



October 2018 Work Plan Reconnaissance Ground Water and Soil Gas Characterization

Islam El Masry Property

1021 Baseline Street
Cornelius, Oregon
UST Facility No. 5112
LUST File No. 34-06-1375

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1.0 INTRODUCTION

EVREN Northwest, Inc. (ENW) has prepared this Work Plan which describes proposed additional characterization of petroleum hydrocarbon-related impacts in the subsurface at the above-referenced property (Figures 1 and 2; subject site). The scope of work described in this Work Plan has been developed consistent with verbal communications with Oregon Department of Environmental Quality (ODEQ) and is designed to provide information required for development of a Corrective Action Plan (CAP).

2.0 BACKGROUND

The site is currently occupied with remnants of a previous gasoline service station, including abandoned underground storage tanks (USTs) and a canopy covering former fuel distribution islands. Currently, the UST system includes four abandoned USTs (one 10,000-gallon unleaded gasoline UST, one 8,000-gallon unleaded gasoline UST, one 5,000-gallon plus gasoline UST, one 4,000-gallon super gasoline) and two previously decommissioned USTs (both 3,000-gallon USTs), as well as three former fuel dispensing islands under a canopy. The property was historically owned by Fred and Iva McLain (operated by Shell Oil Company) until 1963, Valley Petroleum, Inc. until at least 1981, Tri City Fuel until 1982, Dwight Estby Enterprises unit at least 1987, Ethyl Estby until at least 1996, Dwight Estby until at least 2001, M&G Collections until at least 2015, and is currently owned by Islam El Mastry.¹

Below is a brief summary of previous environmental investigations conducted at this property:

- July 2006²: K&S Environmental, Inc. (K&S) sited four (4) soil borings at the subject site (B-1 through B-4), specifically near the 5,000-gallon UST and southwest dispenser island. Silty clay soils were described from just below the gravel subbase below existing pavement to the maximum depth explored (10 feet below ground surface [bgs]). Based on laboratory hydrocarbon identification testing (HCID), only gasoline-range organics (GRO) were suggested present in soil samples collected between eight (8) and ten (10) feet depth bgs. Further quantification of these samples indicated GRO was present in these soil samples from 107- to 659-milligrams per Kilogram (mg/Kg),

¹ Based on ownership research provided by Restorical Research.

² K&S. August 10, 2006. Site Assessment Report

- and that GRO-related volatile organic constituents [benzene, toluene, ethylbenzene and total xylenes (BTEX)] were also present. K&S subsequently reported the release of GRO to soil and recommended additional investigation.
- September 2007³: K&S advanced six (6) additional soil borings at the subject site (TW1 through TW3 and B-5 through B-7). Ground water was observed in the borings at approximately 11 feet bgs. Based on laboratory HCID testing, again only GRO was suggested present in soil samples collected at ten (1) feet depth bgs. Further quantification of these soil samples indicated GRO was not present in soil samples collected from borings B-6 and B-7 and was present in soil samples collected from TW1 through TW3 and B-5 at concentrations ranging from 664- to 3,150- mg/Kg, along with most GRO-related BTEX constituents. K&S also collected several reconnaissance ground-water samples for laboratory analysis, and as with soil, based on laboratory HCID testing only GRO was suggested present in the reconnaissance ground-water samples collected. Further quantification of these reconnaissance ground water samples indicated GRO was present in all water samples collected with concentrations ranging from 1,190- to 62,000-micrograms per Liter (µg/L). The water sample with the greatest concentration of GRO was further tested for all GRO-related volatile constituents. Based on this data, K&S concluded that ground-water impacts likely extend offsite, are greatest at the current tank locations, and attenuate quickly with increased distance from the UST area. K&S recommended installation permanent ground-water monitoring wells and additional investigation regarding the extent of impacts to ground water.
 - March 2007⁴: K&S advanced four (4) additional soil borings at the subject site (TW4 through TW7) to further characterize impacts of GRO to ground water beneath the subject site. K&S collected several reconnaissance ground-water samples for laboratory analysis, which indicated GRO was present in all water samples collected with concentrations ranging from 524- to 28,000-µg/L and diesel-range organics (DRO) ranged from 838- to 14,300-µg/L.⁵ All samples also contained BTEX constituents, with the exception of toluene in the sample collected from TW5. Based on this data, K&S concluded that ground-water impacts have been delineated to the east, and likely extend offsite towards the west. K&S recommended installation of a permanent ground-water monitoring network and proposed locations of monitoring wells.

³ K&S. October 11, 2007. Subsurface Investigation Report

⁴ K&S. April 02, 2008. Subsurface Investigation Report

⁵ Laboratory interpretation suggested the presence of DRO is related to overlap from the gasoline range.

- July 2008⁶: K&S oversaw the advancement of four (4) additional soil borings at the subject site, that were subsequently developed as ground-water monitoring wells (MW-1 through MW-4) to further characterize impacts of GRO to ground water beneath the subject site. K&S collected one soil sample from the MW-3 borehole at 10 feet depth, which contained GRO at a concentration of 1660-mg/Kg, as well as detections of ethylbenzene and total xylenes (note, benzene and toluene were both not detected in this sample). K&S further noted that no indicates of petroleum impacts were suggesting during advancement of the borehole until depth greater than six (6) feet bgs. K&S observed ground water in all borings between eight (8) and ten (10) feet bgs, and subsequently noted that ground-water stabilized in the monitoring wells between 8.5 feet and 10 feet after one hour, suggesting the water table is not under confining pressure. Initial ground-water data from the four newly installed monitoring wells indicated GRO was present in all water samples collected with concentrations ranging from 537- to 48,300-µg/L and DRO ranged from 403- to 12,700-µg/L⁷ with the highest concentration of GRO and DRO in monitoring well MW-2. All water samples were further analyzed for GRO-related VOCs, with the highest concentrations occurring in monitoring well MW-2. K&S survey the wellhead top of casings and collected depth to water data for each monitoring well, and based on this data, determined that the ground-water gradient below the subject site was 0.009 ft/ft, and flows generally to the south. Based on data collected during this investigation, K&S concluded that ground-water impacts are greatest in the UST area, and the extent of ground-water impacts appears to be localized this this area, likely in relationship to the relatively low hydraulic gradient (although other factors may be contributing this this, such as soil permeability and hydraulic conductivity). K&S further stated that the detections of DRO are due to overlap from gasoline range product and do not appear to be related to a release of diesel product at the subject site and recommended additional monitoring of the monitoring well network.
- October 2008 through December 2016 Ground Water Monitoring: From 2008 until the end of December 2016, the ground water monitoring well network was occasionally monitoring by various consulting firms^{8,9} with the results summarized in the below table (GRO concentrations and depth to water for each monitoring event). ENW further evaluated this data, by looking at both GRO trends over time, and how concentrations related to depth to ground water. With the exception of one possible

⁶ K&S. August 08, 2008. Monitoring Well installation and Subsurface Sampling Report

⁷ Again, laboratory interpretation suggested the presence of DRO is related to overlap from the gasoline range.

⁸ K&S. December 05, 2008. Quarterly Sampling for October 29, 2008.

⁹ AMEC. January 25, 2013. Ground Water Sampling and Analytical Results

data outline (12/21/2012 monitoring event conducted by Amec; specifically depth to water measured in MW-1) GRO concentrations appear to be strongly influenced by depth to water, with higher GRO concentrations corresponding to greater depth to water measurements (lower ground-water elevation, see Attachment 1), suggesting possible partitioning from ground-water to soil as depth to ground-water decrease (ground-water elevation increases).

Table 2-1. Summary of Previous Ground-Water Monitoring Events

Monitoring Well ID	Date Monitored	Monitored by	GRO Concentration (µg/L)	Depth to Water (feet BTOC)
MW-1	7/21/2008	K&S	4280	9.79
	10/29/2008	K&S	3550	10.34
	8/27/2009	K&S	84800	10.56
	12/21/2012	amec	4880	14.85
	2/11/2016	Alpha	7600	5.21
	8/24/2016	Alpha	57100	9.45
	12/21/2016	Alpha	10300	5.69
MW-2	7/21/2008	K&S	48300	9.19
	10/29/2008	K&S	50700	9.86
	8/27/2009	K&S	43000	10.05
	12/21/2012	amec	7270	3.26
	2/11/2016	Alpha	4990	4.49
	8/24/2016	Alpha	24600	9.57
	12/21/2016	Alpha	12000	5.28
MW-3	7/21/2008	K&S	4180	9.36
	10/29/2008	K&S	5430	9.99
	8/27/2009	K&S	8660	10.22
	12/21/2012	amec	ND	3.03
	2/11/2016	Alpha	1340	4.87
	8/24/2016	Alpha	5210	9.21
	12/21/2016	Alpha	1200	5.26
MW-4	7/21/2008	K&S	537	8.00
	10/29/2008	K&S	472	8.40
	8/27/2009	K&S	1280	8.85
	12/21/2012	amec	1120	2.43
	2/11/2016	Alpha	219	3.95
	8/24/2016	Alpha	177	8.59
	12/21/2016	Alpha	137	4.23
µg/L - micrograms per Liter				
BTOC - below top of casing				

3.0 PROPOSED SCOPE OF WORK

The following work is proposed to complete the assessment of GRO-related impacts at the site and evaluate new and existing data for the purpose of determining appropriate steps to bring the site to regulatory closure. Work methods and procedures are described in Sections 4.0 through 7.0.

3.1 Boring Investigation

Seven (7) borings (EB01 through EB07) are proposed in locations intended to delineate GRO and related impacts to ground water. The proposed borings are intended to provide delineation information in the assumed down-gradient direction (borings EB04 through EB07), and additional assessment data for former fuel island areas (borings EB01 and EB03). See Figures 3 and 4 for previous boring locations and proposed sampling locations.

3.2 Ground Water Monitoring

Monitoring wells MW-1 through MW-4 will be monitored as part of this investigation. See Figures 3 and 4 for previous boring locations and proposed sampling locations.

3.3 Soil Gas Assessment

Six (6) soil gas samples (SG01 through SG06) will be collected from the locations shown on Figures 3 and 4.

ODEQ has determined that *soil gas sampling* from subsurface soils is an ideal sampling method to determine if vapors have the potential to migrate to adjacent properties and to assess areas of the site not currently overlain by a building slab. Use of soil gas analyses is considered more direct in evaluating the volatilization pathways, since assumptions used in modeling phase transitions in the subsurface environment are not required to evaluate those exposure pathways. Additionally, the empirical gas data is more indicative of the processes (e.g., chemical and biological degradation) that occur in the subsurface environment.

3.4 Report Preparation

The results of the work proposed above will be described in a report, which will:

- Document investigative methods used, and present findings and conclusions of the field work and analytical data.
- Identify data gaps, if any.
- Conduct a risk assessment using all available data for the site. The methodology shall be that described in ODEQ's RBDM¹⁰ guidance document, as described in Section 6.0 of this Work Plan.
- Request regulatory closure of the facility, if supported by the data, or develop a CAP consistent with ODEQ requirements. (The CAP may be submitted as a separate document, if appropriate.)

4.0 METHODS AND PROCEDURES

This section describes the methods proposed to complete the field work described above. All work will be performed by employees and subcontractors trained and licensed to work with

¹⁰ ODEQ. 2003. *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites*. Referencing the most recent updates.

hazardous materials. Safety procedures will be strictly enforced through the use of a Health and Safety Plan. A utility clearance will be obtained for all proposed boring and test pit locations prior to work initiation. Additionally, any permits required by the City of Cornelius will be obtained before work begins, as applicable.

All sample collection activities, field measurements, observations and acquired data shall be recorded during field activities, such as: field personnel; time, date and weather conditions; sampling methodology and equipment used; characteristics such as textures, colors and odors of the media being sampled; and specifics such as sampling depths, sampling rates, water-level measurements, water quality parameters and other relevant data. All record-keeping shall be performed in appropriate field books or clipboards with appropriate forms. All field records will be kept secure at all times. **All data is confidential until released by Client.**

4.1 Equipment Calibration

Monitoring equipment used during sampling (e.g., photoionization detector [PID], specific conductance and pH meters) will be calibrated according to manufacturer's specifications at the beginning of each sample day. Meter calibration will be checked at least twice during a sample day (middle and end of day) or when meter drift is suspected. The meters will be calibrated with gases or buffered solutions closest to known field parameters (usually this is pH = 7, specific conductivity = 240 μ S and VOC concentration = 100 μ g/m³ methane or heptane for PID calibration).

4.2 Decontamination Procedures

Before collecting any sample, collection tools will be decontaminated by steam-cleaning or alternatively using a sequential wash of Alconox[®], rinsed in tap water from a known source (e.g., municipal water), and subjected to a final rinse with distilled water. Wash and rinse liquids will be changed frequently during sampling activities, as appropriate. Wash and rinsate fluids will be collected, if possible, and appropriately disposed. Fresh nitrile gloves will be worn during any sample collection and when handling tools which are to be inserted into sampling areas. Solid waste generated during sampling activities (gloves, foil, paper towels, etc.) will be appropriately disposed.

4.3 Borings

Borings will be advanced by Cascade Drilling Company, Inc. under supervision of an ENW geologist using a hydraulic direct-push probe rig. All boring equipment will be steam-cleaned prior to use. Proposed boring locations are shown on Figure 3.

Soil will be collected within five (5)-foot long cellulose acetate butyrate (CAB) sample tubes and evaluated, sampled, and analyzed according to the protocol and sampling plan described below. Boreholes will have a maximum depth of 15 feet, and screens will be set open to the uppermost water-bearing zone (previous drilling suggested that the uppermost water-bearing zone was at approximately 8 to 10 feet bgs).

After sampling is complete, all temporary borings will be sealed with hydrated Bentonite 'hole plug' to within six (6) inches of the ground surface. The borings will be finished to match the existing ground surface.

4.4 Soil Logging

Standards for uniformity in sample description are very important for correlating hydrostratigraphic units across the site. Soil samples will be described using appropriate geologic nomenclature and Unified Soil Classification System to the extent practical. Color will be described using the Munsell system. Information such as percentage of gravel, sand, and fines; particle size range, shape, and angularity; and plasticity, strength, and dilatancy will be recorded, as appropriate. In addition, the presence of odors, moisture, and interpretation of geologic unit will be documented.

The format to be recorded on boring logs is shown below:

Light brown (5YR 6/4) silty SAND (SM) – 80% fine sand, subrounded, micaceous, 15 to 20% silty fines with low plasticity; firm; wet; some organic debris; petroleum-like odor; (FILL).

4.5 Soil/Water Interface Soil Sampling

Soil samples will be collected from each boring, at the apparent soil/water interface. Soil samples will be screened in the field for the presence of volatile organic constituents (VOCs) with a PID. Samples collected for laboratory analysis will be transferred using fresh nitrile (or other appropriate composition) sampling gloves and placed in an appropriate sample container provided by the laboratory so that minimal headspace remains. Additionally, samples will be collected using sample collection method EPA 5035A (if possible, based on soil texture) for analysis of GRO and related VOCs.

The samples will be labeled as follows:

- Sample Designation, or Identification
- Location
- Date and time of collection
- Medium
- Project number
- Name of sampler(s)
- Analysis required
- Preservation (if applicable).

Samples will be immediately placed in cooled storage until they are delivered to Friedman & Bruya, Inc. (F&BI) of Seattle, Washington. The samples will be analyzed according to the Analysis Plan shown in Table 4-1, below. Sample containers, preservatives, and holding times for each analytical method are provided on Table 4-2. Chain-of-custody protocols will be followed.

4.5.1 Water Level Monitoring

Prior to purging and sampling, depth to water and well depth will be measured using a water level indicator in all four (4) monitoring wells. The depth to water and well depth will be recorded to the nearest 0.01 foot in all wells on field sample data sheets completed during ground-water sampling.

4.5.2 Ground Water Sampling – Monitoring Wells

Ground water well sampling will begin immediately following purging, or as soon as enough water is available for sampling. Ground water samples will be collected using a decontaminated peristaltic pump with dedicated Teflon tubing. To prevent degassing during sampling, the pumping rate will be adjusted below 100 milliliters per minute (mL/min). Clean Nitrile gloves will be worn when collecting each sample.

Sample data will be recorded on the FSDS, including sample number and time collected, and the observed physical characteristics of the sample (e.g., color, visual turbidity, etc.) and other data that may be important in the evaluation of sample quality. The water sample will be discharged slowly and carefully into volatile organic analysis (VOA) containers to prevent aeration; each VOA will be filled so that no headspace remains. VOA sample containers will be checked for air bubbles by turning the bottle upside down, tapping it lightly to make air bubbles move to the bottom of the sample VOA. If air bubbles are observed in any of the VOAs, the container will be re-topped off with fresh sample (refilled, once only, or a new container used).

Samples of ground water collected for lead analysis will be filtered through a 0.45- μ m filter prior to collection in a sample container with an aliquot of nitric acid.

The samples will be labeled as follows:

- Sample Designation, or Identification
- Location
- Date and time of collection
- Medium
- Project number
- Name of sampler(s)
- Analysis required
- Preservation (if applicable).

Samples will be immediately placed in cooled storage until they are delivered to Friedman & Bruya, Inc. (F&BI) of Seattle, Washington. The samples will be analyzed according to the Analysis Plan shown in Table 4-1, below. Sample containers, preservatives, and holding times for each analytical method are provided on Table 4-2. Chain-of-custody protocols will be followed. All sampling will be conducted in accordance with the appropriate provisions of the project Health and Safety Plan.

4.6 Reconnaissance Ground-Water Sampling

Reconnaissance ground-water sampling tools will consist of:

- Temporary steel or polyvinyl chloride (PVC) well point
- Clean polyethylene (PE) tubing for each sample
- Peristaltic pump with low-flow capability
- Water quality parameter monitoring equipment (temperature, conductivity, pH, oxygen-reducing potential [ORP], dissolved oxygen [DO])
- Water-Level Indicator

Seven (7) reconnaissance ground water samples will be collected from clean stainless-steel or fresh PVC temporary well-points inserted into temporary boreholes. A water-level meter will be inserted in the temporary well-point to determine static water levels to within 0.01-foot. This information will be recorded on the sample collection form for ground-water sampling.

Prior to sampling ground water, the well point will be purged using the peristaltic pump and disposable PE tubing or disposable Teflon or PE bailer. At least one (1) borehole volume of water will be removed or until the well point is purged dry. Purge volume will be calculated based on the following formula:

$$1 \text{ borehole volume (gallons)} = \pi r^2 h \times 7.48 \text{ gal/ft}^3,$$

where $\pi = 3.14$, r = radius of well casing in feet, and h = height of water column from the bottom of the well in feet.

Water quality parameters (observations / measurements regarding color, turbidity, temperature, specific conductance, pH, or other factors that may be important in evaluation of sample quality) will be recorded on the sample collection form following sample collection. As these borings are temporary and the well-points are not property developed or surveyed wells, this information is only for qualitative purposes.

The well points will be purged at a rate below the rate that was used for development and below their recovery rate to prevent further development of the well. Purge data will be recorded on the sample collection form. Purge and decontamination water will be contained in drums at the facility for proper disposal.

Ground-water sampling will begin immediately following well purging or the borehole purges dry, as soon as enough water is available in the well for sampling. Sample data will be recorded on the sample collection form, including sample number and time collected, the observed physical characteristics of the sample (e.g., color, turbidity, etc.), field parameters (pH, specific conductance, temperature, dissolved oxygen, and oxidation-reduction potential), and other data that may be important in the evaluation of sample quality. On low-yielding well points, pH, temperature, and specific conductance will be measured at the beginning and end of sampling.

Ground-water samples will be collected for all parameters using a peristaltic pump with disposable PE tubing or a disposable Teflon or PE bailer; volatile organic analysis (VOA) samples will be collected first, using a peristaltic pump with low-flow sampling. To prevent degassing during sampling, the pumping rate will be adjusted below 100 mL/min (or a bailer will be lowered gently into the water column). Clean Nitrile gloves will be worn when collecting each sample.

GRO and GRO-related Volatile Organic Constituents: The water sample will be discharged slowly and carefully into VOA containers to prevent aeration; each VOA will be completely filled so that no headspace remains. VOA sample containers will be checked for air bubbles by turning the bottle upside down, tapping it lightly to make air bubbles move to the bottom of the sample bottle. If air bubbles are observed in any of the VOA containers, the container will be re-topped off with fresh sample (refilled, once only, or a new container used).

Metals: Samples of ground water collected for lead analysis will be filtered through a 0.45- μ m filter prior to collection in a sample container with an aliquot of nitric acid.

Samples will be labeled consistent with the protocol previously provided for soil samples and immediately placed in cooled storage until they are delivered to Friedman & Bruya, Inc. (F&BI) of Seattle, Washington. The samples will be analyzed according to the Analysis Plan shown in Table 4-1, below. Sample containers, preservatives, and holding times for each analytical method are provided on Table 4-2. Chain-of-custody protocols will be followed. All sampling will be conducted in accordance with the appropriate provisions of the project Health and Safety Plan.

4.7 Soil-Gas Sample Collection

Sub-slab vapor and soil-gas samples will be collected from the locations shown on Figures 3 and 4. The sample locations will be sited to minimize disturbance to the onsite occupant and neighboring residents.

Soil gas samples will be collected by manually advancing a one (1)-inch soil-gas probe assembly (using a slide hammer impact technique) to a depth of approximately five (5) feet and then retracting it four (4) inches to allow the soil gas sampling tip to be pushed downward. A threaded connector will then be pressed firmly into 1/4-inch Teflon[®]-lined tubing, lowered down the inside of the drive tube and screwed into the top of the sampling tip. Clean Teflon-lined tubing will be tightly attach to the sampler fitting. The system will then be allowed to equilibrate 30 minutes prior to sampling.

Following equilibration, the sampling train will be attached to Teflon-lined tubing and the sampling train will tested for leaks by briefly opening the sample vessel with the system closed and recording both initial and finial vacuum pressures for five (5) minutes (shut in test). If no leaks were indicated, the system will then be purged to evacuate sampling tubing and manifold for five (5) minutes using the purge summa (sampling summa is closed) to ensure that stagnant or ambient air is removed from the sampling system and to assure samples collected

are representative of subsurface conditions. The five minutes of purge time takes into account the volume of the sampling system, tubing, and the purge rate restricted by the flow controller.

Rags saturated with isopropyl alcohol will then be placed over the soil gas head seal and over the sampling manifold (all connections) to provide secondary leak detection during sample collection to ensure sample integrity and a soil gas will be collected at a sampling rate less than 200 ml/min. Following sample collection, a PID and a landfill gas monitor (LandTec GEM 500) will be attached to the tubing to screen soil gas for VOCs, oxygen, carbon dioxide and methane.

Soil gas samples will be submitted to Environmental Analytical Services, San Luis Obispo, California under chain-of-custody protocols.

4.8 Analysis Plan

Samples collected during this investigation will be analyzed according to the plan and protocol described in the following tables.

Table 4-1. Proposed Analysis Plan

Analytical Method	Constituents	Soil	Ground Water	Soil Gas
NWTPH-Gx	Total Petroleum Hydrocarbons (TPH)—Gasoline-range quantification (GRO)	All	All	---
EPA 5032\8260B	RBDM volatile constituents: Benzene Toluene Ethylbenzene Xylenes (total) Naphthalene 1,2-dichloroethane (EDC) 1,2-dibromoethane (EDB) methyl-t-butyl ether (MTBE) 1,2,4-trimethylbenzene (1,2,4-TMB) 1,3,5-trimethylbenzene (1,3,5-TMB) Isopropylbenzene n-propylbenzene	All	All	---
Metals (EPA 6012B)	Total or Dissolved Lead	All (total)	All (dissolved)	---
EPA T0-15	GRO, RBDM VOCs 2-Propanol (as leak detection)	---	---	All

Table 4-2. Analytical Protocol

Analyte(s)	Analytical Method	Container and preservative	Holding time	Preservation
Soil:				
GRO-related VOCs	EPA Methods 8260/8021/8010/5035A	Fine-grained soil: Laboratory pre-tared polyethylene syringes	1-day until frozen, 14-days until analysis	Ice/Methanol
GRO	NWTPH-Gx/EPA 5035A	Coarse-grained soil: 4-oz Clear wide mouth glass, minimum headspace	14-days	ice
Total Lead	EPA Method 6020/200.8	4-oz Clear wide mouth glass, minimum headspace	14-days	Ice

Analyte(s)	Analytical Method	Container and preservative	Holding time	Preservation
Ground Water:				
GRO-related VOCs	EPA Method 8260	40-ml Teflon cap VOA containers, no headspace	14-days	Ice & HCl
GRO	NWTPH-Gx	40-ml Teflon cap VOA containers, no headspace	14-days	Ice & HCl
Dissolved Lead	EPA Method 6020/200.8	250 ml polyethylene bottles	30-days	Ice & HNO ₃
Indicators (data collected during temporary well-point purge)	ORP	per instrument instructions	Field	
	Dissolved Oxygen	per instrument instructions	Field	
	pH	per instrument instructions	Field	
	Temperature	per instrument instructions	Field	
	Conductivity	per instrument instructions	Field	
Sub-Slab Vapor and Soil Gas:				
GRO	TO-15	1-liter SUMMA canister	14-days	
GRO-related VOCs and IPA	TO-15 (alternate)	1-liter SUMMA canister	14-days	
Indicators (data collected during installation of probe or sub-slab purge)	Total VOCs	per instrument instructions	Field	
	Total Oxygen	per instrument instructions	Field	
	Carbon Dioxide	per instrument instructions	Field	

5.0 INVESTIGATION-DERIVED WASTE STORAGE AND DISPOSAL

Potentially impacted investigation-derived waste may be generated during this investigation. At this time, it is assumed that this waste may be impacted with petroleum-related constituents; however characterization of all waste will be necessary to properly treat or dispose of generated waste.

Soil Cuttings, Cores and Excavated Petroleum-Impacted Soil. Soil cuttings and cores derived from the drilling of soil borings will be placed in drums, sealed, and labeled as to the a) nature of the contents, b) date contents sealed, and c) responsible party. It is anticipated that the drums of soil cuttings/cores will be taken offsite to a Resource Conservation and Recovery Act (RCRA) Subtitle D Landfill facility.

Decontamination and Purge Water. Water associated with drilling, borehole purging and sampling decontamination will be drummed, sealed, and labeled.

Upon receipt of analytical data, the disposal requirements of the drummed fluid investigation-derived waste will be evaluated. It is anticipated that all waste generated will be handled as a hazardous material, and will not be characteristic of hazardous waste. However, water waste determined to be impacted with contaminants at levels regulated under RCRA rules as characteristic (hazardous waste) must be disposed or treated in a manner consistent with RCRA regulation. Waste determined to be impacts with F-Listed waste must be treated/disposed at a hazardous water treatment/disposal facility.

6.0 RISK-BASED ASSESSMENT

The assessment will be developed based on ODEQ's Underground Storage Tank program, which oversees clean-up of petroleum products from USTs and provides risk-based concentrations (RBCs) that are protective of human health under a number of exposure conditions (RBDM¹⁰). Data collected during this investigation will be used to further refine and/or confirm the conceptual model previously developed.

The equations and exposure factors used in the RBDM document are generally consistent with those discussed in "Guidance for Conduct of Deterministic Human Health Risk Assessments". The equations included in the RBDM guidance document are rearranged to calculate RBCs that are protective of human health. RBCs will be those developed in September 2009 for media and constituents.

The evaluation of risk will be composed of four distinct elements:

- Data evaluation and identification of constituents of potential concern (COPCs; if any)
- Exposure assessment (if necessary)
- Toxicity assessment (if necessary)
- Risk characterization (if necessary)

6.1 Data Evaluation and Identification of COPCs

A risk-based screening procedure will be conducted to identify COPCs for the site. Maximum concentrations of constituents detected in each medium will be compared to screening RBCs.

Screening criteria are loosely based on Oregon Administrative Rule (OAR) 340-122-080(5), which allows for pre-baseline screening of contaminants. In this screening, contaminants detected at the site that have not been screened should be designated as "constituents of interest" (COIs), while those that have been included after screening should be designated as COPCs. Following a baseline risk evaluation using RBDM RBCs, contaminants that did not meet acceptable risk levels should be designated as "constituents of concern" (COCs).

COIs will be selected based on the RBDM guidance document and screened against conservative (lowest) RBCs for each specific COI for each media to determine whether they qualify as COPCs that should be carried forward in the risk assessment.

Constituents with maximum detected concentrations below screening-level RBCs will be eliminated from further consideration. Identified COPCs, if any, will be further evaluated for potential risk.

6.2 Toxicity and Exposure Assessment

In the event that COPCs exceed the lowest RBCs, exposure pathways applicable to the site will be selected based on potential receptors identified both onsite and offsite. Existing and potential reasonable future land use, beneficial water use, and the physical setting of the site, including climate, soil characteristics, and hydrogeology, and general ground water quality (e.g., brackish) will be considered in developing the conceptual site exposure model. Future

land-use plans and zoning constraints of the site and surrounding area will be reviewed to identify reasonably likely future uses. Wells on file with the Oregon Water Resources Department and local water supplies will be used to evaluate the ground-water use in the area. Fate and transport of site-related chemicals also will be considered in the evaluation of potential exposure pathways.

Exposure parameters used in the RBDM equations will be evaluated for applicability at the site. Proposed changes will be reviewed with ODEQ, if applicable.

6.3 Risk Characterization

The analytical results from the investigations will be compared to risk-based concentrations for site-specific pathways. The results of the analysis will be used to provide recommendations on closure, additional monitoring, or limited remediation, as applicable.

7.0 REPORT PREPARATION

A report will be prepared documenting the work conducted as described in Section 3.3. During the course of this work, should results indicate a need for additional work, the ODEQ will be consulted regarding proposed actions.

8.0 PROPOSED SCHEDULE

Work on the project can begin upon receiving approval from the ODEQ Project Manager for the proposed work plan. The final report will be submitted to ODEQ within 30 days of receiving the final analytical results.

9.0 CERTIFICATION

This Work Plan has been prepared under the supervision of the following Oregon-registered Certified Engineering Geologist.

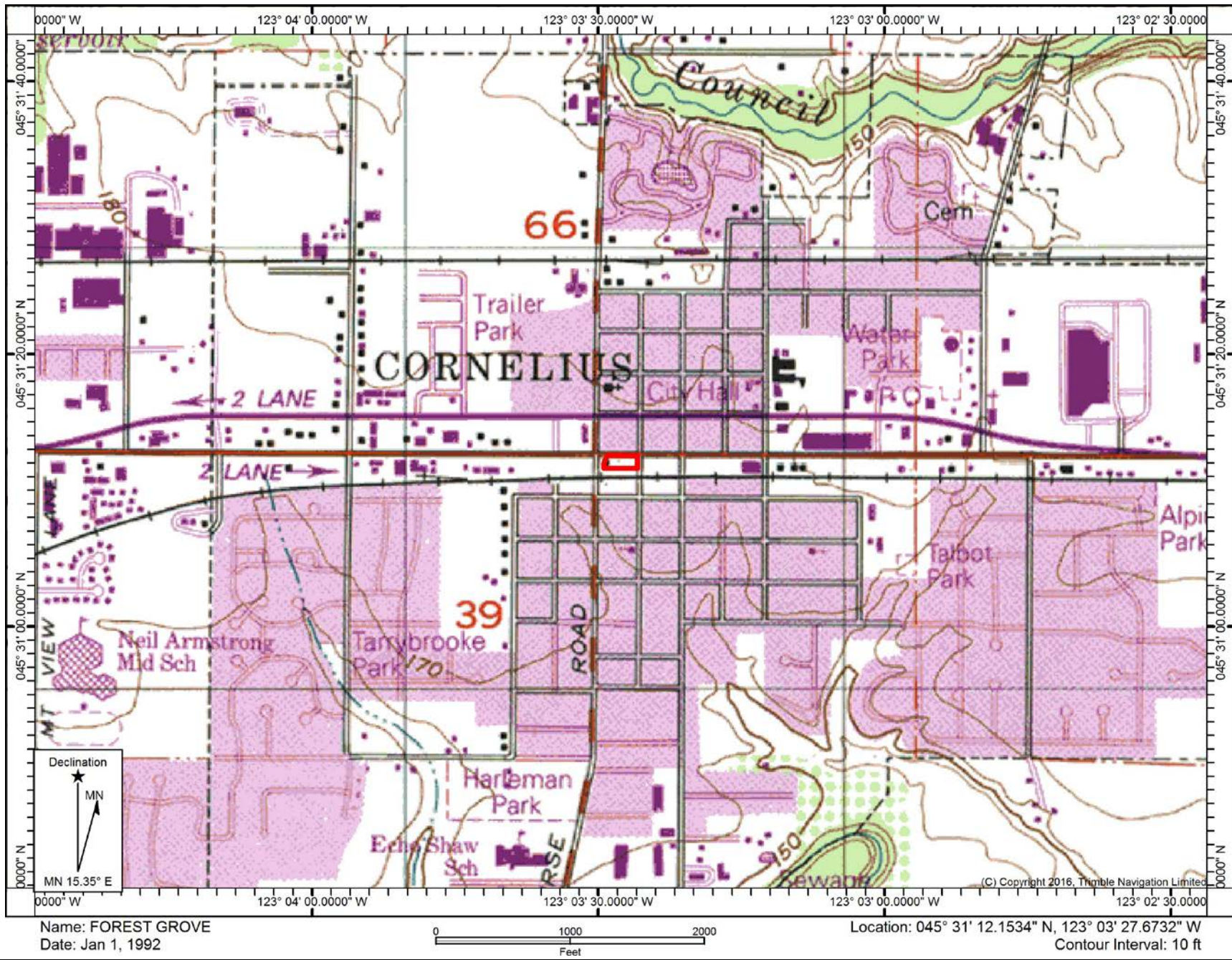
LYNN D. GREEN

Lynn D. Green, L.E.G., Principal Engineering Geologist
EVREN Northwest, Inc.



Exp. 2/1/2019

FIGURES



Date Drawn: 9/18/2018
CAD File Name: 1209-17001-fig1sv_map(v01)
Drawn By: JOB
Approved By: LDG

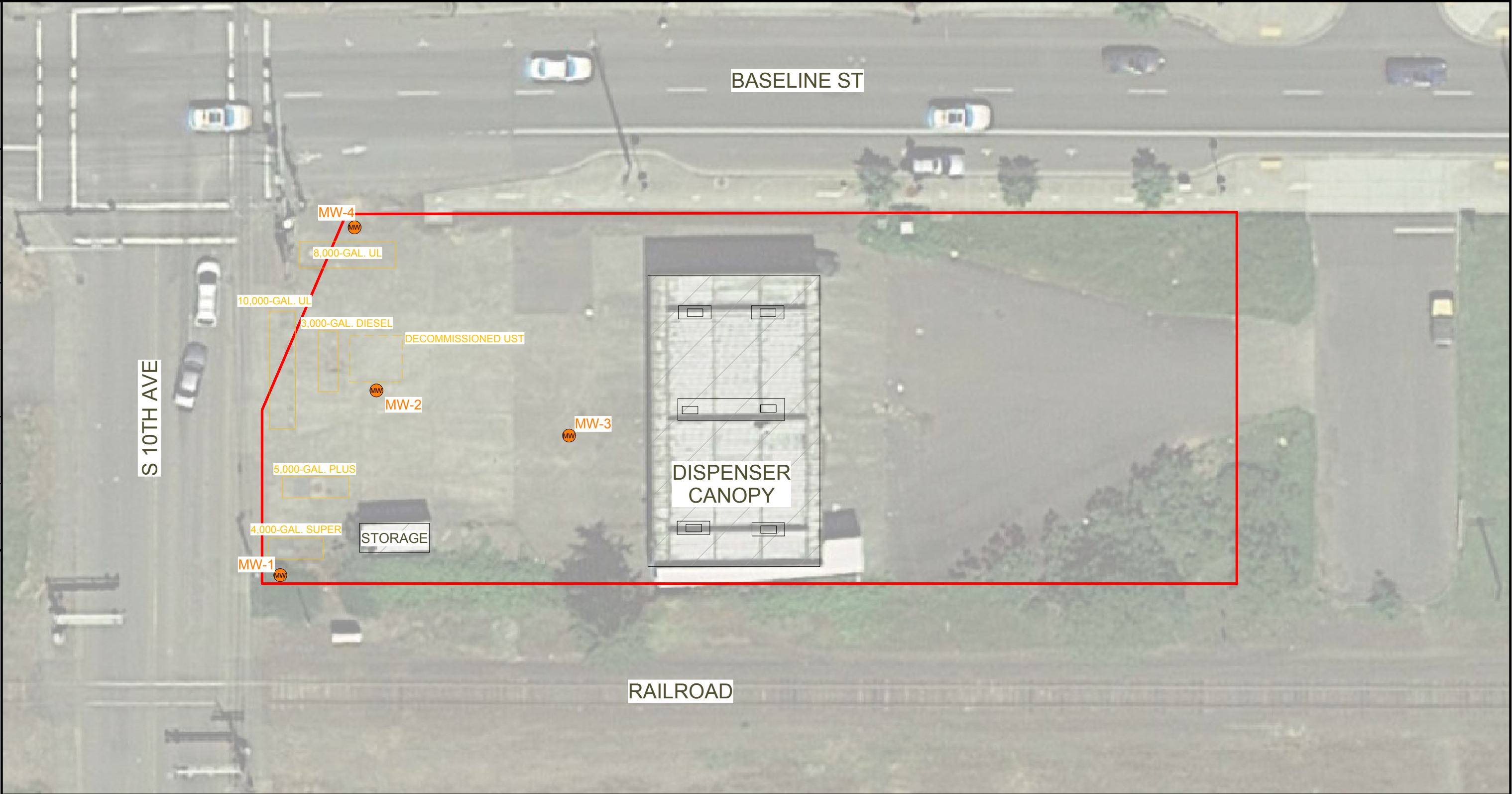
1021 Baseline Street
Cornelius, Oregon

Site Vicinity Map

Project No.
1209-17001

Figure No.

1



LEGEND:

SUBJECT BUILDINGS

MONITORING WELL

SUBJECT PROPERTY BOUNDARIES

UNDERGROUND STORAGE TANK

DECOMMISSIONED UNDERGROUND STORAGE TANK

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2017 AND ENW FIELD NOTES.

2. ALL BUILDING, STREET, AND FEATURE LOCATIONS ARE APPROXIMATE.

3. SYMBOLS REPRESENT LOCATION AND DO NOT ALWAYS REPRESENT EXACT SHAPE, SIZE, OR ORIENTATION

APPROXIMATE SCALE

02550 FEET

N

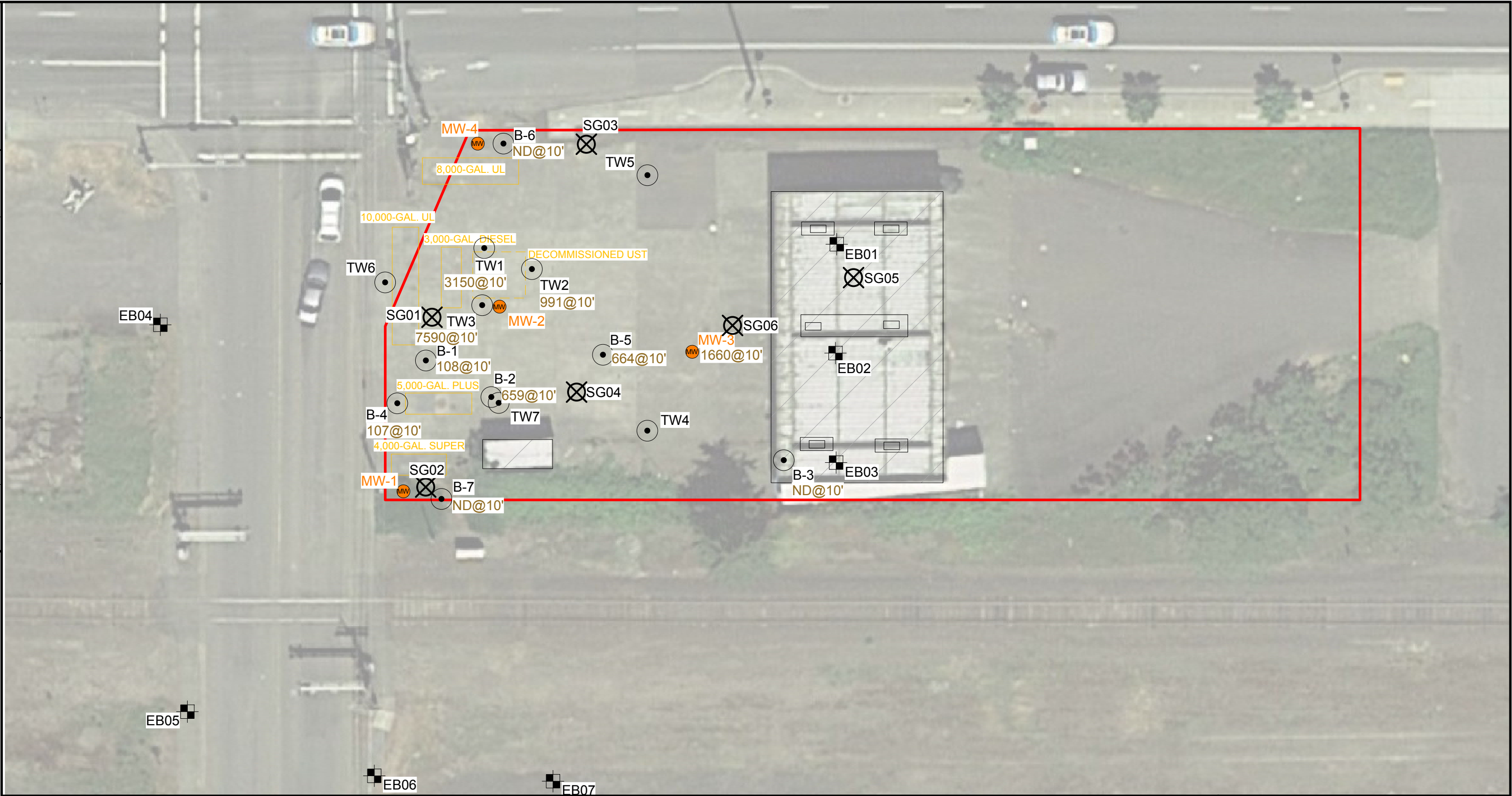
EVREN NORTHWEST
INC.
environmental natural resource consultants

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FIGURE 2

SITE PLAN

1021 E BASELINE STREET
CORNELIUS, OREGON



LEGEND:

SUBJECT BUILDINGS

SUBJECT PROPERTY BOUNDARIES

PREVIOUS SAMPLE LOCATION
COLLECTED BY K&S

UNDERGROUND STORAGE TANK

DECOMMISSIONED UNDERGROUND STORAGE TANK

MONITORING WELL

ENW PROPOSED SOIL BORING LOCATION

ENW PROPOSED SOIL GAS SAMPLE LOCATION

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2017 AND ENW, K&S, AND ALPHA FIELD NOTES.

2. ALL BUILDING, STREET, AND FEATURE LOCATIONS ARE APPROXIMATE.

3. SYMBOLS REPRESENT LOCATION AND DO NOT ALWAYS REPRESENT EXACT SHAPE, SIZE, OR ORIENTATION

APPROXIMATE SCALE

0

25

50 FEET



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FIGURE 3

SOIL SAMPLE LOCATION DIAGRAM
(WITH GRO RESULTS IN PARTS PER MILLION)

1021 E BASELINE STREET
CORNELIUS, OREGON

- SUBJECT BUILDINGS
- SUBJECT PROPERTY BOUNDARIES
- PREVIOUS SAMPLE LOCATION COLLECTED BY K&S
- UNDERGROUND STORAGE TANK
- DECOMMISSIONED UNDERGROUND STORAGE TANK

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2017 AND ENW, K&S, AND ALPHA FIELD NOTES.
2. ALL BUILDING, STREET, AND FEATURE LOCATIONS ARE APPROXIMATE.
3. SYMBOLS REPRESENT LOCATION AND DO NOT ALWAYS REPRESENT EXACT. SHAPE, SIZE, OR ORIENTATION

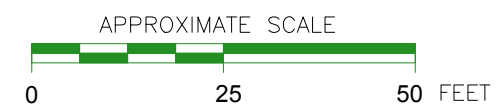


FIGURE 4
GROUND WATER SAMPLE LOCATION DIAGRAM
(WITH GRO RESULTS IN PARTS PER BILLION)

1021 E BASELINE STREET
CORNELIUS, OREGON

ATTACHMENT 1

Attachment 1: GRO Concentration Trends in Ground Water vs. Depth to Water

