

ANNUAL GROUNDWATER MONITORING REPORT - YEAR 2

Olympic Water & Sewer, Inc.

781 Walker Way

Port Ludlow, Washington 98365

VCP Identification No. SW1311

Prepared for: Olympic Property Group, A Rayonier Company

Project No. 130046 • February 9, 2022



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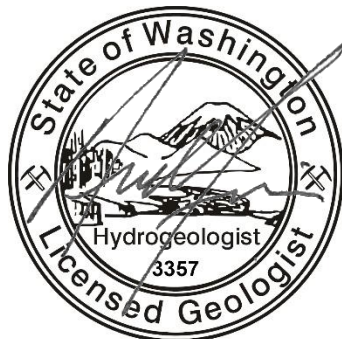
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Aspect Consulting, LLC



2/9/2022

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Abbreviations

AGI	Applied Geotechnology, Inc.
Aspect	Aspect Consulting, LLC
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
COCs	contaminants of concern
Ecology	Washington Department of Ecology
FFS	Focused Feasibility Study
GRO	gasoline-range organics
GMP	Groundwater Monitoring Plan
GWMR	Groundwater Monitoring Report
µg/L	micrograms per liter
MTCA	Model Toxics Control Act
MNA	Monitored Natural Attenuation
NFA	No Further Action
OWSI	Olympic Water & Sewer, Inc.
USTs	underground storage tanks
VOC	volatile organic compound
WAC	Washington Administrative Code

1 Introduction

Aspect Consulting, LLC (Aspect) has prepared this Annual Groundwater Monitoring Report (GWMR) on behalf of Olympic Property Group, A Rayonier Company for the Olympic Water & Sewer, Inc. (OWSI) Site, which is located on the real property located at 781 Walker Way in Port Ludlow, Washington.

1.1 Regulatory Framework

In September 1990, Applied Geotechnology, Inc. (AGI) removed three underground storage tanks (USTs) from the property – one 1,000-gallon UST and two 2,000-gallon USTs. During the UST removals, a release of gasoline from the 1,000-gallon UST was discovered, and gasoline-impacted soil was removed to the extents practicable. During the installation of a water supply well in April 2009, gasoline impacts to shallow, perched groundwater were discovered. The Jefferson County Health Department was notified, who further notified the Washington State Department of Ecology (Ecology). In September 2009, Ecology listed the Site on its Confirmed or Suspected Contaminated Sites list; the Site is identified as the Olympic Water & Sewer Inc Site, cleanup Site ID 1196, and facility ID 62223345.

The Model Toxics Control Act (MTCA) defines the Site as anywhere where a hazardous substance has come to be located (Washington Administrative Code [WAC] 173-340-200). Further investigation through 2013 confirmed that the Site can be defined as the release(s) of total petroleum hydrocarbons measured as gasoline-range organics (GRO) and benzene, toluene, ethylbenzene, and xylenes (BTEX) to soil and groundwater. As part of Site investigation and cleanup activities, a Focused Feasibility Study (FFS; Aspect, 2013) was performed, which identified a preferred remedial alternative in accordance with MTCA. The preferred remedial alternative for the Site consisted of three primary components:

- **Source Removal:** In 1990, three USTs were removed. During removal, a release of gasoline was discovered, and over-excavation of GRO-contaminated soil was performed. The cleanup action consisted of excavation of the impacted soil to the extents practicable; however, residual impacted soil was left in place at the base of one of the UST excavations to prevent structural damage to a nearby building. At that time, residual impacted soil was expected to occur from approximately 10 feet below ground surface (bgs) to the perched groundwater table between approximately 20 to 41 feet bgs (SLR, 2011).
- **Institutional Controls:** An environmental covenant was filed with Jefferson County on September 24, 2015, with the deed on the property that restricts certain activities that could cause exposure to impacted soils or groundwater or could result in mobilization of contaminants at the Site. Specifically, the environmental covenant included the following deed restrictions:
 - The property zoning and use will remain commercial, as the cleanup levels established for compliance are based on a commercial land use.

- The contaminated soil which exceeds cleanup levels and remains on the property is under existing structures and an existing layer of clean soil from the ground surface to a depth of 15 feet bgs. The covenant restricts the alteration of the current property configuration, including earthwork activities which may disturb the clean soil cap.
 - Groundwater use in the shallow, perched groundwater at the Site will not be used for water supply.
 - Groundwater monitoring will be maintained until groundwater at the Site meets applicable cleanup levels. The groundwater monitoring program was further defined in the second portion of the selected cleanup action as described below.
- **Monitored Natural Attenuation (MNA):** Cleanup levels at the Site will be achieved by the natural attenuation of GRO and BTEX in soil and groundwater. To monitor the natural attenuation of contaminants at the Site, a Groundwater Monitoring Plan (GMP) was developed that describes the frequency, location, and analyses of groundwater sampling activities to ensure the protectiveness of the selected cleanup action (Aspect, 2015). The GMP prescribed quarterly groundwater sampling during the first year of MNA, and annual groundwater sampling thereafter. The results of these groundwater sampling events will be evaluated during Ecology’s 5-Year Site review.

The Site was entered in the Ecology Voluntary Cleanup Program (VCP) in 2013 and was assigned identification number SW1311. Ecology provided an opinion that upon completion of the preferred remedial alternative, no further remedial action would be necessary to clean up contamination at the Site (Ecology, 2014). The recorded environmental covenant was sent to Ecology on June 2, 2016. Ecology issued the no further action (NFA) determination letter on January 19, 2021.

1.2 Report Organization

This GWMR documents the results of the first year of MNA groundwater monitoring, in accordance with the Ecology-approved GMP. This report is organized to include the following Sections:

- **Section 2 – Site Background** describes the property location and zoning, operational history, topography, land use, and hydrogeology.
- **Section 3 – Groundwater Monitoring Procedures** describes the monitoring well network, contaminants of concern (COCs) and cleanup levels established for the Site, and the procedures for obtaining groundwater samples.
- **Section 4 – Groundwater Monitoring Results** describes the groundwater elevations, gradient, and flow directions and laboratory analytical results for COCs during Year 2 of groundwater monitoring.
- **Section 5 – Summary** presents a summary of Year 2 groundwater monitoring activities and presents recommendations for continued monitoring under the GMP.

2 Site Background

2.1 Site Location and Description

The Site is located in Section 8, Township 28 North, Range 1 East in Port Ludlow, Washington (Figure 1). Identified as Jefferson County Parcel No. 821084004, the Site consists of an approximately 2.2-acre parcel of land located approximately 0.5-mile northwest of the Port Ludlow bay. The Site is located at the southwest corner of the intersection of Walker Way and Rainer Lane at 781 Walker Way (Figure 2).

The Site is densely forested, with an approximate 0.5-acre area developed with an OWSI operations and maintenance facility, consisting of an office/shop/garage building (garage building), a public water supply well (Well #2), pump house building for Well #2, and a storage trailer (Figure 2). The ground surface within the developed portion of the Site is primarily unpaved, except for a narrow asphalt driveway that runs down the center of the OWSI facility from Walker Way to approximately the storage trailer. A densely vegetated gulley, containing an intermittent seasonal stream, bisects the western half of the parcel, west of the OWSI facility, and flows off-property (Figure 2).

In 2020, OWSI, assisted by Robinson Noble, began the process of siting and installing a new public water supply well (Well #18) at the Site. A location in the northeast corner of the site was selected based on the known location of petroleum impacts on the Site. Prior to Well #18 installation, a monitoring well (MW-18T; Figure 2) was installed to evaluate groundwater quality in the shallow, perched water-bearing zone in the vicinity of the well (Robinson Noble, 2020; Robinson Noble 2021). In consultation with Ecology in December 2020, MW-18T and Well #18 were added to the annual groundwater monitoring program. Well #2 and MW-18T are to be monitored until they are decommissioned. At the time of this report, Well #18 remained under construction and has not yet been surveyed. Once it is surveyed it will be added to the figures and a GWP Addendum will be prepared.

The ground surface elevation proximate to the northern property boundary of the Site is approximately 290 feet above mean sea level. The ground surface of the OWSI facility slopes gently to the southwest toward the intermittent stream (Figure 2).

2.2 Hydrogeology

Shallow groundwater at the Site occurs as a shallow, perched water-bearing zone within the glacial advance outwash and lacustrine deposits at depths above approximately 60 feet bgs. Seasonally, groundwater in the shallow, perched water-bearing zone at the Site ranges between 22 and 44 feet bgs, with individual wells showing seasonal fluctuations of groundwater levels of approximately 4.6 to 8.0 feet (Table 1). A deeper, regional, water-bearing unit used for drinking water occurs at depths of between 215 and 245 feet bgs at Well #2 and Well #18. The regional aquifer depth to water was observed at 80 feet bgs (Table 1), which indicates this is confined and the potentiometric surface is higher than the top of the aquifer.

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The shallow, perched water-bearing zone and the regional aquifer are separated by a thick aquitard comprised of clay and cemented silty sand. This aquitard was encountered in all borings at thicknesses ranging from 15 to more than 23 feet thick (Aspect, 2013). The regional aquifer is greater than 150 feet below the top of the aquitard and the base of the shallow, perched water-bearing zone.

The shallow, perched water-bearing zone occurs within a sand to gravel unit, which is perched on top of the underlying clayey to gravelly, cemented silt to sand unit that comprises the aquitard (SLR, 2011). During periods of seasonal recharge, groundwater appears to collect above the silt and overlying silty sand units. In areas where the silty sands and silts are present at higher elevations, the groundwater elevations are higher. Groundwater within the shallow, perched, water-bearing unit (wells MW-3 through MW-5) is hydraulically continuous with the deeper perched water intercepted by wells MW-1 and MW-2. The horizontal hydraulic conductivity of the sand to gravel unit is expected to be significantly (i.e., orders of magnitude) greater than the vertical hydraulic conductivity of the underlying silt and silty sand (Aspect, 2013). Therefore, groundwater accumulating in the shallow, perched water-bearing zone is expected to primarily flow laterally, toward the intermittent stream in the gulley to the west.

The points of compliance for the shallow, perched groundwater at the Site were set for the protection of drinking water and the protection of surface water. Therefore, the points of compliance are within the perched aquifer extending vertically to the lowest depth potentially affected (the regional aquifer) and the discharge of groundwater to the intermittent stream.

3 Groundwater Monitoring Procedures

Year 2 of annual groundwater monitoring occurred in November 2021. Detailed sampling and quality assurance/quality control procedures are presented in the GMP (Aspect, 2015). In addition to the work outlined in the GMP, Year 2 monitoring included the addition of monitoring groundwater at MW-18T and Well #18, in accordance with discussions with Ecology in December 2020. Upon completion of Well #18, a GMP addendum will be prepared to document the revised annual monitoring procedures.

The following presents a summary of procedures performed during Year 2 of groundwater monitoring. Deviations from the GMP are discussed below.

3.1 Groundwater Monitoring Well Network

The long-term groundwater monitoring network at the Site consists of the existing monitoring wells on the Site (MW-1, MW-2, MW-3, MW-4, MW-5, and MW-18T), the water supply well (Well #2), and the intermittent stream. Monitoring wells MW-1, MW-2, and MW-4 represent the source area wells because of their locations relative to the release of gasoline from the 1,000-gallon UST (Figure 2). Monitoring wells MW-5 and MW-18T represent the upgradient wells, as they are outside of the plume boundary. Water supply Wells #2 and #18, and the intermittent stream at the southern, most-accessible on-property point serve as monitoring points to ensure that human and ecological receptors are protected.

3.2 Contaminants of Concern and Cleanup Levels

As described in the FFS, the groundwater cleanup levels for the Site are the MTCA Method A cleanup levels for unrestricted land use. MTCA Method A cleanup levels are appropriate because the Site meets the criteria of WAC 173-340-704(1): there are few hazardous substances at the Site; the implemented remedy qualifies as a routine cleanup action; and numerical standards are established for the hazardous substances at the Site. The groundwater COCs and applicable MTCA Method A cleanup levels are:

- GRO – 800 micrograms per liter ($\mu\text{g/L}$)
- Benzene – 5 $\mu\text{g/L}$
- Toluene – 1,000 $\mu\text{g/L}$
- Ethylbenzene – 700 $\mu\text{g/L}$
- Total xylenes – 1,000 $\mu\text{g/L}$

3.3 Groundwater Monitoring Procedures

The following procedures were implemented during the collection of groundwater samples for each quarter:

- Prior to sampling, all monitoring wells were inspected to ensure that the well monuments, well caps, and well casings were in good working order and remained undamaged between sampling events.

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- Depth-to-groundwater measurements were recorded for each monitoring well. The water level indicator was decontaminated between wells. Prior to gauging the depth to water at Well #2, the water level indicator was also decontaminated using diluted chlorine bleach to prevent bacteriological and cross-contamination in the water supply well and deeper aquifer.
- With the exception of Well #2, each monitoring well was sampled using standard low-flow procedures. Wells were sampled using a portable bladder pump, which was decontaminated between wells, and a new bladder and tubing used at each monitoring well.
- During purging, field parameters (temperature, pH, specific electrical conductance, dissolved oxygen, and oxidation-reduction potential) were monitored using a YSI meter and flow-through cell. Turbidity was also monitored using a separate turbidimeter.
- Colorimetric test kits were used to measure ferrous iron (Fe^{2+}) and soluble manganese (Mn^{2+}).
- To sample Well #2, the sample port closest to the wellhead was opened, and the pump was allowed to run for a minimum of 10 minutes to purge the well and flush the lines prior to collecting the sample.
- Groundwater samples were collected directly into laboratory-supplied sample containers.
- Quality control groundwater samples (field duplicates and trip blanks) were collected during each monitoring event.
- The intermittent stream was monitored during the annual sampling event and was dry during the sampling event.
- No groundwater sample could be collected from Well #18 due to ongoing well construction.
- Samples were maintained at the proper temperature for sample preservation and under chain-of-custody until delivered to the laboratory.
- Samples were submitted for analysis of site COCs (Section 2.2). Additionally, groundwater samples were analyzed for geochemical parameters, which will be used during the 5-Year Site review to assess MNA.

The only deviation from the GMP and the agreed upon sampling protocol with Ecology was the lack of a sample from Well #18. During the monitoring event, a pump was being installed in the well, and sample collection was impossible.

4 Groundwater Monitoring Results

This section presents the results of Year 2 groundwater monitoring at the Site.

4.1 Groundwater Elevations, Gradient, and Flow Direction

Groundwater elevations are summarized in Table 1 and depicted on Figure 4. During the second year of groundwater monitoring, groundwater elevations at the Site showed seasonal variation consistent with historical data. Compared with Year 1, the groundwater elevation in the shallow, perched water-bearing zone at individual wells fluctuated between 1.1 and 4.7 feet. Similarly, groundwater elevations in the deeper, regional aquifer (measured at Well #2) used for water supply showed a seasonal fluctuation of 3.3 feet. Groundwater elevations in the shallow, perched aquifer at the most upgradient (MW-18T) and downgradient (MW-2) monitoring wells differed by approximately 18.6 feet.

In the shallow, perched water-bearing zone, the flow direction is primarily to the west, with slight southerly flow in the northern portion of the Site and slight northerly flow in the southern portion of the Site. This gradient and direction is consistent with the quarterly monitoring results collected in Year 1 of groundwater monitoring (Figure 3). Groundwater elevations and contours from Year 2 of groundwater monitoring are presented on Figure 4.

The groundwater flow direction was consistent with previous monitoring events. The horizontal hydraulic gradient varied slightly from previous monitoring events. In the central portion of the Site, horizontal gradient was approximately 0.13 foot/foot as measured on November 4, 2021. Horizontal hydraulic gradients measured during previous events varied between approximately 0.06 (February 2020) and 0.11 (May 2020) foot/foot in quarterly monitoring performed during Year 1.

4.2 Groundwater and Surface Water Analytical Results

Groundwater analytical results from Year 2 are summarized in Table 2 and displayed on Figure 5. The laboratory analytical reports for Year 2 are included as Appendix A.

Groundwater analytical results were consistent with Year 1 groundwater monitoring and historical results (Table 3). GRO and benzene were present at concentrations exceeding the MTCA Method A cleanup levels at monitoring wells MW-1 and MW-2:

- Concentrations of GRO at MW-1 and MW-2 were 3,700 and 2,700 µg/L, respectively; the MTCA Method A Cleanup Level for GRO is 800 µg/L.
- Concentrations of benzene at MW-1 and MW-2 were 130 and 220 µg/L, respectively; the MTCA Method A Cleanup Level for benzene is 5 µg/L.
- Toluene, ethylbenzene, and total xylenes were also detected at MW-1 and MW-2, but at concentrations below the respective MTCA Method A cleanup levels.

At the remaining four monitoring wells (MW-3, MW-4, MW-5, and MW-18T) and the water supply (Well #2), GRO and BTEX were not detected during each of the four

sampling events above the laboratory reporting limit. Similarly, GRO and BTEX were not detected in the sample collected from the intermittent stream (Table 2).

The intermittent stream was not flowing during the annual monitoring event and therefore was not sampled.

MNA parameters were collected from each well during the Year 2 sampling event. The MNA parameters included total alkalinity, nitrate and nitrite as nitrogen, sulfate, methane, ferrous iron, and soluble manganese. The geochemical data will be evaluated during the 5-Year Site Review to assess the progress of MNA.

4.3 Plume Stability Assessment

A linear regression analysis and non-parametric analysis for plume stability was performed using the Ecology data analysis tools (Ecology, 2007). Although insufficient historical data exists to perform all of the analyses available, a preliminary analysis using the Mann-Kendall test was performed. The preliminary analysis indicates that the groundwater plume is shrinking for MW-2; whereas the analysis indicates benzene is stable at MW-1 and GRO plume may be expanding (Appendix B). The results for MW-1 are a change from last year and should be continued to be monitored. Further analyses will be conducted in following years, as the data set grows to support more detailed linear regression and non-parametric analysis.

4.4 Data Validation and Management

The groundwater data was managed in a project database operated by Aspect and has been uploaded to Ecology's Environmental Information Management (EIM) database. The Aspect database manager verified the completeness and correctness of all laboratory deliverables (i.e., laboratory report and EDDs) before loading the data into EIM. Field and laboratory quality control were validated in accordance with the United States Environmental Protection Agency (EPA) National Functional Guidelines for organic and inorganic analyses (EPA, 2008 and 2010, respectively), and laboratory defined QC limits, with regard to the following (as appropriate to the particular analysis): sample documentation/custody, holding times, reporting limits, blank/rinsate samples, and surrogate percent recoveries, laboratory duplicates, field duplicates, comparability, and completeness.

For each sampling event, blind field duplicates were submitted to the laboratory. EPA data validation guidance provides no specific evaluation criteria for field duplicate samples. Advisory evaluation criteria are set forth at 35 percent for relative percent difference (if both results are greater than 5 times the RL) and two times the RLs for concentration difference (if either of the result is less than 5 times the RL) between the original and field duplicate results. Results between the field duplicates and samples varied between 7.7 percent and 21.6 percent, indicating the results were valid and reproducible.

Trip blanks were submitted for each quarter to monitor possible cross-contamination occurring during sample transport. No detections of GRO or BTEX were noted in the trip blanks from each quarter.

5 Summary

Groundwater elevations, flow directions, and horizontal hydraulic gradients were consistent with historical results. The flow direction (to the west) and the steep hydraulic gradient are driven by local geology: the clayey and gravelly silt bed, which creates the perched groundwater condition, dips steeply to the west towards the gully and intermittent stream. However, the interconnectedness of the shallow, perched groundwater to surface water is not apparent, as the stream only flows intermittently, and COCs have never been detected in surface water at the Site.

Analytical results from Year 2 groundwater sampling were consistent with historical results. GRO and benzene concentrations exceeded the Site cleanup levels at MW-1 and MW-2, and COCs were not detected at any of the remaining monitoring wells, or in water supply Well #2. Consistent with the Year 1 sampling results, the stream was dry during this season.

Based on the results of groundwater monitoring at the OWSI Site, the groundwater plume is largely stable and/or shrinking, and there are no complete exposure pathways of contaminated groundwater to either surface water or drinking water. However, the GRO plume at MW-1 should be monitored in future years for its stability. Continued MNA of the groundwater plume is recommended at the frequency prescribed in the GMP.

Laboratory reports from the annual sampling event at Well #2 were submitted to the Washington State Office of Drinking Water within 5 days of receipt, as prescribed by the GMP. Analytical results were evaluated for quality control in accordance with the GMP, and all analytical results were validated and loaded into Ecology's EIM database.

For Years 3 through 5 of MNA, groundwater sampling will be performed on an annual basis, and a GWMR will be generated following receipt of laboratory analytical data. The next annual monitoring event should be performed in 2022.

6 References

- Aspect Consulting, LLC (Aspect), 2013, Focused Feasibility Study, Olympic Water & Sewer, Inc. Site, dated September 24, 2013.
- Aspect Consulting, LLC (Aspect), 2015, Groundwater Monitoring Plan, Olympic Water & Sewer, Inc. Site, dated July 20, 2015.
- Robinson Noble, Inc. (Robinson Noble), 2020, Notification of Proposed Drilling Operation, dated December 11, 2020.
- Robinson Noble, Inc. (Robinson Noble), 2021, Drilling and testing results for monitoring Well MW-18T; radius of control-variance for Olympic Water and Sewer, Inc. Production Well 2R (Well 18), dated January 25, 2021.
- SLR, 2011, Additional Investigation Report, Olympic Water & Sewer, Inc. Property, 781 Walker Way, Port Ludlow, Washington, August 2, 2011.
- United States Environmental Protection Agency (EPA), 2008, Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, Office of Superfund Remediation and Technical Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-08-01.
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- Washington State Department of Ecology (Ecology), 2007, Natural Attenuation Analysis Tool Package for Petroleum-Contaminated Groundwater, July 2005, updated for Excel version 2007.
- Washington State Department of Ecology (Ecology), 2014, Letter Re: Opinion on Proposed Cleanup of the following Site: Olympic Water & Sewer Inc. 781 Walker Way, Port Ludlow, WA 98365, Cleanup Site ID 1196, Facility/Site No. 62223345, VCP Project No. SW1311, Prepared for Tom Ringo OPG/Pope Resources, LP, February 11, 2014.

7 Limitations

Work for this project was performed for the Olympic Property Group and Pope Resources, LP (Clients), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

Please refer to Appendix C titled “Report Limitations and Guidelines for Use” for additional information governing the use of this report.

TABLES

Table 1. Summary of Groundwater Elevation Data

Project No. 130046, Port Ludlow, Washington

Well Number	Top of Casing Elevation ^a (feet)	Date Measured	Depth to Groundwater ^b (feet)	Groundwater Elevation (feet)
MW-1	294.02	06/14/10	41.33	252.69
		10/20/10	40.30	253.72
		04/08/11	36.98	257.04
		07/11/19	37.89	256.13
		11/08/19	40.14	253.88
		02/11/20	39.42	254.60
		05/28/20	36.75	257.27
MW-2	293.79	11/04/21	37.80	256.22
		06/14/10	39.63	254.16
		10/20/10	40.71	253.08
		04/08/11	36.90	256.89
		07/11/19	43.58	250.21
		11/08/19	41.95	251.84
		02/11/20	43.20	250.59
MW-3	289.37	05/28/20	39.78	254.01
		11/04/21	41.70	252.09
		06/14/10	25.19	264.18
		10/20/10	28.70	260.67
		04/08/11	23.02	266.35
		07/11/19	27.68	261.69
		11/08/19	31.06	258.31
MW-4	295.33	02/11/20	29.96	259.41
		05/28/20	26.35	263.02
		11/04/21	31.05	258.32
		06/14/10	23.92	271.41
		10/20/10	26.67	268.66
		04/08/11	21.95	273.38
		07/11/19	27.75	267.58
MW-5	299.40	11/08/19	29.06	266.27
		02/11/20	28.03	267.30
		05/28/20	25.43	269.90
		11/04/21	28.23	267.10
		04/08/11	23.55	275.85
		07/11/19	29.04	270.36
MW-18T	300.74	11/08/19	30.36	269.04
Well #2	Not Surveyed	02/11/20	27.59	271.81
		05/28/20	25.73	273.67
		11/04/21	29.75	269.65
		07/11/19	29.04	270.36
Well #2	Not Surveyed	11/08/19	30.36	269.04
		02/11/20	27.59	271.81
		05/28/20	25.73	273.67
		11/04/21	29.75	269.65
Well #2	Not Surveyed	07/11/19	87.10	--
		11/08/19	83.78	--
		02/11/20	86.29	--
		05/28/20	84.82	--

Notes:

^aTop of casing elevations were surveyed relative to NAVD88 datum.

^bDepth to groundwater measured in feet below top of PVC casing.

Table 2. Year 2 Groundwater Analytical Results

Project No. 130046, Port Ludlow, Washington

Location				MW-1	MW-2	MW-3	MW-4	MW-5	W-2	MW-18T
Date				11/04/2021	11/04/2021	11/04/2021	11/04/2021	11/04/2021	11/04/2021	11/04/2021
Sample				MW-1-110421	MW-2-110421	MW-3-110421	MW-4-110421	MW-5-110421	W-2-110421	MW-18T-110421
Analyte	Fraction	Unit	MTCA Method A Cleanup Level							
TPHs										
Gasoline Range Organics	T	ug/L	800 1000	3700	2700	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
BTEX										
Benzene	T	ug/L	5	130	220	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Toluene	T	ug/L	1000	60	46	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Ethylbenzene	T	ug/L	700	320	180	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Total Xylenes	T	ug/L	1000	50	37	< 3 U	< 3 U	< 3 U	< 3 U	< 3 U
Conventionals										
Alkalinity, Total	T	mg/L		282	339	211	127	126	53.2	--
Nitrate as Nitrogen	T	mg/L		< 0.500 UJ	< 0.500 UJ	1.68	0.580	0.630	< 0.500 UJ	--
Nitrite as Nitrogen	T	mg/L		< 0.500 UJ	< 0.500 UJ	< 0.500 UJ	< 0.500 UJ	< 0.500 UJ	< 0.500 UJ	--
Sulfate	T	mg/L		< 0.600 U	13.2	16.1	7.59	6.71	16.0	--
Dissolved Gases										
Methane	T	mg/L		0.0739	0.0153	< 0.00675 U	< 0.00675 U	< 0.00675 U	0.00836	--
Field Parameters										
Temperature	N	deg C		12	11.2	12.3	12.5	11.1	11.9	11.3
Specific Conductance	N	uS/cm		284.3	342.5	234.1	149.6	179.2	106.6	232.2
Dissolved Oxygen	N	mg/L		0.39	1.29	4.07	5.18	4.56	2.26	4.09
pH	N	pH units		6.88	7.24	7.04	7.68	6.52	7.15	6.81
Oxidation Reduction Potential	N	mV		62.7	49	61.3	97.6	100	85.4	69.7
Turbidity	N	NTU		23.1	48.1	25	38.6	93.7	9.03	56.6
Iron, Ferrous, Fe+2	N	ppm		< 0	< 0	< 0	< 0	0.5	< 0	< 0
Manganese, Mn+2	N	ppm		< 0	< 0	< 0	< 0	< 0	< 0	< 0

Notes:

Bold - detected

Blue Shaded - Detected result exceeded screening level

U - Analyte not detected at or above Reporting Limit (RL) shown

J - Result value estimated

UJ - Analyte not detected and the Reporting Limit (RL) is an estimate

D - Dissolved Fraction (filtered) sample result

T - Total Fraction (unfiltered) sample result

Gasoline Range Hydrocarbons are screened against a tighter value when benzene is present in the sample.

"--" - indicates results not available

Table 3. Summary of Historical Groundwater Analytical Results

Project No. 130046, Port Ludlow, Washington

Location					MW-1							
Date					06/11/2010	10/20/2010	04/07/2011	07/11/2019	11/08/2019	02/11/2020	05/28/2020	11/04/2021
Sample					MW1-0610	MW1-1010	MW1-411	MW-1-071119	MW-1-110819	MW-1-021120	MW-1-052820	MW-1-110421
Analyte	CAS_RN	Fraction	Unit	MTCA Method A Cleanup Level								
TPHs												
Gasoline Range Organics	TPH-GRO	T	ug/L	800 1000	990	1900	3000	4000	3600	3900	4300	3700
BTEX												
Benzene	71-43-2	T	ug/L	5	110	520	530	180	180	200	190	130
Toluene	108-88-3	T	ug/L	1000	45	140	82	61	58	72	100	60
Ethylbenzene	100-41-4	T	ug/L	700	1.1	110	160	360	340	420	410	320
Total Xylenes	1330-20-7	T	ug/L	1000	--	--	120	68	< 30 U	< 30 U	120	50
Conventionals												
Alkalinity, Total	ALKT	T	mg/L		--	--	--	312	--	292	--	282
Nitrate as Nitrogen	14797-55-8	T	mg/L		--	--	--	< 0.5 U	--	< 0.100 U	--	< 0.500 UJ
Nitrite as Nitrogen	14797-65-0	T	mg/L		--	--	--	< 0.5 U	--	< 0.100 U	--	< 0.500 UJ
Sulfate	14808-79-8	T	mg/L		--	--	--	0.868	--	0.963	--	< 0.600 U
Dissolved Gases												
Methane	74-82-8	T	mg/L		--	--	--	0.057	--	0.0367	--	0.0739
Field Parameters												
Manganese, soluble, Mn+2	15438-31-0	N	mg/L		--	--	--	--	--	< 0.3	< 0	< 0
Iron, Ferrous, Fe+2	15438-31-0	N	mg/L		--	--	--	--	--	0.5	0.5	< 0
Metals												
Iron	7439-89-6	D	ug/L		--	--	--	590	--	--	--	--
Lead	7439-92-1	T	ug/L	15	< 1 U	--	--	--	--	--	--	--
Manganese	7439-96-5	D	ug/L		--	--	--	805	--	--	--	--
PAHs												
Naphthalene	91-20-3	T	ug/L	160	< 1 U	15	--	--	--	--	--	--
VOCs												
1,2-Dibromoethane (EDB)	106-93-4	T	ug/L	0.01	< 0.01 U	--	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	107-06-2	T	ug/L	5	< 1 U	--	--	--	--	--	--	--
m,p-Xylenes	179601-23-1	T	ug/L		56	71	--	--	--	--	--	--
Methyl tert-butyl ether (MTBE)	1634-04-4	T	ug/L	20	< 1 U	--	--	--	--	--	--	--
o-Xylene	95-47-6	T	ug/L		130	150	--	--	--	--	--	--

Notes:

- Bold** - detected
- Blue Shaded - Detected result exceeded screening level
- U - Analyte not detected at or above Reporting Limit (RL) shown
- J - Result value estimated
- UJ - Analyte not detected and the Reporting Limit (RL) is an estimate
- D - Dissolved Fraction (filtered) sample result
- T - Total Fraction (unfiltered) sample result
- Gasoline Range Hydrocarbons are screened against a tighter value when benzene is present in the sample.
- - indicates results not available

Table 3. Summary of Historical Groundwater Analytical Results

Project No. 130046, Port Ludlow, Washington

Location					MW-2							
Date					06/11/2010	10/20/2010	04/07/2011	07/11/2019	11/08/2019	02/11/2020	05/28/2020	11/04/2021
Sample					MW2-0610	MW2-1010	MW2-411	MW-2-071119	MW-2-110819	MW-2-021120	MW-2-052820	MW-2-110421
Analyte	CAS_RN	Fraction	Unit	MTCA Method A Cleanup Level								
TPHs												
Gasoline Range Organics	TPH-GRO	T	ug/L	800 1000	8400	3900	5600	6400	5400	5000	2800	2700
BTEX												
Benzene	71-43-2	T	ug/L	5	2100	1300	500	780	820	840	150	220
Toluene	108-88-3	T	ug/L	1000	620	290	730	120	83	79	58	46
Ethylbenzene	100-41-4	T	ug/L	700	960	430	160	380	260	240	240	180
Total Xylenes	1330-20-7	T	ug/L	1000	--	--	410	91	69	64	< 60 U	37
Conventionals												
Alkalinity, Total	ALKT	T	mg/L		--	--	--	422	--	380	--	339
Nitrate as Nitrogen	14797-55-8	T	mg/L		--	--	--	< 0.5 U	--	< 0.100 U	--	< 0.500 UJ
Nitrite as Nitrogen	14797-65-0	T	mg/L		--	--	--	< 0.5 U	--	< 0.100 U	--	< 0.500 UJ
Sulfate	14808-79-8	T	mg/L		--	--	--	13.1	--	14.6	--	13.2
Dissolved Gases												
Methane	74-82-8	T	mg/L		--	--	--	0.0284	--	0.0158	--	0.0153
Field Parameters												
Manganese, soluble, Mn+2	15438-31-0	N	mg/L		--	--	--	--	--	< 0.3	< 0	< 0
Iron, Ferrous, Fe+2	15438-31-0	N	mg/L		--	--	--	--	--	0.5	< 0	< 0
Metals												
Iron	7439-89-6	D	ug/L		--	--	--	453	--	--	--	--
Lead	7439-92-1	T	ug/L	15	< 1 U	--	--	--	--	--	--	--
Manganese	7439-96-5	D	ug/L		--	--	--	491	--	--	--	--
PAHs												
Naphthalene	91-20-3	T	ug/L	160	100	35	--	--	--	--	--	--
VOCs												
1,2-Dibromoethane (EDB)	106-93-4	T	ug/L	0.01	< 0.01 U	--	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	107-06-2	T	ug/L	5	< 1 U	--	--	--	--	--	--	--
m,p-Xylenes	179601-23-1	T	ug/L		400	240	--	--	--	--	--	--
Methyl tert-butyl ether (MTBE)	1634-04-4	T	ug/L	20	< 1 U	--	--	--	--	--	--	--
o-Xylene	95-47-6	T	ug/L		250	290	--	--	--	--	--	--

Notes:

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- UJ - Analyte not detected and the Reporting Limit (RL) is an estimate
- D - Dissolved Fraction (filtered) sample result
- T - Total Fraction (unfiltered) sample result
- Gasoline Range Hydrocarbons are screened against a tighter value when benzene is present in the sample.
- "--" - indicates results not available

Table 3. Summary of Historical Groundwater Analytical Results

Project No. 130046, Port Ludlow, Washington

Location					MW-3							
Date					06/11/2010	10/20/2010	04/07/2011	07/11/2019	11/08/2019	02/11/2020	05/28/2020	11/04/2021
Sample					MW3-0610	MW3-1010	MW3-411	MW-3-071119	MW-3-110819	MW-3-021120	MW-3-052820	MW-3-110421
Analyte	CAS_RN	Fraction	Unit	MTCA Method A Cleanup Level								
TPHs												
Gasoline Range Organics	TPH-GRO	T	ug/L	800 1000	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
BTEX												
Benzene	71-43-2	T	ug/L	5	0.36	< 0.35 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Toluene	108-88-3	T	ug/L	1000	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Ethylbenzene	100-41-4	T	ug/L	700	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Total Xylenes	1330-20-7	T	ug/L	1000	--	--	< 3 U	< 3 U	< 3 U	< 3 U	< 3 U	< 3 U
Conventionals												
Alkalinity, Total	ALKT	T	mg/L		--	--	--	202	--	205	--	211
Nitrate as Nitrogen	14797-55-8	T	mg/L		--	--	--	2.14	--	2.22	--	1.68
Nitrite as Nitrogen	14797-65-0	T	mg/L		--	--	--	< 0.2 U	--	< 0.200 U	--	< 0.500 UJ
Sulfate	14808-79-8	T	mg/L		--	--	--	17.4	--	15.3	--	16.1
Dissolved Gases												
Methane	74-82-8	T	mg/L		--	--	--	< 0.00863 U	--	< 0.00863 U	--	< 0.00675 U
Field Parameters												
Manganese, soluble, Mn+2	15438-31-0	N	mg/L		--	--	--	--	--	< 0	< 0	< 0
Iron, Ferrous, Fe+2	15438-31-0	N	mg/L		--	--	--	--	--	< 0	< 0	< 0
Metals												
Iron	7439-89-6	D	ug/L		--	--	--	128	--	--	--	--
Lead	7439-92-1	T	ug/L	15	< 1 U	--	--	--	--	--	--	--
Manganese	7439-96-5	D	ug/L		--	--	--	< 1 U	--	--	--	--
PAHs												
Naphthalene	91-20-3	T	ug/L	160	< 1 U	< 1 U	--	--	--	--	--	--
VOCs												
1,2-Dibromoethane (EDB)	106-93-4	T	ug/L	0.01	< 0.01 U	--	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	107-06-2	T	ug/L	5	< 1 U	--	--	--	--	--	--	--
m,p-Xylenes	179601-23-1	T	ug/L		< 2 U	< 2 U	--	--	--	--	--	--
Methyl tert-butyl ether (MTBE)	1634-04-4	T	ug/L	20	< 1 U	--	--	--	--	--	--	--
o-Xylene	95-47-6	T	ug/L		< 1 U	< 1 U	--	--	--	--	--	--

Notes:

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- U - Analyte not detected at or above Reporting Limit (RL) shown
- J - Result value estimated
- UJ - Analyte not detected and the Reporting Limit (RL) is an estimate
- D - Dissolved Fraction (filtered) sample result
- T - Total Fraction (unfiltered) sample result
- Gasoline Range Hydrocarbons are screened against a tighter value when benzene is present in the sample.
- "--" - indicates results not available

Table 3. Summary of Historical Groundwater Analytical Results

Project No. 130046, Port Ludlow, Washington

Location					MW-4							
Date					06/11/2010	10/20/2010	04/08/2011	07/11/2019	11/08/2019	02/11/2020	05/28/2020	11/04/2021
Sample					MW4-0610	MW4-1010	MW4-411	MW-4-071119	MW-4-110819	MW-4-021120	MW-4-052820	MW-4-110421
Analyte	CAS_RN	Fraction	Unit	MTCA Method A Cleanup Level								
TPHs												
Gasoline Range Organics	TPH-GRO	T	ug/L	800 1000	< 100 U	< 100 U	380	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
BTEX												
Benzene	71-43-2	T	ug/L	5	< 0.35 U	< 0.35 U	5.3	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Toluene	108-88-3	T	ug/L	1000	< 1 U	< 1 U	75	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Ethylbenzene	100-41-4	T	ug/L	700	< 1 U	< 1 U	13	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Total Xylenes	1330-20-7	T	ug/L	1000	--	--	47	< 3 U	< 3 U	< 3 U	< 3 U	< 3 U
Conventionals												
Alkalinity, Total	ALKT	T	mg/L		--	--	--	140	--	239	--	127
Nitrate as Nitrogen	14797-55-8	T	mg/L		--	--	--	0.551	--	0.604	--	0.580
Nitrite as Nitrogen	14797-65-0	T	mg/L		--	--	--	< 0.1 U	--	< 0.100 U	--	< 0.500 UJ
Sulfate	14808-79-8	T	mg/L		--	--	--	8.76	--	8.17	--	7.59
Dissolved Gases												
Methane	74-82-8	T	mg/L		--	--	--	< 0.00863 U	--	< 0.00863 U	--	< 0.00675 U
Field Parameters												
Manganese, soluble, Mn+2	15438-31-0	N	mg/L		--	--	--	--	--	< 0	< 0	< 0
Iron, Ferrous, Fe+2	15438-31-0	N	mg/L		--	--	--	--	--	< 0.5	< 0	< 0
Metals												
Iron	7439-89-6	D	ug/L		--	--	--	65.5	--	--	--	--
Lead	7439-92-1	T	ug/L	15	< 1 U	--	--	--	--	--	--	--
Manganese	7439-96-5	D	ug/L		--	--	--	< 1 U	--	--	--	--
PAHs												
Naphthalene	91-20-3	T	ug/L	160	< 1 U	< 1 U	--	--	--	--	--	--
VOCs												
1,2-Dibromoethane (EDB)	106-93-4	T	ug/L	0.01	< 0.01 U	--	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	107-06-2	T	ug/L	5	< 1 U	--	--	--	--	--	--	--
m,p-Xylenes	179601-23-1	T	ug/L		< 2 U	< 2 U	--	--	--	--	--	--
Methyl tert-butyl ether (MTBE)	1634-04-4	T	ug/L	20	< 1 U	--	--	--	--	--	--	--
o-Xylene	95-47-6	T	ug/L		< 1 U	< 1 U	--	--	--	--	--	--

Notes:

- Bold** - detected
- Blue Shaded - Detected result exceeded screening level
- U - Analyte not detected at or above Reporting Limit (RL) shown
- J - Result value estimated
- UJ - Analyte not detected and the Reporting Limit (RL) is an estimate
- D - Dissolved Fraction (filtered) sample result
- T - Total Fraction (unfiltered) sample result
- Gasoline Range Hydrocarbons are screened against a tighter value when benzene is present in the sample.
- "--" - indicates results not available

Table 3. Summary of Historical Groundwater Analytical Results

Project No. 130046, Port Ludlow, Washington

Location					MW-5						MW-18T
Date					04/08/2011	07/11/2019	11/08/2019	02/11/2020	05/28/2020	11/04/2021	11/04/2021
Sample					MW5-411	MW-5-071119	MW-5-110819	MW-5-021120	MW-5-052820	MW-5-110421	MW-18T-110421
Analyte	CAS_RN	Fraction	Unit	MTCA Method A Cleanup Level							
TPHs											
Gasoline Range Organics	TPH-GRO	T	ug/L	800 1000	220	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U
BTEX											
Benzene	71-43-2	T	ug/L	5	3.4	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Toluene	108-88-3	T	ug/L	1000	43	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Ethylbenzene	100-41-4	T	ug/L	700	7.8	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Total Xylenes	1330-20-7	T	ug/L	1000	25	< 3 U	< 3 U	< 3 U	< 3 U	< 3 U	< 3 U
Conventionals											
Alkalinity, Total	ALKT	T	mg/L		--	136	--	146	--	126	--
Nitrate as Nitrogen	14797-55-8	T	mg/L		--	0.561	--	0.628	--	0.630	--
Nitrite as Nitrogen	14797-65-0	T	mg/L		--	< 0.1 U	--	< 0.200 U	--	< 0.500 UJ	--
Sulfate	14808-79-8	T	mg/L		--	6.66	--	4.61	--	6.71	--
Dissolved Gases											
Methane	74-82-8	T	mg/L		--	< 0.00863 U	--	< 0.00863 U	--	< 0.00675 U	--
Field Parameters											
Manganese, soluble, Mn+2	15438-31-0	N	mg/L		--	--	--	< 0	< 0	< 0	< 0
Iron, Ferrous, Fe+2	15438-31-0	N	mg/L		--	--	--	< 0	< 0	0.5	< 0
Metals											
Iron	7439-89-6	D	ug/L		--	81.3	--	--	--	--	--
Lead	7439-92-1	T	ug/L	15	--	--	--	--	--	--	--
Manganese	7439-96-5	D	ug/L		--	< 1 U	--	--	--	--	--
PAHs											
Naphthalene	91-20-3	T	ug/L	160	--	--	--	--	--	--	--
VOCs											
1,2-Dibromoethane (EDB)	106-93-4	T	ug/L	0.01	--	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	107-06-2	T	ug/L	5	--	--	--	--	--	--	--
m,p-Xylenes	179601-23-1	T	ug/L		--	--	--	--	--	--	--
Methyl tert-butyl ether (MTBE)	1634-04-4	T	ug/L	20	--	--	--	--	--	--	--
o-Xylene	95-47-6	T	ug/L		--	--	--	--	--	--	--

Notes:

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- U - Analyte not detected at or above Reporting Limit (RL) shown
- J - Result value estimated
- UJ - Analyte not detected and the Reporting Limit (RL) is an estimate
- D - Dissolved Fraction (filtered) sample result
- T - Total Fraction (unfiltered) sample result
- Gasoline Range Hydrocarbons are screened against a tighter value when benzene is present in the sample.
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Table 3. Summary of Historical Groundwater Analytical Results

Project No. 130046, Port Ludlow, Washington

Location					W-2					SVE-1	SVE-2	Stream
Date					07/11/2019	11/08/2019	02/11/2020	05/28/2020	11/04/2021	04/07/2011	04/07/2011	2/11/2020
Sample					W-2-071119-P	W-2-110819	W-2-021120	W-2-052820	W-2-110421	SVE1-411	SVE2-411	SW-1-021120
Analyte	CAS_RN	Fraction	Unit	MTCA Method A Cleanup Level								
TPHs												
Gasoline Range Organics	TPH-GRO	T	ug/L	800 1000	< 100 U	< 100 U	< 100 U	< 100 U	< 100 U	34000	2000	< 100 U
BTEX												
Benzene	71-43-2	T	ug/L	5	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	550	5	< 1 U
Toluene	108-88-3	T	ug/L	1000	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	5700	14	< 1 U
Ethylbenzene	100-41-4	T	ug/L	700	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	850	18	< 1 U
Total Xylenes	1330-20-7	T	ug/L	1000	< 3 U	< 3 U	< 3 U	< 3 U	< 3 U	3300	35	< 3 U
Conventionals												
Alkalinity, Total	ALKT	T	mg/L		68.2	--	102	--	53.2	--	--	--
Nitrate as Nitrogen	14797-55-8	T	mg/L		< 0.1 U	--	< 0.100 U	--	< 0.500 UJ	--	--	--
Nitrite as Nitrogen	14797-65-0	T	mg/L		< 0.1 U	--	< 0.100 U	--	< 0.500 UJ	--	--	--
Sulfate	14808-79-8	T	mg/L		43.2	--	47.4	--	16.0	--	--	--
Dissolved Gases												
Methane	74-82-8	T	mg/L		0.0178	--	0.0574	--	0.00836	--	--	--
Field Parameters												
Manganese, soluble, Mn+2	15438-31-0	N	mg/L		--	--	< 0.2	< 0	< 0	--	--	< 0
Iron, Ferrous, Fe+2	15438-31-0	N	mg/L		--	--	1.0	0.5	< 0	--	--	< 0
Metals												
Iron	7439-89-6	D	ug/L		1150	--	--	--	--	--	--	--
Lead	7439-92-1	T	ug/L	15	--	--	--	--	--	--	--	--
Manganese	7439-96-5	D	ug/L		275	--	--	--	--	--	--	--
PAHs												
Naphthalene	91-20-3	T	ug/L	160	--	--	--	--	--	--	--	--
VOCs												
1,2-Dibromoethane (EDB)	106-93-4	T	ug/L	0.01	--	--	--	--	--	--	--	--
1,2-Dichloroethane (EDC)	107-06-2	T	ug/L	5	--	--	--	--	--	--	--	--
m,p-Xylenes	179601-23-1	T	ug/L		--	--	--	--	--	--	--	--
Methyl tert-butyl ether (MTBE)	1634-04-4	T	ug/L	20	--	--	--	--	--	--	--	--
o-Xylene	95-47-6	T	ug/L		--	--	--	--	--	--	--	--

Notes:

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- T - Total Fraction (unfiltered) sample result
- Gasoline Range Hydrocarbons are screened against a tighter value when benzene is present in the sample.
- "--" - indicates results not available

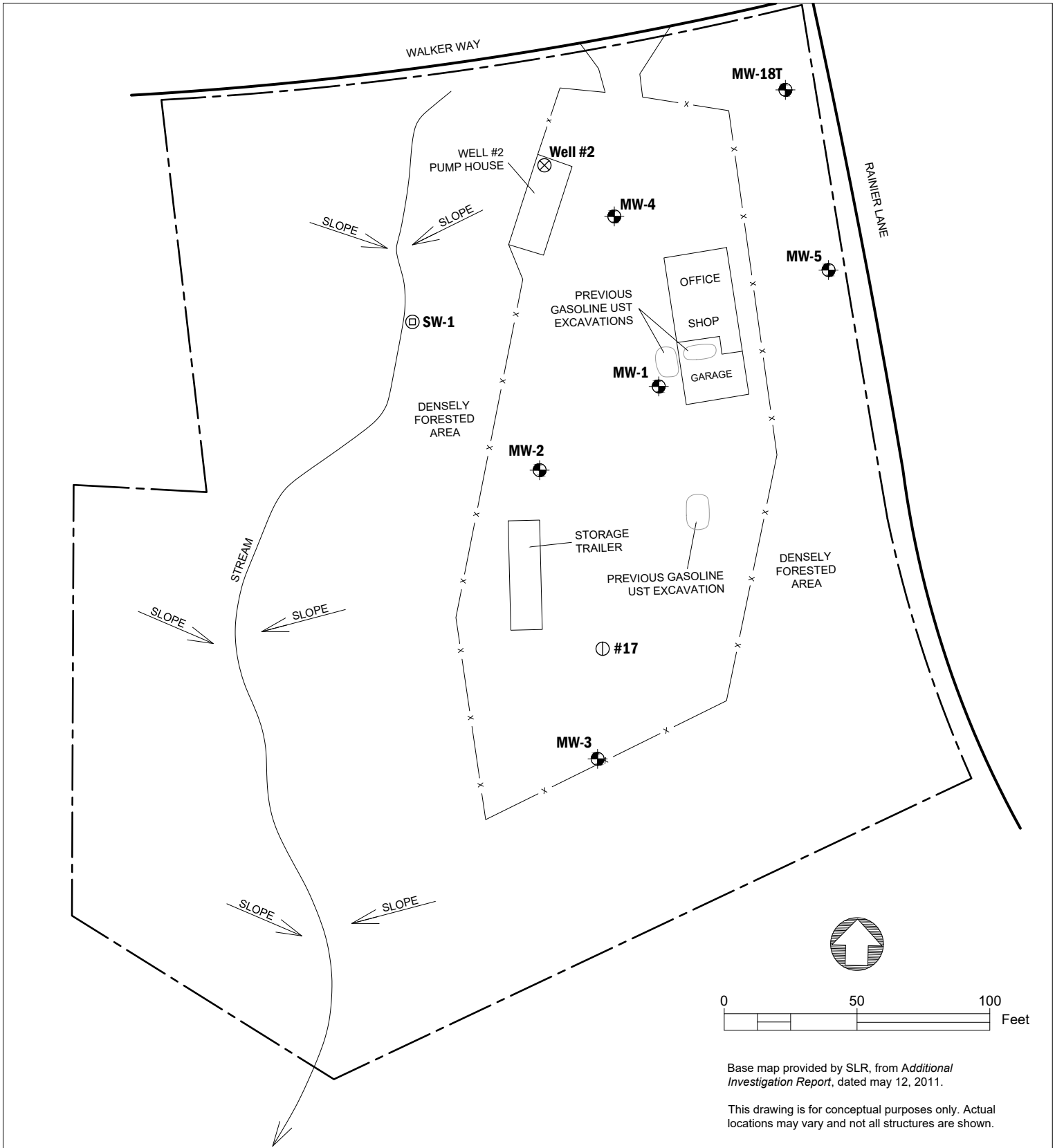
FIGURES



Site Location Map
 Year 2 Annual Groundwater Monitoring Report
 Olympic Water & Sewer, Inc.
 Port Ludlow, Washington

	DEC-2021	BY: DWU / SCC	FIGURE NO. 1
	PROJECT NO. 130046	REVISED BY: ---	

GIS Path: Q:\Olympic Property Group\130046 Port Ludlow\2021-12 GW Monitor\Report - 2021 GIS\01 Site Location Map.mxd | Coordinate System: NAD 1983 StatePlane Washington North FIPS 4801 Feet | Date Saved: 12/13/2021 | User: scudd | Print Date: 12/13/2021



Base map provided by SLR, from *Additional Investigation Report*, dated may 12, 2011.

This drawing is for conceptual purposes only. Actual locations may vary and not all structures are shown.

Legend

- Monitoring Well Location
- Stream Sample Location
- Existing Water Supply Well Location
- Existing Casing Location

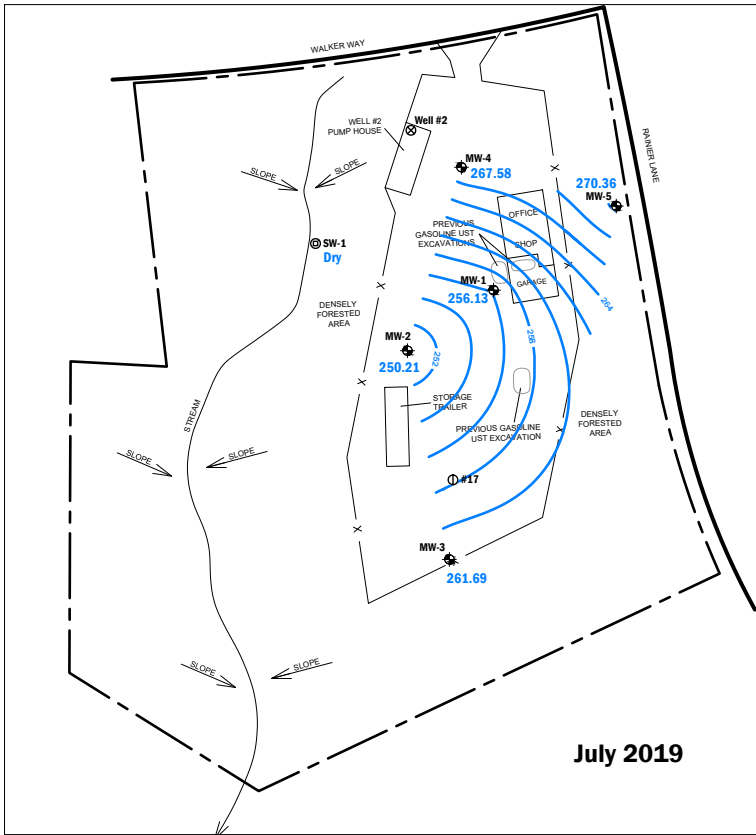
Site Plan
 Year 2 Annual Groundwater Monitoring Report
 Olympic Water & Sewer, Inc.
 Port Ludlow, Washington



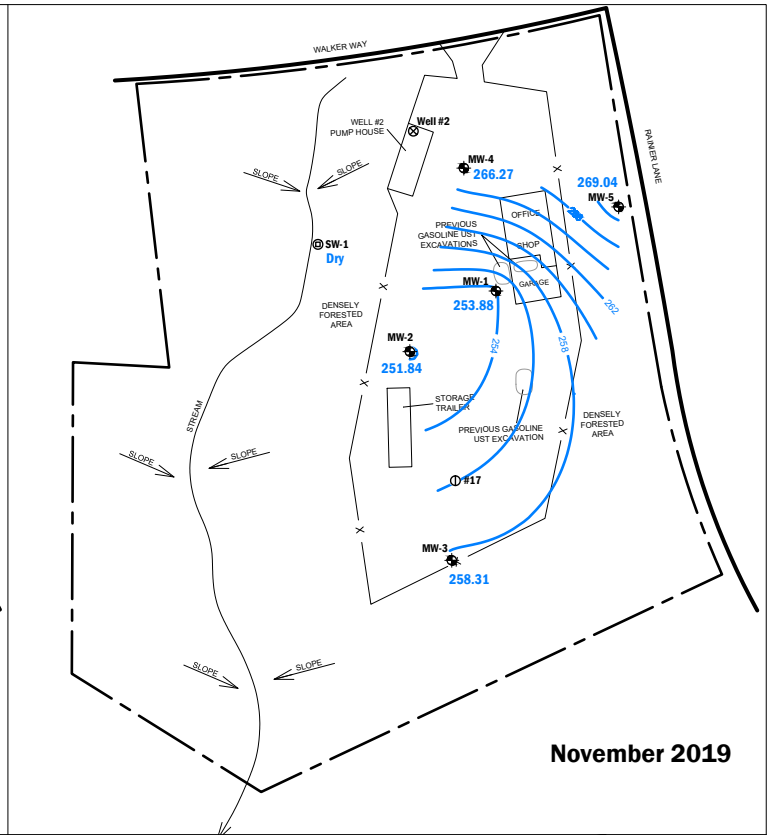
Dec-2021
 PROJECT NO.
 130046

BY:
 DWU/SCC
 REVISED BY:
 -

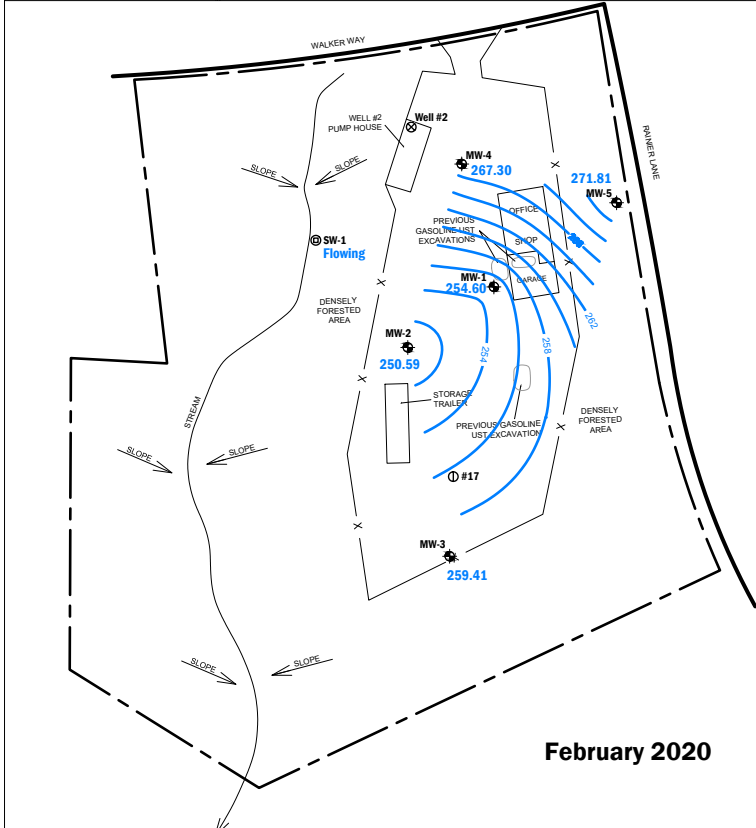
FIGURE NO.
2



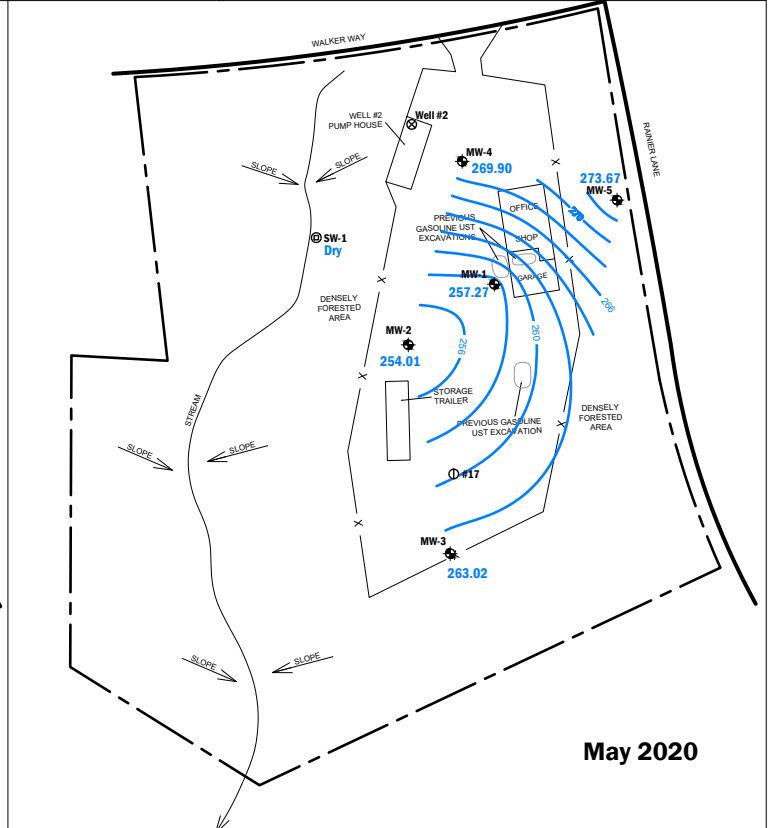
July 2019



November 2019



February 2020



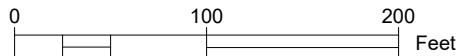
May 2020

Legend

- Monitoring Well Location
- Stream Sample Location
- Existing Water Supply Well Location
- Existing Casing Location
- Groundwater Elevation Contour Line (Feet)

Base map provided by SLR, from *Additional Investigation Report*, dated may 12, 2011.

This drawing is for conceptual purposes only. Actual locations may vary and not all structures are shown.



Year 1 Groundwater Elevation and Contours

Year 2 Annual Groundwater Monitoring Report
Olympic Water & Sewer, Inc.
Port Ludlow, Washington

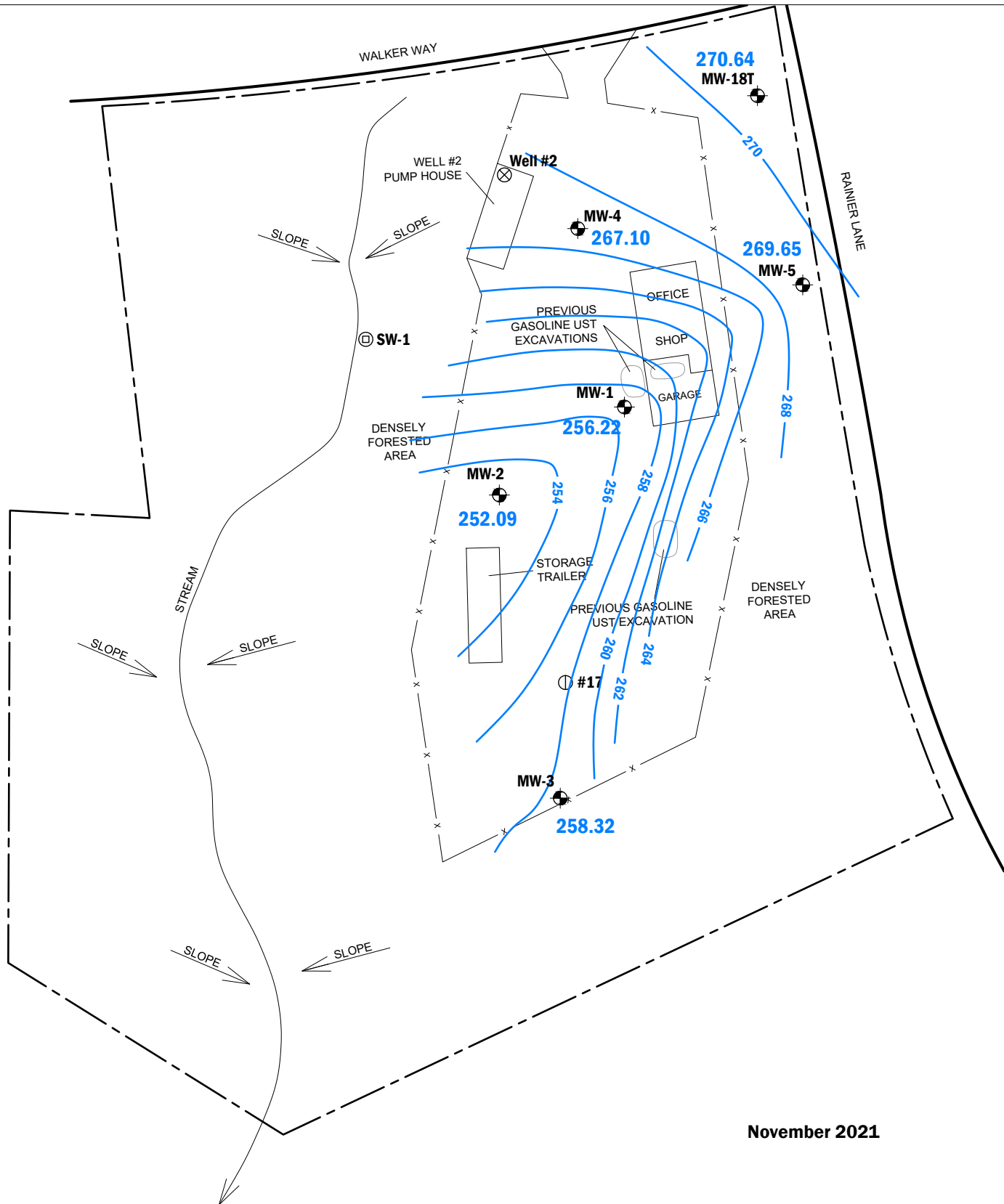


Dec-2021
PROJECT NO.
130046

BY:
DWJ/SCC
REVISED BY:
SCC

FIGURE NO.

3



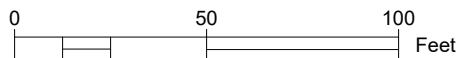
November 2021

Legend

- Monitoring Well Location
- Stream Sample Location
- Existing Water Supply Well Location
- Existing Casing Location
- Groundwater Elevation Contour Line (Feet)

Base map provided by SLR, from *Additional Investigation Report*, dated may 12, 2011.

This drawing is for conceptual purposes only. Actual locations may vary and not all structures are shown.



Year 2 Groundwater Elevation and Contours

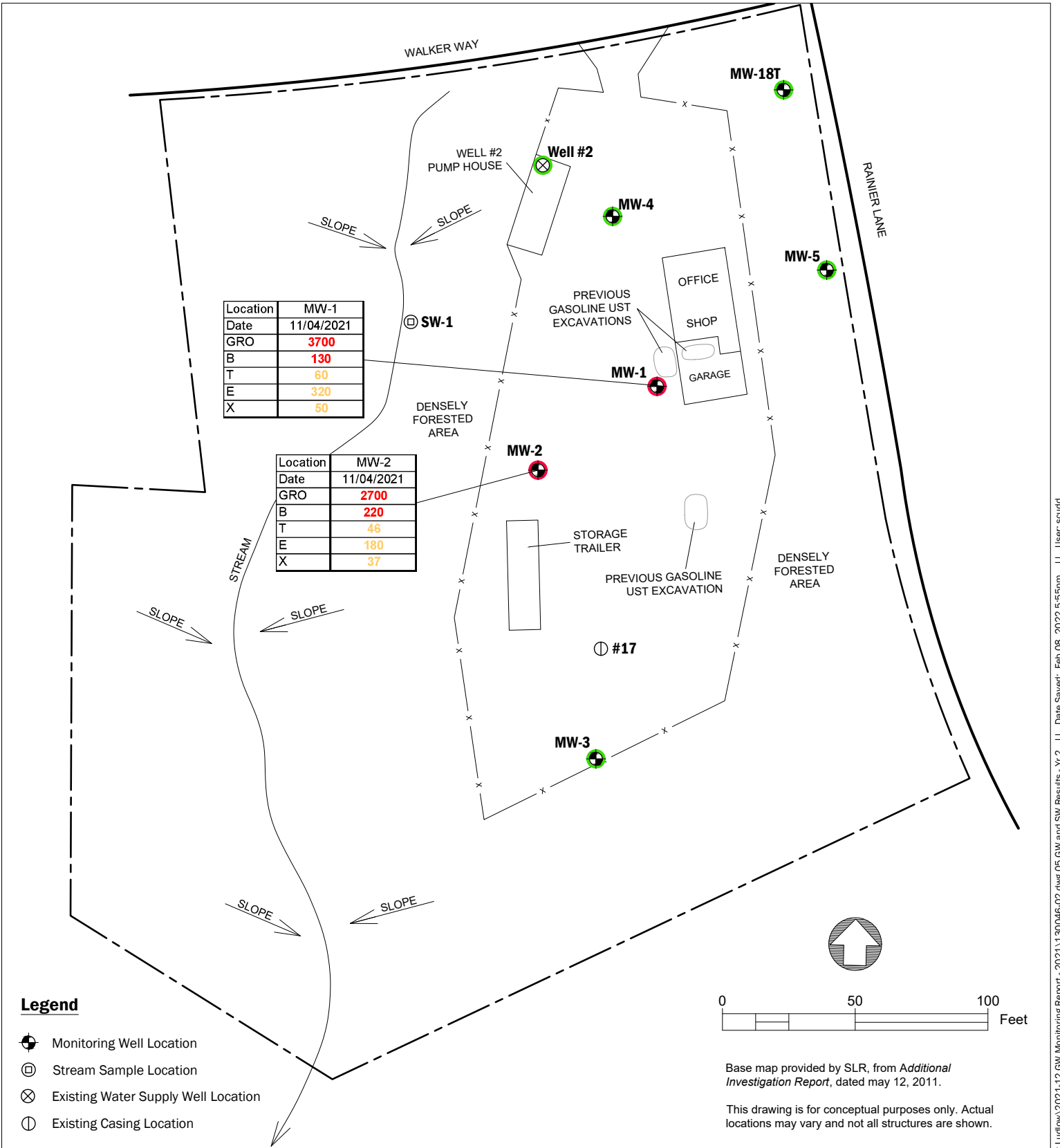
Year 2 Annual Groundwater Monitoring Report
Olympic Water & Sewer, Inc.
Port Ludlow, Washington



Dec-2021
PROJECT NO.
130046

BY:
DWU/SCC
REVISED BY:
SCC

FIGURE NO.
4



Location	MW-1
Date	11/04/2021
GRO	3700
B	130
T	60
E	320
X	50

Location	MW-2
Date	11/04/2021
GRO	2700
B	220
T	46
E	180
X	37

Legend

- Monitoring Well Location
- Stream Sample Location
- Existing Water Supply Well Location
- Existing Casing Location

Analytical Results

- One or more petroleum hydrocarbon constituents was detected at a concentration exceeding its respective MTCA Method A Cleanup Level
- One or more petroleum hydrocarbons constituents was detected at a concentration less than its respective MTCA Method A Cleanup Level
- Petroleum hydrocarbon constituents not detected

GRO - Gasoline-range Total Petroleum Hydrocarbons
 B - Benzene
 T - Toluene
 E - Ethylbenzene
 X - Total Xylenes

Note: Stream was dry during November 2021 sampling event and no sample was collected.

Groundwater and Surface Water Analytical Results

Year 2 Annual Groundwater Monitoring Report
 Olympic Water & Sewer, Inc.
 Port Ludlow, Washington



Feb-2022
 PROJECT NO.
 130046

BY:
 DWU/SCC
 REVISED BY:
 SCC

FIGURE NO.
5

APPENDIX A

Laboratory Analytical Reports

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

November 16, 2021

Kirsi Longley, Project Manager
Aspect Consulting, LLC
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Ms Longley:

Included are the results from the testing of material submitted on November 5, 2021 from the OWSI 130046, F&BI 111094 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures

c: Aspect Data, David Unruh
ASP1116R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on November 5, 2021 by Friedman & Bruya, Inc. from the Aspect Consulting, LLC OWSI 130046, F&BI 111094 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Aspect Consulting, LLC</u>
111094 -01	MW-1-110421
111094 -02	MW-2-110421
111094 -03	MW-3-110421
111094 -04	MW-4-110421
111094 -05	MW-5-110421
111094 -06	W-2-110421
111094 -07	MW-18T-110421
111094 -08	MW-X-110421
111094 -09	TB-110421

Samples MW-1-110421, MW-2-110421, MW-3-110421, MW-4-110421, MW-5-110421, and W-2-110421 were sent to Fremont Analytical for alkalinity, sulfate, nitrate, nitrite and methane analyses. The report is enclosed.

All quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/16/21
 Date Received: 11/05/21
 Project: OWSI 130046, F&BI 111094
 Date Extracted: 11/09/21
 Date Analyzed: 11/09/21

**RESULTS FROM THE ANALYSIS OF WATER SAMPLES
 FOR BENZENE, TOLUENE, ETHYLBENZENE,
 XYLENES AND TPH AS GASOLINE
 USING METHODS 8021B AND NWTPH-Gx**

Results Reported as ug/L (ppb)

<u>Sample ID</u> Laboratory ID	<u>Benzene</u>	<u>Toluene</u>	<u>Ethyl Benzene</u>	<u>Total Xylenes</u>	<u>Gasoline Range</u>	<u>Surrogate (% Recovery)</u> (Limit 52-124)
MW-1-110421 111094-01 1/10	130	60	320	50	3,700	78
MW-2-110421 111094-02 1/10	220	46	180	37	2,700	76
MW-3-110421 111094-03	<1	<1	<1	<3	<100	74
MW-4-110421 111094-04	<1	<1	<1	<3	<100	74
MW-5-110421 111094-05	<1	<1	<1	<3	<100	75
W-2-110421 111094-06	<1	<1	<1	<3	<100	75
MW-18T-110421 111094-07	<1	<1	<1	<3	<100	74
MW-X-110421 111094-08 1/20	140	67	380	<60	4,500	75
TB-110421 111094-09	<1	<1	<1	<3	<100	74
Method Blank 01-2532 MB	<1	<1	<1	<3	<100	74

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 11/16/21

Date Received: 11/05/21

Project: OWSI 130046, F&BI 111094

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER
SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE,
XYLENES, AND TPH AS GASOLINE
USING EPA METHOD 8021B AND NWTPH-Gx**

Laboratory Code: 111094-03 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	102	65-118
Toluene	ug/L (ppb)	50	104	72-122
Ethylbenzene	ug/L (ppb)	50	105	73-126
Xylenes	ug/L (ppb)	150	99	74-118
Gasoline	ug/L (ppb)	1,000	99	69-134

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

111 094

SAMPLE CHAIN OF CUSTODY

ME 11-05-21 11/11/21
 Page # 1 of 1
 WY/ATG

Report To Kirsi Longley / David Unruh
 Company Aspect Consulting
 Address 710 2nd Ave, Ste 550
 City, State, ZIP Seattle WA, 98104
 Phone 206-812-4746 Email klongley@aspectconsulting.com

SAMPLERS (signature) Dylan Branscum
PROJECT NAME OWS1
PO # 130046
REMARKS
INVOICE TO

TURNAROUND TIME
 Standard turnaround
 RUSH
 Rush charges authorized by:
SAMPLE DISPOSAL
 Archive samples
 Other
 Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED										Notes
						NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	sulfate by EPA 300.0	nitrate/nitrite by EPA 353.2	methane by RK 175	
MW-1-110421	01A-H	11/4/21	1230	W	8	X	X						X	X	X	
MW-2-110421	02		1400		1											
MW-3-110421	03		1140		1											
MW-4-110421	04		1215		1											
MW-5-110421	05		0950		1											
MW-2-110421	06		1340		1											
MW-18T-110421	07AC		1030		3											
MW-X-110421	08AC	↓	-	↓	3											
TR-110421	09AB		-	AQ	2											

Friedman & Bryga, Inc.
 3012 16th Avenue West
 Seattle, WA 98119-2029
 Ph. (206) 285-8282

SIGNATURE		PRINT NAME		COMPANY		DATE	TIME
Relinquished by:	<u>Dylan Branscum</u>	Dylan Branscum	Aspect	11/5/21	0540		
Received by:	<u>[Signature]</u>	Adigail Corven	FB1	11/5/21	0540		
Relinquished by:							
Received by:							

Samples received at 300



Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 111094
Work Order Number: 2111131

November 15, 2021

Attention Michael Erdahl:

Fremont Analytical, Inc. received 6 sample(s) on 11/5/2021 for the analyses presented in the following report.

Dissolved Gases by RSK-175
Ion Chromatography by EPA Method 300.0
Total Alkalinity by SM 2320B

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager



CLIENT: Friedman & Bruya
Project: 111094
Work Order: 2111131

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2111131-001	MW-1-110421	11/04/2021 12:30 PM	11/05/2021 9:28 AM
2111131-002	MW-2-110421	11/04/2021 2:00 PM	11/05/2021 9:28 AM
2111131-003	MW-3-110421	11/04/2021 11:40 AM	11/05/2021 9:28 AM
2111131-004	MW-4-110421	11/04/2021 12:15 PM	11/05/2021 9:28 AM
2111131-005	MW-5-110421	11/04/2021 9:50 AM	11/05/2021 9:28 AM
2111131-006	W-2-110421	11/04/2021 1:40 PM	11/05/2021 9:28 AM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

CLIENT: Friedman & Bruya
Project: 111094

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers:

- * - Flagged value is not within established control limits
- B - Analyte detected in the associated Method Blank
- D - Dilution was required
- E - Value above quantitation range
- H - Holding times for preparation or analysis exceeded
- I - Analyte with an internal standard that does not meet established acceptance criteria
- J - Analyte detected below Reporting Limit
- N - Tentatively Identified Compound (TIC)
- Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S - Spike recovery outside accepted recovery limits
- ND - Not detected at the Reporting Limit
- R - High relative percent difference observed

Acronyms:

- %Rec - Percent Recovery
- CCB - Continued Calibration Blank
- CCV - Continued Calibration Verification
- DF - Dilution Factor
- DUP - Sample Duplicate
- HEM - Hexane Extractable Material
- ICV - Initial Calibration Verification
- LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
- MCL - Maximum Contaminant Level
- MB or MBLANK - Method Blank
- MDL - Method Detection Limit
- MS/MSD - Matrix Spike / Matrix Spike Duplicate
- PDS - Post Digestion Spike
- Ref Val - Reference Value
- REP - Sample Replicate
- RL - Reporting Limit
- RPD - Relative Percent Difference
- SD - Serial Dilution
- SGT - Silica Gel Treatment
- SPK - Spike
- Surr - Surrogate



Client: Friedman & Bruya

Collection Date: 11/4/2021 12:30:00 PM

Project: 111094

Lab ID: 2111131-001

Matrix: Water

Client Sample ID: MW-1-110421

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
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Dissolved Gases by RSK-175

Batch ID: R71223 Analyst: SLL

Methane	0.0739	0.00675		mg/L	1	11/10/2021 1:53:00 PM
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Ion Chromatography by EPA Method 300.0

Batch ID: 34338 Analyst: SS

Nitrite (as N)	ND	0.100	H	mg/L	1	11/8/2021 12:35:00 PM
Nitrite (as N)	ND	0.500	D	mg/L	5	11/5/2021 10:06:00 PM
Nitrate (as N)	ND	0.100	H	mg/L	1	11/8/2021 12:35:00 PM
Nitrate (as N)	ND	0.500	D	mg/L	5	11/5/2021 10:06:00 PM
Sulfate	ND	0.600		mg/L	1	11/8/2021 12:35:00 PM

Total Alkalinity by SM 2320B

Batch ID: R71260 Analyst: CH

Alkalinity, Total (As CaCO3)	282	2.50		mg/L	1	11/15/2021 8:38:26 AM
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Client: Friedman & Bruya

Collection Date: 11/4/2021 2:00:00 PM

Project: 111094

Lab ID: 2111131-002

Matrix: Water

Client Sample ID: MW-2-110421

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
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Dissolved Gases by RSK-175

Batch ID: R71223 Analyst: SLL

Methane	0.0153	0.00675		mg/L	1	11/10/2021 1:58:00 PM
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Ion Chromatography by EPA Method 300.0

Batch ID: 34338 Analyst: SS

Nitrite (as N)	ND	0.100	H	mg/L	1	11/8/2021 12:58:00 PM
Nitrite (as N)	ND	0.500	D	mg/L	5	11/5/2021 10:29:00 PM
Nitrate (as N)	ND	0.100	H	mg/L	1	11/8/2021 12:58:00 PM
Nitrate (as N)	ND	0.500	D	mg/L	5	11/5/2021 10:29:00 PM
Sulfate	13.2	0.600		mg/L	1	11/8/2021 12:58:00 PM

Total Alkalinity by SM 2320B

Batch ID: R71260 Analyst: CH

Alkalinity, Total (As CaCO3)	339	2.50		mg/L	1	11/15/2021 8:38:26 AM
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Client: Friedman & Bruya

Collection Date: 11/4/2021 11:40:00 AM

Project: 111094

Lab ID: 2111131-003

Matrix: Water

Client Sample ID: MW-3-110421

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<u>Dissolved Gases by RSK-175</u>				Batch ID: R71223		Analyst: SLL
Methane	ND	0.00675		mg/L	1	11/10/2021 2:00:00 PM
<u>Ion Chromatography by EPA Method 300.0</u>				Batch ID: 34338		Analyst: SS
Nitrite (as N)	ND	0.100	H	mg/L	1	11/8/2021 1:21:00 PM
Nitrite (as N)	ND	0.500	D	mg/L	5	11/5/2021 10:52:00 PM
Nitrate (as N)	1.68	0.500	D	mg/L	5	11/5/2021 10:52:00 PM
Sulfate	16.1	3.00	D	mg/L	5	11/5/2021 10:52:00 PM
<u>Total Alkalinity by SM 2320B</u>				Batch ID: R71260		Analyst: CH
Alkalinity, Total (As CaCO3)	211	2.50		mg/L	1	11/15/2021 8:38:26 AM



Client: Friedman & Bruya

Collection Date: 11/4/2021 12:15:00 PM

Project: 111094

Lab ID: 2111131-004

Matrix: Water

Client Sample ID: MW-4-110421

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
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Dissolved Gases by RSK-175

Batch ID: R71223 Analyst: SLL

Methane	ND	0.00675		mg/L	1	11/10/2021 2:02:00 PM
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Ion Chromatography by EPA Method 300.0

Batch ID: 34338 Analyst: SS

Nitrite (as N)	ND	0.100	H	mg/L	1	11/8/2021 2:30:00 PM
Nitrite (as N)	ND	0.500	D	mg/L	5	11/5/2021 11:15:00 PM
Nitrate (as N)	0.580	0.500	D	mg/L	5	11/5/2021 11:15:00 PM
Sulfate	7.59	0.600		mg/L	1	11/8/2021 2:30:00 PM

Total Alkalinity by SM 2320B

Batch ID: R71260 Analyst: CH

Alkalinity, Total (As CaCO3)	127	2.50		mg/L	1	11/15/2021 8:38:26 AM
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Client: Friedman & Bruya

Collection Date: 11/4/2021 9:50:00 AM

Project: 111094

Lab ID: 2111131-005

Matrix: Water

Client Sample ID: MW-5-110421

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
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Dissolved Gases by RSK-175

Batch ID: R71223 Analyst: SLL

Methane	ND	0.00675		mg/L	1	11/10/2021 2:04:00 PM
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Ion Chromatography by EPA Method 300.0

Batch ID: 34338 Analyst: SS

Nitrite (as N)	ND	0.200	HD	mg/L	2	11/8/2021 2:53:00 PM
Nitrite (as N)	ND	0.500	D	mg/L	5	11/5/2021 11:39:00 PM
Nitrate (as N)	0.630	0.500	D	mg/L	5	11/5/2021 11:39:00 PM
Sulfate	6.71	1.20	D	mg/L	2	11/8/2021 2:53:00 PM

Total Alkalinity by SM 2320B

Batch ID: R71260 Analyst: CH

Alkalinity, Total (As CaCO3)	126	2.50		mg/L	1	11/15/2021 8:38:26 AM
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Client: Friedman & Bruya

Collection Date: 11/4/2021 1:40:00 PM

Project: 111094

Lab ID: 2111131-006

Matrix: Water

Client Sample ID: W-2-110421

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
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Dissolved Gases by RSK-175

Batch ID: R71223 Analyst: SLL

Methane	0.00836	0.00675		mg/L	1	11/10/2021 2:06:00 PM
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Ion Chromatography by EPA Method 300.0

Batch ID: 34338 Analyst: SS

Nitrite (as N)	ND	0.100	H	mg/L	1	11/8/2021 3:17:00 PM
Nitrite (as N)	ND	0.500	D	mg/L	5	11/6/2021 12:02:00 AM
Nitrate (as N)	0.124	0.100	H	mg/L	1	11/8/2021 3:17:00 PM
Nitrate (as N)	ND	0.500	D	mg/L	5	11/6/2021 12:02:00 AM
Sulfate	16.0	3.00	D	mg/L	5	11/6/2021 12:02:00 AM

Total Alkalinity by SM 2320B

Batch ID: R71260 Analyst: CH

Alkalinity, Total (As CaCO3)	53.2	2.50		mg/L	1	11/15/2021 8:38:26 AM
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Work Order: 2111131
 CLIENT: Friedman & Bruya
 Project: 111094

QC SUMMARY REPORT
Total Alkalinity by SM 2320B

Sample ID: MB-R71260	SampType: MBLK	Units: mg/L	Prep Date: 11/15/2021	RunNo: 71260							
Client ID: MBLKW	Batch ID: R71260	Analysis Date: 11/15/2021	SeqNo: 1450953								
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	ND	2.50									

Sample ID: LCS-R71260	SampType: LCS	Units: mg/L	Prep Date: 11/15/2021	RunNo: 71260							
Client ID: LCSW	Batch ID: R71260	Analysis Date: 11/15/2021	SeqNo: 1450954								
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	108	2.50	100.0	0	108	88.3	113				

Sample ID: 2111131-001BDUP	SampType: DUP	Units: mg/L	Prep Date: 11/15/2021	RunNo: 71260							
Client ID: MW-1-110421	Batch ID: R71260	Analysis Date: 11/15/2021	SeqNo: 1450956								
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	279	2.50						281.5	1.06	20	

Work Order: 2111131
 CLIENT: Friedman & Bruya
 Project: 111094

QC SUMMARY REPORT
Ion Chromatography by EPA Method 300.0

Sample ID: MB-34338	SampType: MBLK	Units: mg/L			Prep Date: 11/5/2021	RunNo: 71104					
Client ID: MBLKW	Batch ID: 34338				Analysis Date: 11/5/2021	SeqNo: 1447094					
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Nitrite (as N)	ND	0.100									
Nitrate (as N)	ND	0.100									
Sulfate	ND	0.600									

Sample ID: LCS-34338	SampType: LCS	Units: mg/L			Prep Date: 11/5/2021	RunNo: 71104					
Client ID: LCSW	Batch ID: 34338				Analysis Date: 11/5/2021	SeqNo: 1447095					
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Nitrite (as N)	0.713	0.100	0.7500	0	95.1	90	110				
Nitrate (as N)	0.729	0.100	0.7500	0	97.2	90	110				
Sulfate	3.76	0.600	3.750	0	100	90	110				

Sample ID: 2111119-003ADUP	SampType: DUP	Units: mg/L			Prep Date: 11/5/2021	RunNo: 71104					
Client ID: BATCH	Batch ID: 34338				Analysis Date: 11/5/2021	SeqNo: 1447099					
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Nitrite (as N)	ND	0.200						0		20	D
Nitrate (as N)	ND	0.200						0		20	D
Sulfate	19.2	1.20						19.17	0.427	20	D

Sample ID: 2111119-003AMS	SampType: MS	Units: mg/L			Prep Date: 11/5/2021	RunNo: 71104					
Client ID: BATCH	Batch ID: 34338				Analysis Date: 11/5/2021	SeqNo: 1447100					
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Nitrite (as N)	1.30	0.200	1.500	0	86.4	80	120				D
Nitrate (as N)	1.41	0.200	1.500	0.1360	84.9	80	120				D
Sulfate	27.4	1.20	7.500	19.17	110	80	120				D

Work Order: 2111131
 CLIENT: Friedman & Bruya
 Project: 111094

QC SUMMARY REPORT
 Ion Chromatography by EPA Method 300.0

Sample ID: 2111119-003AMSD	SampType: MSD	Units: mg/L				Prep Date: 11/5/2021	RunNo: 71104				
Client ID: BATCH	Batch ID: 34338					Analysis Date: 11/5/2021	SeqNo: 1447101				
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Nitrite (as N)	1.29	0.200	1.500	0	86.0	80	120	1.296	0.464	20	D
Nitrate (as N)	1.41	0.200	1.500	0.1360	85.1	80	120	1.410	0.142	20	D
Sulfate	27.5	1.20	7.500	19.17	112	80	120	27.44	0.393	20	D

Sample ID: 2111144-001ADUP	SampType: DUP	Units: mg/L				Prep Date: 11/5/2021	RunNo: 71104				
Client ID: BATCH	Batch ID: 34338					Analysis Date: 11/6/2021	SeqNo: 1447120				
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Nitrite (as N)	ND	0.100						0		20	
Nitrate (as N)	ND	0.100						0		20	
Sulfate	ND	0.600						0		20	

Sample ID: 2111144-001AMS	SampType: MS	Units: mg/L				Prep Date: 11/5/2021	RunNo: 71104				
Client ID: BATCH	Batch ID: 34338					Analysis Date: 11/6/2021	SeqNo: 1447121				
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Nitrite (as N)	0.728	0.100	0.7500	0.08400	85.9	80	120				
Nitrate (as N)	0.774	0.100	0.7500	0.08700	91.6	80	120				
Sulfate	3.83	0.600	3.750	0.2840	94.5	80	120				

Work Order: 2111131
CLIENT: Friedman & Bruya
Project: 111094

QC SUMMARY REPORT
Dissolved Gases by RSK-175

Sample ID: LCS	SampType: LCS	Units: mg/L			Prep Date: 11/10/2021	RunNo: 71223					
Client ID: LCSW	Batch ID: R71223				Analysis Date: 11/10/2021	SeqNo: 1449934					
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Methane 1,050 0.00675 1,000 0 105 66.7 141

Sample ID: MB	SampType: MBLK	Units: mg/L			Prep Date: 11/10/2021	RunNo: 71223					
Client ID: MBLKW	Batch ID: R71223				Analysis Date: 11/10/2021	SeqNo: 1449935					
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Methane ND 0.00675

Sample ID: 2111131-001CREP	SampType: REP	Units: mg/L			Prep Date: 11/10/2021	RunNo: 71223					
Client ID: MW-1-110421	Batch ID: R71223				Analysis Date: 11/10/2021	SeqNo: 1449918					
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Methane 0.0750 0.00675 0.07394 1.44 30

Client Name: **FB**
 Logged by: **Clare Griggs**

Work Order Number: **2111131**
 Date Received: **11/5/2021 9:28:00 AM**

Chain of Custody

1. Is Chain of Custody complete? Yes No Not Present
 2. How was the sample delivered? Client

Log In

3. Coolers are present? Yes No NA
 4. Shipping container/cooler in good condition? Yes No
 5. Custody Seals present on shipping container/cooler?
 (Refer to comments for Custody Seals not intact) Yes No Not Present
 6. Was an attempt made to cool the samples? Yes No NA
 7. Were all items received at a temperature of >2°C to 6°C * Yes No NA
 8. Sample(s) in proper container(s)? Yes No
 9. Sufficient sample volume for indicated test(s)? Yes No
 10. Are samples properly preserved? Yes No
 11. Was preservative added to bottles? Yes No NA
 12. Is there headspace in the VOA vials? Yes No NA
 13. Did all samples containers arrive in good condition(unbroken)? Yes No
 14. Does paperwork match bottle labels? Yes No
 15. Are matrices correctly identified on Chain of Custody? Yes No
 16. Is it clear what analyses were requested? Yes No
 17. Were all holding times able to be met? Yes No

Special Handling (if applicable)

18. Was client notified of all discrepancies with this order? Yes No NA

Person Notified:	<input type="text"/>	Date:	<input type="text"/>
By Whom:	<input type="text"/>	Via:	<input type="checkbox"/> eMail <input type="checkbox"/> Phone <input type="checkbox"/> Fax <input type="checkbox"/> In Person
Regarding:	<input type="text"/>		
Client Instructions:	<input type="text"/>		

19. Additional remarks:

Item Information

Item #	Temp °C
Sample	1.8

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Page # **211131** of **1**

Send Report To Michael Erdahl
 Company Friedman and Bruya, Inc.
 Address 3012 16th Ave W
 City, State, ZIP Seattle, WA 98119
 Phone # (206) 285-8282 merdah1@friedmanandbruya.com

SUBCONTRACTER <u>Fremont</u>	
PROJECT NAME/NO. <u>111094</u>	PO # <u>B-470</u>
REMARKS <u>Please Email Results Aspect (DD)</u>	

TURNAROUND TIME <input checked="" type="checkbox"/> Standard TAT <input type="checkbox"/> RUSH	Rush charges authorized by: _____
SAMPLE DISPOSAL <input type="checkbox"/> Dispose after 30 days <input type="checkbox"/> Return samples <input type="checkbox"/> Will call with instructions	

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED							Notes
						Dioxins/Furans	EPH	VPH	Sulfate	Nitrate	Nitrite	Methane RSK-175	
MW-1-110421		11/4/21	1230	H ₂ O	5				X	X	X	X	
MW-2-110421			1400		5				X	X	X	X	
MW-3-110421			1140		5				X	X	X	X	
MW-4-110421			1215		5				X	X	X	X	
MW-5-110421			0950		5				X	X	X	X	
W-2-110421			1340		5				X	X	X	X	

Friedman & Bruya, Inc. 3012 16th Avenue West Seattle, WA 98119-2029 Ph. (206) 285-8282 Fax (206) 283-5044		SIGNATURE 		PRINT NAME Michael Erdahl		COMPANY Friedman & Bruya		DATE 11/5/21	TIME 0627
Received by: <u>Justine Mantz</u>		Received by: <u>Justine Mantz</u>		Received by: <u>Justine Mantz</u>		Received by: <u>FAT</u>			

APPENDIX B

Plume Stability Analyses

Module1: Mann-Kendall Trend Test for Plume Stability (Non-parametric Statistical Test)

Site Name: *Olympic Water & Sewer, Inc. Site*

Site Address: *781 Walker Way, Port Ludlow, WA*

Additional Description:

Well (Sampling) Location? **MW-1**

Level of Confidence (Decision Criteria)? **85%**

1. Monitoring Well Information: Contaminant Concentration at a well: Quarterly sampling recommended.

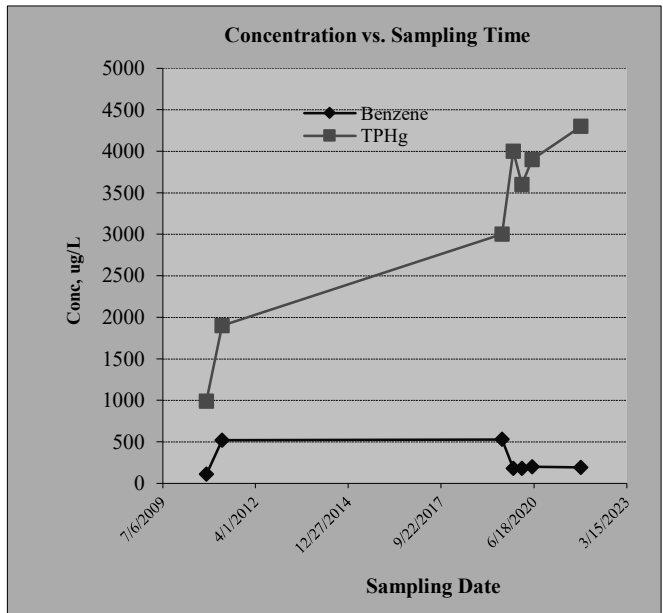
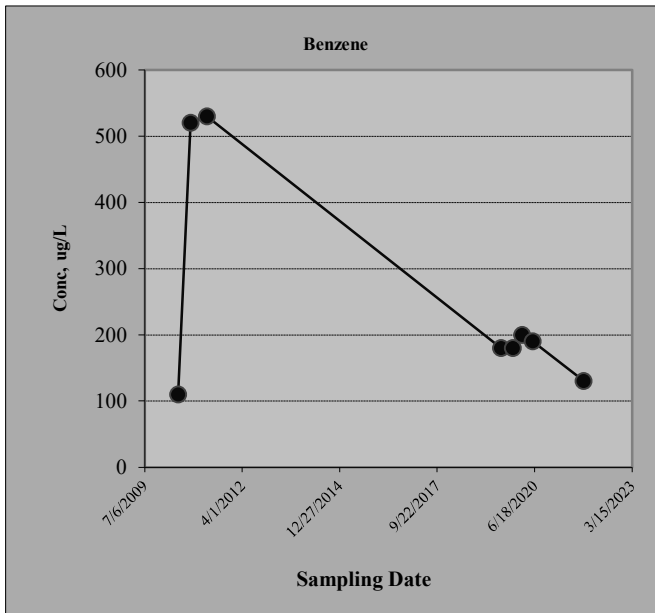
Sampling Event	Date Sampled	Hazardous Substances (unit is ug/L)			
		Benzene	TPHg		
#1	6/14/2010	110	990		
#2	10/20/2010	520	1900		
#3	4/7/2011	530	3000		
#4	7/11/2019	180	4000		
#5	11/8/2019	180	3600		
#6	2/11/2020	200	3900		
#7	5/28/2020	190	4300		
#8	11/4/2021	130	3700		
#9					
#10					
#11					
#12					
#13					
#14					
#15					
#16					

2. Mann-Kendall Non-parametric Statistical Test Results

Hazardous Substance?	Benzene	TPHg				
Confidence Level Calculated?	54.80%	98.40%	NA	NA	NA	NA
Plume Stability?	Stable	<i>Expanding</i>	NA	NA	NA	NA
Coefficient of Variation?	CV <= 1		n<4	n<4	n<4	n<4
Mann-Kendall Statistic "S" value?	-3	18	0	0	0	0
Number of Sampling Rounds?	8	8	0	0	0	0
Average Concentration?	255.00	3173.75	NA	NA	NA	NA
Standard Deviation?	169.45	1156.26	NA	NA	NA	NA
Coefficient of Variation?	0.66	0.36	NA	NA	NA	NA
Blank if No Errors found			n<4	n<4	n<4	n<4

3. Temporal Trend: Plot of Concentration vs. Sampling Time

Hazardous substance? **Benzene**
 Plume Stability? **Stable**



Module1: Mann-Kendall Trend Test for Plume Stability (Non-parametric Statistical Test)

Site Name: *Olympic Water & Sewer, Inc. Site*

Site Address: *781 Walker Way, Port Ludlow, WA*

Additional Description:

Well (Sampling) Location? **MW-2**

Level of Confidence (Decision Criteria)? **85%**

1. Monitoring Well Information: Contaminant Concentration at a well: Quarterly sampling recommended.

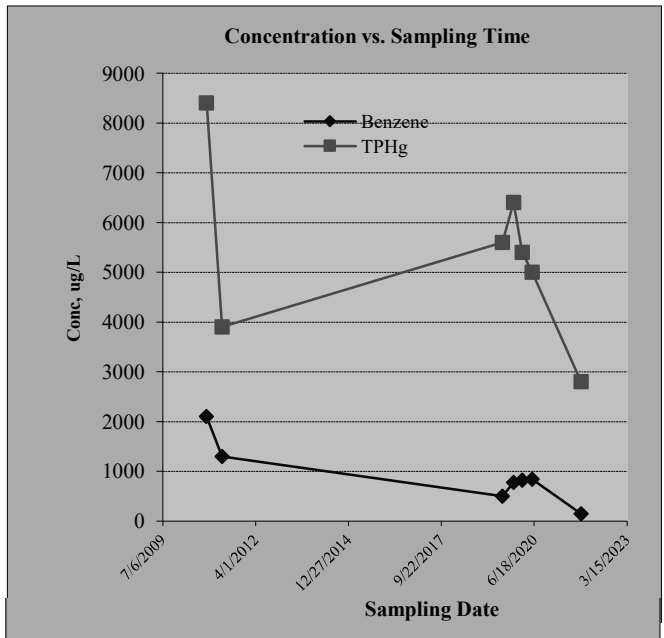
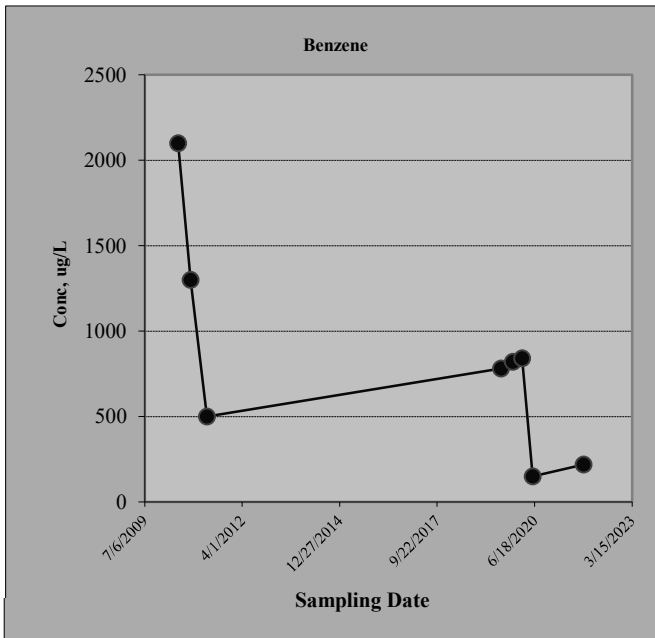
Sampling Event	Date Sampled	Hazardous Substances (unit is ug/L)			
		Benzene	TPHg		
#1	6/14/2010	2100	8400		
#2	10/20/2010	1300	3900		
#3	4/7/2011	500	5600		
#4	7/11/2019	780	6400		
#5	11/8/2019	820	5400		
#6	2/11/2020	840	5000		
#7	5/28/2020	150	2800		
#8	11/4/2021	220	2700		
#9					
#10					
#11					
#12					
#13					
#14					
#15					
#16					

2. Mann-Kendall Non-parametric Statistical Test Results

Hazardous Substance?	Benzene	TPHg				
Confidence Level Calculated?	94.60%	98.40%	NA	NA	NA	NA
Plume Stability?	Shrinking	Shrinking	NA	NA	NA	NA
Coefficient of Variation?			n<4	n<4	n<4	n<4
Mann-Kendall Statistic "S" value?	-14	-18	0	0	0	0
Number of Sampling Rounds?	8	8	0	0	0	0
Average Concentration?	838.75	5025.00	NA	NA	NA	NA
Standard Deviation?	630.11	1903.94	NA	NA	NA	NA
Coefficient of Variation?	0.75	0.38	NA	NA	NA	NA
Blank if No Errors found			n<4	n<4	n<4	n<4

3. Temporal Trend: Plot of Concentration vs. Sampling Time

Hazardous substance? **Benzene**
 Plume Stability? **Shrinking**



APPENDIX C

Report Limitations and Guidelines for Use

REPORT LIMITATIONS AND USE GUIDELINES

Reliance Conditions for Third Parties

This report was prepared for the exclusive use of the Client. No other party may rely on this report or the product of our services without the express written consent of Aspect Consulting, LLC (Aspect). This limitation is to provide our firm with reasonable protection against liability claims by third parties with whom there would otherwise be no contractual conditions or limitations and guidelines governing their use of the report. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and recognized standards of professionals in the same locality and involving similar conditions.

Services for Specific Purposes, Persons and Projects

Aspect has performed the services in general accordance with the scope and limitations of our Agreement. This report has been prepared for the exclusive use of the Client and their authorized third parties, approved in writing by Aspect. This report is not intended for use by others, and the information contained herein is not applicable to other properties.

This report is not, and should not, be construed as a warranty or guarantee regarding the presence or absence of hazardous substances or petroleum products that may affect the subject property. The report is not intended to make any representation concerning title or ownership to the subject property. If real property records were reviewed, they were reviewed for the sole purpose of determining the subject property's historical uses. All findings, conclusions, and recommendations stated in this report are based on the data and information provided to Aspect, current use of the subject property, and observations and conditions that existed on the date and time of the report.

Aspect structures its services to meet the specific needs of our clients. Because each environmental study is unique, each environmental report is unique, prepared solely for the specific client and subject property. This report should not be applied for any purpose or project except the purpose described in the Agreement.

This Report Is Project-Specific

Aspect considered a number of unique, project-specific factors when establishing the Scope of Work for this project and report. You should not rely on this report if it was:

- Not prepared for you
- Not prepared for the specific purpose identified in the Agreement
- Not prepared for the specific real property assessed
- Completed before important changes occurred concerning the subject property, project or governmental regulatory actions

If changes are made to the project or subject property after the date of this report, Aspect should be retained to assess the impact of the changes with respect to the conclusions contained in the report.

Geoscience Interpretations

The geoscience practices (geotechnical engineering, geology, and environmental science) require interpretation of spatial information that can make them less exact than other engineering and natural science disciplines. It is important to recognize this limitation in evaluating the content of the report. If you are unclear how these "Report Limitations and Use Guidelines" apply to your project or site, you should contact Aspect.

Discipline-Specific Reports Are Not Interchangeable

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually address any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding the subject property.

Environmental Regulations Are Not Static

Some hazardous substances or petroleum products may be present near the subject property in quantities or under conditions that may have led, or may lead, to contamination of the subject property, but are not included in current local, state or federal regulatory definitions of hazardous substances or petroleum products or do not otherwise present potential liability. Changes may occur in the standards for appropriate inquiry or regulatory definitions of hazardous substance and petroleum products; therefore, this report has a limited useful life.

Property Conditions Change Over Time

This report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time (for example, Phase I ESA reports are applicable for 180 days), by events such as a change in property use or occupancy, or by natural events, such as floods, earthquakes, slope failure or groundwater fluctuations. If more than six months have passed since issuance of our report, or if any of the described events may have occurred following the issuance of the report, you should contact Aspect so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.