August 19, 2019

BCS America LLC
14151 Fir Street
Oregon City, OR 97045

Attention: John Jansen

Work Plan
Limited Site Investigation
Former Automatic Vending Company
5001 N Lagoon Avenue
Portland, Oregon
ECSI No. 1430
GeoDesign Project: BCSAmerica-1-01-02

INTRODUCTION

GeoDesign, Inc. is pleased to submit this Work Plan to conduct a limited site investigation (LSI) at the Former Automatic Vending Company site located at 5001 N Lagoon Avenue in Portland, Oregon (project site). The project site is located in the upland portion of the Portland Harbor Superfund area on Swan Island. It is our understanding that the project site is located on Tax Lot 1100 and consists of a 1,200-square-foot building formerly used as a truck repair shop and most recently used for general storage.

BACKGROUND

It appears the project site (Tax Lot 1100) and the adjoining property to the north and northeast (Tax Lot 700) contained six underground storage tanks (USTs) that included one 10,000-gallon and three 20,000-gallon gasoline USTs formerly located on Tax Lot 700 and one 550-gallon motor oil UST and one 1,000-gallon waste oil UST formerly located on the project site. These six USTs were decommissioned in the early 1990s. Oil-impacted soil was observed during decommissioning of the motor oil and waste oil USTs formerly located on the project site (location shown on Figures 1 and 2). Approximately 134 tons of petroleum-impacted soil were excavated from the motor oil and waste oil UST pit and disposed of off site. The approximate limits of the excavation associated with decommissioning of the USTs is shown on Figures 1 and 2.

Subsequently, PEMCO advanced four borings (B-1 through B-4) west of the remedial excavation to delineate the extent of impacted soil left in place. The location of the PEMCO borings are shown on Figure 1. Borings B-1 through B-4 are outside of the current project site boundary. The property that they were conducted on has since been sold to another entity. Chemical analytical results of the soil samples collected from the borings indicated that heavy oil was detected in fill material at concentrations of up to 2,000 milligrams per kilogram (mg/kg) collected from boring B-3. PEMCO and the Oregon Department of Environmental Quality (DEQ) concluded that detection of heavy oil appeared to be associated with fill material and was not related to the UST release. DEQ issued a No Further Action (NFA) determination in May 1997 for Leaking Underground Storage Tank File No. 26-91-0415, which was associated with these USTs. However, DEQ listed the project site as DEQ Environmental Cleanup Site Information (ECSI) No. 1430 due to detections of oil in the undocumented fill material.

K&S Environmental, Inc. (K&S) conducted a Phase I Environmental Site Assessment (ESA) at the project site and Tax Lot 700 in December 2018. The Phase I ESA identified in-ground hydraulic hoists and catch basins located in the project site structure as a recognized environmental condition (REC) at the project site. The Phase I ESA also identified the aforementioned open ECSI file as a REC at the project site.

Subsequently, K&S conducted a subsurface investigation by advancing four borings (shown on Figure 1) at the project site to evaluate potential impacts to the subsurface from the hydraulic hoists and catch basins. The maximum detected concentrations of diesel- and oil-range hydrocarbons, tetrachloroethene (PCE), and polychlorinated biphenyls (PCBs) were detected in boring B-3 (at approximately 7 feet below ground surface [BGS]) at concentrations of 25,800 mg/kg, 17,000 mg/kg, 10.3 mg/kg, and 0.109 mg/kg respectively.

The two in-ground hydraulic hoists formerly located inside the project site structure were removed in March 2019. A product sample collected of the hydraulic fluid indicated that PCBs were not detected at concentrations greater than the laboratory reporting limits. K&S observed the excavation of approximately 45.25 tons of impacted soil from the project site and disposed of it off site. Residual impacted soil was left in place because additional excavation would have resulted in undermining the building. A total of seven confirmation soil samples were collected from the limits of the excavation (shown on Figure 1). The maximum detected concentrations of diesel-range hydrocarbons, PCE, and PCBs were detected in confirmation soil sample C3 at concentrations of 3,600 mg/kg, 3.42 mg/kg, and 0.0339 mg/kg, respectively. Groundwater was not encountered to the total depth explored of 14 feet BGS during the 2019 assessment activities and potential impacts to groundwater have not been evaluated.

GeoDesign reviewed available building records for the project site at the City of Portland Development Services. A blueprint of the project site from 1973 confirms that the two catch basins located on the project site discharge to the municipal sanitary sewer and not to stormwater. Therefore, it appears that the catch basins do not provide a pathway to the Willamette River. The blueprint is presented in Attachment A.

SCOPE OF SERVICES

The purpose of the LSI is to further evaluate the extent of impacts to soil and evaluate if groundwater has been impacted at the project site to ultimately support an NFA determination from DEQ. It is our intent that the scope of services below will meet DEQ requirements to evaluate the magnitude and extent of impacts and no further investigation beyond that described in this work plan will be required to receive an NFA determination unless unanticipated impacts are encountered. This LSI will also attempt to locate a source of the contamination at the project site. The specific scope of services is discussed in the following sections.

SOIL AND GROUNDWATER ASSESSMENT

To evaluate potential impacts to soil and groundwater, GeoDesign proposes to advance up to 12 direct-push borings at the project site for the collection of soil and/or groundwater samples. The proposed boring locations are shown on Figure 2. However, the actual number and locations of borings may be modified in the field based on access or the presence of overhead or underground utilities or obstructions. The specific scope of services includes the following:

- Prepare a site-specific Health and Safety Plan.
- Contact Oregon's one-call Utility Notification Center to mark the location of public utilities beneath the project site.
- Subcontract a private utility locator to clear the proposed boring locations of utility conflicts prior to drilling.
- Subcontract a licensed driller to complete the borings using direct-push drilling methods.
- Advance 12 direct-push borings at the project site to a depth of 20 feet BGS, groundwater, or refusal, whichever is encountered first. The locations of the proposed boring locations are shown on Figure 2. The locations of proposed borings DP-1 through DP-8 were selected to evaluate the extent of residual contamination identified during the hydraulic hoist removal. The locations of proposed borings DP-9 through DP-12 were selected to evaluate if fill material identified during the 1991 PEMCO investigation is present beneath the project site.
- To the extent practical, soil samples will be screened continuously from each boring. Soil will be observed to document subsurface conditions and visual and/or olfactory indications of petroleum compounds or other impacts. The samples will be field screened with a 11.7-electronvolt (eV) photoionization detector (PID) to quantitatively estimate the presence of volatile organic compounds (VOCs) using the "headspace method."
- Collect and containerize up to two soil samples from each boring based on field screening results for potential chemical analysis. At least one soil sample will be collected from each boring for chemical analysis.
- Soil samples selected for chemical analysis will be placed in laboratory-prepared sample jars with Teflon™-lined lids and immediately placed in an ice chest and kept cool until delivery to the laboratory. The jars will be packed full to minimize headspace in the containers. Soil samples collected for VOC analyses will be collected in volatile organic analysis vials consistent with U.S. Environmental Protection Agency (EPA) Method 5035A preservation procedures for VOC sampling. Standard chain-of-custody (COC) procedures will be observed during transport of the samples to the laboratory.

- Groundwater samples will be collected from direct-push borings DP-1, DP-6, and DP-11 (locations shown on Figure 2). The groundwater samples will be collected by fitting with a temporary well (slotted PVC piping) in the direct-push borings.
- Grab groundwater samples will be collected using a peristaltic pump and dedicated high density polyethylene tubing. Prior to sampling, each well will be purged using a peristaltic pump and disposable polyethylene tubing to reduce turbidity. During purging, field parameters, including pH, conductivity, temperature, dissolved oxygen, oxidation/reduction potential, and turbidity, will be measured every three to five minutes. Purging will continue until field parameters have stabilized, as follows:
    - pH: ±0.1 unit
    - Conductivity: ±3 percent
    - Temperature: ±3 percent
    - Dissolved oxygen: ±10 percent (or three readings less than 0.5 milligrams per liter [mg/L])
    - Oxidation/reduction potential: ±10 millivolts
    - Turbidity: ±10 percent (or three readings less than 5 nephelometric turbidity units [NTUs])
- Soil cuttings, purge water, and decontamination water will be containerized in 55-gallon drums, labeled, and left on site pending analytical results.
- All explorations will be decommissioned using bentonite chips immediately upon the conclusion of field work for this assessment.

ANALYTICAL PROGRAM

Based on the suspected contaminants of concern at the project site, GeoDesign proposes analyzing soil and groundwater samples for the analytes discussed below.

Soil samples collected from borings DP-9 through DP-12 and any soil samples of suspect fill material identified during previous investigations will be submitted for analysis of the following:

- Gasoline-range hydrocarbons by Method NWTPH-Gx
- Diesel- and oil-range hydrocarbons by Method NWTPH-Dx
- Volatile petroleum hydrocarbons (VPH) by Method WA VPH
- Extractable Petroleum hydrocarbons (EPH) by Method WA EPH
- VOCs by EPA Method 5035A/8260C SIM
- Semi-volatile organic compounds (SVOCs) by EPA Method 8270D-SIM
- Priority 13 pollutant total metals by EPA Method 6020/200.8
- PCBs by EPA Method 8082

Soil samples collected from borings DP-1 through DP-8 will be submitted for the following analysis at a minimum (unless fill material is encountered):

- Gasoline-range hydrocarbons by Method NWTPH-Gx
- Diesel- and oil-range hydrocarbons by Method NWTPH-Dx
- VOCs by EPA Method 5035A/8260C SIM
- PCBs by EPA Method 8082

Based on field screening and preliminary chemical analytical results, soil samples collected from borings DP-1 through DP-8 will also be analyzed for one or more of the following:

- VPH by Method WA VPH
- EPH by Method WA EPH
- PAHs by Method EPA 8270D-SIM
- RCRA 8 total metals by EPA Method 6020

Groundwater samples will be submitted for analysis of the following:

- Gasoline-range hydrocarbons by Method NWTPH-Gx
- Diesel- and oil-range hydrocarbons by Method NWTPH-Dx
- VPH by Method WA VPH
- EPH by Method WA EPH
- VOCs by EPA Method 5035A/8260C SIM
- SVOCs by EPA Method 8270D-SIM
- Priority 13 pollutant metals by EPA Method 6020/200.8 (total and dissolved metals for groundwater)
- PCBs by EPA Method 8082

The achievable detection limits by Apex Laboratories, of Tigard, Oregon, for the compounds of concern in groundwater are presented in Attachment B. Groundwater analytes with reporting limits greater than the Portland Harbor Cleanup Values are presented in the table below.

Analyte	Reporting Limit (µg/L)	Cleanup Value (µg/L)
Arsenic	0.0500	0.018
Cadmium	0.200	0.091
Benzo(a)anthracene	0.00400	0.0012
Benzo(a)pyrene	0.00400	0.00012
Benzo(b)fluoranthene	0.00400	0.0012
Benzo(k)fluoranthene	0.00400	0.0013
Chrysene	0.00400	0.0013
Dibenzo(a,h)anthracene	0.00400	0.00012
Indeno(1,2,3-c,d)pyrene	0.00400	0.0012
TPH-Diesel (C10-C12 Aliphatic)	25.0	2.6

µg/L: micrograms per liter

Analytes with detect limits that exceed the cleanup values are also highlighted in the Attachment. If the samples need to be diluted during analysis, it is possible that additional analyte reporting limits will exceed cleanup values.

Trip blanks will also be analyzed for VOCs by EPA Method 5035A/8260C for coolers containing groundwater samples.

QUALITY OBJECTIVES AND CRITERIA

This section describes the field methodology for collecting and handling soil and groundwater samples for chemical analyses and QA/QC procedures. Elements include sample handling and custody requirements, analytical methods, quality assurance/quality control (QA/QC), instrument/equipment testing and frequency, inspection and maintenance, instrument calibration, supply inspection/acceptance, non-direct measurements, and data management.

SOIL SAMPLE FIELD SCREENING

Field screening procedures will be used to evaluate the potential presence and relative magnitude of soil impacts. Field screening is not planned in lieu of laboratory analysis. Field screening for the presence of metals and PCBs is not reliable with the proposed screening equipment; however, elevated total petroleum hydrocarbon (TPH), VOC, and PAH concentrations may be identified to help assist in soil sample selection. Field screening samples will be collected at the same time and location as the potential laboratory analytical samples.

Sheen Testing

Sheen testing will be performed by placing a small amount (typically a thumbnail size) of soil into a “sheen pan” containing a small amount of water. Typically, a black prospector’s pan is used; however, any dark-colored container is suitable. The presence of heavier-weight compounds (i.e., transformer oil) may create a colored sheen on the water surface. Sheen is categorized based on the brilliance and spreading. The categories for sheen are Slight, Moderate, and Heavy Sheen. Representative examples of each category are discussed as follows:

- **Slight Sheen:** Sheen is sparse and does not spread quickly. Often appears blotchy. Some naturally occurring biogenic compounds can yield blotchy, non-brilliant sheens.
- **Moderate Sheen:** Sheen is typically brilliant and spreads moderately quickly. Does not completely cover the water surface.
- **Heavy Sheen:** Sheen is brilliant and spreads very quickly, covering the water surface.

Headspace Vapor Testing

Headspace vapor testing is a field screening technique that incorporates the use of a PID to assess relative impacts to soil. A sample of the soil (approximately one handful or slightly less) is placed into a plastic bag. The plastic bag is sealed in a fashion that allows a significant amount of air into the bag, and the bag is shaken and/or allowed to sit for a period of time (typically a few minutes). The volatile component of soil contamination will escape the soil pores and enter the air space inside the bag. The tip of the PID is then inserted into the bag, and the instrument reading in units of parts per million (ppm) is recorded. PID readings of 10 ppm or greater typically indicate measurable quantities of volatile contaminants. This method of field screening is sensitive to temperature and humidity. At higher temperatures, VOCs will more readily dissociate from the soil and into the headspace, producing a higher PID reading. Similarly, colder temperatures will typically produce lower PID readings. For this project a 11.7-eV PID will be used.

Visual and Olfactory

Visual and olfactory field screening methods also will be employed during field work. These observations are typically recorded on field reports to convey general (non-quantitative) contamination observations.

- **Visual:** Contaminated soil is typically stained darker than adjacent, non-contaminated soil. Often a gray color is noted where petroleum impacts are significant. This is due to the reducing environment (low oxygen content) typically associated with contamination.
- **Olfactory (Odor):** Contaminated soil, sediment, and water will often yield an odor. The field sampler should NOT make it common practice to repeatedly smell pieces of contaminated material. This increases the frequency and magnitude of exposure to potentially harmful chemicals.

SOIL SAMPLING PROCEDURES

A direct-push drill rig (e.g., Geoprobe®) is a hydraulically powered probing device. A direct-push rig typically consists of a powered percussion hammer that is slide-mounted on a derrick and has a 4.5-foot stroke. The derrick assembly hydraulically folds and unfolds from the traveling or storage position in the rear portion of a truck- or track-mounted vehicle. The derrick can be adjusted to ensure it is vertical. The direct-push rig uses the weight of the vehicle and a hydraulically powered percussion hammer to advance 3- to 5-foot-long rods into the ground. The drill rods vary in thickness but can have an inside diameter of 1.5 to 3.0 inches and an outside diameter of 2.0 to 3.5 inches. A direct-push drill rig is capable of collecting discrete subsurface soil samples with a special soil sampling probe that is screwed onto the end of the lead rod. The sampler consists of the sample tube, cutting shoe, piston tip and piston rod, drive head, and a piston stop pin. A 5-foot-long, acrylic liner fits inside the sample tube, allowing the collection of a 5-foot-long continuous soil sample. The driller retrieves the acrylic liner from the sampler and splits the liner so the soil contents can be examined, field screened, and retained in containers for laboratory analysis.

The following procedures will be performed to collect subsurface soil samples. Disposable nitrile gloves will be worn and changed between sampling.

- Spread the acrylic liner to expose the soil core.
- Log the soil core to document lithological conditions encountered. Conduct field screening at applicable sections of the soil core to identify the most impacted portion(s) of the core to collect for laboratory analysis.
- Immediately transfer a sample from the selected part of the soil core to labeled, laboratory-prepared sample containers. If field screening results for an individual core are consistent, and do not exhibit elevated readings, technical staff will use discretion on the sampled interval.
- Place soil samples into sample containers in the order of volatility. For example, VOC samples first; TPH organics second; followed by PAH, PCB, and metals last.

- For VOC analysis, collect a representative, undisturbed portion from the interior of the core and containerize/preserve in accordance with EPA Method 5035A. Place samples collected for other analyses into 4- and/or 8-ounce, glass jars with Teflon™-lined lids. Attempt to completely fill the jars so that minimum headspace remains in the sample jar. Avoid sample disturbance to minimize volatilization of chemicals.
- After collecting a sufficient volume of sample for the particular analysis, place the labeled sample jars in an iced cooler for temporary storage. The samples will be immediately preserved according to proper packaging and storage procedures. Unless specified otherwise, the samples should be cooled to 4 ±2 degrees Celsius and maintained at that temperature throughout delivery to the laboratory until the samples are analyzed.
- Use a field notebook and boring log to record a description of the soil type comprising the core, the percent recovery, the depth of the core and sample retained for analysis, the time the sample was collected, and results of field screening analysis. Record the soil sample on the soil sample form and COC. Classify soil in accordance with Unified Soil Classification System methodology.
- Decontaminate re-usable equipment between samples according to the procedures discussed in this Work Plan.

GROUNDWATER SAMPLING PROCEDURES (GRAB SAMPLES)

Groundwater samples will be collected from a subset of explorations. Grab groundwater samples will be collected from direct-push borings using temporary Schedule 40 PVC wells, new polyethylene and silicone tubing, and a peristaltic pump. The temporary well is installed by advancing a 10-foot PVC screen connected to an appropriate amount of blank PVC into the open borehole. Prior to sampling, each temporary well will be purged using a peristaltic pump and disposable polyethylene tubing to reduce turbidity. Purging will continue until field parameters have stabilized, as follows:

- pH: ±0.1 unit
- Conductivity: ±3 percent
- Temperature: ±3 percent
- Dissolved oxygen: ±10 percent (or three readings less than 0.5 mg/L)
- Oxidation/reduction potential: ±10 millivolts
- Turbidity: ±10 percent (or three readings less than 5 NTUs)

Groundwater present in the borehole is pumped through the screen and into the sample containers. If sufficient recharge is encountered, additional purging may be conducted in an effort to reduce turbidity in the sample. If groundwater conditions are characterized by slow recharge (requiring several purging attempts to fill sample containers), the drill stem may be temporarily left in the ground and/or temporary piezometers may be placed within the borehole. If temporary piezometers are required, they will be constructed by placing a decontaminated, ¾-inch-diameter PVC casing and a 5-foot-long screen assembly (0.01-inch slot) within the bottom portion of the sampling interval.

Groundwater samples will be transferred into laboratory-prepared sample containers and kept cool during transport to the testing laboratory. As applicable, the sample containers will be filled completely to eliminate headspace in the containers. COC procedures will be observed during transport of the groundwater samples to the testing laboratory.

DECONTAMINATION PROCEDURES

All sampling equipment used in the collection of samples will be decontaminated prior to being taken into the field. Proper decontamination procedures are critical to the collection of representative environmental samples.

Decontamination will be performed on all sample re-usable processing equipment that comes into contact with sampling media, including tools, stainless steel implements, water level indicators, trowels, etc. Decontamination will be performed between each sampling location.

Sample processing equipment will be decontaminated prior to sampling each location using the following procedures:

1. Rinse with tap water and scrub with a scrub brush until free of large particles (e.g., sediment or soil)
2. Wash with phosphate-free detergent solution
3. Rinse with tap water
4. Rinse with distilled water

Any equipment that cannot be cleaned in a satisfactory manner will not be used for further sampling activities.

SAMPLE HANDLING AND CUSTODY

This section describes how individual samples will be processed, labeled, tracked, stored, and transported to the laboratory for analysis. In addition, this section describes sample custody procedures. Sample possession and handling must be traceable from the time of sample collection, through laboratory and data analyses, to delivery of the sample results to the recipient.

Containers

Samples for chemical analyses will be placed in laboratory-prepared, labeled containers appropriate for the sample media and individual analyses requested. Each container will be placed in a cooler with ice.

A completed sample label will be affixed to each sample container at the time of sample collection. Sample labels will be waterproof and self-adhering and will contain the project number, project name, sample I.D., chemical preservation (if any), date and time of collection, and initials of the person(s) preparing the sample. At the laboratory, a unique sample identifier will be assigned to each sample (using either project I.D. or laboratory I.D.).

Storage

All samples will be stored on ice at approximately 4 ±2 degrees Celsius in sturdy, durable coolers in the field prior to delivery to the laboratory.

Custody Procedures

Samples are considered to be in custody if they are (1) in the custodian's possession or view, (2) retained in a secured place (under lock) with restricted access, or (3) placed in a container and secured with an official seal(s) such that the sample cannot be reached without breaking the seal(s). Custody procedures will be used for all samples throughout collection, transport, and analyses.

Custody procedures will be initiated during sample collection. A COC form will accompany the samples between the time of collection to the time of analyses. Each person who has custody of the samples will sign the COC form and ensure that the samples are not left unattended unless properly secured. Minimum documentation of sample handling and custody will include the following:

- Sample location, project name, and unique I.D. number
- Sample collection date and time
- Any special notations on sample characteristics or anomalies
- Initials of the person who collected the sample
- Date sample was sent to the analytical laboratory

The sampler will be responsible for all tracking and custody procedures for samples in the field. The GeoDesign project manager will be responsible for final sample inventory and will maintain custody documentation. The field sampler will also complete COC forms prior to transferring samples to the field processing area or to the analytical laboratory. At the end of each day, and prior to transfer, COC entries will be made for all samples. Information on the labels will be checked against sample log entries, and sample tracking forms and samples will be checked. COC forms will accompany all samples. The COC forms will be signed at each point of transfer. Copies of all COC forms will be retained and included as appendices to subsequent project reports. Samples will be hand-delivered to the analytical laboratory. The field sampler or GeoDesign project manager will confirm that the laboratory has accepted delivery of the shipment at the specified time.

The laboratory will confirm that COC forms are properly signed upon receipt of the samples and will note questions or observations concerning sample integrity on the COC forms or other sample receiving paperwork. The laboratory will contact the field sampler and/or GeoDesign project manager immediately if discrepancies are discovered between the COC forms, sample labels, and/or the sample shipment upon receipt. The laboratory will track each sample through all stages of laboratory processing using a sample tracking record. The sample tracking record must contain, at a minimum, the name/initials of individuals responsible for performing the analyses, dates of sample extraction/preparation and analysis, and the types of analyses being performed.

INSTRUMENT TESTING, INSPECTION, AND MAINTENANCE

Prior to each field event, measures will be taken to test, inspect, and maintain all field equipment. All equipment used, including the PID, water level meters, and other required equipment, will be tested for use before leaving for the field event.

Field personnel will be responsible for overseeing the testing, inspection, and maintenance of all field equipment. The laboratory project manager will be responsible for ensuring that laboratory equipment testing, inspection, and maintenance requirements are met. The methods used in calibrating the analytical instrumentation are described in the following section.

INSTRUMENT CALIBRATION AND FREQUENCY

Multipoint initial calibration will be performed by the laboratory on each analytical instrument at the start of the project, after each major interruption to the instrument, and when any continuing calibration does not meet the specified criteria. The number of points used in the initial calibration is defined in each analytical method.

Calibration of analytical equipment used for chemical analyses includes instrument blanks or continuing calibration blanks, which provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed immediately after the continuing calibration verification at a frequency of one blank for every 10 samples analyzed for inorganic analyses and one blank for every 12 hours or 10 to 20 samples for organic analyses. If the continuing calibration does not meet the specified criteria, the analysis must stop. Analysis may resume after corrective actions have been taken to meet the method specifications. All project samples analyzed by an instrument found to be out of compliance must be re-analyzed.

In the field, the following equipment will be calibrated:

- The PID will be calibrated each morning before use in the field in accordance with the manufacturer's instructions. This includes using a known concentration of laboratory-grade calibration gas, typically a cylinder of gas with a concentration of 100 ppm, to calibrate the instrument. Periodically throughout the day the PID accuracy will be checked using the calibration gas; readings should be within 10 percent (+ or -) of the concentration. If not, the PID will be re-calibrated in the field until the instrument reads the correct concentration of the calibrated gas. The daily calibration procedure will be recorded in the field log.

SUPPLIES AND CONSUMABLES

Field personnel for each sampling event will have a checklist of supplies required for each day in the field. Field personnel will gather and check these supplies daily for satisfactory conditions before each field event. Supplies and consumables for field sampling will be inspected upon delivery and accepted if the condition of the supplies is satisfactory. For example, sample containers and summa canister fittings will be inspected to help ensure that they are the correct size and quantity and were not damaged in shipment.

DOCUMENTATION AND RECORDS

The following sections describe documentation and records needed for field observations and laboratory analyses.

Field Objectives

Field activities will be recorded by GeoDesign personnel. Daily field reports will provide a description of all sampling activities, correspondence associated with field sampling activities, sampling personnel, and weather conditions, plus a record of all modifications to the procedures and plans identified in this Work Plan. Field reports are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the sampling period.

The following forms will also be used to record pertinent information after sample collection:

- Field report
- Exploration Key and Soil Classification System
- Boring/Geoprobe® log
- Groundwater sampling form
- Sub-slab vapor sampling form

Laboratory Reports

Laboratory record requirements for chemistry data are described below. The analytical laboratory to be used for this assessment (Pace Analytical) is accredited by the Oregon Environmental Laboratory Accreditation Program to conduct the chemical analyses specified for this project.

The laboratory will be responsible for performing internal QA audits on sample receiving procedures, sample tracking and handling, analyses, and analytical data review and reporting. The laboratory must implement corrective action procedures to remedy and prevent re-occurrences of any deficiencies identified during these internal QA reviews and/or audits performed by third parties. Corrective action reports relating specifically to this project should be submitted immediately to the GeoDesign project manager.

The laboratory will provide a data deliverable package that includes electronic forms and hard copies as requested. The data deliverable package must include the following elements:

- **Case narrative:** This summary, in the form of a cover letter, must present any problems encountered during any aspect of sample receipt or analysis. The summary will include, but not be limited to, a discussion of QC, sample shipment, sample storage, and analytical difficulties. Any problems encountered by the laboratory and their resolutions will be documented in the case narrative.
- **Sample receiving and handling records:** Legible copies of the completed COC forms and any other laboratory sample receiving records must be provided in the data package. This documentation will include the date and time of sample receipt, the condition of the samples as received by the laboratory with clear descriptions of any anomalies (e.g., broken or leaking sample containers), and the temperature of the cooler(s) upon receipt as measured by infrared devices or temperature blanks. Internal tracking of the samples throughout the laboratory should also be documented and available if requested (i.e., internal custody records do not need to be part of the standard deliverable package). The temperatures of all refrigerators and freezers used for storing samples must be recorded daily and be within

laboratory specifications. These records must be made available upon request, although they do not need to be included in the standard data deliverable package.

- **Sample results:** The data package will summarize the results for each sample analyzed. The summary will include the following information, when applicable:
    - Field sample I.D. name and the corresponding laboratory I.D. code
    - Sample matrix
    - Date of sample extraction or digestion
    - Date and time of analysis
    - Weight and/or volume of sample or extract used for analysis
    - Dilution or concentration factors for the sample analysis
    - Percent solids (for analyses with results expressed in dry weight)
    - Instrument I.D. used for analysis
    - Reporting limits adjusted for sample volumes, dilutions, and/or percent solids (associated method detection limits must be available in the electronic data deliverable, if requested)
    - All data qualifiers and their definitions
- **QA/QC summaries:** These summaries will contain the results of all QA/QC samples and calibrations. Each QA/QC sample analysis will be documented with the same information required for the sample results (see above, as applicable).

REPORTING ACTIVITIES

GeoDesign will summarize the results from the limited subsurface investigation in a report following receipt of the laboratory analyses. The report will include the following:

- A description of project site conditions and field and sample collection activities and methods.
- A site plan depicting all sample locations.
- Tabulated chemical analytical data.
- A Conceptual Site Model
- A discussion of the chemical analytical data. Soil and groundwater data will be compared to the applicable DEQ RBCs for occupational and excavation/construction worker receptors. As requested by DEQ, soil and groundwater data collected during this LSI will also be compared to the Portland Harbor Record of Decision Cleanup Levels (Table 17). Based on the findings, recommendations for further assessment or other activities will be provided as appropriate.
- Supporting information, including laboratory analytical reports and COC documents.

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We appreciate the opportunity to submit this Work Plan. Please do not hesitate to contact us if you have questions or require any additional information.

Sincerely,

GeoDesign, Inc.

Kyle Haggart, G.I.T.
Environmental Staff

L R Yandell

Lon R. Yandell, R.G.
Principal Geologist

LON R. YANDELL
G1655

Expires 06/01/2020

cc: Rob Hood, Oregon Department of Environmental Quality
David Lacey, Oregon Department of Environmental Quality (via email only)

KTH:LRY:kt

Attachments

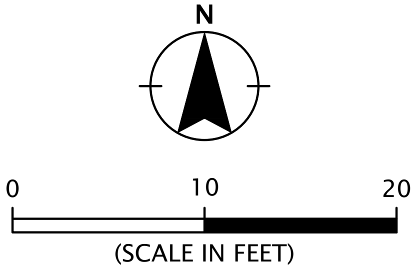
One copy submitted (via email only)

Document ID: BCSAmerica-1-01-02-081919-envwp.docx

FIGURES

LEGEND:

B-1 ◕ BORING (PEMCO, 1991)
B-1 • BORING (K&S ENVIRONMENTAL, 2019)
C-1 ▣ CONFIRMATION SOIL SAMPLE (K&S ENVIRONMENTAL, 2019)
🟨 UST REMEDIAL EXCAVATION (1991)
🟩 HYDRAULIC HOIST REMEDIAL EXCAVATION (2019)
CB CATCH BASIN
— — — PROJECT SITE BOUNDARY



SITE PLAN BASED ON AERIAL PHOTOGRAPH
OBTAINED FROM GOOGLE EARTH PRO®,
JUNE 10, 2019

FIGURE 1

PREVIOUS INVESTIGATIONS

FORMER AUTOMATIC VENDING COMPANY
PORTLAND, OR

BCSAMERICA-1-01-02

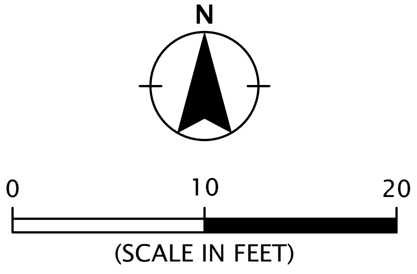
AUGUST 2019

GEODESIGN
9450 SW Commerce Circle - Suite 300
Wilsonville OR 97070
503.968.8787 www.geodesigninc.com

Printed By: mmiller | Print Date: 8/19/2019 12:15:16 PM
File Name: J:\A-D\BCSAmerica\BCSAmerica-1\BCSAmerica-1-01\BCSAmerica-1-01-02-LSI\Figures\CAD\BCSAmerica-1-01-02-LSI-SP01.dwg | Layout: FIGURE 1

LEGEND:

DP-1 ⊕	PROPOSED DIRECT-PUSH BORING
DP-6 ◎	PROPOSED DIRECT-PUSH BORING WITH GROUNDWATER SAMPLE
🟨	UST REMEDIAL EXCAVATION (1991)
🟩	HYDRAULIC HOIST REMEDIAL EXCAVATION (2019)
CB	CATCH BASIN
— - - —	PROJECT SITE BOUNDARY



SITE PLAN BASED ON AERIAL PHOTOGRAPH
OBTAINED FROM GOOGLE EARTH PRO®,
JUNE 10, 2019

FIGURE 2

PROPOSED BORINGS

FORMER AUTOMATIC VENDING COMPANY
PORTLAND, OR

BCSAMERICA-1-01-02

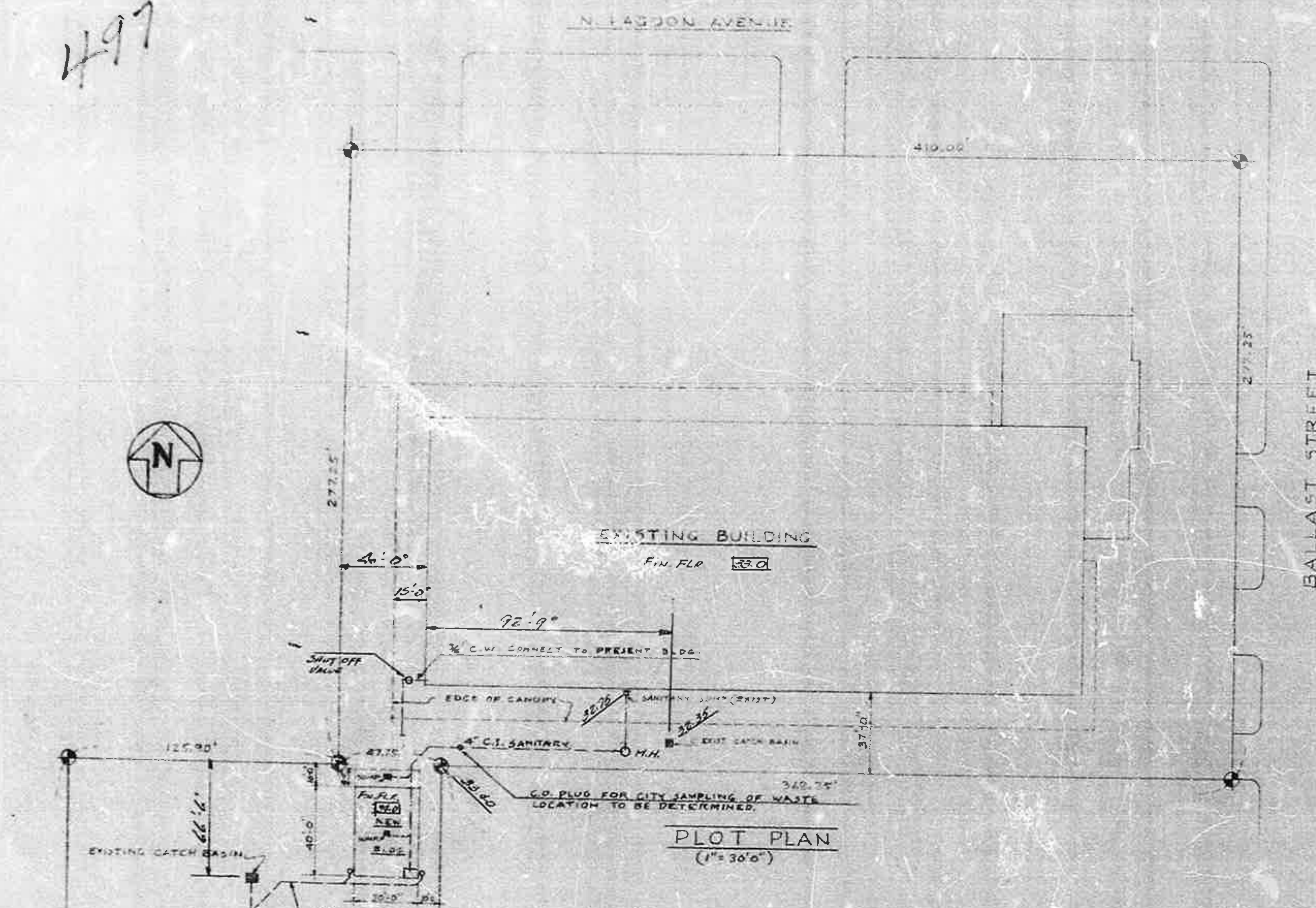
AUGUST 2019

GEODESIGN INC
9450 SW Commerce Circle - Suite 300
Wilsonville OR 97070
503.968.8787 www.geodesigninc.com

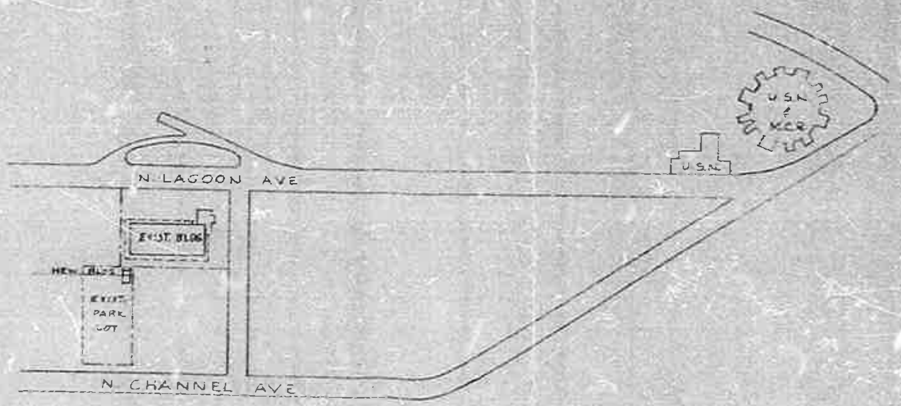
Printed By: mmiller | Print Date: 8/19/2019 12:15:17 PM
File Name: J:\A-D\BCSAmerica\BCSAmerica-1\BCSAmerica-1-01\BCSAmerica-1-01-02-LSI\Figures\CAD\BCSAmerica-1-01-02-LSI-SP01.dwg | Layout: FIGURE 2

ATTACHMENT A

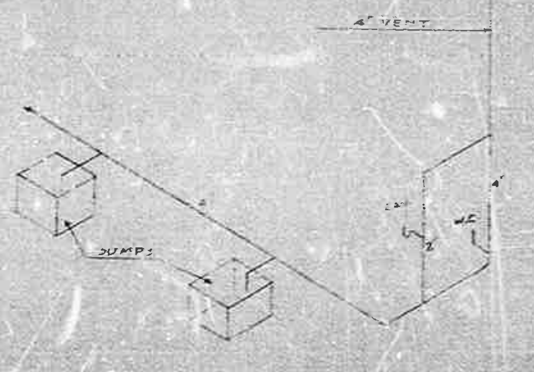
497



PLOT PLAN
(1"= 30'0")



VICINITY MAP
(NO SCALE)



ISOMETRIC OF SANITARY
(NO SCALE)

GENERAL NOTES

LOADS & WORKING STRESSES:–

ROOF LIVE LOAD	– 25 PSF.
WIND LOAD	– 20 PSF.
SOIL BEARING	– 1500 PSF.
CONCRETE (f_c)	– 2500 PSI.
STEEL REINF. (f_s)	– 20000 PSI.
STEEL FRAMING (f_y)	– 50000 PSI.
STEEL SHEETING (f_y)	– 33000 PSI.
WOOD BEAMS & POSTS	– 1450 f NO. 1
DECKING, STUDS & PLATES	– 1100 f NO. 2
HANDRAIL & POSTS	– 1450 f NO. 1

STEEL BUILDING TO BE AS MANUFACTURED BY CUSTOM ROLLED CORRUGATED METALS COMPANY.

ERECTION DETAILS AND STRESS ANALYSIS OF STEEL BUILDING TO BE FURNISHED BY MFR.

ALL WOOD PLATES IN CONTACT WITH CONCRETE TO BE PRESSURE TREATED WITH AN APPROVED PRESERVATIVE.

WOOD PLATES TO BE SECURED TO CONCRETE WITH ⅝" MACHINE BOLTS USING 2 BOLTS PER PIECE.

WOOD POSTS RESTING ON CONCRETE TO BE SEPARATED THEREFROM BY SHEET METAL OR ASPHALT ROOFING FELT AND HELD IN PLACE BY ⅝"ø x 6" STEEL PINS EXTENDING 3" INTO POST.

TOILET ROOM WALLS TO BE INSULATED WITH 2" THICK FIBERGLAS BLANKET INSULATION.

No increase in employees.

F-1 occupancy – Truck Service building
No painting, Motor Repair, or [illegible]

ACCEPTABLE
THIS PLAN HAS BEEN
REVIEWED AND MEETS
THE REQUIREMENTS OF
THE PORT OF PORTLAND
EXCEPTIONS ARE NOTED
BY [illegible] DATE 2/23/73

TRUCK SERVICE BUILDING
FOR
CANTEEN COMPANY OF OREGON
SWAN ISLAND – PORTLAND, OREGON

LESLIE E. POOLE – CONSULTING ENGINEER
4606 S.W. 53RD AVENUE – PORTLAND, OREGON

JOB NO.	DATE:	DRAWN BY:	SHEET NO.
	1-26-73	P	1

ATTACHMENT B

Apex Laboratories

9/14/2018

Analytical Method Information

Ag (Silver) - 200.8 - Total in Water (EPA 200.8)

Method Header: Total Metals by EPA 200.8 (ICPMS)

Container: 250 mL Poly - Nitric (HNO3) **Preservation/Storage:** HNO3 to pH<2

Hold Time(s): Sampled to Analyzed: 180 days

Extraction Method: EPA 3015A

Prep Amounts: Initial Amt: 45.00 mL Final Amt: 50.00 mL Dilution: 1.00

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike		Blank Spike / LCS	
					%R	RPD	%R	RPD
Silver	0.100	0.200 ug/L		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike		Blank Spike / LCS	
					%R	RPD	%R	RPD
Arsenic	0.500	1.00 ug/L		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike		Blank Spike / LCS	
					%R	RPD	%R	RPD
Beryllium	0.100	0.200 ug/L		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike		Blank Spike / LCS	
					%R	RPD	%R	RPD
Cadmium	0.0400	0.200 ug/L		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike		Blank Spike / LCS	
					%R	RPD	%R	RPD
Chromium	0.400	1.00 ug/L		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike		Blank Spike / LCS	
					%R	RPD	%R	RPD
Copper	0.500	1.00 ug/L		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike		Blank Spike / LCS	
					%R	RPD	%R	RPD
Mercury	0.0400	0.0800 ug/L		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike		Blank Spike / LCS	
					%R	RPD	%R	RPD

Reviewed By: ______________________________ Date: ___/_____/_____

Ni (Nickel) - 200.8 - Total in Water (EPA 200.8)

Method Header: Total Metals by EPA 200.8 (ICPMS)

Container: 250 mL Poly - Nitric (HNO3) **Preservation/Storage:** HNO3 to pH<2

Hold Time(s): Sampled to Analyzed: 180 days

Extraction Method: EPA 3015A

Prep Amounts: Initial Amt: 45.00 mL Final Amt: 50.00 mL Dilution: 1.00

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Nickel	0.500	1.00 ug/L		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Lead	0.100	0.200 ug/L		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Antimony	0.500	1.00 ug/L		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Selenium	0.500	1.00 ug/L		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Thallium	0.100	0.200 ug/L		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Zinc	2.00	4.00 ug/L		20	70 - 130	20	85 - 115	20

Cu (Copper) - 200.8 - Total in Solid (EPA 200.8)

Method Header: Inactive

Container: 8 oz Glass Jar **Preservation/Storage:** 0-6 degrees C

Hold Time(s): Sampled to Analyzed: 180 days

Extraction Method: EPA 3051A

Prep Amounts: Initial Amt: 0.50 g Final Amt: 50.00 mL Dilution: 10.00

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Copper	1.00	2.00 mg/kg		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Zinc	1.00	4.00 mg/kg		40	70 - 130	40	85 - 115	20

Ag (Silver) - 200.8 - Total in Liquid (EPA 200.8)

Method Header: Inactive

Container: 8 oz Glass Jar **Preservation/Storage:** 0-6 degrees C

Hold Time(s): Sampled to Analyzed: 180 days

Extraction Method: EPA 3051A

Prep Amounts: Initial Amt: 0.50 g Final Amt: 50.00 mL Dilution: 10.00

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Silver	0.100	1.00 mg/kg		40	70 - 130	40	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Arsenic	0.200	2.00 mg/kg		40	70 - 130	40	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Beryllium	0.200	1.00 mg/kg		40	70 - 130	40	85 - 115	40

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Cadmium	0.100	1.00 mg/kg		40	70 - 130	40	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Chromium	0.100	2.00 mg/kg		40	70 - 130	40	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Copper	1.00	2.00 mg/kg		20	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Mercury	0.0300	0.0800 mg/kg		40	70 - 130	20	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD

Ni (Nickel) - 200.8 - Total in Liquid (EPA 200.8)

Method Header: Inactive

Container: 8 oz Glass Jar **Preservation/Storage:** 0-6 degrees C

Hold Time(s): Sampled to Analyzed: 180 days

Extraction Method: EPA 3051A

Prep Amounts: Initial Amt: 0.50 g Final Amt: 50.00 mL Dilution: 10.00

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Nickel	0.200	2.00 mg/kg		40	70 - 130	40	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Lead	0.100	1.00 mg/kg		40	70 - 130	40	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Antimony	0.100	1.00 mg/kg		40	70 - 130	40	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Selenium	0.400	2.00 mg/kg		40	70 - 130	40	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Thallium	0.100	1.00 mg/kg		40	70 - 130	40	85 - 115	20

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Zinc	1.00	4.00 mg/kg		40	70 - 130	40	85 - 115	20

As (Arsenic) - 200.8 - ULTRA-LOW Total in Water (EPA 200.8)

Method Header: Total Metals by EPA 200.8 (ICPMS) - Low Level

Container: 250 mL Poly - Nitric (HNO3) **Preservation/Storage:** HNO3 to pH<2

Hold Time(s): Sampled to Analyzed: 180 day:

Extraction Method: EPA 3015A

Prep Amounts: Initial Amt: 45.00 mL Final Amt: 50.00 mL Dilution: 1.00

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Arsenic	0.0350	0.0500 ug/L		20	70 - 130	20	85 - 115	20

Reviewed By: ____________________ Date: ___/_____/_____

Apex Laboratories

Analytical Method Information

9/13/2018

8270 SIM PAH (1-2mL FV) in Water (EPA 8270D (SIM))

Method Header: Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Container: 1 L Amber Glass - Non Preserved **Preservation/Storage:** 0-6 degrees C

Hold Time(s): Sampled to Prepared: 7 days | Prepared to Analyzed: 40 days

Extraction Method: EPA 3510C (Acid Extraction)

Prep Amounts: Initial Amt: 1,000.00 mL Final Amt: 1.00 mL Dilution: 1.00

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Acenaphthene	0.0100	0.0200 ug/L		30	47 - 122	30	47 - 122	30
Acenaphthylene	0.0100	0.0200 ug/L		30	41 - 130	30	41 - 130	30
Anthracene	0.0100	0.0200 ug/L		30	57 - 123	30	57 - 123	30
Benz(a)anthracene	0.0100	0.0200 ug/L		30	58 - 125	30	58 - 125	30
Benzo(a)pyrene	0.0100	0.0200 ug/L		30	54 - 128	30	54 - 128	30
Benzo(b)fluoranthene	0.0100	0.0200 ug/L		30	53 - 131	30	53 - 131	30
Benzo(k)fluoranthene	0.0100	0.0200 ug/L		30	57 - 129	30	57 - 129	30
Benzo(g,h,i)perylene	0.0100	0.0200 ug/L		30	50 - 134	30	50 - 134	30
Chrysene	0.0100	0.0200 ug/L		30	59 - 123	30	59 - 123	30
Dibenz(a,h)anthracene	0.0100	0.0200 ug/L		30	51 - 134	30	51 - 134	30
Dibenzofuran	0.0100	0.0200 ug/L		30	53 - 120	30	53 - 120	30
Fluoranthene	0.0100	0.0200 ug/L		30	57 - 128	30	57 - 128	30
Fluorene	0.0100	0.0200 ug/L		30	52 - 124	30	52 - 124	30
Indeno(1,2,3-cd)pyrene	0.0100	0.0200 ug/L		30	52 - 133	30	52 - 133	30
1-Methylnaphthalene	0.0200	0.0400 ug/L		30	41 - 120	30	41 - 120	30
2-Methylnaphthalene	0.0200	0.0400 ug/L		30	40 - 121	30	40 - 121	30
Naphthalene	0.0200	0.0400 ug/L		30	40 - 121	30	40 - 121	30
Phenanthrene	0.0100	0.0200 ug/L		30	59 - 120	30	59 - 120	30
Pyrene	0.0100	0.0200 ug/L		30	57 - 126	30	57 - 126	30
surr: 2-Fluorobiphenyl (Surr)			44 - 120					
surr: p-Terphenyl-d14 (Surr)			50 - 133					

Reviewed By: ____________________ Date: ___/____/____

Apex Laboratories

9/13/2018

Analytical Method Information

8270D ULL PAH (Scan) in Water (EPA 8270D LVI)

Method Header: Polyaromatic Hydrocarbons (PAHs) by EPA 8270D (Large Volume Injection)

Container: 1 L Amber Glass - Non Preserved **Preservation/Storage:** 0-6 degrees C

Hold Time(s): Sampled to Prepared: 7 days | Prepared to Analyzed: 40 days

Extraction Method: EPA 3511 (Bottle Extraction)

Prep Amounts: Initial Amt: 1,000.00 mL Final Amt: 2.00 mL Dilution: 1.00

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Acenaphthene	0.00200	0.00400 ug/L		30	47 - 122	30	47 - 122	30
Acenaphthylene	0.00500	0.0100 ug/L		30	41 - 130	30	41 - 130	30
Anthracene	0.00500	0.0100 ug/L		30	57 - 123	30	57 - 123	30
Benz(a)anthracene	0.00200	0.00400 ug/L		30	58 - 125	30	58 - 125	30
Benzo(a)pyrene	0.00200	0.00400 ug/L		30	54 - 128	30	54 - 128	30
Benzo(b)fluoranthene	0.00200	0.00400 ug/L		30	53 - 131	30	53 - 131	30
Benzo(k)fluoranthene	0.00200	0.00400 ug/L		30	57 - 129	30	57 - 129	30
Benzo(g,h,i)perylene	0.00200	0.00400 ug/L		30	50 - 134	30	50 - 134	30
Chrysene	0.00200	0.00400 ug/L		30	59 - 123	30	59 - 123	30
Dibenz(a,h)anthracene	0.00200	0.00400 ug/L		30	51 - 134	30	51 - 134	30
Fluoranthene	0.0100	0.0200 ug/L		30	57 - 128	30	57 - 128	30
Fluorene	0.00200	0.00400 ug/L		30	52 - 124	30	52 - 124	30
Indeno(1,2,3-cd)pyrene	0.00200	0.00400 ug/L		30	52 - 133	30	52 - 133	30
1-Methylnaphthalene	0.0100	0.0200 ug/L		30	41 - 120	30	41 - 120	30
2-Methylnaphthalene	0.0100	0.0200 ug/L		30	40 - 121	30	40 - 121	30
Naphthalene	0.0100	0.0200 ug/L		30	40 - 121	30	40 - 121	30
Phenanthrene	0.00500	0.0100 ug/L		30	59 - 120	30	59 - 120	30
Pyrene	0.00500	0.0100 ug/L		30	57 - 126	30	57 - 126	30
surr: Acenaphthylene-d8 (Surr)			41 - 130					
surr: Benzo(a)pyrene-d12 (Surr)			54 - 128					

Reviewed By: ____________________

Date: ___/____/____

Apex Laboratories
Analytical Method Information

NWTPH-Dx (Diesel/Oil) in Water (NWTPH-Dx)

Method Header: Diesel and/or Oil Hydrocarbons by NWTPH-Dx

Container: 1 L Amber Glass - HCL **Preservation/Storage:** HCl to pH<2, 0-6 deg C

Hold Time(s): Sampled to Prepared: 14 days | Prepared to Analyzed: 40 days

Extraction Method: EPA 3510C (Fuels/Acid Ext.)

Prep Amounts: Initial Amt: 1,000.00 mL Final Amt: 5.00 mL Dilution: 1.00

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Diesel	0.100	0.200 mg/L		30	50 - 150	50	58 - 115	20
Oil	0.200	0.400 mg/L		30				
surr: o-Terphenyl (Surr)	0.0200		50 - 150					

Reviewed By: ______________________ Date: ___/_____/_____

NWTPH-Dx (Diesel/Oil) Low Level in Water (NWTPH-Dx)

Method Header: Diesel and/or Oil Hydrocarbons by NWTPH-Dx

Container: 1 L Amber Glass - HCL **Preservation/Storage:** HCl to pH<2, 0-6 deg C

Hold Time(s): Sampled to Prepared: 14 days | Prepared to Analyzed: 40 days

Extraction Method: EPA 3510C (Fuels/Acid Ext.)

Prep Amounts: Initial Amt: 1,000.00 mL Final Amt: 2.00 mL Dilution: 1.00

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Diesel	0.0400	0.0800 mg/L		30	50 - 150		52 - 120	20
Oil	0.0800	0.160 mg/L		30				
surr: o-Terphenyl (Surr)	0.00100		50 - 150					

Reviewed By: ____________________ Date: ___/_____/_____

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Printed: 9/20/2017

Analytical Method Information

Analyte	DL	LOD	LOQ / RL	Surrogate %R	Duplicate RPD	Matrix Spike		Blank Spike / LCS	
						%R	RPD	%R	RPD
WA VPH (WA VPH) in Water									
Preservation: HCl, pH <2									
Container: VOA Vial, Amber, 40 mL, HCL		**Minimum Sample Volume:** 120 mL			**Hold Time:** 14 days				
C5-C6 Aliphatics	25.0 ug/L	50.0 ug/L	50.0 ug/L			70 - 130	30	70 - 130	30
C6-C8 Aliphatics	25.0 ug/L	50.0 ug/L	50.0 ug/L			70 - 130	30	70 - 130	30
C8-C10 Aliphatics	25.0 ug/L	50.0 ug/L	50.0 ug/L			70 - 130	30	70 - 130	30
C10-C12 Aliphatics	25.0 ug/L	50.0 ug/L	50.0 ug/L			70 - 130	30	70 - 130	30
C8-C10 Aromatics	25.0 ug/L	50.0 ug/L	50.0 ug/L			70 - 130	30	70 - 130	30
C10-C12 Aromatics	25.0 ug/L	50.0 ug/L	50.0 ug/L			70 - 130	30	70 - 130	30
C12-C13 Aromatics	25.0 ug/L	50.0 ug/L	50.0 ug/L			70 - 130	30	70 - 130	30
Methyl tert-butyl Ether	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
Benzene	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
Toluene	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
Ethylbenzene	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
m,p-Xylene	5.00 ug/L	10.0 ug/L	10.0 ug/L			70 - 130	30	70 - 130	30
o-Xylene	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
1,2,3-Trimethylbenzene	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
Naphthalene	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
1-Methylnaphthalene	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
n-Pentane	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
n-Hexane	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
n-Octane	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
n-Decane	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
n-Dodecane	2.50 ug/L	5.00 ug/L	5.00 ug/L			70 - 130	30	70 - 130	30
surr: PID: 2,5-Dibromotoluene				60 - 140					
surr: FID: 2,5-Dibromotoluene				60 - 140					

Analytical Method Information

8260C Full List in Water (EPA 8260C)

Preservation: HCl to pH<2, 0-6 deg C

Container: 40 mL VOA - HCL **Amount Required:** 40 **Hold Time:** 14 days

Analyte	MDL	Reporting Limit	Surrogate %Rec	Duplicate RPD	----Matrix Spike----		--Blank Spike / LCS--	
					%Rec	RPD	%Rec	RPD
Acetone	10.0	20.0 ug/L		30	39-160	30	80-120	30
Acrylonitrile	1.00	2.00 ug/L		30	63-135	30	80-120	30
Benzene	0.100	0.200 ug/L		30	79-120	30	80-120	30
Bromobenzene	0.250	0.500 ug/L		30	80-120	30	80-120	30
Bromochloromethane	0.500	1.00 ug/L		30	78-123	30	80-120	30
Bromodichloromethane	0.500	1.00 ug/L		30	79-125	30	80-120	30
Bromoform	0.500	1.00 ug/L		30	66-130	30	80-120	30
Bromomethane	5.00	5.00 ug/L		30	53-141	30	80-120	30
2-Butanone (MEK)	5.00	10.0 ug/L		30	56-143	30	80-120	30
n-Butylbenzene	0.500	1.00 ug/L		30	75-128	30	80-120	30
sec-Butylbenzene	0.500	1.00 ug/L		30	77-126	30	80-120	30
tert-Butylbenzene	0.500	1.00 ug/L		30	78-124	30	80-120	30
Carbon disulfide	5.00	10.0 ug/L		30	64-133	30	80-120	30
Carbon tetrachloride	0.500	1.00 ug/L		30	72-136	30	80-120	30
Chlorobenzene	0.250	0.500 ug/L		30	80-120	30	80-120	30
Chloroethane	5.00	5.00 ug/L		30	60-138	30	80-120	30
Chloroform	0.500	1.00 ug/L		30	79-124	30	80-120	30
Chloromethane	2.50	5.00 ug/L		30	50-139	30	80-120	30
2-Chlorotoluene	0.500	1.00 ug/L		30	79-122	30	80-120	30
4-Chlorotoluene	0.500	1.00 ug/L		30	78-122	30	80-120	30
Dibromochloromethane	0.500	1.00 ug/L		30	74-126	30	80-120	30
1,2-Dibromo-3-chloropropane	2.50	5.00 ug/L		30	62-128	30	80-120	30
1,2-Dibromoethane (EDB)	0.250	0.500 ug/L		30	77-121	30	80-120	30
Dibromomethane	0.500	1.00 ug/L		30	79-123	30	80-120	30
1,2-Dichlorobenzene	0.250	0.500 ug/L		30	80-120	30	80-120	30
1,3-Dichlorobenzene	0.250	0.500 ug/L		30	80-120	30	80-120	30
1,4-Dichlorobenzene	0.250	0.500 ug/L		30	79-120	30	80-120	30
Dichlorodifluoromethane	0.500	1.00 ug/L		30	32-152	30	80-120	30
1,1-Dichloroethane	0.200	0.400 ug/L		30	77-125	30	80-120	30
1,2-Dichloroethane (EDC)	0.200	0.400 ug/L		30	73-128	30	80-120	30
1,1-Dichloroethene	0.200	0.400 ug/L		30	71-131	30	80-120	30
cis-1,2-Dichloroethene	0.200	0.400 ug/L		30	78-123	30	80-120	30
trans-1,2-Dichloroethene	0.200	0.400 ug/L		30	75-124	30	80-120	30
1,2-Dichloropropane	0.250	0.500 ug/L		30	78-122	30	80-120	30
1,3-Dichloropropane	0.500	1.00 ug/L		30	80-120	30	80-120	30
2,2-Dichloropropane	0.500	1.00 ug/L		30	60-139	30	80-120	30
1,1-Dichloropropene	0.500	1.00 ug/L		30	79-125	30	80-120	30
cis-1,3-Dichloropropene	0.500	1.00 ug/L		30	75-124	30	80-120	30
trans-1,3-Dichloropropene	0.500	1.00 ug/L		30	73-127	30	80-120	30
Ethylbenzene	0.250	0.500 ug/L		30	79-121	30	80-120	30
Hexachlorobutadiene	2.50	5.00 ug/L		30	66-134	30	80-120	30
n-Hexane	5.00	10.0 ug/L		30	48-143	30	80-120	30
2-Hexanone	5.00	10.0 ug/L		30	57-139	30	80-120	30
Isopropylbenzene	0.500	1.00 ug/L		30	72-131	30	80-120	30
4-Isopropyltoluene	0.500	1.00 ug/L		30	77-127	30	80-120	30
Methylene chloride	1.50	3.00 ug/L		30	74-124	30	80-120	30
4-Methyl-2-pentanone (MiBK)	5.00	10.0 ug/L		30	67-130	30	80-120	30
Methyl tert-butyl ether (MTBE)	0.500	1.00 ug/L		30	71-124	30	80-120	30
Naphthalene	1.00	2.00 ug/L		30	61-128	30	80-120	30
n-Propylbenzene	0.250	0.500 ug/L		30	76-126	30	80-120	30
Styrene	0.500	1.00 ug/L		30	78-123	30	80-120	30
1,1,1,2-Tetrachloroethane	0.200	0.400 ug/L		30	78-124	30	80-120	30
1,1,2,2-Tetrachloroethane	0.250	0.500 ug/L		30	71-121	30	80-120	30
Tetrachloroethene (PCE)	0.200	0.400 ug/L		30	74-129	30	80-120	30

Analytical Method Information

(Continued)

8260C Full List in Water (EPA 8260C) (Continued)

Analyte	MDL	Reporting Limit	Surrogate %Rec	Duplicate RPD	----Matrix Spike---- %Rec	RPD	--Blank Spike / LCS-- %Rec	RPD
Tetrahydrofuran	5.00	10.0 ug/L		30	57-133	30	80-120	30
Toluene	0.500	1.00 ug/L		30	80-121	30	80-120	30
1,2,3-Trichlorobenzene	1.00	2.00 ug/L		30	69-129	30	80-120	30
1,2,4-Trichlorobenzene	1.00	2.00 ug/L		30	69-130	30	80-120	30
1,1,1-Trichloroethane	0.200	0.400 ug/L		30	74-131	30	80-120	30
1,1,2-Trichloroethane	0.250	0.500 ug/L		30	80-120	30	80-120	30
Trichloroethene (TCE)	0.200	0.400 ug/L		30	79-123	30	80-120	30
Trichlorofluoromethane	1.00	2.00 ug/L		30	65-141	30	80-120	30
1,2,3-Trichloropropane	0.500	1.00 ug/L		30	73-122	30	80-120	30
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	1.00	2.00 ug/L		30	70-136	30	80-120	30
1,2,4-Trimethylbenzene	0.500	1.00 ug/L		30	76-124	30	80-120	30
1,3,5-Trimethylbenzene	0.500	1.00 ug/L		30	75-124	30	80-120	30
Isobutyl alcohol	250	250 ug/L		30	70-130	30	70-130	30
Vinyl chloride	0.200	0.400 ug/L		30	58-137	30	80-120	30
m,p-Xylene	0.500	1.00 ug/L		30	80-121	30	80-120	30
o-Xylene	0.250	0.500 ug/L		30	78-122	30	80-120	30
Xylenes, total	0.750	1.50 ug/L		30	79-121	30	80-120	30
trans-1,4-Dichloro-2-butene	5.00	10.0 ug/L		30	70-130	30	70-130	30
Surr: 1,4-Difluorobenzene (Surr)			80-120					
Surr: Toluene-d8 (Surr)			80-120					
Surr: 4-Bromofluorobenzene (Surr)			80-120					
Pentafluorobenzene (ISTD)								
Chlorobenzene-d5 (ISTD)								
1,4-Dichlorobenzene-d4 (ISTD)								

Analytical Method Information

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8260C SIM LL Vols in Water (EPA 8260C SIM)

Preservation: HCl to pH<2, 0-6 deg C

Container: 40 mL VOA - HCL **Amount Required:** 40 **Hold Time:** 14 days

Analyte	MDL	Reporting Limit	Surrogate %Rec	Duplicate RPD	----Matrix Spike---- %Rec	RPD	--Blank Spike / LCS-- %Rec	RPD
Benzene	0.0500	0.100 ug/L		30	79-120	30	80-120	30
Toluene	0.0500	0.100 ug/L		30	80-121	30	80-120	30
Ethylbenzene	0.0500	0.100 ug/L		30	79-121	30	80-120	30
m,p-Xylene	0.100	0.200 ug/L		30	80-121	30	80-120	30
o-Xylene	0.0500	0.100 ug/L		30	78-122	30	80-120	30
1,2,4-Trimethylbenzene	0.0500	0.100 ug/L		30	76-124	30	80-120	30
1,3,5-Trimethylbenzene	0.0500	0.100 ug/L		30	75-124	30	80-120	30
Carbon disulfide	0.0500	0.100 ug/L		30	64-133	30	80-120	30
Chloroform	0.0500	0.100 ug/L		30	79-124	30	80-120	30
Chloromethane	0.500	1.00 ug/L		30	50-139	30	80-120	30
1,2-Dibromo-3-chloropropane	0.100	0.200 ug/L		30	62-128	30	80-120	30
1,2-Dibromoethane (EDB)	0.0100	0.0200 ug/L		30	77-121	30	80-120	30
1,1-Dichloroethane	0.0100	0.0200 ug/L		30	77-125	30	80-120	30
1,2-Dichloroethane (EDC)	0.0100	0.0200 ug/L		30	73-128	30	80-120	30
1,1-Dichloroethene	0.0100	0.0200 ug/L		30	71-131	30	80-120	30
cis-1,2-Dichloroethene	0.0100	0.0200 ug/L		30	78-123	30	80-120	30
trans-1,2-Dichloroethene	0.0100	0.0200 ug/L		30	75-124	30	80-120	30
1,2-Dichloropropane	0.0100	0.0200 ug/L		30	78-122	30	80-120	30
cis-1,3-Dichloropropene	0.0100	0.0200 ug/L		30	75-124	30	80-120	30
trans-1,3-Dichloropropene	0.0100	0.0200 ug/L		30	73-127	30	80-120	30
Methyl tert-butyl ether (MTBE)	0.0100	0.0200 ug/L		30	71-124	30	80-120	30
Naphthalene	0.0500	0.100 ug/L		30	61-128	30	80-120	30
1,1,2,2-Tetrachloroethane	0.0100	0.0200 ug/L		30	71-121	30	80-120	30
Tetrachloroethene (PCE)	0.0100	0.0200 ug/L		30	74-129	30	80-120	30
1,1,2-Trichloroethane	0.0100	0.0200 ug/L		30	80-120	30	80-120	30
Trichloroethene (TCE)	0.0100	0.0200 ug/L		30	79-123	30	80-120	30
1,2,3-Trichloropropane	0.0500	0.100 ug/L		30	73-122	30	80-120	30
Vinyl chloride	0.0100	0.0200 ug/L		30	58-137	30	80-120	30
Surr: 1,4-Difluorobenzene (Surr)			70-130					
Surr: Toluene-d8 (Surr)			70-130					
Surr: 4-Bromofluorobenzene (Surr)			70-130					
Pentafluorobenzene (ISTD)								
Chlorobenzene-d5 (ISTD)								
1,4-Dichlorobenzene-d4 (ISTD)								