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SAMPLING AND ANALYSIS PLAN

ALLEY AREA OF BLOCK 38 WEST SITE
BETWEEN REPUBLICAN STREET AND MERCER STREET
SEATTLE, WASHINGTON

Submitted by:
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Farallon PN: 397-019
AGREED ORDER NO. DE 17963

For:
City Investors IX LLC
505 5th Avenue South
Seattle, Washington 98104

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1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this Sampling and Analysis Plan (SAP) for City Investors IX L.L.C. (City Investors IX) to present specific methodologies for the collection, handling, and analysis of samples to be collected during the implementation of the interim action planned for the Alley (defined below), a portion of which is part of the Block 38 West Site in the South Lake Union Area of Seattle, Washington. The Block 38 West Site is generally located at 500 through 536 Westlake Avenue North in Seattle, Washington (West property) and extends to the east into an adjacent alley that is owned by the City of Seattle (Alley) (Figure 1).

For simplicity, the entire City block will be referred to in this SAP as Block 38. This is a name used by the property owner to refer to this particular City block in Seattle. It is not a denomination by the City. Block 38 is comprised of the West property, the north-south–trending Alley that bisects the block, and the parcels at 535 Terry Avenue North and 960 Republican Street (collectively the East property). Block 38 is bordered by Mercer Street to the north, Terry Avenue North to the east, Republican Street to the south, and Westlake Avenue North to the west (Figure 1).

This SAP has been prepared in accordance with the Washington State Model Toxics Control Act Cleanup Regulation (MTCA) as established in Section 820 of Chapter 173-340 of the Washington Administrative Code (WAC 173-340-820) and *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* revised December 2016, prepared by the Washington State Department of Ecology (Ecology) (2004).

The purpose of the SAP is to define the specific requirements for sample collection and analytical activities to ensure that activities are conducted in accordance with technically acceptable protocols and that the results meet the data quality objectives. The SAP presents the protocols pertaining to sampling equipment and procedures and sample handling and analysis that will be used during alley excavation activities. Sampling objectives, sample locations, and measurement frequencies also are described. The SAP provides a basis for conducting field activities and a mechanism for complying with quality assurance requirements.

1.1 PURPOSES

The specific purposes of this SAP are to:

- Describe the scope of work for the interim action to be performed in connection with improvements to the Alley associated with the redevelopment of the West property and under Agreed Order No. DE 17963 (AO) between Ecology and City Investors IX;
- Identify sample locations and media, sample quantities, analytical methods, and documentation protocols for the sampling program;
- Describe standard operating procedures (SOPs) for field sampling of soil; and

- Provide quality assurance (QA) and quality control (QC) protocols for field activities and laboratory analysis to ensure collection of representative and useable data.

2.0 PROJECT DESCRIPTION

This section provides a summary of the scope of work and Farallon's project organization and schedule.

2.1 SCOPE OF WORK

The interim action is being conducted to remove fill material containing hazardous substances from the Alley while it is accessible during construction activities and Alley improvements. The *Public Review Draft Interim Action Work Plan, Alley Area of Block 38 West Site Between Republican Street and Mercer Street, Seattle, Washington* dated December 14, 2020, prepared by Farallon, presents the complete scope of work and discussion of the rationale for the Alley interim action activities. The objective of the interim action is to reduce the threat to human health and the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance at a facility and to correct a problem that will likely cost substantially more to address if not completed during the Alley improvements (WAC 173-340-430). The interim action will be performed consistent with the cleanup requirements of MTCA. The interim action will be an Ecology-supervised remedial action for the Alley and will not foreclose reasonable alternatives for the final cleanup action at the Block 38 West Site.

Subsurface investigations have been conducted at the Alley since 1998. Based on the results of these subsurface investigations, the following hazardous substances have been detected at concentrations exceeding regulatory screening levels in soil at the Alley: petroleum hydrocarbons, benzene, polycyclic aromatic hydrocarbons, cadmium, and lead. Construction activities associated with the current West property redevelopment include creating a through-alley that provides access to the West property and buildings on the East property from Mercer Street and Republican Street. Soil containing hazardous substances will be encountered during these activities. The interim action will remove to the extent practicable shallow soil contamination encountered during utility improvements, roadway resurfacing, and subsurface structural improvements at the southern end of the Alley.

The scope of work for the Alley interim action includes:

- Conducting public and private utility locates to clear excavation areas and provide additional information pertaining to the location of subsurface utilities in work areas;
- Excavating fill material to a depth of approximately 5 feet below ground surface or an elevation of 25 to 18 feet North American Vertical Datum of 1988 (NAVD88) (north to south) in order to place structural backfill to support the new concrete road surface and to access utilities;
- Excavating fill material in six separate phases of excavation over a period of 6 months to ensure continuous access through the Alley;

- Collection and retention of soil samples from the north, east, and south sidewalls and floor of identified excavation grids at elevations ranging from 23 to 17.5 feet NAVD88 for laboratory analysis; and
- Backfill and grading of excavated areas to restore vehicular and pedestrian access through the Alley.

Table 1 provides a summary of sampling scope of work and rationale and Table 2 provides a summary of the proposed analytes by sampling grid. Table 3 shows the hazardous substances identified for the Alley based on historical data compared to the most stringent MTCA screening levels.

The results of the interim action will be presented in an Interim Action Report, and as applicable, summarized in the remedial investigation for the Block 38 West Site.

2.2 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization for conducting the scope of work described in the SAP, including identification of key personnel and their responsibilities, is presented below.

Regulatory Agency. Ecology is the lead regulatory agency for the interim action. Ecology's Site manager for the Block 38 West Site is:

Tena Seeds, P.E.
Washington State Department of Ecology
Northwest Regional Office
3190 160th Avenue Southeast
Bellevue, Washington 98008
Telephone: (425) 649-7008
tena.seeds@ecy.wa.gov

Project Contact. Farallon has been contracted by City Investors IX to plan and implement the SAP. The Project Contact for City Investors IX is:

Jim Broadlick
City Investors IX LLC
505 5th Avenue South
Seattle, Washington 98104
Telephone: (206) 342-2000
JimBr@vulcan.com

Project Principal. The Project Principal provides support for all project activities and reviews data and deliverables prior to their submittal to the Project Contact or Regulatory Agency. The Project Principal is:

Clifford T. Schmitt, L.G., L.H.G.
Farallon Consulting, L.L.C.
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Issaquah, Washington 98027
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cschmitt@farallonconsulting.com

Project Manager. The Project Manager has day-to-day responsibility for project implementation. The Project Manager will be responsible monitoring the quality of the technical and managerial aspects of the project, and implementing the SAP and corresponding corrective actions, if necessary. The Project Manager for Farallon is:

Suzy Stumpf, P.E.
Farallon Consulting, L.L.C.
1809 7th Avenue
Seattle, Washington 98101
Telephone: (425) 295-0800
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Project Task Manager. The Project Task Manager has day-to-day responsibility to supervise field staff and contractor procedures, and to manage collection of samples. The Task Manager will communicate progress updates to the Project Manager, including deviations from the SAP. The Task Manager will be responsible for implementing the SAP and corresponding corrective actions to the Project Manager, if necessary. The Project Task Manager for Farallon is:

Greg Peters
Farallon Consulting, L.L.C.
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Issaquah, Washington 98027
Telephone: (425) 295-0800
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Project Data Manager. The Project Data Manager manages data as it is received from the laboratory and is responsible for data validation. Data validation responsibilities include reviewing laboratory reports, advising on data corrective action procedures, and performing QA/QC on analytical data reports. In addition, the Project Data Manager will directly transfer laboratory data into an EQuIS environmental data management system database (EQuIS database) and the Ecology Environmental Information Management System. The Data Manager for Farallon is:

Jeanette Mullin
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Field Staff. Members of the field staff supervise contractor procedures, manage collection of samples, coordinate sample deliveries to the laboratory, and document field-sampling activities. Field staff also will communicate progress updates to the Project Task Manager, including deviations from the SAP.

Laboratory – OnSite Environmental, Inc. OnSite Environmental Inc. (OnSite) in Redmond, Washington will perform analytical services in support of the supplemental subsurface investigation and will be responsible for implementing specific QA/QC requirements.

2.3 PROJECT SCHEDULE

The Alley interim action is currently planned for February through July 2021 following Ecology's approval of the scope of work.

3.0 FIELD PROCEDURES

This section summarizes the protocols and procedures that will be followed for field data collection. Farallon SOPs for fieldwork, including detailed step-by-step protocols, are provided in Appendix A.

3.1 SOIL SAMPLING

Soil samples will be collected from the north, east, and south sidewalls and floor of identified excavation grids during Alley excavation activities (Table 2). Excavation grids are shown on Figures 2 and 3. Specific sample locations may be adjusted within the excavation grid based on soil conditions and visual evidence of contamination. Farallon will use the one-call and private utility location services to confirm the location of subsurface utilities in accordance with Farallon SOP GN-02 (Appendix A).

Alley excavations will be completed to elevations of approximately 25 to 18 feet NAVD88 from north to south, corresponding to depths of approximately 5 feet below ground surface throughout the Alley. Soil samples will be collected from the sidewalls and floor of identified excavation grids by hand or by using an excavator bucket (Tables 1 and 2). Soil samples will be observed for lithologic description, visual and olfactory evidence of contamination, and volatile organic vapor concentrations as measured using a photoionization detector. Floor and sidewall samples will be collected from identified excavation grids (Table 2). Sidewall samples will also be collected from the north and south sidewalls of the northernmost and southernmost excavation grids at each end of the alley.

Soil samples will be collected and handled in accordance with the requirements of Farallon SOP SL-02 (Appendix A); Section 4, Sample Handling; and Section 7, Field Documentation. Soil samples to be analyzed for volatile organic compounds will be collected in accordance with U.S. Environmental Protection Agency (EPA) Method 5035A as described in SOP SL-02.

3.2 DECONTAMINATION PROCEDURES

Reusable equipment will be decontaminated in accordance with Farallon SOP EQ-01 (Appendix A).

4.0 SAMPLE HANDLING

This section discusses the sample designation, labeling, and sample-handling methods to be used during the excavation activities associated with the interim action. The protocols discussed include sample containers, preservation and holding times, sample documentation, collection of QA/QC samples, and sample packaging and shipment.

4.1 SAMPLE DOCUMENTATION

Sample documentation includes sample labels, Field Report forms, Soil Sample Data Log forms, and Chain of Custody forms. Other sample documentation to be maintained by field personnel are provided in Appendix B.

Each sample container will be marked with a durable adhesive label and labeled with a unique identifier. The sample identifier for each sample will be constructed according to Section 4.2, Sample Designation, and recorded in the Field Report forms and on the sample Chain of Custody form (Appendix B). Sample labels will include the client name, project name and number, date and time sampled, sample identifier, sampler's initials, requested sample analysis, and analyte preservative(s), if any. The Chain of Custody form will include the sample identifier, date and time of sample collection, sampler's initials, number of containers, and requested sample analysis. Entries for all samples will be made on the Chain of Custody form prior to the transfer of the samples off the area of interest.

4.2 SAMPLE DESIGNATION

Sample designation and labeling procedures for soil samples are presented below.

4.2.1 Soil Sample Identifiers

Soil samples will be assigned a unique sample identifier that will include the sample location (e.g., excavation grid), the number of the sample collected from the excavation grid, and the depth of the sample stated in feet below ground surface. Soil samples collected from interior portions of the excavation will be assigned a unique sample identifier that will include the components listed below:

- Soil sampling grid designation (e.g., A2);
- Sampling grid designation, as appropriate:
    - North sidewall (NSW);
    - East sidewall (ESW);
    - West sidewall (WSW);
    - South sidewall (SSW);
    - Floor/bottom (B);

- Elevation of the surface soil sample in feet NAVD88; and
- Sampling date (e.g., MMDDYY).

For example, the soil sample collected from the north sidewall of sampling grid A/A5 at 17.5 feet NAVD88 on February 28, 2021 would be assigned the sample identifier A/A5-NSW-17.5-022821.

The sample identifier will be recorded on the sample label, Field Report form, Soil Sample Data Log, and Chain of Custody form.

4.3 SAMPLE CONTAINERS, PRESERVATION PROCEDURES, AND HOLDING TIMES

Sample container requirements for soil sampling are based on the medium to be sampled and the type(s) of analysis to be performed. The containers, preservation procedures, and hold times for soil are shown in Table 4 and follow standard laboratory protocols.

4.4 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Field duplicate samples will not be collected during the Alley interim action excavations because only soil samples will be collected. Soil sampling is subject to potentially wide ranges of variability due to the heterogeneity of the sample and the limited mass of soil sampled. Conversely, media such as groundwater are not as susceptible to the effects of heterogeneity and are more-reliable media for establishing measures of precision and/or accuracy.

Trip blanks will be submitted with all coolers containing samples for volatile organic compound (VOC) analyses. Trip blanks will be evaluated for the possibility of cross-contamination during sample handling and transport to the laboratory.

4.5 SAMPLE PACKAGING AND SHIPMENT

The samples shipped for laboratory analysis will be packaged according to applicable regulations and the recommendations of the laboratory performing the analysis. Samples will be expeditiously transported to the analytical laboratory after being sealed in coolers.

The following procedures (representing the minimum shipping and handling requirements) will be used for sample packaging:

- A sample label will be affixed to the corresponding sample container at the time of sample collection.
- Bubble-wrap bags or an equivalent will be used to protect sample containers.
- Sample containers will be placed into a cooler and checked against the Chain of Custody form to ensure that all samples are listed and are placed into the correct cooler.

- One copy of the Chain of Custody form will be detached and retained by the Farallon Field Scientist.
- Remaining paperwork will be sealed in a resealable plastic bag and taped to the inside of the cooler lid.
- One to three resealable bags will be filled with ice and/or a chemical equivalent and included in the cooler. Ice will be double-bagged in heavy-duty bags.
- The cooler will be sealed with a chain-of-custody seal and taped shut using strapping tape.
- The laboratory address will be affixed to the cooler.
- Extraneous stickers will be removed from the cooler.
- The cooler will be examined to ensure that Farallon's return address is affixed.

Upon transfer of the samples to laboratory personnel or arrival of the samples at the laboratory facility, the laboratory will assume responsibility for custody of the samples. Laboratory personnel will document the status of shipping and handling containers and will adhere to standard chain-of-custody procedures to track each sample through all of the stages of laboratory processing.

5.0 LABORATORY ANALYSIS

This section describes the details of the laboratory analysis associated with soil and groundwater samples that will be collected during this independent remedial action. Laboratory analyses will be conducted by OnSite. OnSite is accredited by Ecology and meets the QA/QC requirements of Ecology and EPA.

5.1 LABORATORY ANALYSES

Soil samples will be analyzed for one or more the following analytes, depending on the sample location:

- Total petroleum hydrocarbons as gasoline-range organics by Northwest Method NWTPH-Gx;
- Total petroleum hydrocarbons as diesel-range and as oil-range organics by Northwest Method NWPTH-Dx;
- Polycyclic aromatic hydrocarbons, including naphthalenes and carcinogenic polycyclic aromatic hydrocarbons, by EPA Method 8270D; and
- Resource Conservation and Recovery Act metals, including cadmium and lead, by EPA Methods 6010D and 7471B.

Table 2 lists the analytes that will be analyzed at each sampling location.

5.2 REPORTING LIMITS

The analytical methods identified above result in the reporting limits (or practical quantitation limits) that are shown on Table 5. The laboratory reporting limits are based on current laboratory data and may be modified during the investigation as methodology is refined. Instances may arise where high sample concentration, nonhomogeneity of samples, or matrix interferences preclude achieving the laboratory reporting limits.

6.0 OFF-PROPERTY SOIL DISPOSAL AND WASTE MANAGEMENT

Off-property soil disposal and management of waste, including wastewater from decontamination of equipment and disposable sampling supplies, during the Alley interim action excavations will be managed with the existing waste profiles. Soil samples collected during excavation activities will be used to confirm that excavated soil meets the current waste profiles, and excavated soil will be managed under the existing soil waste profiles for the West property. Groundwater is not expected to be encountered during the planned work in the Alley, as the static groundwater level is typically at 18 feet NAVD88. However, limited construction dewatering is planned in January and February 2021 on the southern portion of the Alley to support the installation of structural improvements. Wastewater generated during the Alley interim action will be processed by the existing construction dewatering treatment system and permitted discharge. Wastewater generated after the construction dewatering system is decommissioned will be containerized, sampled to confirm the waste profile for disposal, and properly disposed of at a licensed facility.

6.1 OFF-PROPERTY DISPOSAL OF SOIL

Soil will be exported and disposed of off the Alley at an approved disposal facility according to waste soil category. The categories of soil containing concentrations of hazardous substances that will be generated during the construction and the corresponding disposal facilities are described below.

- **Category 3 Soil** is excavated soil containing hazardous substances at concentrations that do not meet acceptance criteria for disposal as clean soil, but meet the acceptance criteria for disposal at the following facilities:
    - Cadman, Inc Subtitle D Landfill in Everett, Washington;
    - Republic Services Regional Subtitle D Landfill in Roosevelt, Washington; and
    - Waste Management Columbia Ridge Subtitle D Landfill in Arlington, Oregon.

- **Category 3+ Soil** is excavated soil with concentrations of hazardous substances exceeding the Cadman, Inc. disposal acceptance criteria. This category of soil also contains greater than 15 percent organic material not meeting acceptance criteria for disposal at the Cadman, Inc. facility. This soil will meet acceptance criteria for disposal at the following Category 3+ disposal facilities:
    - Republic Services Regional Subtitle D Landfill; and
    - Waste Management Columbia Ridge Subtitle D Landfill.

The actual volumes and location of each category of soil generated during excavation activities will vary based on the extent of the construction and fill material encountered and upon actual subsurface conditions encountered during the construction excavation. Each truckload of soil transported off the site from the Alley excavations will be tracked on Farallon's Truck Tracking log (Appendix B).

6.2 WASTEWATER

Wastewater generated by equipment decontamination (if applicable) will be processed through the construction dewatering system and treated and discharged under the existing construction general stormwater permit issued for the independent remedial action for the West property.

If it can't be processed through the construction dewatering system, wastewater will be placed into Department of Transportation–approved 55-gallon drums for storage at the Block 38 West Site. Wastewater generated will be tracked using a Waste Inventory Tracking Sheet. Wastewater generated may be disposed of under existing waste profiles at a selected facility for treatment and disposal.

6.3 DISPOSABLES

Disposable personal protective clothing (e.g., Tyvek suits, rubber gloves, boot covers) and disposable sampling devices (e.g., plastic soil sample plungers) will be cleaned, placed into plastic garbage bags, and disposed of as nonhazardous waste.

7.0 FIELD DOCUMENTATION

Documentation of field activities will be provided on Field Report forms, Soil Sample Data Logs, Truck Tracking logs, sample and waste material labels, Waste Inventory forms, and Chain of Custody forms. Documentation generated during the field program will be retained in the project files and included in the reports generated, as appropriate. Filled forms and records will be maintained in the Farallon project files. Example forms and labels are provided in Appendix B.

7.1 FIELD REPORT FORM

Field personnel will be required to keep a daily field log on a Field Report form. Field notes will be as descriptive and inclusive as possible, enabling independent parties to reconstruct the sampling situation from the recorded information. Language will be objective, factual, and free of inappropriate or ambiguous terms and/or opinions.

A summary of each day's events will be provided on the Field Report form. At a minimum, field documentation will include the date, job number, project identification and location, weather conditions, sample collection data, personnel present and responsibilities, field equipment used, and any activities performed in a manner other than as specified in this SAP. In addition, if other forms or documents such as boring location surveys or maps are completed or used, they will be cited in and attached to the Field Report form. Field personnel will sign the completed Field Report form.

7.2 SOIL SAMPLE DATA LOG

A Soil Sample Data Log will be used to record information pertaining to soil samples collected. This log includes entries for the sample location, identification, and depth; the time sampled; field-screening results; the types and number of containers collected; and a brief lithologic description.

7.3 TRUCK TRACKING LOG

Truck Tracking logs will be used to record each truckload of soil that is exported off the site from the Alley excavations. Truck tracking logs will include the time each truck leaves the Alley, the transporter company name and truck number, if available, the destination facility, the soil classification, and any pertinent comments. The excavation grid and approximate soil elevation may also be recorded if the information is readily available.

7.4 SAMPLE LABELS

Sample labels will be filled out and affixed to appropriate sample containers immediately prior to sample collection. The label will be filled out with indelible ink and includes the medium, date, time sampled, sample identifier (see Section 4.2, Sample Designation), project name, project number, sampler's initials, and analyte preservative(s) if any.

7.5 WASTE MATERIAL LABELS

A waste material label is filled out and affixed to the appropriate waste container immediately upon filling. The label is filled out in indelible ink and includes the job number and name, address where the waste was generated, container contents, date, consultant's name and phone number, and sampler's initials.

7.6 WASTE INVENTORY FORM

A Waste Inventory form will be used to document and track the drummed wastes generated during excavation activities, if necessary. The form will include information on the waste container, origin of the waste, type of waste, date generated, date removed from the Alley, transporter, and disposal location. A copy of the Waste Inventory form is included in Appendix B.

7.7 CHAIN OF CUSTODY FORM

The Chain of Custody form provides an accurate written record that can be used to trace the possession and handling of the sample from the moment of its collection through analysis and reporting of analytical values. The Chain of Custody form should be updated whenever samples are collected, transferred, stored, analyzed, or destroyed. The Chain of Custody form includes the client name, project name and number, date and time sampled, sample identifier, sampler's initials, and requested sample analysis.

8.0 QUALITY ASSURANCE PROJECT PLAN

This section describes the analytical program to be conducted for each sample selected for chemical analysis, as well as the laboratory QA objectives and QC protocols required to be met to ensure collection of representative and useable data.

8.1 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) for this project will be used to develop and implement procedures to ensure that the data collected are of sufficient quality to adequately address the Alley interim action excavation objectives. Observations and measurements will be made and recorded in a manner so as to yield results representative of the media and conditions observed and/or measured. Goals for representativeness will be met by ensuring that sampling locations are selected properly, a sufficient number of samples are collected, and field screening and laboratory analyses are conducted properly.

DQOs for this project include:

- Collect confirmation soil samples at the limits of the excavation to evaluate soil conditions at the limits of the excavation;
- Collect performance soil samples at the northern and southern ends of the Alley to evaluate the effectiveness of the excavation;
- Achieve a practical quantitation limit sufficient for direct comparison against MTCA screening levels; and
- Implement QA/QC protocols described in this SAP so that data collected are scientifically defensible.

The quality of the field sampling methods and laboratory data will be assessed using the parameters of precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS). QC procedures for PARCCS are described in the following sections. Quantitative DQOs for applicable parameters (i.e., precision, accuracy, and completeness) are provided following their definition. Laboratory DQOs have been established by the analytical laboratories and are specified in the individual analytical laboratory Quality Assurance Manuals. The applicable analytical laboratory Quality Assurance Manual will be kept on file at the Farallon corporate office in Issaquah, Washington.

8.1.1 PRECISION

Precision is defined as the degree of agreement between or among independent, similar, or repeated measures, and is expressed in terms of analytical variability. For this project, analytical variability will be measured as the relative percent difference (RPD) or coefficient of variation between analytical laboratory duplicates, and between the matrix spike (MS) and matrix spike duplicate

(MSD) analyses. Monitoring and sampling variability will be measured by analysis of blind field-replicate samples.

The tolerance limit for percent differences between laboratory duplicates will be ±20 percent; deviations from these criteria will be reported. If the criteria are not met, the laboratory will provide an explanation of why the limits were exceeded, and will implement appropriate corrective actions for laboratory control samples (LCSs)/LCS duplicates only. RPDs will be evaluated during data review and validation. If precision limit exceedances are linked to field sampling, those field sampling procedures will be reviewed, and any problems will be identified. Re-sampling and analysis may be required.

8.1.2 ACCURACY

Accuracy (bias) is a statistical measurement of correctness and includes components of random error (i.e., variability due to imprecision) and systematic error. It therefore reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ excessively from the known concentration of the spike or standard.

Accuracy measures the bias in a measurement system and is difficult to measure for the entire data collection activity. Sources of error include the sampling process, field contamination, preservative handling, sample matrix effects, and sample preparation and analysis techniques. To confirm that the samples collected are not contaminated during handling and transport, laboratory method blank samples will be analyzed.

Laboratory MSs and surrogates will be carried out at the analytical laboratory in accordance with EPA SW-846 requirements for organic chemical analyses. The frequency for both MSs and MSDs analysis will be one per batch of 20 or fewer samples. Quantitative percent recovery criteria for organic analyses will be based on laboratory-derived control limits for surrogate recovery and MS results.

The resultant percent recovery will be compared to the acceptance criteria defined by the laboratory for each sample in the laboratory report, and deviations from specified limits will be reported. If the objective criteria are not met, the laboratory will provide an explanation of why acceptability limits were exceeded, and will implement appropriate corrective actions. Percent recoveries will be reviewed during data validation, and deviations from the specified limits will be noted. The data reviewer will comment on the effect of the deviations on reported data.

8.1.3 REPRESENTATIVENESS

Representativeness is a qualitative assessment of how closely the measured results reflect the actual concentration or distribution of the constituent concentrations in the matrix sampled. The sampling plan design, sample collection techniques, sample handling protocols, sample analysis methods, and data review procedures have been developed to ensure that the results obtained are representative of site conditions. Representativeness also will be determined by evaluating holding

times, sample preservation, and blank contamination. Samples with expired holding times, improper preservation, or blank contamination may not be representative.

8.1.4 COMPLETENESS

Completeness, defined as the number of acceptable data points relative to the total number of data points, will be assessed for all samples within a given media (i.e., soil). The QA/QC objective for completeness for all components of this project is 95 percent. Data that were qualified as estimated because the QA/QC criteria were not met will be considered valid for the purpose of assessing completeness. Data that have been qualified as estimated will be further reviewed for usability. For this scope of work, the primary use of the data is to evaluate the vertical and lateral extent of petroleum-, cPAHs-, and/or metals-impacted soil in the Alley. Data that were qualified as rejected will not be considered valid for the purpose of assessing completeness. If a sample medium has an unacceptable completeness percentage after comparison to the individual data quality objectives described above, original samples will be re-analyzed if sufficient sample volume is available, or archived samples will be analyzed if appropriate.

8.1.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared to another. In order to ensure results are comparable, samples will be analyzed using standard EPA or Ecology methods and protocols. Calibration and reference standards will be traceable to certified standards, and standard data reporting formats will be employed. Data will also be reviewed to verify that precision and accuracy criteria were achieved and, if not, that data were appropriately qualified.

8.2 DATA QUALITY CONTROL

Data will undergo two levels of QA/QC evaluation: one by the laboratory and one by Farallon. Initial data reduction, evaluation, and reporting will be performed by the laboratory, as specified in the laboratory Quality Assurance Manual. The analytical data will then be validated by Farallon under the supervision of the Project Data Manager. The following types of QC information will be reviewed, as appropriate:

- Method deviations;
- Sample extraction and hold times;
- Method reporting limits;
- Blank samples (e.g., equipment rinsate, trip, and laboratory method);
- RPD (for precision);
- MS/MSD samples (for accuracy);
- Surrogate recoveries; and
- Percent completeness.

Farallon will review field records and the results of field observations and measurements to ensure that procedures were properly performed and documented. Field procedures will be reviewed for the following elements:

- Completeness and legibility of field logs;
- Preparation and frequency of field QC samples;
- Field equipment calibration and maintenance; and
- Chain of Custody forms.

8.3 LABORATORY DATA PACKAGE REQUIREMENTS

Laboratory data packages will consist of a laboratory report and electronic data deliverable. Laboratory reports will include the following elements:

- Case narrative;
- Analytical notes;
- QC narrative;
- Sample inventory report;
- Analytical results; and
- Data qualifiers and abbreviations.

The electronic data deliverable will include at a minimum:

- Sample identification information;
- Sample media;
- Sampling, laboratory receiving, extraction, and analysis dates;
- Analyte and Chemical Abstracts Service Reference No.;
- Reported concentrations and reporting units;
- Analytical method detection limits;
- Machine reporting limits and reporting units; and
- QA/QC results, including identification of MS/MSD and surrogate samples.

8.4 CORRECTIVE ACTION

Corrective action will be the joint responsibility of the Project Manager and the Project Data Manager. Corrective procedures may include:

- Identifying the source of deviation from the quality standards set forth in the SAP and its supporting documents;
- Re-analyzing soil samples if hold-time criteria permit;
- Re-sampling and analyzing soil, if necessary to meet the quality standards set forth in this SAP;
- Evaluating and amending sampling, analytical, and/or data transfer procedures; and/or
- Qualifying data to indicate the level of uncertainty.

During field operations and sampling procedures, field team members will be responsible for identifying and correcting equipment malfunctions and documenting sampling procedures in a manner that will enable the Project Manager or the Project Data Manager to evaluate whether corrective action is warranted.

Equipment malfunctions, variances in sampling protocols, and corrective actions taken by field team members will be documented in the field notes. The Project Manager or the Project Data Manager will evaluate the field notes upon submittal to determine whether the corrective action taken was adequate to meet project quality standards or whether additional corrective action is required.

8.5 DATA MANAGEMENT

The final repository for sample analytical information will be an EQuIS database. The electronic data deliverables received from the laboratories will be directly transferred into the EQuIS database, reducing the likelihood of data entry errors. The Project Data Manager will manage and maintain the EQuIS database.

Farallon will directly transfer the analytical data provided by the laboratory into the Ecology Environmental Information Management System, thus eliminating the likelihood of data entry errors inherent with manual data entry.

Field measurements and other data requiring manual entry will be reviewed by Farallon personnel other than the data entry staff prior to submission to the Environmental Information Management System. Ecology's confirmation of receipt of the data will be maintained in Farallon project files.

8.6 DATA VALIDATION

Farallon will conduct a Level I Compliance Screening on all the analytical data.

All chemical data will be reviewed with regard to the following:

- Chain-of-custody/documentation;
- Sample preservation and holding times;
- Method blanks;
- Reporting limits;
- Surrogate recoveries;
- MS/MSD recoveries;
- LCS recoveries; and
- Laboratory RPDs.

Data validation will be based on the QA/QC criteria as recommended in the methods identified in this SAP and in the *National Functional Guidelines for Organic and/or Inorganic Methods Data Review* (EPA 2017a, 2017b).

Data usability, conformance with the QA/QC objectives, and any deviations that may have affected the quality of the data, as well as the basis of application of qualifiers, will be included in the final reporting of the data. Any required corrective actions based on the evaluation of the analytical data will be determined by the laboratory in consultation with the Farallon Project Manager and may include qualification or rejection of the data.

9.0 REFERENCES

Farallon Consulting, L.L.C. (Farallon). 2020. *Public Review Draft Interim Action Work Plan, Alley Area of Block 38 West Site Between Republican Street and Mercer Street, Seattle, Washington.* Prepared for City Investors IX LLC. December 14.

U.S. Environmental Protection Agency (EPA). 2017a. *National Functional Guidelines for Organic Superfund Methods Data Review.* EPA Administrative Record EPA-540-R-2017-002. January.

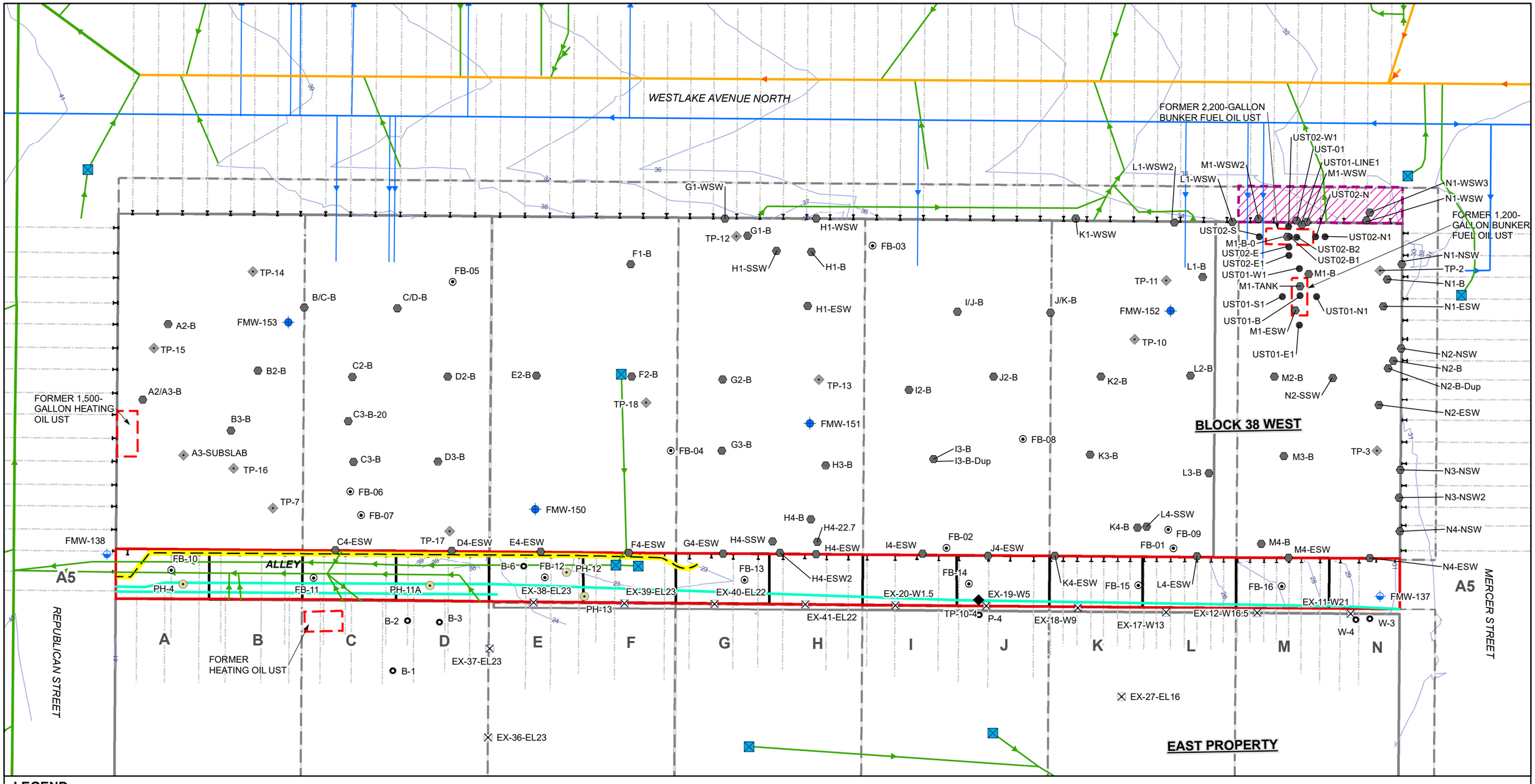
———. 2017b. *National Functional Guidelines for Organic Superfund Methods Data Review.* EPA Administrative Record EPA-540-R-2017-001. January.

Washington State Department of Ecology (Ecology). 2004. *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*. Publication No. 04-03-030. Revised December 2016. July.

FIGURES

SAMPLING AND ANALYSIS PLAN
Alley Area of Block 38 West Site
Between Republican Street and Mercer Street
Seattle, Washington

Farallon PN: 397-019



LEGEND

- INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- DEEP OUTWASH AQUIFER WELL
- BORING (FARALLON)
- BORING (GEOENGINEERS)
- EXCAVATION SAMPLE (GEOENGINEERS)
- TEST PIT (GEOENGINEERS)
- POTHOLE (FARALLON)
- UST SAMPLE LOCATION (FARALLON)
- EXCAVATION SAMPLE LOCATION (FARALLON)
- TEST PIT (FARALLON)
- FORMER UNDERGROUND STORAGE TANKS (USTs)
- MECHANICAL EQUIPMENT AREA DECOMMISSIONED AND FILLED WITH CDF
- PROPERTY BOUNDARY
- KING COUNTY PARCELS
- LOT LINE
- 20' X 30' GRID
- PILE
- TIEBACK
- CATCH BASIN
- SANITARY SEWER MAIN
- WATER LINE
- COMBINED MAIN
- FIBER OPTIC LINE
- PROPOSED GAS LINE

N

0 30

SCALE IN FEET

CDF = CONTROLLED DENSITY FILL
ELEVATION DATA PRESENTED IN FEET ABOVE MSL
IN THE NORTH AMERICAN VERTICAL DATUM OF 1988
ELEVATION SOURCE: BUSH, ROED, & HITCHINGS, INC. (2014)

NOTES:
1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

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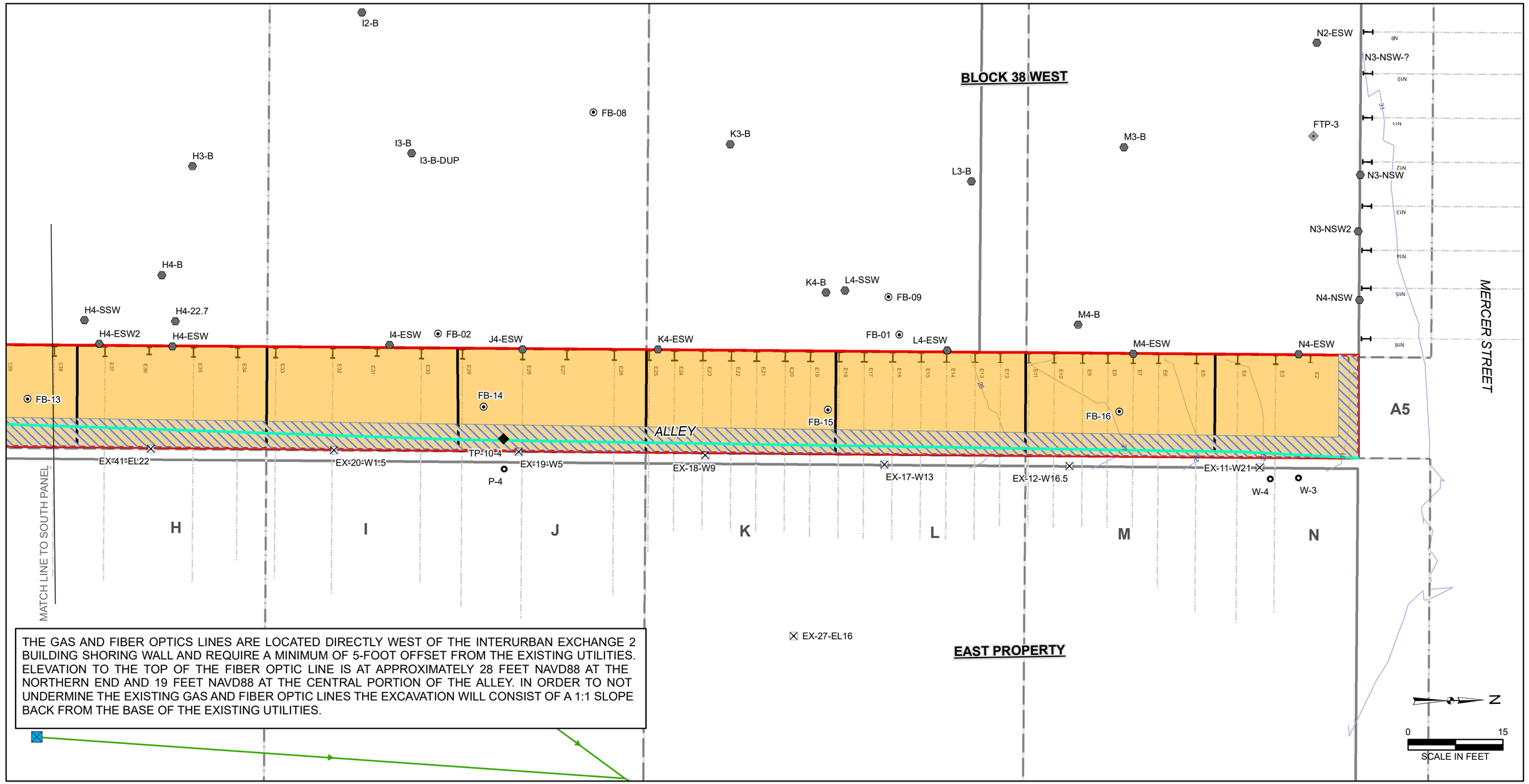
FIGURE 1

SITE PLAN WITH SOIL SAMPLING GRID
BLOCK 38 ALLEY
SEATTLE, WASHINGTON

FARALLON PN: 397-019

Drawn By: tperrin | Checked By: CS | Date: 1/15/2021 | Disc Reference: Q:\Projects\397 VULCAN\019_Block38\Mapfiles\017E_Alley SAP 202101\Figure-01_BL38W_Grid_Alley_17E_202101.mxd



THE GAS AND FIBER OPTICS LINES ARE LOCATED DIRECTLY WEST OF THE INTERURBAN EXCHANGE 2 BUILDING SHORING WALL AND REQUIRE A MINIMUM OF 5-FOOT OFFSET FROM THE EXISTING UTILITIES. ELEVATION TO THE TOP OF THE FIBER OPTIC LINE IS AT APPROXIMATELY 28 FEET NAVD88 AT THE NORTHERN END AND 19 FEET NAVD88 AT THE CENTRAL PORTION OF THE ALLEY. IN ORDER TO NOT UNDERMINE THE EXISTING GAS AND FIBER OPTIC LINES THE EXCAVATION WILL CONSIST OF A 1:1 SLOPE BACK FROM THE BASE OF THE EXISTING UTILITIES.

LEGEND

- BORING (FARALLON)
- BORING (GEOENGINEERS)
- EXCAVATION SAMPLE (GEOENGINEERS)
- TEST PIT (GEOENGINEERS)
- EXCAVATION SAMPLE LOCATION (FARALLON)
- TEST PIT (FARALLON)
- CONSTRUCTION EXCAVATION
- PROPERTY BOUNDARY
- KING COUNTY PARCELS
- LOT LINE
- CATCH BASIN
- SANITARY SEWER MAIN
- FIBER OPTIC LINE
- STRUCTURAL OR UTILITY PROTECTION/BUFFER/SLOPE BACK
- E36 PILE AND IDENTIFIER
- TIEBACK
- 20' X 30' GRID

ELEVATION DATA PRESENTED IN FEET ABOVE MSL IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 ELEVATION SOURCE: BUSH, ROED, & HITCHINGS, INC. (2014)

BLOCK 38 PANEL LOCATOR MAP

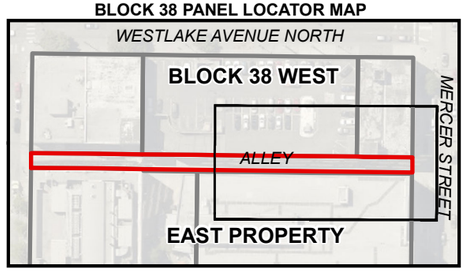


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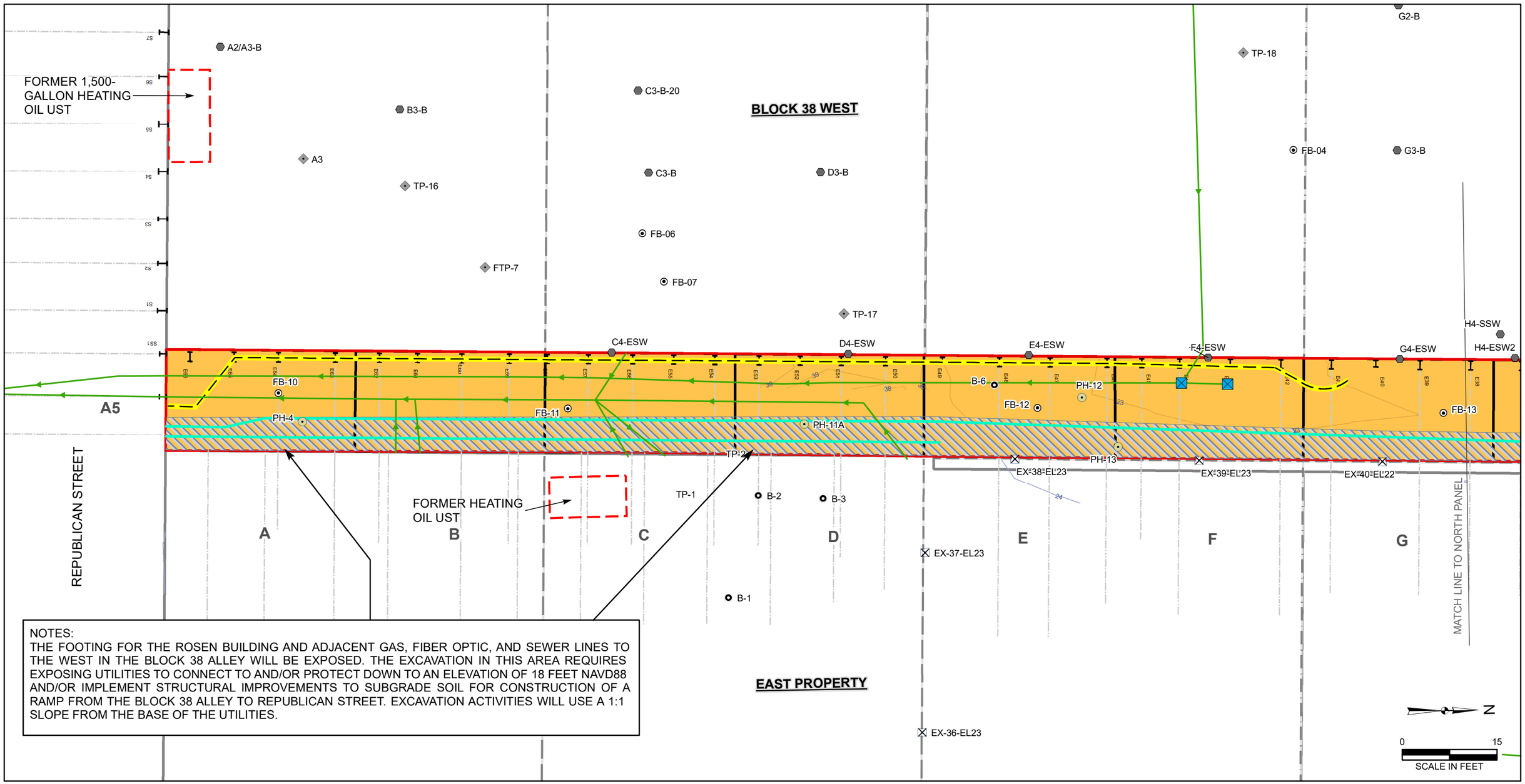
FIGURE 2

NORTH CONSTRUCTION EXCAVATION EXTENT
BLOCK 38 ALLEY
SEATTLE, WASHINGTON

FARALLON PN: 397-019

Drawn By: tperrin | Checked By: CS | Date: 1/15/2021 | Disc Reference: Q:\Projects\397 VULCAN\019_Block38\Mapfiles\017E_Alley SAP 202101\Figure-02_AlleyNorth_BL38WEA_Grid_Alley_17E_202101.mxd



NOTES:
THE FOOTING FOR THE ROSEN BUILDING AND ADJACENT GAS, FIBER OPTIC, AND SEWER LINES TO THE WEST IN THE BLOCK 38 ALLEY WILL BE EXPOSED. THE EXCAVATION IN THIS AREA REQUIRES EXPOSING UTILITIES TO CONNECT TO AND/OR PROTECT DOWN TO AN ELEVATION OF 18 FEET NAVD88 AND/OR IMPLEMENT STRUCTURAL IMPROVEMENTS TO SUBGRADE SOIL FOR CONSTRUCTION OF A RAMP FROM THE BLOCK 38 ALLEY TO REPUBLICAN STREET. EXCAVATION ACTIVITIES WILL USE A 1:1 SLOPE FROM THE BASE OF THE UTILITIES.

LEGEND

- BORING (FARALLON)
- BORING (GEOENGINEERS)
- EXCAVATION SAMPLE (GEOENGINEERS)
- POTHOLE (FARALLON)
- EXCAVATION SAMPLE LOCATION (FARALLON)
- TEST PIT (FARALLON)
- PROPERTY BOUNDARY
- CONSTRUCTION EXCAVATION
- KING COUNTY PARCELS
- LOT LINE
- CATCH BASIN
- SANITARY SEWER MAIN
- FIBER OPTIC LINE
- PROPOSED GAS LINE
- STRUCTURAL OR UTILITY PROTECTION/BUFFER/SLOPE BACK
- E36 PILE AND IDENTIFIER
- TIEBACK
- 20' X 30' GRID

ELEVATION DATA PRESENTED IN FEET ABOVE MSL IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 ELEVATION SOURCE: BUSH, ROED, & HITCHINGS, INC. (2014)

BLOCK 38 PANEL LOCATOR MAP

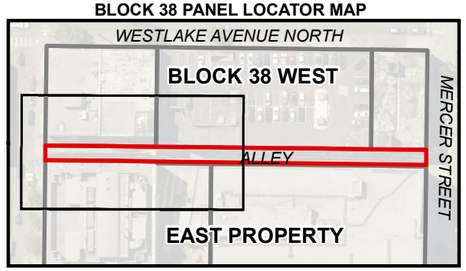


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FIGURE 3

SOUTH CONSTRUCTION EXCAVATION EXTENT
BLOCK 38 ALLEY
SEATTLE, WASHINGTON

FARALLON PN: 397-019

Drawn By: tperrin | Checked By: CS | Date: 1/15/2021 | Disc Reference: Q:\Projects\397 VULCAN\019_Block38\Mapfiles\017E_Alley SAP 202101\Figure-03_AlleySouth_BL38WEA_Grid_Alley_17E_202101.mxd

TABLES

SAMPLING AND ANALYSIS PLAN
Alley Area of Block 38 West Site Between Republican Street and Mercer Street
Seattle, Washington

Farallon PN: 397-019

Table 1
Scope of Work and Rationale
Block 38 Alley
Seattle, Washington
Farallon PN: 397-019

Alley Location	Rationale	Scope	Analytes and Methods
North, Central, South	Evaluation of the lateral extent of cPAHs.	Collect and retain soil samples at from the northern sidewall (elevations 28 and 26 feet NAVD88), east sidewall (elevations 22.5, 20, 17.5 feet NAVD88), south sidewall (elevations 22.5, 20, 17.5 feet NAVD88), and base of the excavation as necessary (elevations ranging from 25 to 17.5 feet NAVD88) .	1) cPAHs by EPA 8270D SIM.
North, Central	Evaluation of the lateral extent of ORO, which will include DRO analysis and GRO.	Collect and retain soil samples at from the east sidewall (elevations 22.5, 20, 17.5 feet NAVD88) and base of the excavation as necessary (elevations ranging from 25 to 17.5 feet NAVD88).	1) DRO and ORO by NWTPH-Dx; 2) GRO by NWTPH-Gx; and, 3) Benzene, toluene, ethylbenzene, and xylenes by EPA 8260D.
Central	Evaluation of the lateral extent of naphthalenes.	Collect and retain soil samples at from the east sidewall (elevations 22.5, 20, 17.5 feet NAVD88) and base of the excavation as necessary (elevation 17.5 feet NAVD88).	1) total naphthalenes (1-methylnaphthalene, 2-methylnaphthalene, and naphthalene) by EPA 8270D SIM.
Central	Evaluation of the lateral extent of lead and cadmium.	Collect and retain soil samples at from the east sidewall (elevations 22.5, 20, 17.5 feet NAVD88) and base of the excavation as necessary (elevation 17.5 feet NAVD88) near sample locations EX-40-EL22, EX-41-EL22 and TP-10-4.	1) Lead and cadmium by EPA Method 6010D (not hazardous substances associated with the Block 38 West Site).

NOTES:

bgs = below ground surface

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

DRO = total petroleum hydrocarbons (TPH) as diesel-range organics

EPA = U.S. Environmental Protection Agency

GRO = TPH as gasoline-range organics

NAVD88 = North American Vertical Datum of 1988

ORO = TPH as oil-range organics

SIM = Selective Ion Mode

Table 2
Proposed Analyte List
Block 38 Alley
Seattle, Washington
Farallon PN: 397-019

Location	Sidewall Location	Sample Elevation Depth (feet NAVD88)	GRO	DRO	ORO	BTEX	Naphthalenes	cPAHs	Lead	Cadmium	Comments
A/A5	East Sidewall	22.5						X			Note that the east sidewall samples will be offset 5 feet west from the Rosen Building foundation with a 1:1 slope of the sidewall to the base of the construction excavation.
		20						X			
		17.5						X			
	South Sidewall	22.5						X			
		20						X			
		17.5						X			
	West Sidewall	22.5/20/17.5						NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property.
	Bottom	17.5						X/collected			Base of construction excavation is approximately elevation 17.5 feet NAVD88. Boring FB-10 was located at excavation grid A/A5 and cPAHs are less than MTCA screening levels at elevations 20 and 17.5 feet NAVD88.
C/A5	East Sidewall	22.5						X			Note that the east sidewall samples will be offset 5 feet west from the Rosen Building foundation with a 1:1 slope of the sidewall to the base of the construction excavation.
		20						X			
		17.5						X			
	West Sidewall	19/15						NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property. West property mass excavation sidewall sample, C4-ESW, cPAHs are less than MTCA screening level at elevations 19 and 15 feet NAVD88.
	Bottom	17.5		X/collected	X/collected			X/collected			Base of construction excavation is approximately elevation 17.5 feet NAVD88. Boring FB-11 was located at excavation grid C/A5 and cPAHs are less than MTCA screening level at elevation 17.5 feet NAVD88; DRO and ORO are less than MTCA screening levels at elevations 20 and 17.5 feet NAVD88.
D/A5	West Sidewall	19/15					NA	NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property. West property mass excavation sidewall sample, D4-ESW, cPAHs are less than MTCA screening level at elevations 19 and 15 feet NAVD88; total naphthalenes are less than MTCA screening level at elevation 19 feet NAVD88.
	Bottom	17.5						X			
E/A5	East Sidewall	22.5	X	X	X	X	X	X			Note that the east sidewall samples will be offset to the west of existing utilities with a 1:1 slope of the sidewall to the base of the construction excavation.
		20	X	X	X	X	X	X			
		17.5	X	X	X	X	X	X			
	West Sidewall	15						NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property. West property mass excavation sidewall sample, E4-ESW, cPAHs are less than MTCA screening level at elevation 15 feet NAVD88.
	Bottom	17.5	X/collected	X/collected	X/collected	X/collected	X/collected	X/collected	X/collected		Base of construction excavation is approximately elevation 17.5 feet NAVD88. Boring FB-12 was located at excavation grid E/A5 and cPAHs are less than MTCA screening level at elevation 15 feet NAVD88; naphthalenes and lead are less than MTCA screening level at elevation 21.5 feet NAVD88; and GRO, DRO, ORO and BTEX are less than MTCA screening level at elevations 20 and 17.5.
	Bottom - near PH-12	17.5	X	X	X	X	X	X			Per Ecology's requirements, added a bottom sample at the former location of PH-12.
F/A5	West Sidewall	15						NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property. West property mass excavation sidewall sample, F4-ESW, cPAHs are less than MTCA screening level at elevation 15 feet NAVD88.
	Bottom	17.5	X	X	X	X	X	X			

Table 2
Proposed Analyte List
Block 38 Alley
Seattle, Washington
Farallon PN: 397-019

Location	Sidewall Location	Sample Elevation Depth (feet NAVD88)	GRO	DRO	ORO	BTEX	Naphthalenes	cPAHs	Lead	Cadmium	Comments
G/A5	East Sidewall	22.5		X	X		X	X	X		Note that the east sidewall samples will be offset to the west of existing utilities with a 1:1 slope of the sidewall to the base of the construction excavation.
		20		X	X		X	X	X		
		17.5		X	X			X			
	West Sidewall	15						NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property. West property mass excavation sidewall sample, G4-ESW, cPAHs are less than MTCA screening level at elevation 15 feet NAVD88.
	Bottom	17.5	X/collected	X/collected	X/collected	X/collected	X/collected	X/collected	X/collected	X/collected	Base of construction excavation is approximately elevation 17.5 feet NAVD88. Boring FB-13 was located at excavation grid G/A5 and DRO, ORO, and cPAHs are less than MTCA screening level at elevation 15 feet NAVD88; total naphthalenes are less than MTCA screening level at elevation 20 feet NAVD88; lead and cadmium are less than MTCA screening levels at elevations 22.5 and 20 feet NAVD88.
H/A5	East Sidewall	22.5		X	X		X	X	X		Note that the east sidewall samples will be offset to the west of existing utilities with a 1:1 slope of the sidewall to the base of the construction excavation.
		20		X	X		X	X	X		
		17.5		X	X			X			
	West Sidewall	20/15	NA	NA	NA			NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property. West property mass excavation sidewall sample, H4-ESW, cPAHs, DRO, ORO, and GRO are less than MTCA screening level at elevation 15 feet NAVD88.
	Bottom	17.5		X	X		X	X	X		
I/A5	East Sidewall	22.5		X	X		X	X	X		
		20		X	X		X	X	X		
		17.5		X	X			X			
	West Sidewall	20/15		NA	NA			NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property. West property mass excavation sidewall sample, I4-ESW, cPAHs, DRO and ORO are less than MTCA screening level at elevation 15 feet NAVD88.
	Bottom	17.5		X	X		X	X	X		
J/A5	East Sidewall	22.5		X	X			X	X	X	Note that the east sidewall samples will be offset to the west of existing utilities with a 1:1 slope of the sidewall to the base of the construction excavation.
		20		X	X			X	X	X	
		17.5		X	X			X			
	West Sidewall	20/15		NA	NA			NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property. West property mass excavation sidewall sample, J4-ESW, cPAHs, DRO, and ORO are less than MTCA screening level at elevation 15 feet NAVD88.
	Bottom	17.5		X/collected	X/collected		X/collected	X/collected	X/collected	X/collected	Base of construction excavation is approximately elevation 17.5 feet NAVD88. Boring FB-14 was located at excavation grid J/A5 and DRO, ORO, and cPAHs are less than MTCA screening level at elevation 17.5 feet NAVD88; total naphthalenes are less than MTCA screening level at elevation 20 feet NAVD88; lead and cadmium are less than MTCA screening levels at elevations 22.5 and 20 feet NAVD88.
K/A5	West Sidewall	20/15		NA	NA		NA	NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property. West property mass excavation sidewall sample, K4-ESW, cPAHs are less than MTCA screening level at elevation 15 feet NAVD88; total naphthalenes are less than MTCA screening level at elevation 20 feet NAVD88; DRO and ORO are less than MTCA screening level at elevations 20 and 15 feet NAVD88.
	Bottom	17.5		X/collected	X/collected		X/collected	X/collected	X/collected	X/collected	Base of construction excavation is approximately elevation 18 feet NAVD88. Boring FB-15 was located at excavation grid K/A5 and DRO and ORO are less than MTCA screening level at elevations 22.5, 20, and 17.5 feet NAVD88; cPAHs are less than MTCA screening level at elevation 15 feet NAVD88; total naphthalenes are less than MTCA screening level at elevations 22.5, 20, and 17.5 feet NAVD88; lead and cadmium are less than MTCA screening levels at elevations 22.5, 20 and 17.5 feet NAVD88.

Table 2
Proposed Analyte List
Block 38 Alley
Seattle, Washington
Farallon PN: 397-019

Location	Sidewall Location	Sample Elevation Depth (feet NAVD88)	GRO	DRO	ORO	BTEX	Naphthalenes	cPAHs	Lead	Cadmium	Comments
L/A5	**East Sidewall**	25		X	X			X			Note that the east sidewall samples will be offset to the west of existing utilities with a 1:1 slope of the sidewall to the base of the construction excavation.
		22.5		X	X			X			
	West Sidewall	15		NA	NA			NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property. West property mass excavation sidewall sample, L4-ESW, cPAHs, DRO, and ORO are less than MTCA screening level at elevation 15 feet NAVD88.
	Bottom	22		X	X			X			
M/A5	**East Sidewall**	25		X	X			X			
		22.5		X	X			X			
	West Sidewall	20		NA	NA			NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property. West property mass excavation sidewall sample, M4-ESW, cPAHs, DRO and ORO are less than MTCA screening level at elevation 20 feet NAVD88.
	Bottom	22		X/collected	X/collected			X/collected			Base of construction excavation is approximately elevation 22 feet NAVD88. Boring FB-16 was located at excavation grid M/A5 and cPAHs are less than MTCA screening level at elevations 20 and 17.5 feet NAVD88; DRO and ORO are less than MTCA screening levels at elevations 22.5, 20, and 17.5 feet NAVD88.
N/A5	**North Sidewall**	28						X			
		26						X			
	East Sidewall	28						X			Note that the east sidewall samples will be offset to the west of existing utilities with a 1:1 slope of the sidewall to the base of the construction excavation.
		26						X			
	West Sidewall	20		NA	NA			NA			Western extent of excavation is the exposed face of the soldier pile and wood lagging shoring wall for the West property. West property mass excavation sidewall sample, N4-ESW, cPAHs, DRO and ORO are less than MTCA screening level at elevation 20 feet NAVD88.
	Bottom	25						X			

NOTES:
bgs = below ground surface
shading = collect and retain sample for future analysis
cPAHs = carcinogenic polycyclic aromatic hydrocarbons
DRO = total petroleum hydrocarbons (TPH) as diesel-range organics
GRO =TPH as gasoline-range organics
NAVD88 = North American Vertical Datum of 1988
NA = Not Applicable
MTCA = Washington State Model Toxics Control Act Cleanup Regulation
ORO = TPH as oil-range organics

Table 3
Summary of MTCA Screening Levels
Block 38 West Alley
Seattle, Washington
Farallon PN: 397-019

Parameter	Soil Screening Levels[1] (milligrams per kilogram)
Total Petroleum Hydrocarbons	
Gasoline-range organics	30/100[2]
Diesel-range organics	2,000[3]
Oil-range organics	
Volatile Organic Compounds	
Benzene	0.03
Polycyclic Aromatic Hydrocarbons	
Naphthalene	5.0[4]
1-Methylnaphthalene	
2-Methylnaphthalene	
Benzo(a)Pyrene	0.1[5]
Benzo(a)Anthracene	
Benzo(b)Fluoranthene	
Benzo(j,k)Fluoranthene	
Chrysene	
Dibenzo(a,h)Anthracene	
Indeno(1,2,3-cd)Pyrene	
Metals	
Cadmium	2.0
Lead	250

NOTES:

[1]Washington State Model Toxics Control Act Cleanup Regulation (MTCA) Method A Soil Cleanup Levels for Unrestricted Land Uses, Table 740-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised 2013.

[2]Screening level is 30 milligrams per kilogram if benzene is detected and 100 milligrams per kilogram if benzene is not detected.

[3]Screening level based on the sum of diesel-range organics and oil-range organics.

[4]Screening level based on sum of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.

[5]Screening level based on total carcinogenic polycyclic aromatic hydrocarbons derived using the total toxicity equivalency method in Section 708(8) of Chapter 173-340 of the Washington

Table 4
Sample Containers, Preservatives, and Hold Times
Block 38 West Alley
Seattle, Washington
Farallon PN: 397-019

Parameter	Analytical Method	Container Size and Type	Holding Time	Sample Preservation Technique
Soil				
Gasoline-range organics	NWTPH-Gx/ EPA 5035A	(1) 40-ml glass pre-weighed VOA vial without a stir bar (5 gram soil sample)	48 hours to freeze; 14 days to analyze	Cool to 4°C ±2°C in field; freeze ≤ 0°C in laboratory
Diesel-range organics	NWTPH-Dx	(1) 4-oz CWM Jar	14 days to extract, 40 days to analyze after extraction	Cool to 4°C ±2°C
Oil-range organics				
Benzene	EPA 8260D/ EPA 5035A	(2) 40-ml glass pre-weighed VOA vial with stir bar (5 gram soil sample), and (1) 40-ml glass pre-weighed VOA vial without a stir bar (5 gram soil sample)	48 hours to freeze; 14 days to analyze	Cool to 4°C ±2°C in field; freeze ≤ 0°C in laboratory
Naphthalene	EPA 8270E-SIM	(1) 4-oz CWM Jar	14 days to extract, 40 days to analyze after extraction	Cool to 4°C ±2°C
1-Methylnaphthalene				
2-Methylnaphthalene				
Benzo(a)Pyrene				
Benzo(a)Anthracene				
Benzo(b)Fluoranthene				
Benzo(j,k)Fluoranthene				
Chrysene				
Dibenzo(a,h)Anthracene				
Indeno(1,2,3-cd)Pyrene				
Cadmium	EPA 6010D	(1) 4-oz CWM Jar	6 months to analyze	Cool to 4°C ±2°C
Lead				

NOTES:
°C = degrees Celsius
CWM = clear wide-mouth
EPA = U.S. Environmental Protection Agency
HCl = hydrochloric acid
HNO_3 = nitric acid
ml = milliliter
oz = ounce

Table 5
Soil Laboratory Reporting Limits and Control Limits
Block 38 West Alley
Seattle, Washington
Farallon PN: 397-019

Parameter	Analytical Method	Soil PQL[1] (mg/kg)	Soil Surrogate	Soil Surrogate Control Limits (percent)	Soil Spike Blank Control Limits (percent)	Spike Blank/Spike Blank Duplicate RPD Control Limit (percent)	Soil Duplicate RPD Control Limit (percent)
Total Petroleum Hydrocarbons							
Gasoline-range Organics	NWTPH-Gx/EPA 5035A	5.0	Fluorobenzene	58 - 129	---	---	30
Diesel-range Organics	NWTPH-Dx	25	o-Terphenyl	50 - 150	61-130 (varies; see report)	---	Provided in report
Oil-range Organics	NWTPH-Dx	50					
Volatile Organic Compounds							
Benzene	EPA 8260D/EPA 5035A	0.001	Fluorobenzene	58 - 129	75 - 121 (varies; see report)	15	---
Polycyclic Aromatic Hydrocarbons							
Naphthalene	EPA 8270E-SIM	0.0067			60 - 116 (varies; see report)	15	---
1-Methylnaphthalene	EPA 8270E-SIM	0.0067			---	---	---
2-Methylnaphthalene	EPA 8270E-SIM	0.0067			---	---	---
Benzo(a)Pyrene	EPA 8270E-SIM	0.0067	2-Fluorobiphenyl	46 - 113	66 - 130 (varies; see report)	15	---
Benzo(a)Anthracene	EPA 8270E-SIM	0.0067	Pyrene-d10	45 - 114	64 - 127 (varies; see report)	15	---
Benzo(b)Fluoranthene	EPA 8270E-SIM	0.0067	Terphenyl-d14	49 - 121	61 - 122 (varies; see report)	15	---
Benzo(j,k)Fluoranthene	EPA 8270E-SIM	0.0067			64 - 123 (varies; see report)	15	---
Chrysene	EPA 8270E-SIM	0.0067			63 - 121 (varies; see report)	15	---
Dibenzo(a,h)Anthracene	EPA 8270E-SIM	0.0067			61 - 123 (varies; see report)	15	---
Indeno(1,2,3-cd)Pyrene	EPA 8270E-SIM	0.0067			59 - 124 (varies; see report)	15	---
Metals							
Cadmium	EPA 6010D/200.8	0.50	---	---	---	---	20
Lead	EPA 6010D/200.8	5.0	---	---	---	---	20

NOTES:

[1] The PQL for project samples will vary with moisture content of the samples.

--- denotes not required by method

EPA = U.S. Environmental Protection Agency

mg/kg = milligrams per kilogram

PQL = practical quantitation limit

RPD = relative percent difference

APPENDIX A
FARALLON STANDARD OPERATING PROCEDURES

SAMPLING AND ANALYSIS PLAN
Alley Area of Block 38 West Site Between Republican Street and Mercer Street
Seattle, Washington

Farallon PN: 397-019

STANDARD OPERATING PROCEDURE EQ-01
EQUIPMENT DECONTAMINATION PROCEDURES

PURPOSE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to provide field personnel with the methodology for decontaminating sampling equipment during various field activities. The step-by-step guidelines provided in this SOP are to be followed by the field crew during all site visits, as applicable.

EQUIPMENT AND SUPPLIES/REAGENTS

The following equipment is necessary to properly decontaminate field equipment during various field tasks:

- Rinse water or distilled water.
- Deionized water.
- Liquinox or other phosphate-free detergent.
- Paper towels.
- Labeled squirt bottles.
- Long-handled hard-bristle brushes (for sediment and soil).
- Cotton swabs.
- Plastic sheeting, garbage bags, and aluminum foil (for sediment and soil).
- Core liner caps or plastic wrap and rubber bands (for sediment and soil).
- Extension arm for cleaning core liners (for sediment and soil).
- Plastic 5-gallon bucket.
- U.S. Department of Transportation-approved drum(s) for decontamination water unless other water-handling arrangements have been made. Separate drums are needed for liquid and solid wastes (see Farallon SOP WM-01, Field-Handling of Investigation-Derived Waste). Liquid wastes should not be added to drums containing solid wastes.

Dilute Liquinox with distilled water in a squirt bottle in accordance with the instructions on the Liquinox package, and label the bottle. Fill another squirt bottle with distilled water, and label the bottle.

FIELD EQUIPMENT TO BE DECONTAMINATED AFTER USE

Decontaminate the following field equipment at the conclusion of field work each day, in accordance with the procedures outlined in this SOP:

- Water-level meter.
- Horiba/YSI multiparameter probe.
- Bladder pump.
- Submersible pump.
- Sediment and soil collection and processing equipment.

WATER-LEVEL METER DECONTAMINATION

Decontaminate the water-level meter after measuring the water level at a monitoring well before moving to a new monitoring well, using the following procedures:

- Spray the bottom half of a paper towel with the diluted Liquinox solution, and the upper half with deionized water.
- Grip the measuring tape of the water-level meter with the paper towel in one hand with the Liquinox side down toward the monitoring well casing.
- Begin slowly reeling up the water-level meter while maintaining firm contact between the measuring tape and the paper towel.
- Ensure that no debris or contamination remains on the measuring tape of the water-level meter once it has been reeled up.
- Use a clean new paper towel for each successive decontamination of the measuring tape of the water-level meter.

HORIBA/YSI MULTIPARAMETER PROBE DECONTAMINATION

Decontaminate the Horiba/YSI multiparameter probe at the end of each workday or after sampling a monitoring well with high concentrations of contamination, using the following procedures:

- Remove the multiparameter probe from the flow-through cell, and thoroughly spray each component with deionized water.
- Use a cotton swab to gently clean around each sensor probe, ensuring that all contaminated water and material has been washed away.
- Refill the protective dissolved oxygen and pH probe caps with deionized water, and replace prior to storage.
- Once the multiparameter probe has been adequately cleaned, replace the protective shield, and return the probe to the case. If the device appears to be overly wet, allow it to air-dry with the case open.

- Do not use Liquinox to clean any probes on the Horiba multiparameter probe, as it may damage the device.

BLADDER PUMP DECONTAMINATION

Decontaminate the bladder pump after sampling a well and at the end of each workday, using the following procedures:

- After extracting the bladder pump from the well, break down the pump, remove and dispose of the used bladder, and spray each component with the diluted Liquinox solution, followed by deionized water.
- Wipe away any visible contamination or debris with a paper towel.
- Capture cleaning water in a liquid waste drum for proper disposal in accordance with Farallon SOP WM-01, Field-Handling of Investigation-Derived Waste.
- Ensure that all contamination and Liquinox solution is washed off all components before reassembling the device, installing a new bladder, and moving to sample a new well.

SUBMERSIBLE PUMP DECONTAMINATION

Decontaminate the submersible pump after purging water from any well, using the following procedures:

- After extracting the submersible pump from the well, thoroughly spray down the pump with the diluted Liquinox solution, followed by deionized water.
- Wipe away any visible contamination or debris with a paper towel.
- Purge clean water through the pump and tubing to ensure that contaminated water has been cleared from all lines.
- Capture cleaning water in a liquid waste drum for proper disposal in accordance with Farallon SOP WM-01, Field-Handling of Investigation-Derived Waste.

SEDIMENT AND SOIL SAMPLING AND PROCESSING EQUIPMENT DECONTAMINATION

Decontaminate sampling equipment used to collect and process sediment and soil samples, using the following procedures:

- Place contaminated equipment and decontamination tools on plastic sheeting.
- Thoroughly rinse all used equipment with distilled water in a 5-gallon bucket to remove excess sediment or soil.
- Pour one capful of Liquinox solution into a 5-gallon bucket filled with tap water or distilled water.
- Using a long-handled hard-bristle brush, thoroughly scrub the equipment with the Liquinox solution until no sediment or soil particles remain.

- Holding the equipment over a 5-gallon bucket, double-rinse the equipment with distilled water until no Liquinox solution remains. Do not allow clean equipment to come into contact with a contaminated surface.
- Drain the equipment and place it in a clean, dry place to prevent recontamination.
- If decontaminated equipment will not be re-used immediately, wrap stainless steel equipment (e.g., bowls, spoons) in aluminum foil with the dull side facing the equipment. Seal polycarbonate core liners with core caps or cellophane plastic. Rubber-band ends to ensure a proper seal.
- After decontamination has been completed, place disposable items into a garbage bag, and store decontamination water in a drum in accordance with Farallon SOP WM-01, Field-Handling of Investigation-Derived Waste.

STANDARD OPERATING PROCEDURE EQ-02
PHOTOIONIZATION DETECTOR CALIBRATION AND OPERATION

PURPOSE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to provide field personnel with the information needed to properly use, operate, and handle MiniRAE Photoionization Detector (PID) Models 2000 and 3000. The PID is used as a field-screening instrument for measurement of total volatile organic (TVO) concentrations in air. Typical uses include air monitoring of the breathing zone for health and safety purposes, screening of groundwater and soil for TVO emissions, and monitoring of the headspace of a monitoring well. The PID is a highly sensitive instrument. MiniRAE Models 2000 and 3000 have a potential operating range of 0.1 to 15,000 parts per million (ppm) isobutylene equivalents, depending on the lamp used. The detection limit is 0.1 ppm hexane or isobutylene, with a response time of less than 3 seconds.

Operation and maintenance manuals specific to this equipment should be referenced as necessary. Two user manuals are kept in Farallon's PID case: the *MiniRAE 3000 Pocket Reference;* and the *MiniRAE 3000 User's Guide*. These manuals should always be stored in the PID case so they are available for reference.

The step-by-step guidelines provided in this SOP are to be followed by the field crew when monitoring concentrations of TVO compounds in the breathing zone, a soil sample, a water sample, or the headspace of a monitoring well.

EQUIPMENT

The following equipment is necessary to calibrate and operate the PID:

- The PID instrument;
- A calibration gas regulator and silicon tubing;
- Calibration gas containing approximately 100 ppm isobutylene; and
- A 110-volt battery charger.

PID CALIBRATION CHECK

PID calibration should be checked at the beginning of the day, and as needed if drift occurs (see "PID Drift or Other Change" section below). The instructions below are to be followed to check PID calibration (refer to pages 17 and 18 of the *MiniRAE 3000 User's Guide* for information regarding the connection between buttons and control functions):

- Turn on the PID by pressing [MODE]. Wait for the PID to proceed to the default display, and allow the instrument to warm up for 10 minutes in accordance with the manufacturer's instruction. The initial reading should be 0 or 0.1 part per million volume (ppmv).
- Connect the regulator to the gas cylinder, and connect the tubing to the regulator.

- Start the gas flow by pushing in the regulator knob and turning 90 degrees. Some gas will begin to escape.
- Connect the tubing from the regulator to the PID sensor tip. The PID reading should climb to 99 to 101 ppmv.
- When the PID reading reaches the maximum level displayed, turn off the regulator and disconnect the sensor tip. The reading should return to zero.
- If any of the readings predicted above do not occur, re-calibrate the PID or arrange for repair.

PID CALIBRATION

The instructions below are to be followed to perform a zero (fresh air) calibration and a span calibration on the PID (refer to pages 35 through 46 of the MiniRAE 3000 User's Guide for information regarding calibrations):

Zero Calibration (a zero calibration always should be performed prior to a span calibration):

- Turn the unit on by pressing [MODE] for approximately 1 second.
- Press and hold [MODE] and [N/-] simultaneously until you see the Password Screen.
- Input the password:
    - The default password is 0000.
    - Use the [Y/+] to increase the number value from 0 through 9.
    - Use the [N/-] to move the cursor to a different number slot.
    - Press [MODE] once you have input the password.
- Select "Calibration" by using [Y/+].
- Select "Zero Calib" by using [Y/+].
- Apply a fresh air source to the unit. Clean ambient air without detectable contaminants may be used as a fresh air source.
- Press [Y/+] to start the zero calibration. The zero calibration will take approximately 30 seconds to complete.
- The display screen will return to the Calibration menu when the zero calibration is complete.
- Record the values read by the PID in a calibration book or in the Log Field Book.

Once the zero calibration is complete, the unit automatically returns to the Calibration menu.

If the PID does not read 0.0 ppmv following the zero calibration, repeat the zero calibration procedure. If the PID fails both attempts to zero calibrate, move on to span calibration.

SPAN CALIBRATION

- Press [N/-] to scroll down to "Span Calib."
- Press [Y/+] to select "Span Calib."
- Select the proper calibration gas. Ensure that the calibration gas and the span value on the unit's display screen have the same TVO concentration.
- Connect the regulator to the gas cylinder, and connect the tubing to the regulator.
- Press [Y/+] to begin the span calibration.
- Immediately apply the correct calibration gas to the unit's probe by turning the regulator knob 90º in either direction. The span calibration will take approximately 30 seconds.
- The calibrated value should be +/- 2 percent of the concentration indicated on the calibration gas canister. Once the span calibration is complete, the unit will automatically return to the calibration menu.
- If the calibrated value is 2 percent greater than the concentration indicated on the calibration gas canister, repeat the span calibration procedure.
- Press [MODE] twice to navigate back to the main display.
- When calibrating the PID with isobutylene, record values read by the PID in a calibration book or in the Log Field Book.
- If the PID did not initially calibrate using the zero calibration mode, re-attempt to calibrate the PID using fresh air.

If the PID does not calibrate using the span calibration gas, call and update the Project Manager on the status.

PID DRIFT OR OTHER CHANGE

PID drift commonly is a failure of the instrument to return to zero after TVO concentrations dissipate. A failure to return to zero usually reflects inaccuracy at the upper end of the instrument's detection range. Several situations can cause drift, including soil or water in the tip of the probe, soil or water in the sensor filter, or a change such as tightening or loosening the probe tip assembly since the instrument was last calibrated. The degree of drift from the initial daily calibration can be checked by exposing the PID to the calibration gas (see the "PID Calibration" section above). Re-calibration serves little purpose until the cause of the drift is determined.

If you determine that PID drift is occurring, complete the following actions:

- Unscrew the probe from the PID unit;
- Inspect the probe and the top of the unit for soil or moisture;
- Carefully remove any soil or moisture from the probe and/or unit by air drying;

- Replace the sensor filter on the probe with a new, unused sensor filter;
- Screw the probe back on the unit; and
- Apply Span Calibration gas to test the accuracy of the PID unit.

PID OPERATION

The instructions below are to be followed for PID use to screen soil and groundwater for TVO concentrations, to monitor the breathing zone for health and safety purposes, and to monitor monitoring well headspace:

- Connect the PID sample probe with filter to the PID hand-held air monitor.
- Turn on the PID by pressing [MODE]. Wait for the PID to proceed to the default display, and allow the instrument to warm up for 10 minutes in accordance with the manufacturer's instructions.
- **CAUTION!** Do not seal the soil in a plastic bag for longer than 5 minutes when conducting soil screening to avoid false readings due to moisture build-up (in wet situations, use the filter on the end of the sensor tip). Pierce the plastic bag with a clean tool, and immediately insert the sensor tip, quickly establishing a tight seal. The meter should react rapidly. Record the maximum value displayed within 30 seconds.
- To monitor groundwater and soil for TVO emissions, place the probe inlet near the groundwater or soil surface, and read the meter display showing detected concentrations. Do not allow water or soil to be sucked into the instrument.
- To monitor the breathing zone for health and safety purposes, allow the PID to monitor air quality at the breathing zone, chest, or face level, and read the meter display showing detected concentrations.
- Monitor the headspace of a monitoring well directly after the well has been opened. Place the probe inlet directly above the polyvinyl chloride well casing or tubing that is associated with a dedicated pump in the well. Read the meter display showing detected concentrations.
- Ensure that the PID is kept dry while in use. Humidity or moisture from rain can cause large fluctuations in PID readings, and can damage the instrument.
- If the PID displays erratic readings, it is possible that either moisture or dirt is in the probe, or dirt has collected in the filter. If this occurs, clean and dry the sample probe (possibly by placing it near a running heater in a vehicle), and replace the filter if necessary.

DOCUMENTATION

Document the PID measurements for all monitoring events on field forms and in a detailed field notebook, and record observations of varying weather conditions such as temperature and humidity fluctuations.

REFERENCES

PE Photovac Air Monitor/Portable Photoionization Detector Model 2000/3000 Manuals.

RAE Systems. 2010. *MiniRAE 3000 Pocket Reference.* PN: 059-4030-000-D. August.

———. 2010. *MiniRAE 3000 User's Guide.* P/N 059-4020-000. August.

STANDARD OPERATING PROCEDURE (SOP) GN-02

UTILITY LOCATE

PURPOSE

The purpose of this SOP is to provide Farallon Consulting, L.L.C. (Farallon) personnel with the specific information needed to identify and locate utilities on sites where drilling or excavation activities will occur. Excavation is defined by Section 20 of Chapter 19.122 of the Revised Code of Washington (RCW 19.122.020) as "any operation, including the installation of signs, in which earth, rock, or other material on or below the ground is moved or otherwise displaced by any means." For the purposes of this SOP, the excavation area refers to the area of an excavation or a perimeter around all proposed borings, test pits, soil gas sampling locations, and subslab soil gas sampling locations. Identifying utilities within the boundaries of a proposed excavation area prior to any digging is required by law and is necessary for the safety of Farallon personnel and contractors.

The guidelines provided in this SOP are to be followed by Farallon personnel who coordinate utility locating, mark locate boundaries, and/or observe field work that involves any type of excavation.

EQUIPMENT AND SUPPLIES

The following equipment and supplies are necessary to arrange and conduct utility locating:

- A map of the site with the proposed excavation area(s);
- Readable side sewer card figures, if applicable;
- Geographic information system (GIS) utility figures, if applicable;
- Readable American Land Title Association (ALTA) survey figures, if applicable;
- Any previous utility figures associated with the site;
- White marking products (e.g., paint, flags, stakes, grease marking pen, tape, chalk);
- Materials necessary to provide required documentation (e.g., Field Report form, camera, measuring wheel, global positioning system); and
- Personal protective equipment (PPE) as described in the site-specific Health and Safety Plan, or Level D PPE at a minimum.

PROCEDURES

The following utility locating procedures have been developed for use before excavation occurs on a site. The procedures are divided into the following five parts:

- Call Before You Dig System;
- Private Utility Locating Services;
- Hand-Clearing Proposed Excavation Areas;
- Maintaining Public Utility Locate Marks; and
- Utility Line Damage.

The Project Manager should discuss the scope of work, details of the project location, and any essential information with the project field team before any of the procedures described below commence. When practicable, an on-site kickoff meeting involving a member of the field team and the Project Manager should be conducted to discuss the work to be performed, mark the boundaries of the excavation area, and mark potential boring locations, if applicable.

Call Before You Dig System

According to RCW 19.122.030, excavators are required to mark the boundary of a proposed excavation area using white marking products. Marking products include paint, flags, and stakes. Boundary marks should conform to the following guidelines:

- A continuous line, hashed line, dots, or corner marks with arrows are acceptable ways to mark the boundary.
- Flags and stakes can be used if paint is not adequate.

The location(s) of the proposed excavation area(s) must be reviewed to verify that no visible utilities that would interfere with the proposed excavation area(s) are present. If utilities are present, the Project Manager and field personnel should communicate the changes to the excavation that are area necessary before the boundaries are marked with white paint.

After marking the boundaries of the proposed excavation area, Farallon personnel must provide notice of the scheduled excavation to the owner/operators of buried utilities at least 2 but no more than 10 business days in advance by calling 811 or 1-800-424-5555, or using the online tool at www.callbeforeyoudig.org. Use of the online tool is preferred.

A map with the excavation area boundaries depicted and/or photos of the white paint marks is helpful in conveying the scope of work to the Call Before You Dig service.

The following information should be available to provide the Call Before You Dig service at the time of initial contact:

- Scope of work, including the start date and time.
- Contact information for the Project Manager and a field person able to answer questions from public utility locators regarding project details.

- Site address, township/range/section quarter, and name of property owner.

Once the Call Before You Dig system has been notified of the upcoming work, the system provides a ticket number, which

- Should be referenced whenever the Call Before You Dig service is contacted about the job.
- Provides proof that the Call Before You Dig system was notified prior to excavation. Public utility locators, inspectors, and law enforcement personnel may ask for the ticket number.
- Should be supplied to any subcontractors doing work on the site for reference when contacting the system for their own ticket number.

Call Before You Dig personnel will provide a list of public utilities present on the site, and will notify public utility operators of the planned work.

Public utility operators have 2 full business days after the day notification was received to locate and mark their lines, or to provide reasonable information on lines that they are not able to locate. The day notice is given is not included as 1 of these 2 days. Therefore, if excavation work is planned to start on a Monday, for example, the Call Before You Dig system must be notified by Wednesday the week before.

Two full business days must elapse between Call Before You Dig notification and the start of excavation. No excavation is to take place until all known utilities are marked or otherwise accounted for with information provided by the facility operator.

Locators mark their lines with colored hash marks. The American Public Works Association determines the colors to be used to denote different kinds of lines:

Red: Power Lines and Cable	Yellow: Gas, Oil, Petroleum
Orange: Telephone and Cable	Blue: Drinking Water
Green: Sewer (Storm and Sanitary)	Purple: Non-Potable Water
Pink: Survey Marks	White: Excavator Marks

Public utility operators are required to mark their lines only to the meter. Utility lines located beyond the meter are the responsibility of the property owner. Public utility operators should indicate by marking if no public utilities are present.

Public utility locators are required to mark their lines with reasonable accuracy. According to RCW 19.122.020, “reasonable accuracy means location within twenty-four inches of the outside dimensions of both sides of an underground facility.”

At this time, public utility companies are not required to mark abandoned or deactivated lines in Washington.

An individual not following the protocols established by the Call Before You Dig system can be held liable for up to three times the cost to repair a utility line damaged during excavation.

Records of ticket numbers and communications with the Call Before You Dig service should be stored in the project folder and supplied to on-site project personnel.

Before any excavation work is started, Farallon personnel should verify that all public utility marks are present on the site. The public utility company/ies listed on the Call Before You Dig system ticket should be contacted if marks for that utility/ies are not present.

Private Utility Locating Services

After the public utility companies have marked their lines and before excavation begins, it is standard practice to have a private utility locating service clear areas that will be excavated.

Private locates generally are scheduled for the day before or the morning of the start of excavation.

Areas where excavation will occur must be cleared for conductible utilities by a private locator. Depending on the nature of the site and the proximity of utility lines, the private locator may also mark non-conductible utilities.

If possible, the excavation contractor should be on the site during the private utility locating to verify with the private locator that all proposed excavation areas are accessible.

When working with private utility locators, Farallon personnel should:

- Study existing figures of the site, noting the locations of known utilities.
- Use available side sewer cards or geographic information system utility figures to verify utility locations at the site.
- Verify that all public utilities have been marked by physically verifying that colored paint marks are present for all of the public utility companies listed on the One Call Before You Dig ticket. If any public utilities have not been marked, the utility company must be contacted and requested to mark the area, or to provide confirmation that the area is clear of their utility.
- Discuss the scope of work/excavation areas with the private locator.
- Document the name of the locating company and the name of the locator.
- Observe the locator clear the excavation area(s).
- Document the locate marks with photos, and note any uncertainties in the Field Report form.
- Identify the locations of shut-off valves for utilities such as water and natural gas.
- Contact the Project Manager or Principal to discuss relocating the excavation area if a proposed excavation area is in conflict with a utility identified by the private locator.
- Sign the locator's paperwork, if necessary, and depart the site if no additional field work is to be performed that day.

Private location of conductible utilities should sweep the excavation area in two perpendicular directions.

Private location of non-conductible utilities (typically storm and sanitary sewer) can use either a probe or a camera for accessible lines. Appropriately colored paint marks are applied by the private locator based on a signal sent from the probe or camera. For inaccessible lines, a ground-penetrating radar or magnetometer can be used to approximate the line locations. Marks based on this method should be considered approximate.

Hand-Clearing Excavation Areas

Prior to conducting certain excavation activities, excavators will clear the proposed excavation area to verify that no utilities are present. This can be accomplished through use of an air knife/vacuum truck, post-hole digging, hand-augering, or use of other hand tools that allow the excavation location be explored sufficiently to verify that no utilities are present. Farallon Project Managers will confirm the method of clearing and depths with the field team before the excavation work is performed. Farallon Project Managers also need to discuss shallow soil sampling needs with the field team if clearing activities are being performed. Clearing activities should be conducted according to the following guidelines:

- Hollow-Stem Auger Drilling: Hand-clear to a minimum depth of 5 feet below ground surface (bgs) using an air knife/vacuum truck whenever possible. Alternative methods such as post-hole digging or hand-augering also may be used.
- Sonic Drilling: Hand-clear to a minimum depth of 5 feet bgs using an air knife/vacuum truck whenever possible. Alternative methods such as post-hole digging or hand-augering also may be used.
- Geoprobe Drilling: Clearing activity requirements are dependent on known utilities and results of the public and private utility location procedures completed above. Hand-clear using a post-hole digger or hand-auger to a maximum depth of 5 feet bgs is necessary. An air knife/vacuum truck may be used to hand clear each boring location to a maximum depth of 5 feet bgs, if available.
- Test Pit Excavation: No hand-clearing is necessary. Excavation contractors should be directed to dig cautiously in the upper 5 feet bgs in the event an unknown utility is present. A test pit excavation or regular excavation using machinery (e.g., track hoe, backhoe) should include using a spotter to watch for unidentified utility lines. Ideally, the spotter should be provided by the excavation contractor.
- Rotary Hammer for Soil Gas Sampling: No hand-clearing is necessary.
- Rotary Hammer for Subslab Soil Gas Sampling: No-hand clearing is necessary.

Some drilling contractors require that a utility line be exposed prior to drilling if the proposed drilling location is within a certain distance of the utility line. Farallon personnel should confirm drilling contractor requirements prior to conducting drilling activities.

If a utility line is encountered during clearing, excavators should verify that the utility has not been damaged, and Farallon personnel should document the encounter on the Field Report form with photos and details. RCW 19.122.020 states that “damage” includes the substantial weakening of

structural or lateral support of an underground facility, penetration, impairment, or destruction of any underground protective coating, housing, or other protective device, or the severance, partial or complete, of any underground facility to the extent that the project owner of the affected facility operator determines that repairs are required. The Project Manager or Principal should be notified immediately if a utility line is encountered during hand-clearing, and an alternate location will be proposed. A hand-cleared area having an exposed utility line should be backfilled with a bentonite seal and finished to match existing grade.

Maintaining Public Utility Locate Marks

According to RCW 19.122.030, "public utility locate marks expire 45 days from the date the excavator provides notice," and "it is the responsibility of the excavator to maintain the public utility marks for 45 days, or for the length of the project–whichever is shortest. In any case, the public utility locate marks expire after 45 days."

Locate marks can be maintained digitally through both photos and figures drawn to scale.

Locate marks can be maintained in the field using white paint. White paint can be applied between original hash marks, on either side of the hash marks, or on both ends. Offset paint or staking can be used if placed a uniform distance from the original marks with a clear indication of the direction and distance from the original marks. The original marks should not be painted over, and white paint should never be applied over colored paint. White marks should include a letter identifying the type of buried line.

Utility Line Damage

A utility line does not need to be ruptured or severed to be considered damaged. Scratching or denting a utility line or its protective tape also is considered damage, as the integrity of the line may have damaged even if the damage does not appear to be significant. Before excavation work begins, shut-off valve locations for applicable utilities should be documented. If a utility is believed to be damaged, the utility should be shut down if practicable and safe to do so. According to RCW 19.122.053, "all facility operators and excavators who observe or cause damage to an underground facility must report the damage event to the Washington State Utilities and Transportation Commission."

If a utility line is hit and public safety is a concern, 911 should be the first call made after the immediate area has been evacuated. If a utility line is hit and the public is not at risk, the field team should notify the Project Manager, who will notify the Principal and the corporate Health and Safety Coordinator immediately. The Project Manager should then contact the utility that owns the damaged line, and report to the field team any instructions issued by the utility owner, and an expected timeframe for arrival of a utility owner representative at the site. Repairs to a utility line will not be attempted by Farallon personnel or contractors.

Damage must be reported through the Common Ground Alliance Damage Information Reporting Tool website, hosted by the Washington State Utilities and Transportation Commission: http://www.utc.wa.gov/publicSafety/pipelineSafety/Pages/Damagereportingrequirements.aspx

Access to damaged utility lines should be maintained to allow inspection by the utility company. An exposed utility should not be backfilled or patched until instruction to do so has been provided by the Project Manager or Principal.

DOCUMENTATION

Farallon personnel should document in the Field Report form the work performed and methods used by private utility locators, and photos from multiple angles with good reference points for each utility line in the excavation area(s).

REFERENCES

Washington Utilities Coordinating Council. 2014. *Guide to Safe Digging, Washington State Law and Industry Best Practices.*

STANDARD OPERATING PROCEDURE SL-02
EXCAVATION SOIL SAMPLING

1.0 PURPOSE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to provide field personnel with technical guidance and the methodology to ensure consistent and representative collection and documentation of soil samples from excavations and test pits. This SOP is a supplement to site-specific work plans, and should be used in conjunction with other Farallon SOPs.

2.0 RESPONSIBILITIES AND QUALIFICATIONS

All personnel performing these actions are required to be familiar with the procedures described in this SOP. Personnel overseeing excavation and test pit activities must be familiar with the health and safety requirements presented in the project-specific Health and Safety Plan (HASP) and with local, state, and federal regulations governing excavations.

3.0 RELATED STANDARD OPERATING PROCEDURES

The following SOPs are referenced herein and are intended for use with this SOP:

- SOP EQ-01 Equipment Decontamination Procedures;
- SOP EQ-02 Photoionization Detector Calibration and Operation; and

4.0 EQUIPMENT LIST

The following materials and equipment may be needed for collection of soil samples from an excavation or a test pit:

- Documentation supplies: sample labels, site figure(s), Field Report forms, Log of Test Pit forms, Soil Sample Data Log forms, Chain of Custody forms.
- Digital camera.
- Spatial measurement equipment: Global Positioning System (GPS) unit, measuring wheel, tape measure.
- Personal protective equipment (PPE) as described in the site-specific HASP.
- Field-screening equipment: photoionization detector (PID) to monitor and record soil headspace readings, a sheen pan, water.
- Soil sampling equipment: stainless steel spoons/hand trowels, stainless steel mixing bowl, resealable plastic bags, laboratory-provided certified pre-cleaned sample containers.
- Soil sample plunger and syringes for sampling volatile organic compounds (VOCs) using U.S. Environmental Protection Agency (EPA) Method 5035A.

- Decontamination equipment as specified in Farallon SOP EQ-01, Equipment Decontamination Procedures.
- Sampling-support equipment: sample coolers, double-bagged ice, bubble wrap, clear tape, duct tape, heavy resealable plastic bags, razor knives, garbage bags, paper towels, distilled water, nitrile gloves, plastic sheeting, sample table.

5.0 PROCEDURES

The following soil sampling procedures have been developed for use during excavation field activities. The specific equipment used is to be recorded on the Soil Sample Data Log form and the Field Report form. For excavations less than 4 feet below ground surface (bgs), soil samples will be collected using hand tools. For excavations greater than 4 feet bgs, soil samples will be collected using a backhoe bucket.

Personnel will under no circumstance enter excavations or trenches deeper than 4 feet bgs unless the side slopes are stepped, sloped, or stabilized by shoring in accordance with Occupational Safety and Health Administration (OSHA) excavation standards, as established in Subpart P of Part 1926 of Title 29 of the Code of Federal Regulations.

Setup

The setup instructions below are to be followed at the excavation site:

- Don appropriate PPE as described in the site-specific HASP.
- Check all sample locations to confirm that all known utilities and product/other lines have been clearly marked, and no overhead obstructions are present in the work area.
- Delineate an exclusion area adjacent to the excavator for use in collecting and logging soil samples from the excavation area or the excavator bucket. Lay plastic sheeting on the sample table to keep the sampling surface clean, and to prevent potential cross-contamination between samples. Designate clean areas for decontaminated sampling equipment and pre-cleaned soil sample containers.
- Set up 5-gallon buckets for use in decontaminating soil sampling equipment between soil samples. Refer to Farallon SOP EQ-01, Equipment Decontamination Procedures.
- Calibrate the PID to monitor headspace for selected soil samples. Refer to SOP EQ-02, PID Calibration and Operation. Collect headspace readings for individual soil samples by placing the PID probe into a sample jar or a heavy resealable plastic bag containing a portion of a soil sample. Record the reading on the Soil Sample Data Log form.

Sample Collection and Screening

The instructions below are to be followed for soil sample collection:

- Don a new pair of nitrile sampling gloves for each individual soil sample collected to avoid potential cross-contamination from the prior sample and/or contamination of the sampling equipment.
- Decontaminate all non-dedicated sampling equipment before collection of the initial sample and before collection of each additional sample. It is not necessary to decontaminate the backhoe bucket if the soil samples are collected from freshly excavated soil in the center of the backhoe bucket rather than from soil in direct contact with the backhoe bucket or teeth.
- Use PID readings and visual and olfactory soil indicators to assist during soil sample collection.
- Collect the soil sample from the excavation or the backhoe bucket using the stainless steel spoon and bowl.
- Immediately transfer the soil sample to a laboratory-provided certified pre-cleaned sample container(s) using a decontaminated stainless steel spoon. Fill the container(s) completely to the top to minimize headspace, and verify that the sample container threads are free of soil/debris to ensure that the lid will seat securely. Follow the sample collection guidelines provided by the manufacturer or the analytical laboratory when using a plunger-type sampling device in accordance with EPA Method 5035A. Label each sample container and place into a sample cooler. Record sample information on a Chain of Custody form, a Soil Sample Data Log form, and a Field Report form.
- Use the Soil Sample Data Log form to record the sample location, date, identification, depth, time of collection, observation of staining (yes/no), odor (yes/no), sheen (yes/no), and any pertinent comments.
- Retain a portion of the sample in a heavy resealable plastic bag or a glass sample jar to measure headspace using the PID. Wait approximately 10 minutes before taking the measurement for headspace analysis using the PID. Insert the PID probe tip into a small opening in the top of the bag, and record the PID units on the Soil Sample Data Log form.
- Use the Log of Test Pit form to record the lithology of the test pit from the ground surface to the total depth of the excavated test pit. The lithology should be described in accordance with the Farallon Standard Practice for Description and Identification of Soil: Visual-Manual Procedure, presented in the Technical Memorandum Regarding Farallon Standard Practice for Description and Identification of Soil, Visual-Manual Procedure, prepared by Farallon (2007).
- Note the location and depth of any utilities present in the test pit, including piping diameters and material types. Note the depth to water, if present, including any seepage observed.

Note whether sidewalls of the excavation or test pit are stable or readily cave (estimation of soil density).

- Use a camera to create a photographic log of the excavation or each test pit and note on the Field Report form the sequence of photos taken.
- Refer to the project work plan or contact the Farallon Project Manager regarding backfilling procedures. The excavation may be backfilled using excavated material or clean fill, depending on logistics, field-screening evidence of contamination, and project objectives.

DOCUMENTATION

The instructions below are to be followed to document the sampling:

- Document soil sampling activities on the Log of Test Pit form, the Soil Sample Data Log form, the Chain of Custody form, and the Field Report form.
- Record the location of each sample collected from the excavation using a GPS unit or measurements from a fixed reference point. Record the location and depth bgs on a site figure as part of the Field Report form.
- Upon completion of the excavation, measure the horizontal and vertical limits of the excavation from an on-site permanent datum using the GPS unit, a tape measure, and a measuring wheel.

REFERENCES

Farallon Consulting, L.L.C. (Farallon). 2007. Technical Memorandum Regarding Farallon Standard Practice for Description and Identification of Soil, Visual-Manual Procedure. To Farallon Staff. September 28.

U.S. Department of Energy. 1990. *Quality Control Requirements for Field Methods*. DOE/HWP-69/RI. July.

U.S. Environmental Protection Agency. 1987. *A Compendium of Superfund Field Operation Methods*. EPA/540/P-87/001a. August.

APPENDIX B
FARALLON FIELD FORMS AND RECORDS

SAMPLING AND ANALYSIS PLAN
Alley Area of Block 38 West Site Between Republican Street and Mercer Street
Seattle, Washington

Farallon PN: 397-019

FARALLON CONSULTING

Washington
Issaquah | Bellingham | Seattle
Oregon
Portland | Bend | Baker City
California
Oakland | Folsom | Irvine

FIELD REPORT

Page ___ of ___

Date: _____ **Project #:** _____ **Task #:**_____

Project: _____ **Site Address:** _____

Client: _____ **Contractor:** _____

Weather: _____ **Temp:** _____

Equipment Used: _____

Hours: _____ _____ **Mileage:** _____ **Project Manager:** _____

Contractor *Staff*

Prepared By: _____ **Reviewed By:** _____

Comments:

FIELD REPORT (continued)

Page ___ of ___

Project: _____ **Date:** _____ **Project #:** _____ **Task #:**_____

FARALLON CONSULTING

Sheet____of____

Soil Sample Data Log

Date: _____ **Project Name:** _____ **Farallon P/N:** _____

PID Model & Serial No: _____ **Calibration Date/Standard:** _____

Headspace Container: ☐ 16 oz glass ☐ 8 oz glass ☐ Zip-loc ☐ Other

Sample Method: ☐ Hand auger ☐ Direct push ☐ Split spoon ☐ Corer ☐ Other

Equip Decon: ☐ Tap water wash ☐ DIST/DEION 1 Rinse ☐ Isopropanol ☐ Analyte-free final rinse ☐ Tap water final rinse

☐ Alconox wash ☐ Liquinox Wash ☐ DIST/DEION 2 rinse ☐ Other solvent ☐ DIST/DEION final rinse ☐Air Dry

Test Pit/Boring Location	Sample ID	Time	Depth	PID	Odor	Sheen Tare Weight	Staining Field Weight	Containers	Lithological Description Remarks

2 oz = two-ounce jars

4 oz = four-ounce jars

WASTE INVENTORY TRACKING SHEET

Project Number: _____ **Page:** _____ **of**

Project Name: _____ **Generation Date:** _____

Project Address: _____ **Prepared By:** _____

Field Work Description: _____ **Date Waste Removed:** _____

Project Manager: _____ **Waste Transporter:** _____

Waste Disposal Location: _____

Unique Container ID	Container Size	% Capacity Used	Contents (Soil/GW/Decon Water)/ Origin (Boring or Well ID)	Date(s) Accumulated	Labeling (Contents Under Test/ Haz/Non-Haz/Other-Specify)	Sampled (Y/N)	Comments

NOTES: Contents should be specified and include identification of well/boring, media, source, depth of soil (if applicable), and any other helpful information.

Container ID should be unique when compared against other nearby containers. Special waste labels may include flammable, corrosive, dangerous when wet, and/or oxidizer.

Location of Drums (sketch or describe):

FARALLON CONSULTING

Chain of Custody

Page _____ of _____

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Company:

Project Number:

Project Name:

Project Manager:

Sampled by:

Turnaround Request (in working days)

(Check One)

☐ Same Day ☐ 1 Day

☐ 2 Days ☐ 3 Days

☐ Standard (7 Days)

☐ _____ (other)

Laboratory Number:

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A					% Moisture

	Signature	Company	Date	Time
Relinquished				
Received				
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions

Data Package: Standard ☐ Level III ☐ Level IV ☐

Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

Soil Disposal Tracking Sheet
Alley Area of Block 38 West Site
Seattle, Washington
Farallon PN: 397-019

											Farallon Field or Office
Date Transported	Time Leave Site	Transporter	Truck Identification	Container Identification (as applicable)	Bill of Lading	Destination Landfill	Field Classification (1, 2, 3, 3+)	Grid Location	Depth (feet below ground surface)	Elevation (feet relative to mean sea level)	Comments