 for use in disposal of purge water generated from routine groundwater sampling events and for well redevelopment and hydraulic conductivity testing approved by Ecology. The oil water separator was decommissioned during the June 2014 Trench D decommissioning activities and the King County Major Discharge Authorization Number 529-04 was discontinued.

Throughout the third and fourth quarter of 2011, monitoring well MW-205 was gauged on a bi-weekly (every other week) basis. During these events, no LNAPL or sheen was observed. Gauging was reduced to quarterly as of the first semi-annual 2012 reporting period at this location and continued on a quarterly basis since.

Upper Yard and Elliott Avenue LNAPL Removal

Monitoring well MW-61A-R was re-developed on September 3, 2008 using a disposable bailer and a vacuum truck to remove sediment and LNAPL which may have accumulated in the well and/or sand pack. Approximately ten well volumes of groundwater and residual LNAPL were removed. The re-development water and recovered LNAPL were collected in the vacuum truck and transported to an approved facility for recycling. The amount of LNAPL recovered was not quantified. Mobile multi-phase extraction (MPE) was initiated in August 2009 in monitoring wells MW-30 and MW-61A-R. Observations made during MPE operations indicate that short term MPE does not influence the groundwater table and subsurface vapor flow. MPE was determined to be an ineffective method to address the remaining LNAPL and dissolved-phase impacts at the site due to the minimal remaining hydrocarbon impacts at the site and associated low MPE mass removal rate.

To assess persistent measurable LNAPL observed during groundwater monitoring, a surfactant-enhanced LNAPL recovery pilot test was performed on monitoring well MW-61A-R in July 2010. Approximately 200 gallons of surfactant were injected into MW-61A-R. The surfactant solution was allowed to remain in the formation for approximately 24 hours and then approximately 900 gallons of fluids were extracted. Monitoring was completed weekly for the first month after extraction. After weekly monitoring was completed, monthly monitoring was initiated and quarterly monitoring is ongoing. A complete summary of the surfactant-enhanced LNAPL recovery pilot test was submitted in the *2010 Summary Report and Risk Evaluation* on February 1, 2011.

Lower Yard LNAPL Recovery

LNAPL was observed in recovery well RW-21 during the September 2013 groundwater monitoring event (visually observed on oil/water interface probe, a measurable thickness was not present). This recovery well, as well as the downgradient Trench D recovery wells (RW-1 through RW-3), were included in the quarterly gauging program. Manual LNAPL recovery from RW-21 had been unsuccessful due to the highly-viscous nature of the LNAPL. LNAPL has not been observed in recovery wells RW-1 and RW-2 since the gauging program was implemented and has not been observed in RW-3 since the first semi-annual groundwater monitoring event of 2013. Wells RW-1, RW-2 and RW-21 were decommissioned in 2014 during the Trench D decommissioning activities.

REFERENCES

Arcadis. 2009. Low-Flow Groundwater Purging and Sampling Procedures for Monitoring Wells. March 9.

Arcadis. 2013. Work Plan for Decommissioning Trench D Recovery System and Three Piezometers Installed in 2010. May 31.

Arcadis. 2014. Trench D Recovery System Decommissioning Summary and Recommendation for Replacement Well Installation. July.

Arcadis. 2015. Work Plan for Additional Well Installation in Former Trench D Area and Offsite Area, Former Unocal Seattle Marketing Terminal. May.

GeoEngineers, 1998. Final Cleanup Report – Lower Yard, Unocal Former Seattle Marketing Terminal Property. September 23.

Seattle Art Museum (SAM). 1999. Draft Cleanup Action Plan, Former Unocal Seattle Marketing Property. October 6. Numbered Heading Level 2

Appendix B

2016 Site Constraints

GEOMARKOUT
a trade name of ULS Services Corporation

WWW.GEOMARKOUT.COM

CORPORATE ADDRESS / INQUIRIES
P.O. Box 724, Pocatello, ID 83204 (Mail only)
6742 W Buckskin Rd, Pocatello, ID 83201 (Parcels only)
Ph. (208) 234-1441 (800) 301-4420 FAX (208) 234-1507

FIELD SERVICES:
SEATTLE/PDX /ALASKA/ SAC / HWI -GUAM:
1 866 804-5734
SOCAL 1 800 528-8206

Work Order Agreement

Job Site Location 3100 ELLIOTT (FORMER CHEV TERMINAL)	Job PO TO
City, State SEATTLE , WA	Job Date 18 -19 JAN 16

CLIENT ARCADIS	**HS/LABOR 1.5 Tel Meeting/JSA** **ONSITE 18TH 0730 -1500 (7.5)** **19th 0930-1315 (3.75)** **REPORT 2 HRS**
LABOR HOURS W/REPORT/ **ONSITE 11.25 HS 1.5** **REPORT 2 TOTAL 14.75**	
E-MAIL	**E-MAILED**

WORK REQUESTED: UTILITY LOCATE - MARKOUT SERVICES AT SIX PROPOSED MWS PLUS ALTS ALONG BNSF ROW AND WITHIN SCULPTURE PARK.

WORK PERFORMED	**PRELIMINARY REVIEW OF CLIENT PROVIDED UTILITY DRAWINGS/AS-BUILTS: LIMITED**
VISUAL SITE INSPECTION (MANHOLES, DRAINS): SD INLETS ON SITE. SURFACE ONLY	**EMPCL CONDUCTIVE UTILITY SURVEY: CHECK GAS: X ELECTRIC: OVER COMM.: OVER X WATER: X**
EMIMD METAL DETECTION SURVEY : AMBIENT NOISE AND SETTINGS LOW NOISE | GAIN 7.0 | LOW ELV GOOD RESPONCE	**EM INSERTION : NF**
GPR NON-CONDUCTIVE SURVEY: YES FAIR RESPONSE	**CLIENT ON-SITE REVIEW OF FINDINGS: YES**

GENERAL LIMITATIONS

NOTE: The work described herein is performed to industry standards (or higher) using multiple methodology and QA/QC protocol. ULS cannot guarantee the accuracy or the ability to detect all underground facilities and potential interferences. Non-conductive or conductive utilities/facilities may not be detected due to variables and constraints beyond ULS control. Where known, constraints and limitations will be brought to the client's attention. Excavation work may result in injury to persons and/or damage to facilities. Client and/or excavator are advised to take all steps necessary to avoid contact with underground facilities. This includes, but is not limited to, safe digging practices, hand tooling in congested areas and within two feet on side of marked utilities (distance may vary by law), utility drawing review, site facilities representative review, and "one-call" utilities notification. ULS and its representatives are not responsible for injury to persons or damage to facilities. This document and accompanying pages will be delivered to the client before commencement of intrusive work for the client's review. If any questions arise, please notify our office immediately.

NOTE: Specific comments/limitations/constraints, known and recognized will be recorded on attached pages (field notes). Caution – some facilities (conductive or non- conductive) may not be detected. Not all limitations and constraints may be recognized.

SIGNATURE OF ULS REPRESENTATIVE ON-SITE **M BENEDICT**		**PAGE OF** 1

GEOMARKOUT
a trade name of ULS Services Corp

3100 ELLIOTT SEATTLE WA

METHODS:

ARRIVED SITE MET CLIENT AND ATTENDED HASP-HS TAIL GATE WITH PERMIT TO WORK. REVIEWED SOW AND PROPOSED WORK AREAS. REVIEWED BNSF SAFETY PROCEDURES WITH BNSF FLAG MAN REP. AREA CHECKED FOR SURFACE UTILITY MANIFESTATIONS SUCH AS VALVES, METERS, AND CONDUITS, TRENCHING SEAMS, MH OR VAULT COVER LIDS. CHECKED FOR EXISTING ONE CALL MARKINGS. *METHODS UTILIZED INCLUDE: EM PIPE AND CABLE LOCATION USING AMBIENT, GROUND INDUCTION AND CONNNECTION MODE SWEEPS, EM INDUCTION METAL DETECTION LOCATOR AND GPR AS WELL AS VISUAL MEANS.* A CARTISIAN GRID PATH IS WALKED ACROSS THE SURROUNDING AREA OF PROPOSED ZONE USING THE ABOVE METHODS.

GENERAL OBSERVATIONS - INSTRUMENT RESPONCE :

WEATHER IS DRY TO SLIGHTLY DAMP TURNING TO WET ON DAY 2. EMIMD METAL DETECTOR BACKGROUND EM NOISE IS LOW ALLOWING FOR GOOD RESPONSE. EMPCL INDUCTION AND CONNECTION MODE BROADCAST IS GOOD. GPR RESPONSE IS FAIR TO GOOD OVER KNOWN EM LINEATIONS.
OBSERVATIONS ARE MARKED WITH WHITE AND HI VIS PINK PAINT. WHITE BOX IS COMPLETED AT EACH LOCATION.

SEE OBSERVATION COMMENTS TO RIGHT SIDE AND BELOW WITH PHOTOS SENT SEPERATELY.>

X	ONECALL /DIG ALERT RECALL? SEWER AND SD ADVISED
X	**UTILITY MAINS**
X	ELECTRIC NO OVERHEAD OBSERVED. ELECT TO RAIL ROAD SWITCHES TREND N-S ALONG SOUTH SIDE TRACKS NEAR FOUR PROPOSED MWS. ELECT TO PAARK LIGHTS TREND GENERAL N-S AND MARKED.
X	TELEPHONE FIBER OPTIC TO RAILROAD REPORTED NORTH TRACKS.
X	NAT GAS NO METERS, MARKERS ONE CALL MARKS NOTED IN AREA.
X	WATER PVC IRRIGATION IN PARK. CAUTION WHEN AIRKNIFING IF PIPING IS NOT DETECTED OR MARKED. . .
X	SEWER/STORM **CAUTION SEWER MH COVERS IN RR ROW ARE STUCK AND VISUAL NOT COLLECTED. DWGS SHOW A NS TREND ALONG FENCE SOUH TRACKS. CAUTION MW 208 ALT.**
X	**STORM DRIANS - CAUTION POTENTIAL SD PIPES NEAR MW 70R AND MW12 AS NOTE LINEATION AND DWG REVIEW.**
X	**SECONDARYS CAUTION** E CONDUITS TO PARK LIGHTS AND IRRIGATION IN PARK.

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SPECIFIC OBSERVATIONS

BNSF ROW LOCATIONS

MW 208 THRU MW 211 PLUS MW 208 ALT:

THESE PROPOSED LOCATIONS ARE SOUTH OF TO SETS OF N-S TRENDING ELECTRICAL UTILITIES ASSOCIATED WITH BNSF SWITCHS AND LIGHTS. A THIRD GPRLINEATION APPROXIMATLY 6 TO 8 FEET DEP IS OBSERVED CLOSE TO NORTH SIDEOF EACH PROPOSED. LINEATION ISUNKNOWN AND MY POTENTIALLY BE ASSOCIATED WITH FORMER REMEDIATION PIPING AND TRENCH, OR SOME OTHER UNKNOWN UTILITY. CAUTION WHEN AIRKNIFING OR DRILLING NEAR IT.

ALTERNATIVE LOCATION MW 208 TO WEST END (NEAR REMPAD) OF FOUR MWS IS CONGESTED AND NEAR A REPORTED SEWER MAIN. THISLOCATION NOT ADVISED.

SCULPTURE PARK LOCATIONS

MW 212 TOP SLOPE AND BOTTOM SLOPE AND MW 70R:

PROPOSED LOCATIONS MW 212 AT TOP SLOPE IS SITUATED ON A NARROW PATH NEXT TO RETAING WALL AND TOP OF VERY STEEP SLOPE. SHALLOW DRAINS AND IRRIGATION ARE ITH PATH AND TOP SLOPE. THIS LOCATION IS NOT ADVISED DUE TOLIMED SPACE, UTILITYS, AND GENERAL SAFETY ONCERNS AT TOP OF STEEP SLOPE. An ALTERNSTIVE LOCATION 212R AT BOTTOM OF SLOPE WEST OF 70R ON BIKE PATH IS PROPOSED AND MARKED. SEE BELOW.

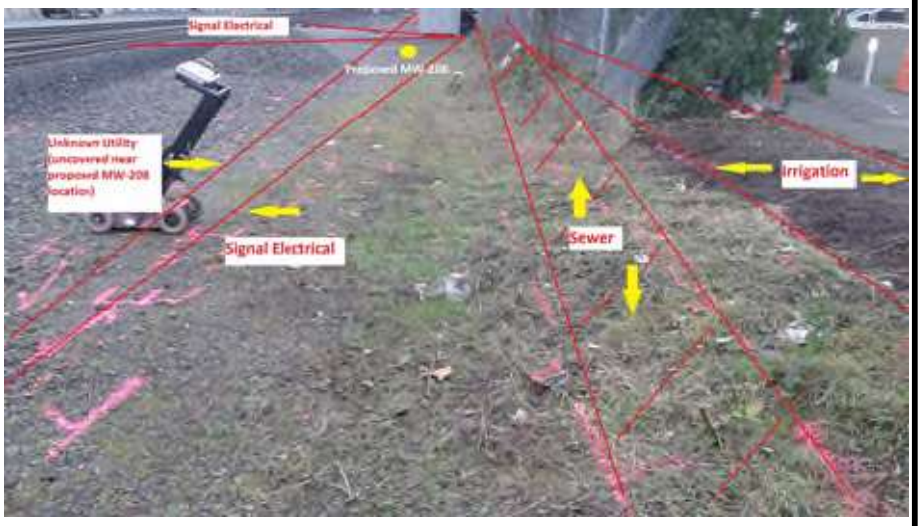
PROPOSED 212 ALT:

UNKNOWN GPR LINEATION (POTENTIAL STORM DRAIN) IS OBSERVED ALONG SOUTH SIDE. CAUTION IN LANDSCAPING TO SOUTH AS ELECTRIC LIGHTS AND IRRIGATION EXIST.

PROPOSED MW 70R:

UNKNOWN GPR LINEATION (POTENTIAL STORM DRAIN) IS OBSERVED ALONG SOUTH AND EAST SIDE. ADDTIONALLY TWO OTHER N-S TRENDING GPR LINEATION ARE NEXT TO LOCATION. CAUTION IN LANDSCAPING TO SOUTH AS ELECTRIC LIGHTS AND IRRIGATION EXIST.

ADVISED CHECKING RECEHEKING WITH ONE CLL AS NEEDED IE FOR SEWER AND STORM AND CHECKING ENERGY ISOLATION (IE, WATER) BEFORE COMMENCING
WITH MECHANICAL INSTUSSIVE TOOLS)
END REPORT
MWB



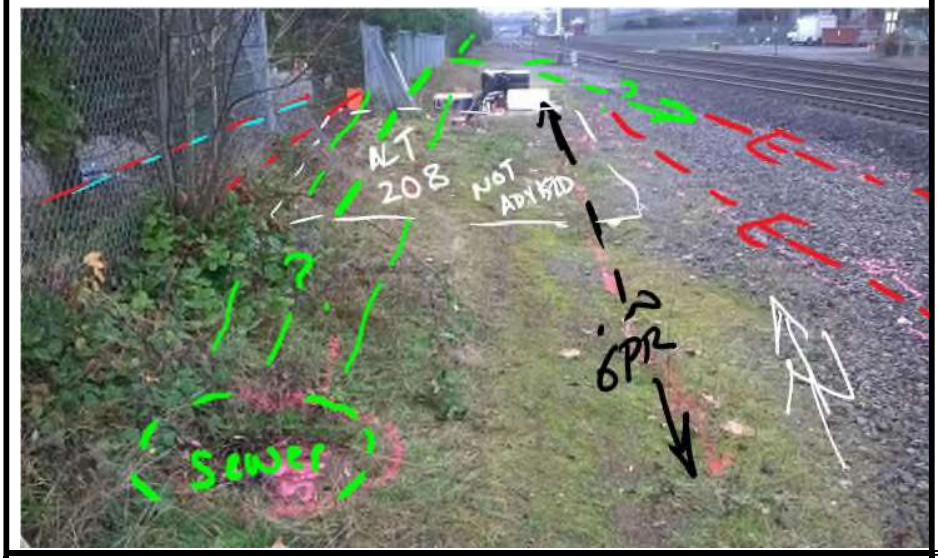
Photograph #1

Description of Photograph:
MW-208 Utilities

Site Location:
Former Unocal
Seattle Marketing Terminal
3001 Elliott Avenue
Seattle, Washington

Photograph Taken By:

Date of Photograph:



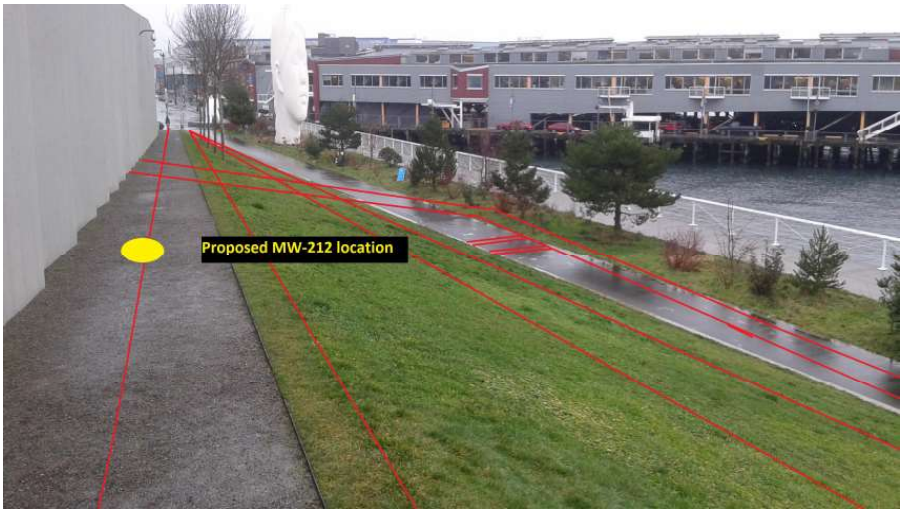
Photograph #2

Description of Photograph:
MW-208b

Site Location:
Former Unocal
Seattle Marketing Terminal
3001 Elliott Avenue
Seattle, Washington

Photograph Taken By:

Date of Photograph:



Photograph #3

Description of Photograph:
MW-214 Location

Site Location:
Former Unocal
Seattle Marketing Terminal
3001 Elliott Avenue
Seattle, Washington

Photograph Taken By:

Date of Photograph:

Photograph #4

Description of Photograph:
MW-214 Utilities

Site Location:
Former Unocal
Seattle Marketing Terminal
3001 Elliott Avenue
Seattle, Washington

Photograph Taken By:

Date of Photograph:


211
NORTH

Appendix C

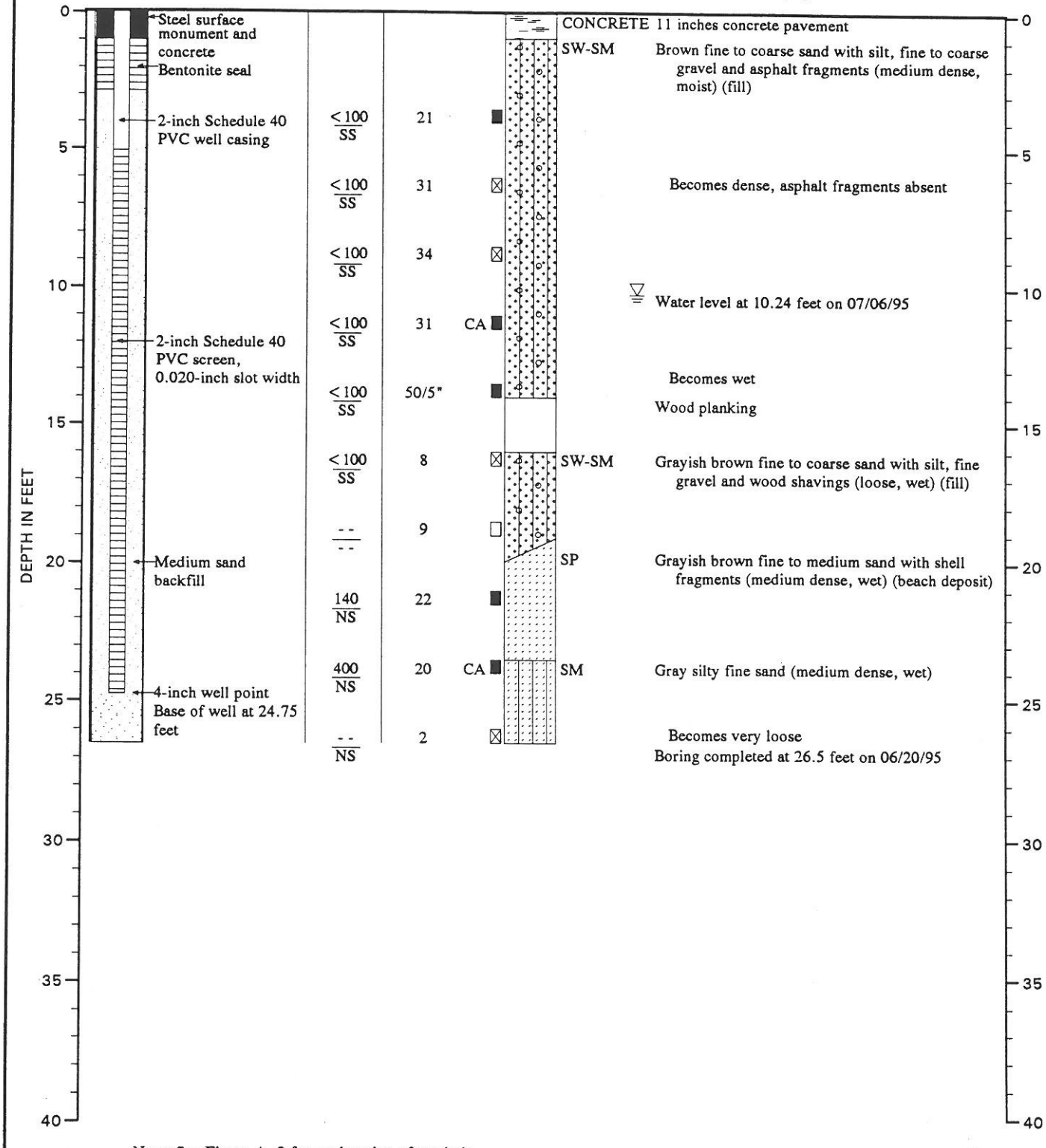
Boring Logs

DRAFT

MONITORING WELL MW-70

WELL SCHEMATIC

Casing Elevation (ft.): 5.58
Casing Stickup (ft.): -0.65



Note: See Figure A- 2 for explanation of symbols

0161-357-R04 Task6.6 :TNV:CMS 8/30/95

Geo Engineers

LOG OF MONITORING WELL

FIGURE A-18

UNOCAL 003625649

Aspect consulting
IN-DEPTH PERSPECTIVE

Well Construction Log

Project Number	Well Number	Sheet
020118-001	MW-207	1 of 2

Project Name	SAM - Olympic Sculpture Park	Ground Surface Elev	15.93
Location	28,172.24 N, 26,992.14 E / Seattle, Washington	Top of Casing Elev.	15.47
Driller/Method	Malcom; Matt Kenedy / Air Rotary	Depth to Water	11.0
Sampling Method	Cuttings	Start/Finish Date	10/17/2006

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	USGS Unit	Material Type	Description	Depth (ft)
1 – 15	Steel Surface Monument				Loose, Slightly Moist, Brown, Silty Fine to Coarse SAND with Trace Gravel. SM	1
2 – 14	Cement					2
3 – 13						3
4 – 12						4
5 – 11	Hydrated Bentonite Chips					5
6 – 10						6
7 – 9						7
8 – 8						8
9 – 7						9
10 – 6	2-Inch Schedule 40 PVC Well Casing					10
11 – 5	▼ 10/17/2006				Wood Planking	11
12 – 4	▽ 13.77 ft Screen					12
13 – 3					Loose, Wet, Grayish Brown, Silty Fine to Coarse SAND with Wood Debris and Trace Gravel. SM	13
14 – 2						14
15 – 1	10-20 Colorado Sand Backfill					15
16 – 0						16
17 – -1						17
18 – -2	2-Inch Schedule 40 PVC Screen 0.020-Inch Slot Width					18
19 – -3					Loose, Wet, Gray Fine to Coarse Silty SAND. SM	19

Sampler Type:
No Recovery

PID - Photoionization Detector (Headspace Measurement)
▼ Static Water Level
▽ Water Level (ATD)

Logged by: MJN
Approved by: DLC
Figure No. A - 9

WELL CONSTRUCTION SAM-SHORELINE.GPJ February 22, 2007

Aspect consulting
IN-DEPTH PERSPECTIVE

Well Construction Log

Project Number	Well Number	Sheet
020118-001	MW-207	2 of 2

Project Name	SAM - Olympic Sculpture Park	Ground Surface Elev	15.93
Location	28,172.24 N, 26,992.14 E / Seattle, Washington	Top of Casing Elev.	15.47
Driller/Method	Malcom; Matt Kenedy / Air Rotary	Depth to Water	11.0
Sampling Method	Cuttings	Start/Finish Date	10/17/2006

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	USGS Unit	Material Type	Description	Depth (ft)
21 -5	8" Diameter Borehole.					21
22 -6						22
23 -7	0.2' Flat Threaded Sump					23
24 -8						24
25 -9						25
26 -10						26
27 -11						27
28 -12						28
29 -13						29
30 -14						30
31 -15						31
32 -16						32
33 -17						33
34 -18						34
35 -19						35
36 -20						36
37 -21						37
38 -22						38
39 -23						39

23.27
23.53

7.5 ft = 1 ft
4/7.5 x 4 = 0.53
4/7.5 x 2 = 0.27

Sampler Type:
No Recovery

PID - Photoionization Detector (Headspace Measurement)
Static Water Level
Water Level (ATD)

Logged by: MJN
Approved by: DLC
Figure No. A - 9

WELL CONSTRUCTION SAM-SHORELINE.GPJ February 22, 2007

Date Start/Finish: 1/20/16 to 1/21/16
Drilling Company: Cascade Drilling
Driller's Name: James G.
Drilling Method: Hollow Stem Auger
Auger Size: 8 inch outer diameter
Rig Type: Limited Access Track Mounted HSA Rig
Sampling Method: Split Spoon

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 19 feet bgs
Surface Elevation: NE

Descriptions By: RwL

Well/Boring ID: **MW-70R**

Client: Chevron Environmental Managment Company

Location: Former Unocal Seattle Marketing Terminal
3001 Elliott Ave, Seattle, 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										3 inches of Asphalt	8" Flush-mount Monument
		1	HA	0.5	NA	NA	NA				Sand and Gravel - medium to very coarse sand, small to large gravel, well graded, wet	Concrete
		2	HA	0.5	NA	NA	NA					Groundwater First Encountered (surface water infiltration)
		3	HA	0.5	NA	NA	NA				Sand with some Gravel - medium to very coarse sand, large to very large gravel, brown, moist	
		4	HA	0.5	NA	NA	NA					Well J-Plug
		5	HA	0.5	NA	NA	NA		SG			Bentonite Chips
5	-5	6	HA	0.5	NA	NA	NA					Schedule 40 PVC Riser
		7	HA	0.5	NA	NA	NA				Sand with little Gravel - medium to very coarse sand, small to medium gravel	
		8	HA	0.5	NA	NA	NA					
10	-10	9	SS	1	50/6 50/6	100	NA		SG		Sand with some Gravel - sand is medium to very coarse, small rounded gravel, dark brown, wet	#2/12 Sand
		10	SS	1.5	100/6 9 15	24	NA		OP		Organics - solid wood	0.020 Slot PVC Screen
									SG		Sand and Gravel - Sand is medium to coarse, gravel small to medium subrounded, brown, wet	
15	-15	11	SS	1.5	12 22 20	42	NA		SG		Same as Above	
									SP		Sand with trace Silt - sand fine to coarse, silt non-plastic, dark brown to black, wet	

ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks: bgs = below ground surface; NE = Not Established; HA = hand auger; SS = Split Spoon; PVC = polyvinyl chloride; ppm = parts per million

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