Remedial Investigation/Feasibility Study and Cleanup Action Plan

Carpenter Road Site
Lacey, Washington

for
City of Olympia

February 2, 2022

GeoEngineers
Earth Science + Technology

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Carpenter Road Site
Lacey, Washington

File No. 0415-068-04

February 2, 2022

Prepared for:

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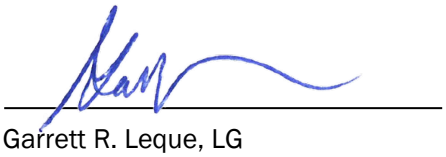

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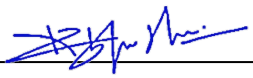

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1.0 INTRODUCTION

This report presents the Remedial Investigation (RI), Feasibility Study (FS), and Cleanup Action Plan (CAP) for the City of Olympia's (City) Carpenter Road site (the "Site") in Lacey, Washington (Figure 1). The Site is the location of an approximately 18,250 square-foot building utilized as an indoor firing range that is contaminated with lead and requires demolition and cleanup prior to redevelopment of the Site. The City is planning to construct a solid waste management operations facility as part of the City's redevelopment of the property that encompasses the Site. The layout of the Site and property are shown on Figure 2. General Site and property information is summarized below.

GENERAL SITE AND PROPERTY INFORMATION

Project Contacts	
Property Owner	City of Olympia
Environmental Consultant	GeoEngineers
Site and Property Information and Location	
Address	6530 Martin Way E, Lacey, Washington 98516
General Site Description	18,250 square-foot building used as an indoor firing range.
Area of Property	8.45 acres.
Area of Site	0.4 acres
Parcel Number	11815210500
GPS Coordinates	47.050601 N, -122.7959314 W
Quarter, Section, Township and Range	NE Quarter of Section 15, Township 18, Range 1W, Willamette Meridian
Surface Elevation	Elevation is approximately 170 feet (NAVD88).
Geologic and Hydrogeologic Setting	
Geologic Setting	Vashon Outwash
Nearest Surface Water Body	Woodland Creek is approximately 0.30-miles to the west
Soil and Geologic Conditions	Vashon Recessional Outwash, Vashon Advanced Outwash
Depth to Groundwater	Minimum depth to groundwater – 28 feet on the western portion of the property and 10 feet on the eastern portion of the property
Direction of Groundwater Flow	Groundwater flow is inferred to be to the west
Regulatory Database	
Site Name	Carpenter Road Olympia PD Shooting Range
Cleanup Site ID	14692
Facility/Site ID	50400

Notes:

bgs = below ground surface

NAVD88 = North American Vertical Datum of 1988

This report is provided to document the nature and extent of contamination at the Site, provide an evaluation of remedial alternatives for Site cleanup, and identify the preferred alternative for Site cleanup to be conducted as part of redevelopment of the Property. The overall project objectives and regulatory framework are discussed in the following sections.

1.1. Objectives

The objective is to complete a cleanup action for the Site as part of redevelopment of the property. The cleanup will be completed in accordance with the requirements of the Model Toxics Control Act (MTCA) (Chapter 70A.305 Revised Code of Washington (RCW)) and the MTCA regulations (Chapter 173-340 of the Washington Administrative Code (WAC)). Specifically, this RI/FS/CAP document is provided to:

- Present the results of the environmental characterization of the Site and define the nature and extent of contamination (RI).
- Identify the areas requiring remedial action and the associated cleanup standards for the Site including cleanup levels and points of compliance (RI).
- Present an evaluation of cleanup action alternatives for the Site (FS) based on the results of the Site characterization (RI) and the redevelopment plans for the Site.
- Present the preferred cleanup action to be conducted concurrent with redevelopment of the Site to address the media with contaminant concentrations greater than the MTCA cleanup levels (CAP).

1.2. Regulatory Framework

The Site is to be cleaned up through Ecology's Voluntary Cleanup Program (VCP). The cleanup will be completed in accordance with MTCA regulations (Chapter 173-340 WAC).

2.0 BACKGROUND

2.1. Site Description

The Site is located north of Martin Way and east of Carpenter Road in Lacy, Washington (Figure 1). The address for the Site is 6530 Martin Way. The southern portion of the property is generally flat. The elevation slopes up from the southern to the northern portion of the property. The elevation ranges from approximately 145 feet NAVD88 in the southwest portion of the property to approximately 220 feet in the northeast portion of the property (KPFF 2020) (Figure 2).

The northern portion of the property is undeveloped and covered by trees and shrubs. The central portion of the property is the current location of an indoor firing range that operates within an approximately 18,250-square foot metal building which is where contamination has been detected at concentrations greater than MTCA cleanup levels. The Site encompasses the indoor firing range building and the areas located adjacent on the west and east sides on the northern portion of the building (Figure 2). The eastern portion of the property is currently used for storage of solid waste dumpsters.

Hummocky soil is observed to be present in two areas. One location of hummocky soil is north of the existing building and the second location is northeast of the building. The soil in these two areas was observed to have different gradational characteristics than soil observed in other areas of the property that is interpreted to be soil native to the property. Therefore, the soil present in these two areas is assumed to be soil piles that were imported to the property (i.e., fill).

The building in the central portion of the property is comprised of metal framing, metal roofing, and metal siding on the south side. Earthen/soil walls are present on the west, north and east sides of the building and the soil comprising the earthen walls slopes up from the floor of the building to within between

approximately 2 to 5 feet from the ceiling (Figure 3). An approximate 5-foot wall comprised of ecology blocks or wood is present at the base of the earthen walls at the floor of the building on the west, northwest and southeast sides. The floor of the building is comprised of concrete pavement on the west side, and asphalt pavement on the east side. Multiple wood frame structures with sheetrock walls and ceilings are present inside the building. The wood frame structures include a meeting room, bathrooms, storage, and training rooms. Several cinder block walls are also present within the building including a wall separating the two firing lanes in the building (i.e., Firing Lane A on the west side and Firing Lane B on the east side).

Bullet trap structures constructed of heavy gage galvanized metal are located on the north end of each firing lane (i.e., a total of two bullet trap structures) (Figure 3). Chunks of foam are contained in the bullet trap structure located at the north end of Firing Lane A. The metal bullet trap structures are located in front of the earthen/soil wall located on the north side of the building. The earthen/soil wall located on the north side of the building was identified to have been the historical bullet stop feature and therefore, projectiles (i.e., bullets) were previously fired into the soil wall on the north end of the building.

A ventilation system is present in the building. The ventilation system has a series of eight (8) intakes and blowers/fans on the southern end of the building and three exhaust fans/vents in the ceiling/roof on the northern end of the building (Figure 2). The ventilation system introduces outdoor air and blows the air from the south end of the building toward the north end of the building where air is exhausted from the building through the three ceiling fans/roof vents.

2.2. Site History

The Site appears to have been used as a sand and gravel quarry between 1941 to 1980 based on review of historical aerial photographs. The existing building was constructed in 1987 according to Thurston County assessor records. The existing building has been used as a firing range from 1987 to the present.

In April 2017, an investigation was performed of the property to evaluate the potential presence of contamination due to use of the building as a firing range and because the property is within the historical Tacoma ASARCO Smelter Plume to support planning for redevelopment. The results of the investigation identified that there had been a release to the property as a result of firing range activities. A MTCA notification of the discovery of a release was sent to Ecology following the investigation (GeoEngineers 2017).

2.3. Current and Future Site Use

The City of Olympia Police Department currently uses the building as an indoor firing range facility for training and firearm qualifications. Solid waste dumpsters are currently stored on the eastern portion of the property. The property is zoned Open Space-Institutional (OS-I), Mixed Use High Density Corridor (MHDC) Thurston County 2022).

The City is planning to construct a new solid waste management operations facility as part of redevelopment of the property. The approximately 18,250-square-foot building utilized as an indoor firing range will be demolished and cleaned up prior to redevelopment of the Site. The northern portion of the property will be excavated to create additional space for buildings. The majority of the property will be covered by new buildings and/or paved surfaces. Vegetated/landscaped areas will be constructed around the perimeter of the property and a stormwater detention pond will be constructed in the southern portion

of the property. The currently proposed redevelopment plan is shown on Sheets C3.0 (north) and C3.1 (south) provided in Appendix A.

2.4. Geology and Hydrogeology

2.4.1. Soil Conditions

The "Geologic Map of the Lacey 7.5-Minute Quadrangle" (Logan and others 2003) was reviewed to identify geologic units present at the Site. Two primary geologic units are mapped at and near the Site that include Vashon recessional outwash (Qgo) and Vashon advance outwash (Qga). Both geologic units are glacial deposits. Advance outwash deposits were deposited by streams and rivers emanating from the glaciers during periods of glacial advance. After deposition, the advance outwash soils were overridden by the advancing glacier. Recessional outwash deposits were deposited during period of glacial retreat. Because the advance outwash deposits are glacially overridden, they are generally more compacted and consolidated than the overlying recessional outwash. Locally, the two outwash deposits are similar in composition, generally consisting of sand and gravel with variable silt content.

Information concerning soil type at the property was collected from three borings (P-1 through P-3) that were completed as piezometers in November 2019 (Figure 2). The soil encountered in the borings consisted of dense fine to coarse gravel and sand to silty sand with an intermittent silt layers. The boring logs with descriptions of the soil types encountered at the Site are included in Appendix B.

2.4.2. Groundwater Conditions

Information concerning the depth to groundwater at the property was collected from the three piezometers (P-1 through P-3) that were installed in November 2019 (Figure 2). Groundwater was encountered at depths of 15 feet or greater at the time of drilling. Pressure transducer dataloggers were installed in the piezometers and depth to groundwater was recorded from November 2019 to November 2020. The minimum depth to groundwater at the property occurred in February. Depth to groundwater in February was approximately 28 feet below ground surface (bgs) in P-1 located on the western portion of the property and 10 feet bgs in P-3 located on the eastern portion of the property. The depth to groundwater was 16 feet bgs in P-2 located on south, central portion of the property. The groundwater flow direction is inferred to be to the west based on the piezometer data collected at the property. The transducer data are included in Appendix B.

3.0 ENVIRONMENTAL INVESTIGATION SUMMARY

Environmental investigation was performed at the Site to evaluate threats to human health and the environment due to use of the Site for firing range activities and because the Site is within the historical Tacoma ASARCO Smelter Plume. The following sections present the results of the environmental investigation.

3.1. May 2016 – University of Washington

In May 2016, the Field Research and Consultation Group (FRCG) of the University of Washington's Department of Environmental Health conducted air monitoring and surface wipe sampling to assess the potential for lead exposure. Surface wipe sampling performed within the firing range facility indicated lead

concentrations greater than 250 micrograms per square foot (µg/ft^2) within the firing range and other parts of the building. The report detailing the investigation is included in Appendix C.

3.2. April 2017 – GeoEngineers and Pacific Rim Environmental

3.2.1. GeoEngineers

Between April 18 and 24 2017, GeoEngineers (GEI) performed an investigation of the property to evaluate the potential presence of contamination due to use of the building as a firing range and because the property is within the historical Tacoma ASARCO Smelter Plume. The results of the investigation were presented in an Environmental Investigation report (GeoEngineers 2017).

The investigation included advancement of nine direct push borings outside of the building, excavation of four test pits on the north and northeast side of the building, and 16 hand auger borings inside and outside of the firing range building to evaluate the nature and extent of contamination. Soil samples from the investigation locations were screened and sent to the laboratory for chemical analysis. The results from sample screening and laboratory analysis are presented in Section 4. The sample locations are shown on Figures 4 through 7.

Direct push borings were advanced to approximately 15 feet bgs using a limited access track-mounted direct push probe rig. Borings B-1 through B-3 were advanced in the northern portion of the property to assess potential soil contamination from aerial deposition from the historical Tacoma ASARCO Smelter (Figure 4). Borings B-4 through B-9 were advanced around the building to assess the potential extent of soil contamination from firing range activities due to ventilation from the building onto adjacent soil and/or ventilation onto the roof and runoff from the roof via stormwater through building down spouts (Figure 5). The sample collection and screening methodology included advancing the boring and collecting cores in 5-foot intervals, removing the disposable PVC sleeve from the core, cutting the PVC sleeve open, and examining the soil. Soil was field screened using visual and X-ray fluorescence analyzer (XRF[1]) techniques and soil samples were collected from approximate depths of 0 to 6 inches, 6 to 12 inches, 24 to 30 inches, and 60 to 66 inches. All borings were performed and backfilled by a licensed driller in accordance with Washington State law.

Test pits ETP1 through ETP4 were excavated to depths of 2 to 4 feet bgs into hummocky soil piles using a backhoe (Figure 6). Test pit field screening and sampling was performed to assess the potential for soil contamination in the imported soil. Sample screening and collection methodology included excavating the test pit to up to four feet bgs and field screening the soil in the sidewalls of the test pit. Field screening included visual and XRF techniques. Samples for laboratory analysis were then collected from sidewalls that were representative of fill observed in the test pit. Test pits were backfilled with the excavated soil after sampling.

Hand augers HA-1 through HA-6, similar to direct push borings B-4 through B-9, were advanced outside and adjacent to the northern portion of the building to assess the potential extent of soil contamination from firing range activities due to ventilation from the building onto adjacent soil and/or ventilation onto the roof

[1] XRF consists of a hand-held field screening device that can provide estimates of metals concentrations in soil to assist in sample selection for laboratory analysis. Regulatory decisions are based on the results of laboratory analysis.

and runoff from the roof via stormwater through building down spouts (Figure 5). Hand augers HA-7 through HA-14 were advanced inside the building into the earthen/soil slopes on the west, north, and east sides of building to assess the potential for soil contamination from firing range activities (Figure 7). Hand augers HA-15 and HA-16 were advanced beneath the pavement floor of the building to assess whether firing range activities had been performed on the soil surface prior to paving of the floor. The hand augers were advanced after the asphalt pavement was removed by an asphalt cutting tool. All hand augers were advanced to approximately 18 to 24 inches below ground surface. The sample screening and collection methodology generally included advancing the hand auger in approximate six (6) inch intervals, removing the hand auger, depositing soil collected in the auger on clean disposable plastic sheeting, and field screening the soil. Field screening included visual and XRF techniques. After a hand auger boring was completed at a given location, soil samples were collected from the depths of 0 to 6 inches, 6 to 12 inches, 12 to 18 inches or 18 to 24 inches.

Selected samples from each location were submitted to the laboratory for analysis of chemicals of potential concern (COPCs) as well as for soil disposal characterization (i.e., for anticipated future disposal considerations). Site COPCs based on firing range practices included lead, antimony, and copper. COPCs based on ASARCO Smelter Plume considerations included lead and arsenic. Based on these considerations, samples were analyzed for total Resource Conservation and Recovery Act (RCRA) 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) as well as antimony, copper and nickel using United States Environmental Protection Agency (EPA) Method 6020A and EPA Method 7471A.

Several composite samples were also collected for disposal characterization purposes. The composite samples were initially analyzed for total RCRA 8 metals and antimony, copper, and nickel. Follow up analyses were performed on the composite samples using the toxicity characteristic leaching procedure (TCLP). TCLP analyses were performed for lead because total lead concentrations in the composite samples exceeded the "20 times rule" suggesting the possibility of leachable lead greater than the hazardous/dangerous waste toxicity characteristic criteria. TCLP analysis was not performed for other metals in the composite samples because the concentrations for other metals were less than the 20 times rule.

3.2.2. Pacific Rim

In April 2017, Pacific Rim Environmental performed a regulated building survey to evaluate the presence of asbestos containing materials, presence of lead in paint, and to assess lead concentrations on building components. The sampling included collection of 21 bulk samples of suspected asbestos containing materials to evaluate the presence of asbestos in building materials, three wipe samples (WS-1 through WS-3) of dust from the horizontal surface of components of the building that would be removed as part of demolition, and three TCLP lead samples (TCLP-1 through TCLP-3) from building components that would require disposal. Additionally, XRF screening was performed on 15 interior painted surfaces to evaluate the presence of lead based paint.

Bulk asbestos samples were not collected from suspect asbestos-containing materials in the bathrooms and training room as destructive sampling was required to collect the samples and the bathrooms were still in use at the time sampling in April 2017. Additional sampling of potential asbestos containing materials was performed in November 2021 to evaluate the suspect asbestos-containing materials. Three

bulk samples were collected of the suspect asbestos-containing mastic to evaluate the presence of asbestos in the building materials.

The reports detailing the regulated building materials surveys are included in Appendix D.

4.0 CHEMICAL ANALYTICAL RESULTS

The chemical analytical results for the soil samples collected in April 2017 from hand auger and direct push borings and test pits during the investigation described in Section 3.2.1 are presented in Tables 1 through 5 and discussed in the following sections. Laboratory data reports for the sample analyses performed as part of the investigation are included in Appendix E. The results of the investigation have been submitted to Ecology's Environmental Information Management (EIM) system.

4.1. Data Quality Review

The analytical data for the soil samples collected in April 2017 were reviewed for quality assurance/quality control purposes. Based on the review of the environmental data, no significant data quality exceptions were noted for the laboratory results and the data are considered acceptable for use. The data validation report is included in Appendix E.

4.2. Environmental Investigation Results

The following sections present the observations and results of the environmental investigation of the property and the nature and extent of contamination resulting from the firing range activities.

4.2.1. Northern Portion of Property

Tables 1A and 1B present the results from XRF screening and laboratory analysis, respectively, for soil samples collected from locations B-1 through B-3 present in the northern portion of the property (Figure 4). Soil present in northern portion of the property does not appear to be impacted by Tacoma ASARCO Smelter Plume contamination based on the following results:

- Arsenic and lead concentrations are less than soil background concentrations in Washington State (Table 1B).

Soil present in northern portion of the property also does not appear to have any other elevated concentrations of metals based on the following results:

- Cadmium, chromium, copper, mercury, and nickel were not detected or were detected at concentrations less than soil background concentrations in Washington State (Table 1B).
- Antimony, barium, selenium, and silver were not detected or were detected at concentrations two orders of magnitude less than MTCA Method B cleanup levels (Table 1B). Note that background concentrations for these metals have not been identified for Washington State.

4.2.2. Hummocky Soil Piles Located North and Northeast of Building

Tables 2A and 2B present the results from XRF screening and laboratory analysis, respectively, for soil samples collected from ETP-1 through ETP-4 in the hummocky soil piles present north and northeast of the building (Figure 6). The soil present in piles north of the building is not believed to be impacted by firing

range activities or Tacoma ASARCO Smelter Plume deposition based on the following results for samples collected from test pits ETP1 and ETP2 (Table 2B):

- Lead concentrations are low and below the MTCA Method A cleanup level.
- Antimony concentrations are low and below the MTCA Method B cleanup level.
- Copper concentrations are less than soil background concentrations in Washington State.
- Arsenic concentrations are less than soil background concentrations in Washington State.

The soil present in piles northeast of the building is not believed to be impacted by firing range activities or Tacoma ASARCO Smelter Plume deposition based on the following results for samples collected from test pits ETP3 and ETP4 (Table 2B):

- Lead concentrations are less than soil background concentrations in Washington State.
- Antimony concentrations are low and below the MTCA Method B cleanup level.
- Copper concentrations are less than soil background concentrations in Washington State or below the MTCA Method B cleanup level.
- Arsenic concentrations are less than soil background concentrations in Washington State.

Note that mercury was measured at a concentration of 15 milligrams per kilogram (mg/kg) by XRF field screening in the sample from EPT3 (Table 2A). However, the soil sample analyzed by the laboratory did not confirm the XRF results. The mercury concentration in the sample from EPT3 based on laboratory analysis was 0.080 mg/kg and is below the MTCA Method A cleanup level (Table 2B).

4.2.3. Soil Inside the Building

Tables 3A and 3B present the results from XRF screening and laboratory analysis, respectively, for soil samples collected from borings HA-8 through HA-16 present inside the building (Figure 7). Soil present in the building has been impacted by firing range activities based on the following observations and results:

- A thin, light to dark gray layer is visible on the surface of the earthen/soil walls in areas.
- Lead is present in surface soil at concentrations greater than the MTCA Method A Cleanup Level in samples collected from borings HA-8, HA-9, HA-10, HA-11 and HA-12 advanced in the earthen/soil walls based on results of XRF screening and laboratory analyses (Tables 3A and 3B).
- Lead is present in subsurface soil at concentrations greater than the MTCA Method A Cleanup Level in samples collected from borings HA-9, HA-10, and HA-11 advanced in the earthen/soil walls based on results of XRF screening and laboratory analyses (Tables 3A and 3B).

The following subsections discuss observations for the west and east sidewalls, north sidewall, and beneath the concrete floor of the building (sub-slab).

4.2.3.1. West and East Sidewalls

Impacts from firing range activities are present in surface soil (i.e., upper several inches) throughout the northern portions of the west and east sidewalls based on the following observations and results:

- A thin, light to dark gray layer is visible on the surface of the earthen/soil walls on the west and east side.
- The measured lead concentration based on XRF screening at the surface at HA-8 (1,379 mg/kg) is greater than the MTCA Method A cleanup level (250 mg/kg) (Table 3A).
- The lead concentration at HA-8 was measured by XRF to be an order of magnitude lower than the surface concentration, and lower than the MTCA Method A cleanup level at a depth of 0.25 inches below the surface layer (191 mg/kg) (Table 3A).

In addition to the impacts to surface soil, there are impacts from firing range activities that were detected in subsurface soil in several locations in the west sidewall based on the following observations and results:

- The measured lead concentrations based on XRF screening (413 mg/kg) and laboratory analysis (1,200 mg/kg) at HA-9 are greater than the MTCA Method A cleanup level at depths between 12 to 24 inches (Tables 3A and 3B).
- Boring HA-9 is where soil was observed to have sloughed down to the bottom of the sloped earthen/soil wall.
- Soil sloughing was observed at the base of the sidewalls at other locations on the west and east walls (Figure 7).

4.2.3.2. North Sidewall

Impacts from firing range activities are present in surface soil in the north sidewall based on the following results:

- The measured lead concentration based on XRF screening at HA-11 (475 mg/kg) is greater than the MTCA Method A cleanup level on the surface of soil (Table 3A).
- The lead concentration at HA-11 was measured by XRF to be lower than the surface concentration, and lower than the MTCA Method A cleanup level at a depth of 0.25 inches below the surface layer (191 mg/kg) (Table 3A).

In addition to the impacts to surface soil, there are impacts from firing range activities that were detected in subsurface soil in several locations in the north sidewall based on the following observations and results:

- The measured lead concentrations based on laboratory analysis and/or XRF screening at HA-10 and HA-11 are greater than the MTCA Method A cleanup level at depths of 6 to 18 inches (Tables 3A and 3B).
- The north wall was previously the bullet trap for the firing range and therefore, projectiles were fired into the north wall and likely penetrated to depths of up to approximately 18 inches.
- Additionally, soil was observed to be piled up and/or sloughed at the base of the slope.

Two (2) composite samples (Comp C and Comp D) were collected of soil within the building and analyzed for total and TCLP lead. The total lead concentrations were 480 and 1,200 mg/kg. The TCLP lead concentrations for composite samples Comp C and Comp D were 7.7 and to 77 milligrams per liter (mg/L) and were greater than the toxicity characteristic criteria for lead indicating that the soil would designate as hazardous/dangerous waste (Table 5).

4.2.3.3. Sub-slab

The soil present beneath the concrete floor of the building does not appear to have been impacted by firing range activities based on the following results for samples collected from HA-15 and HA-16:

- Lead concentrations measured by XRF and laboratory analysis are less than the MTCA Method A Cleanup Level.
- The results of laboratory analyses indicate that arsenic, cadmium, chromium, copper, lead, mercury, and nickel are less than background concentrations in Washington state.
- The results of laboratory analysis for antimony, barium, selenium, and silver were not detected or were detected at concentrations two orders of magnitude less than MTCA Method B cleanup levels.

4.2.4. Soil Outside the Building

Tables 4A and 4B present the results from XRF screening and laboratory analysis, respectively, for soil samples collected from HA-1 through HA-6 and B-4 through B-9 present outside the building (Figure 5).

Soil in a limited area adjacent to the north end of the building has been impacted by firing range activities based on the following results:

- Lead is present in surface and subsurface soil at concentrations greater than the MTCA Method A Cleanup Level in borings HA-1, HA-2, HA-3 on the east side of the building and HA-4 and HA-5 on the west side of the building based on results of XRF screening (Table 4A).
- The lead concentrations greater than the MTCA Method A Cleanup Level are present in soil near the ceiling fans/vents that exhaust air from the firing range and roof down spouts on the northern portion of the building.

The impacts to soil outside the building are limited in area and are bounded based on the following observations:

- The lead concentrations in HA-6 and B-5 on the west side of the building are less than the MTCA Method A Cleanup Level (Tables 4A and 4B).
- The lead concentrations in B-8 and B-9 on the east side of the building are less than the MTCA Method A Cleanup Level (Tables 4A and 4B).
- The lead concentrations in B7 are less than or slightly greater than the MTCA Method A Cleanup level (Tables 4A and 4B).

Two composite samples (Comp A and Comp B) were collected of soil outside the building and analyzed for total and TCLP lead. The total lead concentrations were 1,100 and 2,500 mg/kg. The TCLP lead concentrations for composite samples Comp A and Comp B were 20 and 32 mg/L and were greater than the toxicity characteristic criteria for lead indicating that the soil would designate as hazardous/dangerous waste (Table 5).

4.2.5. Components of the Building

The results of the analyses performed as part of the regulated building materials surveys performed in April 2017 and November 2021 include the following:

- Asbestos was not detected in all of the 21 bulk samples of suspected asbestos containing materials collected in April 2017.
- Asbestos was not detected in one of the three samples and was detected but less than 1% in the remaining two bulk samples of suspected asbestos containing materials collected in November 2021. As noted in Pacific Rim's Supplemental Asbestos Survey (Appendix D), EPA does not regulate material containing less than 1% asbestos as asbestos containing material (ACM).
- XRF screening did not identify lead based paint greater than 1.0 milligram per meter squared (mg/m^2). A concentration of 1 mg/m^2 is the EPA/HUD standard.
- Lead concentrations ranged from 14,000 $\mu g/ft^2$ to 67,000 $\mu g/ft^2$ in the three wipe samples (WS-1 through WS-3) of dust collected from the top of an Ecology block, on top of the training room inside the firing range building, and on top of a component of the ventilation system that would be removed as part of demolition.
- The TCLP lead concentration for a sample (TCLP 3) comprised of a composite of building materials (21 mg/kg) was greater than the toxicity characteristic criteria for lead indicating that the building materials would designate as hazardous/dangerous waste and would require treatment and disposal at a Subtitle C landfill.
- The TCLP lead concentrations for the remaining samples (TCLP 1 and 2) collected from paved surfaces were 0.4 to 75 mg/L were greater than the toxicity characteristic criteria for lead indicating that some paved surfaces would designate as hazardous/dangerous waste and would require treatment and disposal at a Subtitle C landfill.

5.0 NATURE AND EXTENT OF CONTAMINATION

The results of investigation of the property identified that contamination is present at concentrations greater than MTCA cleanup levels within and adjacent to the building that has been used for firing range activities. The contamination from firing range activities is present in soil and on the building components. Contaminants were not detected at concentrations greater than MTCA cleanup levels in other areas investigated on the property.

The COPCs for firing range activities include lead, antimony, and copper. However, antimony and copper were only detected in two samples at concentrations greater than MTCA B cleanup levels. Lead was detected at concentrations greater than the MTCA Method A cleanup level in surface and subsurface soil including the samples containing antimony and copper at concentrations greater than cleanup levels.

Inside the building, lead was detected at concentrations greater than the MTCA Method A cleanup level in soil in the northern portions of the west and east earthen/soil sidewalls and north earthen/soil sidewall. Lead was detected in soil at concentrations greater than the MTCA Method A cleanup level on the surface of the soil to a depth of approximately 24-inches bgs inside the building (Tables 3A and 3B). The extent of contamination in soil inside the firing range building is shown in Figure 8.

Lead was also detected on the surface of building materials inside the firing range building. Wipe sampling performed as part of the regulated building materials survey identified elevated lead concentrations on top of horizontal surfaces of materials that would be removed as part of demolition including an Ecology block, the training room inside the firing range building, and a component of the ventilation system.

Outside the building, lead was detected at concentrations greater than the MTCA Method A cleanup level in soil near the ceiling fans/vents that exhaust air from the firing range and roof down spouts on the northern portion of the building. Lead was detected at concentrations greater than the MTCA Method A cleanup level on the surface of soil to a depth of approximately 30-inches bgs outside the building (Tables 4A and 4B). The extent of contamination in soil outside the firing range building is shown in Figure 9.

The area inside and outside the building where lead is present at concentrations greater than the MTCA Method A cleanup level is the Site in accordance with the definition of a Site under MTCA.

6.0 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) was developed based on historical land use and the results of the investigation performed at the Site. The CSM includes discussion of the source of contamination, contaminant of concern (COC), media of concern, and potential exposure pathways that could affect human or environmental health. The following sections describe the components of the CSM.

6.1. Source of Contamination

The source of contamination is firing range activities. Impacts from the ASARCO smelter plume were not identified because soil arsenic concentrations are less than Washington State background concentrations and elevated arsenic in shallow soil is an indicator of smelter plume contamination.

6.2. Contaminant of Concern

The contaminant of concern (COC) for the Site is lead. Antimony and copper were identified as COPCs for the Site based on the use as a firing range. However, antimony and/or copper were only detected in two samples at concentrations greater then MTCA cleanup levels and lead was also detected in the two samples at a concentration greater than the MTCA Method A cleanup level. Samples were also analyzed for arsenic, barium, cadmium, chromium, mercury, nickel, selenium, and silver and none of the metals were detected at concentrations greater than MTCA cleanup levels. Therefore, an overall Site cleanup for lead will be protective of human health and the environment.

6.3. Media of Concern

Soil is the media of concern at the Site. Groundwater and surface water are not media of concern for the following reasons. Soil contamination does not extend to the depth of groundwater. Lead sorbs strongly to soil and soil with lead concentrations greater than the MTCA cleanup level are typically less than two feet deep inside the building (Tables 3A and 3B). Soil with lead concentrations greater than the MTCA cleanup level are also approximately two feet deep outside the building (Tables 4A and 4B). Because the earthen/soil sidewalls on the west and east sides of building slope up to almost the roof of the building, the elevation of the soil surface outside the building is approximately 20 feet higher than inside the building. Therefore, groundwater is not a media of concern. There are no surface water features (i.e., ponds, streams, etc.) on or adjacent to the site. The closest surface water feature is Woodland Creek which is located approximately 1,600 feet west of the site. Therefore, surface water is not a media of concern.

Air is not currently a media of concern for the Site as a result of the presence of lead in soil or on building components. Air will be a media of concern during demolition of the building and cleanup of the Site based on the potential for lead to be present in dust resulting from disturbance during remedial actions. Best

management practices and engineering controls will be required during the cleanup to control the generation of dust.

6.4. Potential Exposure Pathways

Exposure pathways describe the mechanisms by which an individual or population is exposed, or has the potential to be exposed, to hazardous substances at or originating from a Site (WAC 340-350 (7)(e)(ii)). The following sections summarize potential exposure pathways for the Site.

6.4.1. Direct Contact

Soil at the Site with lead concentrations greater than the MTCA Method A cleanup level is present from the surface to a depth of approximately 2 feet bgs. The soil with lead concentrations greater than the cleanup level presents a current direct contact exposure pathway. The direct contact to soil pathway will be eliminated by soil excavation and off Site disposal during Site cleanup performed as part of redevelopment which will remove all lead-contaminated soil with concentrations greater than the MTCA Method A cleanup level.

6.4.2. Soil to Groundwater

As stated in Section 6.3, lead contamination extends to a depth of approximately 2 feet bgs at the Site and does not extend to the depth of groundwater. Additionally, lead sorbs strongly to soil and is not readily transported in water. Lead in soil with concentrations greater than the MTCA Method A cleanup level will be removed during cleanup of the Site.

6.4.3. Soil to Surface Water

There are no surface water features on or adjacent to the Site.

6.4.4. Air

As stated in Section 6.3, air will be a potential exposure pathway during demolition of the building and cleanup of the Site based on the potential for lead to be present in dust. Best management practices and engineering controls will be required during the cleanup to control the generation of dust.

6.4.5. Terrestrial Ecological Evaluation

The Site currently presents a potential exposure to ecological receptors where lead is present outside the building. The area outside and inside the building will be cleaned up as part of redevelopment of the Site. Cleanup of the Site includes excavation and offsite disposal of all soil with lead concentrations greater than the MTCA Method A cleanup level as described in the following sections. Redevelopment of the property includes construction of buildings and paved surfaces over the entire area of the Site after completion of the cleanup action (Appendix A). Therefore, no ecological exposure to soil at the Site will occur upon completion of the redevelopment.

7.0 CLEANUP STANDARDS

Cleanup standards include (1) chemical concentrations in environmental media that are protective of human health and the environment; and (2) locations where the cleanup levels must be met (points of compliance). The cleanup level for lead in soil at the Carpenter Road Site is the MTCA Method A cleanup

level for unrestricted land use of 250 mg/kg. The cleanup level will be met at the standard point of compliance for soil which is from the surface to 15 feet bgs.

8.0 CLEANUP ACTION OBJECTIVES

The overall cleanup action objective (CAO) is to eliminate, reduce, or otherwise control to the extent feasible and practicable, unacceptable risks to human health and the environment posed by Site contamination in accordance with the MTCA regulation (Chapter 173-340 WAC) and other applicable regulatory requirements. The specific CAOs for the Site include the following:

- Demolish the existing building and control lead-contaminated dust during demolition in a manner that does not pose unacceptable risks to human health and the environment.
- Cleanup lead-contaminated soil located inside and outside building to meet the cleanup standards.
- Complete Site cleanup to support redevelopment of the property for use as a new solid waste management operations facility.

9.0 CLEANUP ACTION ALTERNATIVES

Three cleanup action alternatives (Alternatives 1 through 3) were developed as described in Sections 9.1 through 9.3 below. All of the cleanup action alternatives address contaminated media at the Site, achieve the CAOs, meet MTCA threshold and other requirements [WAC 173-340-360(2)], and are compatible with the plans for redevelopment and future use.

In general, the cleanup action alternatives were developed using the following remedial technologies:

- Demolition/deconstruction of the building.
- Management of building components using one of the following approaches:
  - Deconstruct and clean (if necessary) metal and concrete building components (e.g., metal frame, metal roof, ventilation system components, concrete blocks, etc.) and transport off Site for recycling. Demolish and transport other building components (e.g., dry wall/sheet rock, plywood, insulation, wood frame, asphalt floors, underground utilities, etc.) to a hazardous waste landfill (i.e., RCRA Subtitle C landfill) for macroencapsulation (permanent isolation from the surrounding environment, including rain water, leachate, and any other materials in the surrounding landfill) and disposal; or
  - Demolish and transport all building components to hazardous waste landfill (i.e., RCRA Subtitle C landfill) for macroencapsulation and disposal.
- Remedial excavation of contaminated soil.
- Management of excavated soil using one of the following approaches:
  - On Site treatment of excavated soil to reduce the TCLP lead concentration to below hazardous/dangerous waste criteria and transportation of treated non-hazardous/non-dangerous waste soil to a permitted solid waste landfill (e.g., Subtitle D landfill) for disposal; or
  - Transportation of excavated hazardous/dangerous waste soil to a hazardous waste landfill (i.e., Subtitle C landfill) for disposal. The soil would be treated/stabilized at the landfill prior to disposal.

Remediation technologies that would leave contaminated material on site such as in-situ (in-place) treatment of contaminated material were not considered because redevelopment plans include regrading the property following the cleanup action and treated media left in place would get disturbed as a result of site grading and redevelopment. No Action was also not considered as it does not meet MTCA threshold requirements for the protection of human health and the environment and is not compatible with the plans for redevelopment.

The alternatives were developed and the costs estimated on a conceptual level to meet the primary objective of the FS which is to perform a comparative evaluation of alternatives and identify a preferred alternative for cleanup of the Site. The final design for the selected alternative may differ from the alternative descriptions presented in this FS based on agency decisions, permit requirements, further evaluation of existing Site conditions, supplemental data that may be collected to support design and other factors. The assumptions and quantity/cost estimates used in developing alternatives are conceptual-level and are based on engineering judgment and current knowledge of Site conditions.

For each alternative, an FS-level cost estimate was developed using a combination of published engineering reference manuals (i.e., RS Means Heavy Construction Cost Data Manual), construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar, applicable projects and professional judgment. The FS-level quantities and cost estimates for each alternative are detailed in Table 6 and include construction cost, sales tax, cost for professional services and a 30 percent (%) contingency. The accuracy of FS-level cost estimate is assumed to be -30% to +50% as per EPA's FS cost estimate guidance (EPA 2000).

9.1. Alternatives 1

Alternative 1 consists of demolition of the building, recycling of the metal and concrete components of the building, off Site transport and disposal of other building components at a Subtitle C landfill, excavation of contaminated soil, on Site treatment and off Site transport and disposal of treated soil at a permitted landfill (e.g., Subtitle D landfill). The cost estimate for Alternative 1 is approximately 1.78 million dollars. The approximate location of the building is shown on Figure 2 and approximate locations of soil excavation areas are shown on Figures 7 and 8. The components of Alternative 1 include the following:

- Install temporary Site controls including site security, temporary erosion and sediment controls (TESC) and traffic controls.
- Perform Site preparation activities including setting up a contractor laydown area and material management and stockpile areas, and performing utility locates.
- Deconstruct and clean (if necessary) metal and concrete building components (e.g., metal frame, metal roof, ventilation system components, concrete blocks, etc.) and transport off Site for recycling. Cleaning, if performed, will be completed using methods (vacuum cleaners with high-efficiency particulate air [HEPA] filters or wet cleaning) that prevent or minimize generation of airborne dust.
- Demolish and transport other building components (e.g., dry wall/sheet rock, plywood, insulation, wood frame, asphalt floors, underground utilities, etc.) to a hazardous waste landfill (i.e., RCRA Subtitle C landfill) for macroencapsulation and disposal.
- Transport and dispose of materials used for cleaning building components (e.g., rags, vacuum filters, etc.) to hazardous waste landfill (i.e., RCRA Subtitle C landfill). Collect water used in cleaning and either

treat on Site and discharge to sewer or transport off Site for treatment and disposal. Perform chemical analytical testing of waste, as necessary, for disposal characterization purposes.

- Excavate contaminated soil from inside and outside the building, treat excavated soil on Site by mixing a reagent with the soil to reduce TCLP lead concentrations below hazardous/dangerous waste levels, perform chemical analytical testing of treated soil and transport treated soil with TCLP lead contractions below hazardous/dangerous waste levels to a permitted landfill (e.g., RCRA Subtitle D landfill). Recovery of bullets from soil comprising the north earthen/soil wall may be performed before treatment if bullet recovery is identified to be feasible and cost effective.
- Perform verification soil sampling and analysis at the limits of remedial excavation to confirm compliance with cleanup standards.
- Grade the Site to even grades to eliminate steep slopes, humps and depressions.
- Install post-cleanup erosion and sediment controls (e.g. straw wattles, etc.), as necessary, to minimize generation of sediment laden stormwater and dust until redevelopment activities occur on the Site.
- Remove temporary site controls/facilities and garbage and leave the Site in clean and tidy condition.

9.2. Alternatives 2

Alternative 2 consists of demolition of the building, recycling of metal and concrete components of the building, off Site transport and disposal of other building components at a Subtitle C landfill, excavation of contaminated soil and off Site transport and disposal of excavated soil at a Subtitle C landfill. The cost estimate for Alternative 2 is approximately 1.95 million dollars.

The components of Alternative 2 are the same as Alternative 1 except that all of the soil would be transported off Site to a Subtitle C landfill for disposal without on Site treatment. The Subtitle C landfill would treat the soil prior to disposal, if necessary.

9.3. Alternatives 3

Alternative 3 consists of demolition of the building, off Site transport and disposal of all building components at a Subtitle C landfill, excavation of contaminated soil and off Site transport and disposal of excavated soil at a Subtitle C landfill. The components of Alternative 3 are described below. The cost estimate for Alternative 3 is approximately 3.11 million dollars.

- Install temporary Site controls including site security, temporary erosion and sediment controls (TESC) and traffic controls.
- Perform Site preparation activities including setting up a contractor laydown area and material management and stockpile areas, and performing utility locates.
- Demolish and transport all building components to hazardous waste landfill (i.e., RCRA Subtitle C landfill) for macroencapsulation and disposal.
- Excavate contaminated soil from inside and outside the building, and transport to a hazardous waste landfill (i.e., RCRA Subtitle C landfill) for treatment and disposal.
- Perform verification soil sampling and analysis at the limits of remedial excavation to confirm compliance with cleanup standards.

- Grade the site to even grades to eliminate steep slopes, humps and depressions.
- Install post-cleanup erosion and sediment controls (e.g. straw wattles, etc.), as necessary, to minimize generation of sediment laden stormwater and dust until City commences redevelopment of the Site.
- Remove temporary site controls/facilities, remove garbage and leave the Site in clean and tidy condition.

10.0 EVLAUATION OF CLEANUP ALTERNATIVES

Evaluation criteria and a comparative analysis of the cleanup action alternatives developed for the Site are summarized in the following sections.

10.1. Cleanup Alternative Evaluation Criteria

Threshold and other MTCA requirements used to evaluate the cleanup action alternatives are identified below:

10.1.1. Threshold Requirements

Cleanup actions performed under MTCA must comply with the threshold requirements. Cleanup action alternatives that do not comply with the threshold requirements are not considered suitable cleanup actions under MTCA. As provided in WAC 173-340-360(2)(a), the four threshold requirements for remedial actions are that they must:

- **Protect human health and the environment:** The results of cleanup actions performed under MTCA must ensure that both human health and the environment are protected.
- **Comply with cleanup standards:** Cleanup standards include cleanup levels and points of compliance at which the cleanup levels must be met. The cleanup actions must comply with cleanup standards.
- **Comply with applicable state and federal laws:** Cleanup actions performed under MTCA must comply with applicable state and federal laws. The term "applicable state and federal laws" includes legally applicable requirements and those requirements that Ecology determines to be relevant and appropriate as described in WAC 173-340-710.
- **Provide for compliance monitoring:** Cleanup action performed under MTCA must allow for compliance monitoring in accordance with WAC 173-340-410. Compliance monitoring consists of protection monitoring, performance monitoring and confirmational monitoring. Protection monitoring is conducted to confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of a cleanup action. Performance monitoring is conducted to confirm that the cleanup action has attained cleanup standards. Confirmational monitoring is conducted to confirm the long-term effectiveness of the cleanup action once cleanup standards or other performance standards have been attained.

10.1.2. Other MTCA Requirements

When selecting from cleanup action alternatives that fulfill the threshold requirements, the selected action is required to:

- **Use permanent solutions to the maximum extent practicable:** MTCA requires that when selecting a cleanup action alternative, preference shall be given to permanent solutions to the maximum extent practicable [WAC 173-340-360(2)(b)(i)]. MTCA specifies that the permanence of cleanup action alternatives shall be evaluated by balancing the costs and benefits of each of the alternatives using a "disproportionate cost analysis" in accordance with WAC 173-340-360(3)(e). The criteria for conducting this analysis are described in Section 10.1.3 below.
- **Provide a reasonable restoration time frame:** In accordance with WAC 173-340-360(2)(b)(ii), MTCA places a preference on those cleanup action alternatives that, while equivalent in other respects, can be implemented in a shorter period of time.
- **Consideration of Public Concerns:** In accordance with WAC 173-340-360(2)(b)(iii) and WAC 173-340-600(3), Ecology will consider public comment in making its selection of an appropriate cleanup action alternative. Public comment on the cleanup will be performed as part of the State Environmental Policy Act (SEPA) process.

10.1.3. MTCA Disproportionate Cost Analysis (DCA)

The MTCA disproportionate cost analysis (DCA) is used to further evaluate which of the alternatives that meet the threshold requirements are permanent to the maximum extent practicable. This analysis involves comparing the costs and benefits of alternatives and selecting the alternative whose incremental costs are not disproportionate to the incremental benefits. The evaluation criteria for the DCA are specified in WAC 173-340-360(2) and (3), and include protectiveness, permanence, long-term effectiveness, management of short-term risks, implementability, consideration of public concerns and cost.

As outlined in WAC 173-340-360(3)(e), MTCA provides a methodology that uses the criteria listed below to determine whether the costs associated with each cleanup alternative are disproportionate relative to the incremental benefit of the alternative above the next lowest-cost alternative. The comparison of benefits relative to costs may be quantitative but will often be qualitative. Costs are disproportionate to benefits if the incremental costs of the higher-cost alternative exceed the incremental degree of benefits achieved by the other lower-cost alternative [WAC 173-340-360(e)(i)]. Where two or more alternatives are equal in benefits, the less costly alternative is retained as the preferred alternative [WAC 173-340-360(e)(ii)(c)].

MTCA criteria used in the DCA include the following:

- **Protectiveness:** The overall protectiveness of a cleanup action alternative is evaluated based on several factors. First, the extent to which human health and the environment are protected and the degree to which overall risk at a Site is reduced are considered. Both on-site and off-site reduction in risk resulting from implementing the alternative are considered.
- **Permanence:** MTCA specifies that when selecting a cleanup action alternative, preference shall be given to actions that are "permanent solutions to the maximum extent practicable." Evaluation criteria include the degree to which the alternative permanently reduces the toxicity, mobility or mass of hazardous substances, including the effectiveness of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment processes, and the characteristics and quantity of treatment residuals generated.
- **Long-Term Effectiveness:** Long-term effectiveness is a parameter that expresses the degree of certainty that the alternative will be successful in maintaining compliance with cleanup standards over the long-

term performance of the cleanup action. Long-term effectiveness also takes into account long-term reliability, magnitude of residual risk, management of treatment wastes, and management of waste left untreated.

- **Management of Short-term Risks:** Evaluation of this criterion considers the relative magnitude and complexity of actions required to maintain protection of human health and the environment during implementation of the cleanup action. Cleanup actions carry short-term risks, such as potential mobilization of contaminants during construction, or safety risks typical of large construction projects. Some short-term risks can be managed through the use of Best Management Practices (BMPs) during project design and construction, while other short-term risks are inherent to project alternatives and can offset the long-term benefits of an alternative.
- **Implementability:** Implementability is an overall metric expressing the relative difficulty and uncertainty of implementing the cleanup action. Evaluation of implementability includes consideration of technical factors such as the availability of established technologies and experienced contractors to accomplish the cleanup work. It also includes administrative factors associated with permitting and completing the cleanup.
- **Consideration of Public Concerns:** The extent to which an alternative addresses the public's concerns is considered as part of the evaluation process. This criteria includes concerns raised by individuals, community groups, local governments, tribes, federal and state agencies, and other organizations that may have an interest in or knowledge of the Site. In particular, the public concerns for this Site would generally be associated with environmental concerns and performance of the cleanup action, which are addressed under other criteria such as protectiveness and permanence.
- **Cost:** The analysis of cleanup action alternative costs under MTCA includes the costs associated with implementing an alternative, including design, construction, long-term monitoring, and institutional controls. Costs are intended to be comparable among different alternatives to assist in the overall analysis of relative costs and benefits of the alternatives.

10.2. Evaluation and Comparison of Cleanup Action Alternatives

This section provides an evaluation and comparative analysis of cleanup action alternatives developed for the Site. The alternatives developed for the Site were evaluated with respect to the MTCA threshold and other relevant requirements described above, then were compared to each other relative to the expected performance under each DCA criterion as discussed in the following sections.

10.2.1. Threshold Requirements

Each alternative meets the MTCA threshold requirements including protection of human health and the environment, compliance with cleanup standards, compliance with applicable state and federal regulations, and provision for compliance monitoring.

All alternatives protect human health and the environment by addressing contaminated media present on the Site including lead dust on building components and lead contaminated soil as identified in the description of each alternative (Section 9.0). Compliance with cleanup standards is achieved under each alternative by removing contaminated media present on the Site. All alternatives will be planned, designed and constructed in a manner that complies with applicable state and federal laws. Applicable permits will be obtained and the permit requirements will be met during construction.

As identified in Section 10.1.1, compliance monitoring includes protection monitoring, performance monitoring and confirmational monitoring. Protection monitoring under each alternative will include monitoring of worker health and safety and implementing environmental protection practices such as stormwater, erosion, and sediment controls. Performance monitoring under each alternative will include completing verification soil sampling and analysis at the limits of remedial excavation to confirm compliance with cleanup standards. Since all of the alternatives will result in removal of the media present at the Site with concentrations greater than the cleanup levels, long-term confirmational monitoring is not considered applicable to any of the alternatives.

10.2.2. Other MTCA Requirements

As described in Section 10.1.2, other MTCA requirements include the use of permanent solutions to the maximum degree practicable, providing reasonable restoration timeframe and considering public concerns. Permanence and considerations for public concerns are evaluated as part of a MTCA DCA as described in Section 10.1.3. All alternatives provide for a reasonable restoration timeframe of approximately 1 year. All alternatives will result in demolition of firing range building and removal of contaminated media from the Site and therefore, are expected to achieve restoration timeframe at the completion of cleanup action construction.

10.2.3. Disproportionate Cost Analysis (DCA) Criteria

The DCA is used to compare the benefit of a cleanup action alternative to the cleanup cost in order to select a cleanup action that is the most permanent and practicable.

For each cleanup action alternative, the overall benefit was determined based on the summation of weighted scores for each DCA criterion, including protectiveness, permanence, long-term effectiveness, management of short-term risks, technical and administrative implementability and consideration of public concerns. For each criterion, the alternative was scored on a 1 to 10 scale based on the degree to which the alternative satisfies the full description of the individual criterion. A score of 1 indicates the alternative is considered to satisfy the elements of the criterion to a very low degree while a score of 10 indicates the alternative is considered to satisfy the elements of the criterion to a very high degree. For each alternative, the individual criterion scores were then weighted according to the following weighting factors identified by Ecology to be used in the FS.

DCA CRITERIA WEIGHTING FACTORS

DCA Criteria	Weighting Factor (%)
Protectiveness	30
Permanence	20
Long-term effectiveness	20
Management of short-term risks	10
Technical and administrative implementability	10
Consideration of public concerns	10

The following summarizes evaluation of alternatives in relation to DCA criterion. A detailed evaluation of alternatives in relation to DCA criterion and relative benefit scoring is provided in Table 7. The weighted benefit scoring and the results of the MTCA DCA are summarized in Table 8.

- **Protectiveness:** All three alternatives score similar for overall protectiveness because all of the alternatives will result in the cleanup and removal of contaminated media from the Site, will achieve cleanup standards at the completion of cleanup construction, and have a similar restoration timeframe.
- **Permanence:** Alternatives 1 and 2 score similarly for permanence as the alternatives reduce toxicity, mobility and/or volume of hazardous substances by treatment of lead contaminated soil (either on Site or off Site) prior to disposal and include on Site cleanup (if necessary) of salvageable or recyclable building components containing lead contaminated dust. Alternative 3 scores the lowest for permanence as it relies on disposal of all contaminated material resulting from building demolition at a hazardous waste landfill and does not include any on Site treatment/cleanup to reduce the toxicity, mobility and/or volume of contamination. Hazardous building material disposed of at hazardous waste landfill will get microencapsulated resulting in a reduction in the mobility of hazardous substances.
- **Long-Term Effectiveness:** Alternative 1 scores the lowest for long-term effectiveness because of the uncertainties associated with on Site treatment of lead contaminated soil. If on Site treatment is not successful or results in an unintended consequence (e.g., increase/decrease in soil geochemical properties such as pH above/below regulatory levels as a result of the addition of reagents, etc.) than the contaminated soil will require transport and disposal at a hazardous waste landfill (i.e., RCRA Subtitle C landfill) with additional treatment performed at the landfill, as necessary. Alternative 2 scores higher than Alternative 1 as it does not involve on Site treatment of lead contaminated soil and therefore eliminates the uncertainty associated with it. Alternative 3 scores highest for long-term effectiveness because of the following reasons: 1) It does not involve on Site treatment of lead contaminated soil and therefore eliminates the uncertainty associated with it, and 2) It does not require management of treatment waste as it does not entail any on Site treatment of soil or cleanup of lead dust from building components.
- **Management of Short-Term Risk:** Alternative 1 scores the lowest as compared to other alternatives because of higher risk to human health (i.e., on Site workers) associated with treatment/cleanup of hazardous waste on Site. Alternative 2 scores slightly higher than Alternative 1 because Alternative 2 does not involve treatment of soil on Site and therefore, short-term exposure risk is reduced as compared to Alternative 1. Alternative 3 scores the highest as compared to other alternatives because all hazardous/contaminated material is planned to be transported off site for disposal without on Site treatment/cleanup and therefore, short-term exposure risk is lowest when compared to the other two alternatives.
- **Technical and Administrative Implementability:** All alternatives score similar on administrative implementability. Alternative 1 scores the lowest on technical implementability as compared to other alternatives due to the additional technical challenges associated with on Site treatment of lead contaminated soil and management of treatment waste generated as a result of cleanup of lead dust from building components, if performed. Alternative 2 scores slightly higher than Alternative 1 because it does not involve treatment of lead contaminated soil on Site. Alternative 3 scores highest as compared to other alternatives for technical implementability because this alternative does not involve on Site treatment of soil or cleanup of lead dust from building components and therefore, does not have technical challenges associated with it.
- **Consideration for Public Concerns:** Since the Site is located in a commercial area with no residential development around it, it is anticipated that public concerns will be limited regarding the on Site cleanup activities including demolition, remedial excavation and on Site treatment. Alternative 1 scores highest as compared to the other alternatives for public concerns because it involves the smallest

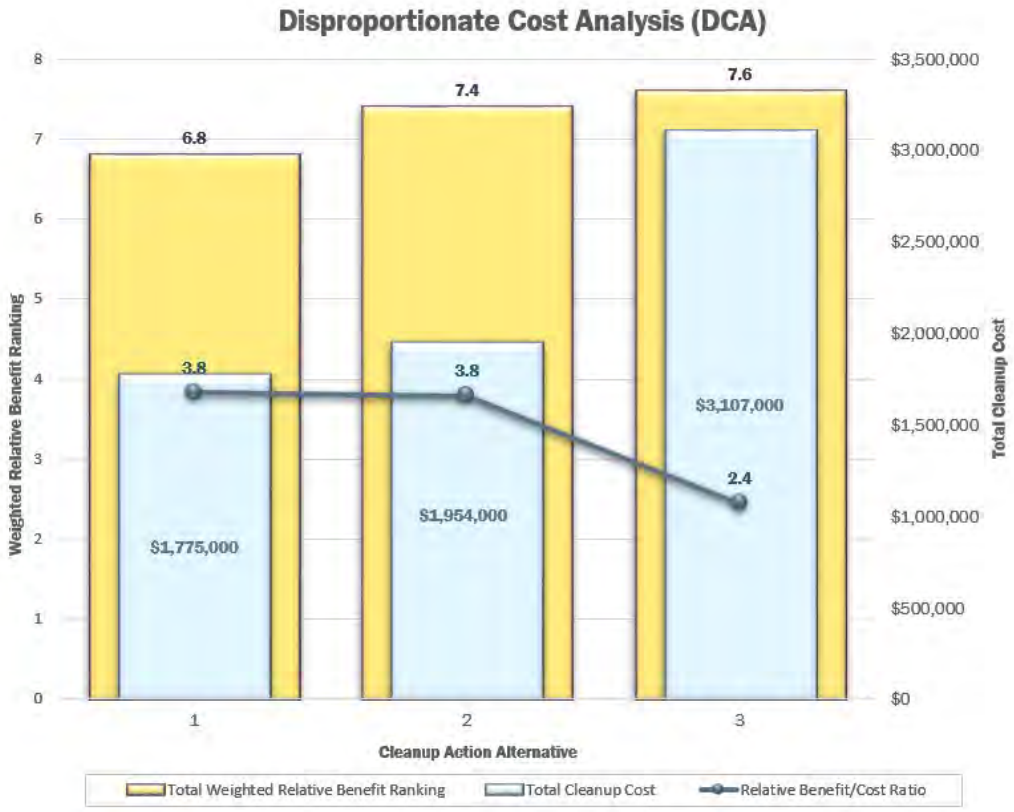
quantity of hazardous waste material being transported from the Site on City streets and State highways and therefore, is anticipated to generate the least amount of public concern as compared to the other alternatives. Alternative 2 scores slightly lower than Alternative 1 as it involves a higher quantity of hazardous waste material being transported from the Site on City streets and State highways as compared to Alternative 1. Alternative 3 scores the lowest as compared to other alternatives for public concerns because it involves the largest quantity of hazardous waste material being transported from the Site on City streets and State highways.

- **Cost:** Alternative 3 has the highest cost, followed up by Alternative 2 and 1. Alternative 1 has the lowest cost as compared to the other two alternatives because it involves the lowest amount of contaminated material being transported and disposed of at a hazardous waste landfill. Alternative 2 has the next highest quantity of material being disposed of at a hazardous waste landfill and therefore, the next highest cost. Alternative 3 disposes of all material at a hazardous waste landfill and therefore, has the highest quantity of material being disposed of at a hazardous waste landfill and therefore, has the highest cost. The FS-level cost estimate for each alternative is presented in Table 6.

10.2.4. Disproportionate Cost Analysis

The MTCA DCA analysis uses a benefit/cost ratio to compare each of the alternatives developed and is used to determine whether cleanup cost is disproportionate to the benefit when compared to other alternatives. Using the summation of the weighted benefit scores described in Section 10.2.3 and the estimated remedy cost presented in Table 6, a benefit/cost ratio was calculated for each alternative. The relative benefit to cost ratio is calculated by dividing total weighted relative benefit ranking by total cleanup cost, which results in a number with a millionth decimal place for all alternatives. Therefore, the ratio includes a multiplying factor of one million to eliminate the non-significant zero digits (Table 8).

The total weighted relative benefit rankings for Alternatives 1, 2 and 3 are 6.8, 7.4 and 7.6, respectively. The total cleanup cost for Alternatives 1, 2 and 3 are approximately 1.78 million, 1.95 million and 3.11 million, respectively. The relative benefit to cost ratio for Alternatives 1, 2 and 3 are 3.8, 3.8 and 2.4, respectively. The total weighted relative benefit ranking, total cleanup cost and relative benefit to cost ratio for each alternative are plotted in a graphical presentation below. The individual DCA criterion, weighting factors, weighted benefit ranking and total cleanup cost for each of the alternatives used to generate the graphic below are presented in Table 8.



Alternative 3 provides slightly higher environmental benefit at a significant higher cost as compared to other two alternatives. The relative benefit to cost ratio of Alternative 3 is significantly lower than the other two alternatives. Therefore, the cost of Alternative 3 is considered disproportionate to the additional benefits provided by this alternative as compared to the other two alternatives.

Alternative 2 provides a slightly higher environmental benefit at a slightly higher cost when compared to Alternative 1. Both the environmental benefit and cost of Alternative 2 are approximately 10 percent higher than Alternative 1, which results in a similar relative benefit to cost ratio for Alternatives 1 and 2. The difference in cost between Alternatives 1 and 2 is within the accuracy of the FS-level cost estimate, which is -30% to +50%, as identified in Section 9.0. Additionally, based on actual contractor bid prices the cost difference between these two alternatives may be smaller than estimated. Therefore, both Alternatives 1 and 2 emerge as preferred alternatives.

11.0 PREFERRED CLEANUP ACTION ALTERNATIVE AND CLEANUP ACTION PLAN

As described in Section 10.2.4, both Alternatives 1 and 2 emerge as preferred alternatives. Therefore, the cleanup action plan selected for the Site is a combination of Alternatives 1 and 2 and integrates components of both alternatives. Alternatives 1 and 2 are identical with the exception of the cleanup approach for the contaminated soil. Alternative 1 includes on Site treatment of excavated soil that would designate as hazardous/dangerous waste to reduce TCLP lead concentrations below hazardous/dangerous waste levels and transport of treated non-hazardous/non-dangerous waste soil to a permitted solid waste landfill (e.g., Subtitle D landfill) for disposal. Alternative 2 includes transport of soil that would designate as hazardous/dangerous waste to a permitted hazardous waste landfill (i.e., Subtitle

C landfill) for disposal without on Site treatment. The cleanup action plan for the Site allows for both of the cleanup approaches for contaminated soil since the environmental benefits of these two approaches are similar. During the pre-construction/construction phase of the project, an approach will be selected based on actual site conditions and contractor bid prices. This approach provides flexibility and takes advantage of potential cost efficiencies provided by the selected contractors' means and methods.

The selected Site cleanup action is protective of human health and the environment, will attain federal and state requirements that are applicable or relevant and appropriate, complies with cleanup standards, and provides for compliance monitoring. In addition, the selected cleanup action satisfies the preference expressed in WAC 173-340-360 for the use of permanent solutions to the maximum extent practicable and provides for a reasonable restoration time frame. The cleanup action is anticipated to be completed within 1 year from approval and finalization of this RI/FS and CAP.

11.1. Description of the Cleanup Action

The cleanup action plan for the Site includes the following:

- Install temporary Site controls including site security, temporary erosion and sediment controls (TESC) and traffic controls.
- Perform Site preparation activities including setting up a contractor laydown area and material management and stockpile areas, and performing utility locates.
- Deconstruct and clean (if necessary) metal and concrete building components (e.g., metal frame, metal roof, ventilation system components, concrete blocks, etc.) and transport off Site for recycling. Cleaning, if performed, will be completed using methods (vacuum cleaners with high-efficiency particulate air [HEPA] filters or wet cleaning) that prevent or minimize generation of airborne dust.
- Demolish and transport other building components (e.g., dry wall/sheet rock, plywood, insulation, wood frame, asphalt floors, underground utilities, etc.) to hazardous waste landfill (i.e., RCRA Subtitle C landfill) for macroencapsulation and disposal.
- Transport and dispose of materials used for cleaning building components (e.g., rags, vacuum filters, etc.) to hazardous waste landfill (i.e., RCRA Subtitle C landfill). Collect water used in cleaning and either treat on Site and discharge to sanitary sewer or transport off Site for treatment and disposal. Perform chemical analytical testing of waste, as necessary, for disposal characterization purposes.
- Excavate contaminated soil from inside and outside the building, and follow one or a combination of the following two approaches based on actual site conditions and contractor bid prices:
  - Treat excavated soil on Site by mixing a reagent with soil to reduce TCLP lead concentrations below hazardous/dangerous waste levels, perform chemical analytical testing of treated soil and transport treated soil with TCLP lead contractions below hazardous/dangerous waste levels to a permitted solid waste landfill (e.g., RCRA Subtitle D landfill). Recovery of bullets from soil comprising the north earthen/soil wall may be performed before treatment if bullet recovery is identified to be feasible and cost effective.
  - Transport excavated soil to a hazardous waste landfill (i.e., RCRA Subtitle C landfill) for treatment and disposal.
- Perform compliance monitoring as described in Section 10.2.1.
- Grade the site to even grades to eliminate steep slopes, humps and depressions.

- Install post-cleanup erosion and sediment controls (e.g. straw wattles, etc.), as necessary, to minimize generation of sediment laden stormwater and dust until Site redevelopment occurs.
- Remove temporary site controls/facilities and garbage and leave the Site in clean and tidy condition.

Additional description of the components of selected cleanup action will be presented in the Engineering Design Report (EDR).

11.2. Applicable or Relevant and Appropriate Requirements (ARARs)

ARARS identified for the cleanup action are presented in the following sections.

11.2.1. Washington State Environmental Policy Act (SEPA)

The State Environmental Policy Act (SEPA) (Revised Code of Washington [RCW] 43.21C; WAC 197-11) and the SEPA procedures (WAC 173-802) are intended to ensure that state and local government officials consider environmental values when making decisions. Prior to taking any action on a proposal, including initiating a remedial construction activity, agencies must follow specific procedures to ensure that appropriate consideration has been given to the environment. This includes issuing an environmental determination and holding a public comment period. If there is a probable significant adverse environmental impact associated with the project, then a Determination of Significance is issued and an Environmental Impact Statement (EIS) is required. If there is no probable significant adverse environmental impact associated with the project, then a Determination of Non-Significance is issued.

To meet this requirement, a SEPA checklist is being prepared to address both the cleanup and redevelopment plan. A SEPA determination will be made prior to implementation of the cleanup and redevelopment at the Site.

11.2.2. Solid and Hazardous Waste Management

The Washington Hazardous Waste Management Act and the implementing regulations and the Dangerous Waste Regulations (Chapter 173-303 WAC) apply to the cleanup action due to the presence of hazardous/dangerous waste levels of lead concentrations in Site soil and on building materials. Related regulations include state and federal requirements for solid waste handling and disposal facilities (40 Code of Federal Regulations [CFR] 241, 257; Chapter 173-350 and -351 WAC) and land disposal restrictions (40 CFR 268; WAC 173-303-340). Waste designation, management, transport and disposal of the hazardous/dangerous waste and solid waste will be performed in accordance with the requirements of these regulations and the requirements set forth by the chosen permitted disposal facility.

11.2.3. Washington State Construction Stormwater General Permit (CSWGP)

Coverage under the CSWGP is generally required for any clearing, grading, or excavating if the project site has a discharge that meets the following:

- Stormwater from the site discharges into surface water(s) of the State; or
- Into storm drainage system that discharges to a surface water(s) of the State; and
- Disturbs one or more acres of land area (including off Site disturbance acreage); or

- Disturbs less than one acre of land area, if the project or activity is part of a larger common plan of development or sale, if the common plan of development or sale will ultimately disturb one or more acres.

The coverage under CSWGP is applicable to the cleanup action because the cleanup action is part of the larger regrading and redevelopment plan which is expected to disturb more than one acre of land and stormwater resulting from site activities has a potential to enter a stormwater drainage system.

To obtain coverage under the CSWGP, a stormwater pollution prevention plan (SWPPP) will be prepared. A CSWGP application process will be completed and coverage under CSWGP will be obtained prior to the implementation of construction at the Site.

11.2.4. Local Permits

All cleanup action alternatives involve demolition of the existing building, excavation of contaminated soil and localized grading of the Site following the cleanup action. Additionally, the overall redevelopment plan involves grading of the entire property, construction of new buildings and paving. Local permits/permitting processes currently identified to be applicable to the project include the Thurston County Site Plan Review process that is applicable to redevelopment components of the project including construction of new buildings and paving, the Thurston County grading permit that is applicable to grading and earth disturbing activities, and two demolition permits one issued by Thurston County and second by the Olympic Region Clean Air Agency (ORCAA). Permit application forms will be completed and supporting information (site plans, etc.) will be submitted to Thurston County and ORCAA to obtain applicable permits prior to the implementation of construction at the Site.

11.2.5. Historical and Cultural Resources

The Archeological and Historical Preservation Act (16 USCA 496a-1) would be applicable if any subject materials are discovered during remedial design or site grading and excavation activities.

The City will be applying for a Remedial Action Grant to fund up to 50% of the cleanup at the Site. Pursuant to Executive Order 21-02, all state agencies implementing or assisting capital projects using funds appropriated in the State's biennial Capital Budget are to consider how future proposed projects may impact significant cultural and historic places. To do so, agencies are required to notify the Department of Archaeology and Historic Preservation (DAHP), the Governor's Office of Indian Affairs (GOIA), and concerned tribes and provide them an opportunity to review and provide comments about potential project impacts. The City will complete Ecology's Cultural Resources Review Form and coordinate with Ecology to determine if any requirements for historical and cultural resources are considered applicable.

11.2.6. Health and Safety

Site cleanup-related construction activities will need to be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (WISHA; RCW 49.17) and the federal Occupational Safety and Health Act (OSHA; 29 CFR 1910, 1926). These applicable regulations include requirements that workers are to be protected from exposure to contaminants and that excavations are to be properly shored.

11.3. Compliance Monitoring

Compliance monitoring will be implemented in accordance with MTCA requirements presented in WAC 173-340-410. WAC 173-340-410 identifies three types of compliance monitoring applicable to a cleanup action including protection monitoring, performance monitoring, and confirmational monitoring.

- Protection monitoring is performed to confirm that human health and the environment are adequately protected during the construction phase of the cleanup action.
- Performance monitoring is performed to confirm that the cleanup action has attained cleanup standards.
- Confirmational monitoring is performed to confirm the long-term effectiveness of the cleanup action.

11.3.1. Protection Monitoring

Protection monitoring will include monitoring of worker health and safety and environmental protection practices such as stormwater, erosion, and sediment controls. Personnel engaged in work that involves hazardous material excavation, demolition and handling will be required to comply with the provisions of WAC 173-340-810 (MTCA Cleanup Regulation, Worker Safety and Health) and be Hazardous Waste Operations and Emergency Response (HAZWOPER), OSHA, and WISHA certified. Each entity (contractor, engineer, owner, etc.) engaged in construction will be responsible for development of their own health and safety plan (HASP) and implementing its requirements for their employees. In addition, environmental protection measures will be implemented and maintained throughout the duration of the cleanup action including all necessary stormwater management, temporary erosion and sediment control measures to meet the requirements of the applicable local, state and federal regulations.

11.3.2. Performance Monitoring

Performance monitoring will involve collection and analysis of soil samples from the base and sidewalls of remedial excavation areas to verify the removal of soil exceeding the cleanup level. The verification soil samples will be submitted for analysis of lead at an Ecology-accredited laboratory on a short turnaround to allow for timely decision making regarding additional excavation, if needed, to meet cleanup standards. Additional description of verification soil sampling and analysis activities will be presented in the EDR.

11.3.3. Confirmational Monitoring

The cleanup action will result in removal of all contaminated media present at the Site with concentrations greater than cleanup levels and the results of verification soil sampling and analysis will be used to confirm that the cleanup standards are achieved at the limits of remedial excavation. Since the cleanup action will result in removal of the contaminated media present at the Site, long-term confirmational monitoring is not considered applicable.

12.0 LIMITATIONS

We have prepared this report for the exclusive use by the City of Olympia and their authorized agents for the Carpenter Road Site located in Lacey, Washington. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted

environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any appendices are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Please refer to Appendix F titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

13.0 REFERENCES

EPA, 2000, "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study," prepared by Environmental Protection Agency (EPA) and US Army Corps of Engineers (USACE), dated July 2000.

GeoEngineers, Inc., 2017. "Environmental Investigation Report, Carpenter Road Site Lacey, Washington." GEI File No. 0415-068-01. November 6, 2017.

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KPFF, 2020. City Of Olympia Carpenter Road Waste Resource Facility Conceptual Site Design, Thurston County, Washington. June 17, 2020.

Revised Code of Washington, 1989. Hazardous Waste Cleanup – Model Toxics Control Act. Chapter 70A.305.

Thurston County GeoData Parcel Information. 2022 https://www.geodata.org/parcelinfo/details.ext.html?id=11815210500

University of Washington School of Public Health, 2016. "Air Monitoring Results." FRCG # 16.03. May 16, 2016.

Washington Administrative Code (WAC). 2021. Department of Ecology Model Toxic Control Act. Title 173-340.

Table 1A

XRF Results - Northern Portion of the Property

Carpenter Road Site

Lacey, Washington

Location	Depth (inches)	Arsenic		Copper		Lead		Mercury	
		Reading (ppm)	Error (+/- ppm)	Reading (ppm)	Error (+/- ppm)	Reading (ppm)	Error (+/- ppm)	Reading (ppm)	Error (+/- ppm)
B1	0 to 6	ND	<11	ND	<34	**16**	5	ND	<13
	6 to 8	ND	<10	ND	<35	ND	<13	ND	<10
	24 to 32	ND	<11	ND	<31	ND	<11	ND	<12
	60 to 66	ND	<9	ND	<33	ND	<13	ND	<12
B2	0 to 5	ND	<10	ND	<32	**24**	5	ND	<11
	6 to 12	ND	<9	ND	<32	ND	<12	ND	<10
	24 to 30	ND	<9	ND	<36	ND	<13	ND	<13
	60 to 66	ND	<10	ND	<34	ND	<11	ND	<15
B3	0 to 6	ND	<10	ND	<37	ND	<14	ND	<10
	6 to 12	ND	<10	ND	<34	ND	<14	ND	<12
	24 to 30	ND	<8	ND	<34	ND	<13	ND	<13
	60 to 66	ND	<9	ND	<32	ND	<13	ND	<12

Notes:

XRF = X-ray fluorescence

ppm = parts per million

ND = Not detected

Table 1B

Soil Analytical Results - Northern Portion of the Property

Carpenter Road Site

Lacey, Washington

Location ID	Sample ID	Start Depth (Inches)	End Depth (Inches)	Analyte Units	Antimony mg/Kg	Arsenic mg/Kg	Barium mg/Kg	Cadmium mg/Kg	Chromium mg/Kg	Copper mg/Kg	Lead mg/Kg	Mercury mg/Kg	Nickel mg/Kg	Selenium mg/Kg	Silver mg/Kg
				MTCA CUL[1]	32	20	16,000	2	2,000	3,200	250	2	1,600	400	400
				Washington Background[2]	--	7	--	1	48	36	24	0.07	48	--	--
B-1	B-1-0-6-20170424	0	6		0.18 U	**2.6**	**40**	0.36 U	**19**	**12**	**4.0**	0.029 U	**25**	0.90 U	0.18 U
	B-1-6-8-20170424	6	8		0.17 U	**1.9**	**130**	0.33 U	**23**	**11**	**2.2**	0.031 U	**15**	0.84 U	0.17 U
B-2	B-2-0-5-20170424	0	5		**0.21**	**2.7**	**44**	0.42 U	**22**	**20**	**5.7**	0.033 U	**20**	1.0 U	0.21 U
	B-2-6-12-20170424	6	12		0.19 U	**4.4**	**61**	0.38 U	**34**	**30**	**3.3**	**0.031**	**33**	0.96 U	0.19 U
B-3	B-3-0-6-20170424	0	6		0.18 U	**2.7**	**65**	0.36 U	**16**	**13**	**5.1**	0.032 U	**19**	0.90 U	0.18 U

Notes:

[1] The lowest of the Model Toxics Control Act (MTCA) Method A or B Cleanup Levels (CULs). The chromium cleanup level of 2,000 mg/kg is the total chromium level.

[2] Washington State background metals concentration (Puget Sound Region) based on "Background Concentration of Metals in Washington State" (Ecology 1994).

Bold font indicates the analyte was detected

Table 2A

XRF Results - Hummocky Soil Areas

Carpenter Road Site

Lacey, Washington

Location	Depth (Feet)	Arsenic		Copper		Lead		Mercury	
		Reading (ppm)	Error (+/- ppm)	Reading (ppm)	Error (+/- ppm)	Reading (ppm)	Error (+/- ppm)	Reading (ppm)	Error (+/- ppm)
ETP1	0 to 4	ND	<16	**43**	13	**63**	7	ND	<15
ETP2	0 to 4	ND	<14	ND	<32	**47**	7	ND	<13
ETP3	0 to 2	ND	<10	ND	<33	ND	<13	**15**	5
ETP4	0 to 4	ND	<12	**53**	12	**31**	5	ND	<12

Notes:

XRF = X-ray fluorescence

ppm = parts per million

ND = Not detected

Table 2B

Soil Analytical Results - Hummocky Soil Areas

Carpenter Road Site

Lacey, Washington

Location ID	Sample ID	Start Depth (Feet)	End Depth (Feet)	Analyte / Units	Antimony mg/Kg	Arsenic mg/Kg	Barium mg/Kg	Cadmium mg/Kg	Chromium mg/Kg	Copper mg/Kg	Lead mg/Kg	Mercury mg/Kg	Nickel mg/Kg	Selenium mg/Kg	Silver mg/Kg
				MTCA CUL[1]	32	20	16,000	2	2,000	3,200	250	2	1,600	400	400
				Washington Background[2]	--	7	--	1	48	36	24	0.07	48	--	--
ETP1	E-TP1-2-2.5-20170418	2	2.5		**0.67**	**5.2**	**85**	**0.49**	**25**	**27**	**67**	**0.092**	**25**	1.1 U	0.22 U
ETP2	E-TP2-2-2.5-20170418	2	2.5		**0.30**	**3.5**	**57**	0.42 U	**18**	**18**	**28**	**0.034**	**16**	1.1 U	0.21 U
ETP3	E-TP3-1-1.5-20170418	1	1.5		**0.44**	**6.5**	**130**	0.48 U	**29**	**24**	**13**	**0.080**	**25**	1.2 U	0.24 U
ETP4	E-TP4-2-2.5-20170418	2	2.5		**0.95**	**2.8**	**88**	0.40 U	**20**	**38**	**24**	0.030 U	**19**	1.0 U	0.20 U

Notes:

[1] The lowest of the Model Toxics Control Act (MTCA) Method A or B Cleanup Levels (CULs). The chromium cleanup level of 2,000 mg/kg is the total chromium level.

[2] Washington State background metals concentration (Puget Sound Region) based on "Background Concentration of Metals in Washington State" (Ecology 1994).

Bold font indicates the analyte was detected

Table 3A

XRF Results - Inside Building

Carpenter Road Site

Lacey, Washington

Location ID	Depth (inches)	Arsenic		Copper		Lead		Mercury	
		Reading (ppm)	Error (+/- ppm)	Reading (ppm)	Error (+/- ppm)	Reading (ppm)	Error (+/- ppm)	Reading (ppm)	Error (+/- ppm)
HA-7	0 to 6	ND	<13	ND	<39	**23**	6	ND	<15
	6 to 12	ND	<14	ND	<35	**49**	6	ND	<14
	12 to 18	ND	<11	ND	<41	ND	<16	ND	<11
HA-8	Surface	--	--	--	--	**1,379**	--	--	--
	0.25	--	--	--	--	**191**	--	--	--
	0 to 6	ND	<10	ND	<38	ND	<14	ND	<14
	6 to 12	ND	<19	**97**	16	**30**	6	ND	<14
	12 to 18	**13**	4	**171**	18	ND	<15	ND	<14
HA-9	0 to 6	ND	<10	ND	<37	ND	<14	ND	<14
	6 to 12	ND	<13	**48**	13	**32**	6	ND	<16
	12 to 18	ND	<35	**112**	15	**413**	16	ND	<16
	18 to 24	ND	<15	**45**	13	**47**	7	ND	<13
HA-10	0 to 6	ND	<71	**138**	17	**1,988**	45	ND	<24
	6 to 12	ND	<49	ND	<40	**834**	25	ND	<18
	12 to 18	ND	<23	ND	<35	**188**	11	ND	<13
HA-11	Surface	--	--	--	--	**475**	--	--	--
	0.25	--	--	--	--	**191**	--	--	--
	0 to 6	ND	<23	ND	<37	**175**	11	ND	<15
	6 to 12	**37**	10	ND	<36	**328**	14	ND	<16
	12 to 18	ND	<13	ND	<34	**40**	6	ND	<13
HA-12	0 to 6	ND	<30	**51**	14	**293**	14	ND	<14
	6 to 12	ND	<10	ND	<33	ND	<13	ND	<13
	12 to 18	**21**	6	ND	<39	**85**	8	ND	<16
HA-13	Surface	--	--	--	--	**51**	--	--	--
	0 to 6	**18**	4	**36**	12	**24**	5	--	--
	6 to 12	ND	<16	ND	<44	**33**	7	ND	<16
	12 to 18	ND	<12	**40**	12	**33**	6	ND	<12
HA-14	0 to 6	ND	<17	**85**	14	**75**	7	ND	<15
	6 to 12	ND	<18	**49**	12	**88**	8	ND	<14
	12 to 18	ND	<22	**124**	16	**151**	10	ND	<17
HA-15	0 to 6	ND	<12	ND	<36	**19**	5	ND	<11
	6 to 12	ND	<10	**39**	13	**16**	5	ND	<15
	12 to 18	ND	<15	**169**	20	**33**	7	ND	<16
HA-16	0 to 6	**16**	4	ND	<39	ND	<15	ND	<14
	6 to 12	ND	<13	**71**	15	**23**	6	ND	<15
	12 to 18	ND	<14	**212**	18	**43**	6	ND	<14

Notes:

XRF = X-ray fluorescence

ppm = parts per million

ND = Not detected

Surface = An XRF reading performed on the surface of the soil

Table 3B

Soil Analytical Results - Inside Building

Carpenter Road Site

Lacey, Washington

Location ID	Sample ID	Start Depth (Inches)	End Depth (Inches)	Analyte / Units	Antimony mg/Kg	Arsenic mg/Kg	Barium mg/Kg	Cadmium mg/Kg	Chromium mg/Kg	Copper mg/Kg	Lead mg/Kg	Mercury mg/Kg	Nickel mg/Kg	Selenium mg/Kg	Silver mg/Kg
				MTCA CUL[1]	32	20	16,000	2	2,000	3,200	250	2	16,000	400	400
				Washington Background[2]	--	7	--	1	48	36	24	0.07	48	--	--
HA7	HA7-0-6-20170419	0	6		**0.89**	**4.2**	**57**	0.37 U	**19**	**21**	**16**	**0.032**	**20**	0.92 U	0.18 U
HA8	HA8-0-6-20170419	0	6		**0.29**	**2.9**	**44**	0.40 U	**15**	**14**	**6.2**	0.030 U	**16**	1.0 U	0.20 U
HA9	HA9-18-24-20170419	18	24		**43**	**10**	**82**	0.36 U	**21**	**7,800**	**1,200**	0.029 U	**18**	0.89 U	**0.23**
HA10	HA10-0-6-20170419	0	6		**41**	**4.6**	**37**	0.36 U	**16**	**170**	**2,200**	0.029 U	**18**	0.91 U	0.18 U
HA10	HA10-12-18-20170419	12	18		**8.4**	**2.2**	**32**	0.36 U	**13**	**49**	**650**	0.027 U	**15**	0.90 U	0.18 U
HA11	HA11-12-18-20170419	12	18		**0.58**	**1.9**	**39**	0.40 U	**21**	**24**	**30**	0.031 U	**24**	1.0 U	0.20 U
HA12	HA12-0-6-20170419	0	6		**3.3**	**2.3**	**42**	0.39 U	**12**	**17**	**86**	0.029 U	**16**	0.96 U	0.19 U
HA13	HA13-0-6-20170419	0	6		**0.34**	**2.8**	**47**	0.38 U	**13**	**15**	**9.4**	0.030 U	**15**	0.94 U	0.19 U
HA14	HA14-12-18-20170419	12	18		**0.73**	**4.1**	**40**	0.41 U	**13**	**30**	**51**	**0.060**	**13**	1.0 U	0.20 U
HA15	HA15-0-6-20170419	0	6		**0.48**	**3.2**	**40**	0.39 U	**24**	**21**	**13**	0.027 U	**25**	0.97 U	0.19 U
HA16	HA16-12-18-20170419	12	18		**0.26**	**2.7**	**49**	0.40 U	**18**	**26**	**6.1**	**0.042**	**25**	0.99 U	0.20 U
COMP C	COMP C				**16**	**6.5**	**63**	0.39 U	**18**	**38**	**480**	0.029 U	**23**	0.98 U	0.20 U
COMP D	COMP D				**22**	**3.0**	**44**	0.39 U	**13**	**57**	**1,200**	0.027 U	**18**	0.97 U	0.19 U

Notes:

[1] The lowest of the Model Toxics Control Act (MTCA) Method A or B Cleanup Levels (CULs). The chromium cleanup level of 2,000 mg/kg is the total chromium level.

[2] Washington State background metals concentration (Puget Sound Region) based on "Background Concentration of Metals in Washington State" (Ecology 1994).

Bold font indicates the analyte was detected

Yellow shading indicates the concentration exceeds the MTCA CUL

Comp C was a composite of HA-9 0 to 6, 6 to 12, and 12 to 18 inches

Comp D was a composite of HA-10 0 to 6 inches and 6 to 12 inches and HA-11 0 to 6 inches and 6 to 12 inches

Table 4A

XRF Results - Outside Building

Carpenter Road Site

Lacey, Washington

Location ID	Depth (inches)	Arsenic		Copper		Lead		Mercury	
		Reading (ppm)	Error (+/- ppm)	Reading (ppm)	Error (+/- ppm)	Reading (ppm)	Error (+/- ppm)	Reading (ppm)	Error (+/- ppm)
HA-1	0 to 6	**756**	44	**1,219**	38	**6,445**	108	**72**	14
	6 to 12	ND	<87	**370**	20	**4,080**	68	**32**	9
	12 to 18	**43**	14	ND	<43	**506**	20	ND	<17
HA-2	0 to 6	**128**	16	**90**	16	**2,919**	62	ND	<28
	6 to 12	**190**	28	**130**	16	**2,728**	55	ND	<28
	12 to 18	**152**	29	**92**	17	**2,377**	56	ND	<28
	18 to 24	**121**	28	**98**	17	**209**	51	ND	<26
HA-3	0 to 6	ND	<34	**477**	26	**380**	16	ND	<16
	6 to 12	ND	<18	**262**	20	**311**	14	ND	<11
	12 to 18	ND	<22	**69**	17	**94**	10	ND	<18
HA-4	0 to 6	**112**	31	**265**	24	**2,223**	58	ND	<29
	6 to 12	**298**	31	**458**	25	**3,139**	62	ND	<27
	12 to 18	**195**	26	**274**	24	**1,594**	44	ND	<28
HA-5	0 to 6	**66**	12	**95**	12	**676**	17	ND	<14
	6 to 12	ND	<33	**52**	13	**370**	15	ND	<16
	12 to 18	ND	<22	**51**	<12	**182**	<10	ND	<12
HA-6	0 to 6	**20**	6	ND	<33	**107**	8	ND	<12
	6 to 12	ND	<12	ND	<33	**42**	6	ND	<14
	12 to 18	ND	<15	ND	<37	**51**	7	ND	<13
B4	0 to 6	ND	<10	ND	<32	**14**	4	ND	<12
	24 to 30	ND	<9	ND	<32	ND	<13	ND	<13
B5	0 to 6	ND	<9	ND	<34	**32**	6	ND	<12
	24 to 30	ND	<11	ND	<32	**84**	9	ND	<10
	48 to 60	ND	<10	ND	<31	**14**	5	ND	<13
B6	0 to 6	ND	<10	ND	<32	**14**	5	ND	<13
	24 to 28	ND	<10	ND	<36	ND	<14	ND	<11
	60 to 66	ND	<10	ND	<35	ND	<12	ND	<13
B7	0 to 6	ND	<14	**50**	13	**51**	6	ND	<14
	24 to 30	ND	<11	ND	<36	**22**	5	ND	<14
	60 to 66	ND	<9	ND	<35	ND	<12	ND	<11
B8	0 to 6	ND	<9	ND	<31	ND	<12	ND	<12
	24 to 30	ND	<10	ND	<34	ND	<14	ND	<14
B9	0 to 6	ND	<17	ND	<49	**32**	8	ND	<19
	24 to 30	ND	<9	ND	<28	ND	<12	ND	<12
	60 to 66	ND	<9	ND	<26	ND	<11	ND	<15

Notes:

XRF = X-ray fluorescence
ppm = parts per million
ND = Not detected

Table 4B

Soil Analytical Results - Outside Building

Carpenter Road Site

Lacey, Washington

Location ID	Sample ID	Start Depth (Inches)	End Depth (Inches)	Analyte	Antimony mg/Kg	Arsenic mg/Kg	Barium mg/Kg	Cadmium mg/Kg	Chromium mg/Kg	Copper mg/Kg	Lead mg/Kg	Mercury mg/Kg	Nickel mg/Kg	Selenium mg/Kg	Silver mg/Kg
				Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
				MTCA CUL[1]	32	20	16,000	2	2,000	3,200	250	2	16,000	400	400
				Washington Background[2]	--	7	--	1	48	36	24	0.07	48	--	--
B-4	B-4-0-6-20170424	0	6		0.19 U	**2.6**	**43**	0.37 U	**16**	**17**	**4.0**	**0.030**	**16**	0.94 U	0.19 U
B-5	B-5-0-6-20170424	0	6		**3.4**	**2.1**	**45**	0.37 U	**16**	**36**	**230**	0.033 U	**16**	0.94 U	0.19 U
B-5	B-5-24-30-20170424	24	30		**1.8**	**3.4**	**58**	0.38 U	**27**	**35**	**120**	0.030 U	**23**	0.95 U	0.19 U
B-6	B-6-0-6-20170424	0	6		**0.21**	**2.8**	**40**	0.35 U	**25**	**19**	**6.6**	0.028 U	**21**	0.87 U	0.17 U
B-7	B-7-0-6-20170424	0	6		**0.27**	**2.3**	**51**	0.33 U	**14**	**14**	**17**	0.030 U	**13**	0.83 U	0.17 U
B-7	B-7-24-30-20170424	24	30		**3.4**	**1.8**	**46**	0.34 U	**21**	**66**	**260**	0.035 U	**19**	0.85 U	0.17 U
B-8	B-8-0-6-20170424	0	6		**2.4**	**3.5**	**63**	0.30 U	**26**	**24**	**240**	0.032 U	**22**	0.75 U	0.15 U
B-9	B-9-0-6-20170424	0	6		**0.38**	**3.6**	**73**	0.37 U	**21**	**21**	**20**	0.032 U	**22**	0.91 U	0.18 U
HA6	HA6-0-6-20170418	0	6		**1.5**	**3.4**	**38**	0.43 U	**19**	**21**	**140**	**0.031**	**18**	1.1 U	0.21 U
Comp A	Comp A	0	6		**43**	**4.2**	**42**	0.44 U	**15**	**200**	**2,500**	0.036 U	**14**	1.1 U	0.22 U
Comp B	Comp B	0	6		**28**	**4.4**	**52**	0.47 U	**12**	**120**	**1,100**	**0.071**	**13**	1.2 U	0.24 U

Notes:

[1] The lowest of the Model Toxics Control Act (MTCA) Method A or B Cleanup Levels (CULs). The chromium cleanup level of 2,000 mg/kg is the total chromium level.

[2] Washington State background metals concentration (Puget Sound Region) based on "Background Concentration of Metals in Washington State" (Ecology 1994).

Bold font indicates the analyte was detected

Yellow shading indicates the concentration exceeds the MTCA CUL

Comp A was a composite of HA-1 0-6 inches, HA-2 0-6 inches, and HA-3 0-6 inches

Comp B was a composite of HA-4 0-6 inches and HA-5 0-6 inches

Table 5

Total and TCLP Lead Results - Composite Samples

Carpenter Road Site

Lacey, Washington

Location ID	Sample ID	Analyte Units	Lead mg/Kg	TCLP Lead mg/L
		MTCA CUL[1] /TCLP Criteria[2]	250	5
		Washington Background[3]	24	--
Comp A	Comp A		**2,500**	**20**
Comp B	Comp B		**1,100**	**32**
Comp C	Comp C		**480**	**7.7**
Comp D	Comp D		**1,200**	**77**

Notes:

[1] Model Toxics Control Act (MTCA) Cleanup Level (CUL) for lead (250 mg/kg).

[2] Hazardous/Dangerous Waste Toxicity Characteristic Criteria (5 mg/L).

[3] Washington State background metals concentration (Puget Sound Region) based on "Background Concentration of Metals in Washington State" (Ecology 1994).

Bold font indicates the analyte was detected

Yellow shading indicates the concentration exceeds the MTCA CUL

Orange shading indicates the concentration exceeds the Hazardous/Dangerous Waste Toxicity Characteristic Criteria

Comp A was a composite of HA-1 0-6 inches, HA-2 0-6 inches, and HA-3 0-6 inches

Comp B was a composite of HA-4 0-6 inches and HA-5 0-6 inches

Comp C was a composite of HA-9 0-6, 6-12, and 12-18 inches

Comp D was a composite of HA-10 0-6 inches and 6-12 inches, and HA-11 0-6 inches and 6-12 inches

Table 6

Alternative Cost Estimate

Carpenter Road Site

Lacey, Washington

Item No.	Description	Estimated Quantity[1]			Unit	Unit Cost[2]	Estimated Cost[3]			Notes and Assumptions
		Alt 1	Alt 2	Alt 3			Alt 1	Alt 2	Alt 3	
Construction										
Mobilization and Demobilization										
1	Mobilization/Demobilization	1	1	1	%	10%	$89,697	$99,897	$165,572	Includes cost for Contractor mobilization to and demobilization from property to perform construction and their project management cost. Assumed to be 10 percent of other construction cost.
Temporary Facilities and Site Controls										
2	Temporary Facilities	1	1	1	LS	$15,000	$15,000	$15,000	$15,000	Includes cost for facilities such as construction trailer, portable toilet, and necessary utilities (ex. power, water, etc.). Cost includes removal of temporary facilities prior to demobilization.
3	Temporary Chain Link Fence (6 Ft High)	1,100	1,100	1,100	LF	$10	$11,000	$11,000	$11,000	Includes cost to establish and maintain security fencing. Existing fence on east, north and west of the building will be maintained (or relocated as necessary) during the project. Temporary chain link fence will be procured and installed in the parking area in front of the building that does not have an existing fence. Cost includes removal of the fence prior to demobilization.
4	Temporary Erosion and Sediment Control (TESC) and Traffic Controls	1	1	1	LS	$10,000	$10,000	$10,000	$10,000	Includes cost to establish and maintain TESC (e.g. silt fence, straw wattle, etc.) and traffic controls (e.g. signs). Cost includes removal of these controls prior to demobilization.
Health and Safety										
5	Health and Safety	1	1	1	LS	$50,000	$50,000	$50,000	$50,000	Includes cost to establish, monitor, and maintain health and safety measures including air monitoring to protect worker safety from exposure to lead present on structures and in media at the property during remedial actions. Assumes that this item will require a Certified Industrial Hygienist (CIH) to plan and perform air monitoring, preparation of health and safety plans, etc.
Ventilation System										
6	Remediation of Ventilation System Components	1	1		LS	$2,000	$2,000	$2,000	$0	Includes cost for cleaning ventilation system surfaces to remove elevated concentrations of lead prior to transport and recycling.
7	Demolition, Transport and Recycling of Ventilation System Components	1	1		LS	$3,000	$3,000	$3,000	$0	Includes cost for demolition, transport and recycling of ventilation system components. Assumes 2 truck loads will be required for transport of ventilation system components to a recycling facility.
8	Demolition, Transport and Disposal of Ventilation System Components at Hazardous Waste Landfill			2	Container	$6,200	$0	$0	$12,400	Includes cost for demolition, transport and disposal of material at hazardous waste landfill (RCRA Subtitle C landfill). Assumes macroencapsulation (permanent isolation from the surrounding environment, including rain water, leachates, and any other materials in the surrounding landfill) performed by landfill prior to disposal. Assumes $310 per cubic yard to transport and dispose building material at hazardous waste landfill.
Interior Structures and Insulation										
9	Demolition of Interior Structures and Ceiling Insulation	1	1	1	LS	$30,000	$30,000	$30,000	$30,000	Includes cost for performing demolition of interior structures and removing insulation on ceiling of buildings. Assumes removal of insulation from ceiling of metal building and disposal of insulation with interior structures.
10	Transport and Disposal of Interior Structures/Ceiling Insulation to Hazardous Waste Landfill	8	8	8	Container	$6,200	$49,600	$49,600	$49,600	Includes cost for transportation and disposal of material at a hazardous waste landfill. Assumes macroencapsulation (permanent isolation from the surrounding environment, including rain water, leachates, and any other materials in the surrounding landfill) performed by landfill prior to disposal. Assumes $310 per cubic yard to transport and dispose building material at hazardous waste landfill.
Ecology Blocks										
11	Remediation of Ecology Blocks	1	1		LS	$7,000	$7,000	$7,000	$0	Includes cost for remediation of ecology blocks to remove elevated concentrations of lead from the surfaces of the ecology blocks prior to transport for reuse. Lump sum cost based on an assumption of $2/SF for concrete surface cleaning.
12	Transport of Ecology Blocks for Reuse	1	1		LS	$2,000	$2,000	$2,000	$0	Includes cost for transport of ecology blocks for reuse. Assumed 4 truck loads will be required for transport of ecology blocks.
13	Transport and Disposal of Ecology Blocks to Hazardous Waste Landfill			4	Container	$6,200	$0	$0	$24,800	Includes cost for transportation and disposal of material at a hazardous waste landfill. Assumes macroencapsulation (permanent isolation from the surrounding environment, including rain water, leachates, and any other materials in the surrounding landfill) performed by landfill prior to disposal. Assumes $310 per cubic yard to transport and dispose building material at hazardous waste landfill.
Wastewater Treatment, Transport and Disposal										
14	Wastewater treatment, transport and disposal	1	1		LS	$75,000	$75,000	$75,000	$0	Includes cost for treatment, transport, and disposal of water generated from cleaning of the building components.

Item No.	Description	Alt 1	Alt 2	Alt 3	Unit	Unit Cost[2]	Alt 1	Alt 2	Alt 3	Notes and Assumptions
Contaminated Soil Inside Building										
15	Remedial Excavation and Stockpiling of Soil inside building	240	240	240	CY	$25	$6,000	$6,000	$6,000	Includes cost for excavation of earthen/soil walls inside building to remove soil with lead concentrations greater than MTCA Cleanup Level. Assumes excavation of soil to depths of between 0.5 and 3 feet from earthen/soil walls. Assumes stockpiling of soil can be completed on existing pavement to facilitate sampling and analysis, if required for disposal purposes.
16	Transport and Disposal of Soil to Hazardous Waste Landfill		384	384	TON	$370	$0	$142,080	$142,080	Includes cost for loading, transport, and disposal of soil. Assumes that soil designated as Hazardous/Dangerous Waste will require disposal at Subtitle C landfill. Assumes 1.6 tons/cubic yard conversion factor for soil volume to weight.
17	Remove Recoverable Lead Shots from Northern Side Slope Soil	1			LS	$0	$0	$0	$0	Includes cost to screen soil through series of appropriately sized screens and/or using other mechanical/gravity separation process to separate heavier lead shots from soil. Includes storing recovered lead shots in 55-gallon drums temporarily on site prior to off Site transport and recycling. Assumes credit received by recovered lead recycling offsets the cost to recover lead shots from soil.
18	Treatability Study Performed by Contractor	1			LS	$20,000	$20,000	$0	$0	Includes cost to complete treatability study to identify reagent that is effective in treating Site soil and reagent dosage rate.
19	On Site Treatment of Soil	384			TON	$100	$38,400	$0	$0	Includes cost to treat excavated soil on Site by mixing reagent in accordance with treatment by generator (TGB) requirements of State Dangerous Waste Regulations (WAC 173-303).
20	Stockpile Sampling and Analysis	1			LS	$5,000	$5,000	$0	$0	Includes cost for performing stockpile sampling and analysis to characterize treated soil prior to disposal. Assumes TCLP analysis for lead.
21	Transport and Disposal of Soil to Non-Hazardous Waste Landfill	384			TON	$80	$30,720	$0	$0	Includes cost for loading, transport, and disposal of soil. Assumes that treated soil with toxicity characteristics leaching procedure (TCLP) levels below hazardous/dangerous levels can be disposed at a permitted landfill (e.g. Subtitle D landfill). Assumes 1.6 tons/cubic yard conversion factor for soil volume to weight.
Soil Outside Building										
22	Remedial Excavation and Stockpiling of Soil Outside Building	260	260	260	CY	$25	$6,500	$6,500	$6,500	Estimated cost for excavation of soil outside building to remove soil with lead concentrations greater than MTCA Cleanup Level. Assumes excavation of soil to depths on average to 2 feet. Assumes stockpiling of soil can be completed on existing pavement to facilitate sampling and analysis, if required for disposal purposes.
23	Transport and Disposal of Soil to Hazardous Waste Landfill		416	416	TON	$370	$0	$153,920	$153,920	Includes cost for loading, transport, and disposal of soil. Assumes that soil designated as Hazardous/Dangerous Waste will require disposal at Subtitle C landfill. Assumes 1.6 tons/cubic yard conversion factor for soil volume to weight.
24	Treatability Study Performed by Contractor	1			LS	$20,000	$20,000	$0	$0	Includes cost to complete treatability study to identify reagent that is effective in treating Site soil and reagent dosage rate.
25	On Site Treatment of Soil	416			TON	$100	$41,600	$0	$0	Includes cost to treat excavated soil on Site by mixing reagent in accordance with treatment by generator (TGB) requirements of State Dangerous Waste Regulations (WAC 173-303).
26	Stockpile Sampling and Analysis	1			LS	$5,000	$5,000	$0	$0	Includes cost for performing stockpile sampling and analysis to characterize treated soil prior to disposal. Assumes sample analysis for RCRA 8 metals and copper and nickel. Assumes follow up TCLP analysis for lead.
27	Transport and Disposal of Soil to Non-Hazardous Waste Landfill	416			TON	$80	$33,280	$0	$0	Includes cost for loading, transport, and disposal of soil. Assumes that treated soil with toxicity characteristics leaching procedure (TCLP) levels below hazardous/dangerous levels can be disposed at a permitted landfill (e.g. Subtitle D landfill). Assumes 1.6 tons/cubic yard conversion factor for soil volume to weight.
Asphalt Pavement										
28	Asphalt Demolition	460	460	460	SY	$20	$9,200	$9,200	$9,200	Includes cost for controlled demolition of asphalt pavement within the building to minimize cross-contamination
29	Transport and Disposal of Asphalt to Hazardous Waste Landfill	54	54	54	TON	$370	$19,980	$19,980	$19,980	Includes cost for loading, transport, and disposal of demolished asphalt. Assumes that asphalt designates as Hazardous/Dangerous Waste requiring disposal at Subtitle C landfill. Asphalt assumed to be 2 inches thick. Assumed 1.8 tons/cubic yard conversion factor for asphalt volume to weight. Assumes a quantity of 30 CY.
Concrete Pavement, Footings and Utilities										
30	Remediation of Concrete Surfaces Prior to Demolition and Recycling	9,700	9,700		SF	$2	$19,400	$19,400	$0	Includes cost for cleaning concrete surfaces to remove elevated concentrations of lead from the surface of the concrete prior to demolition.
31	Concrete Demolition	9,700	9,700	9,700	SF	$5	$48,500	$48,500	$48,500	Includes cost for demolition of concrete pavement and footings adjacent to pavement.
32	Transport and Recycling of Concrete	522	522		TON	$15	$7,830	$7,830	$0	Includes cost for transport and off-site recycling of demolished concrete. Assumes variable thicknesses of concrete structures. Assumed 1.8 tons/cubic yard conversion factor for concrete volume to weight. Assumes a quantity of 290 CY.
33	Transport and Disposal of Concrete to Hazardous Waste Landfill			522	TON	$370	$0	$0	$193,140	Includes cost for loading, transport, and disposal of demolished concrete. Assumes that concrete designates as Hazardous/Dangerous Waste requiring disposal at Subtitle C landfill. Assumes variable thicknesses of concrete structures. Assumed 1.8 tons/cubic yard conversion factor for concrete volume to weight. Assumes a quantity of 290 CY.
34	Utilities Decommissioning, Demolition, Transport and Disposal to Hazardous Waste Landfill	1	1	1	LS	$20,000	$20,000	$20,000	$20,000	Includes cost for decommissioning, demolition and disposal of utilities to a hazardous waste landfill (i.e. Subtitle C landfill). Assumed to include removing utilities within remedial excavations and building demolition footprint and disposal of utilities that are removed.
Building Structure										
35	Remediation of Metal Building Components	13,680	13,680		SF	$2	$27,360	$27,360	$0	Includes cost for remediation of components of the metal building to remove elevated concentrations of lead from the surface of the metal building components prior to demolition, transport, and recycling. Assumes 75% of the building area needs remediation.
36	Demolition, Transport and Recycling of Building Components	18,240	18,240		SF	$15	$273,600	$273,600	$0	Includes cost for demolition, transport and recycling of building components including metal roof, walls and structural components. Building is assumed to be 152 feet long by 120 feet wide. Unit cost based on quote received from PacRim.
37	Demolition, Transport and Disposal of Building Components to Hazardous Waste Landfill			2,280	TON	$370	$0	$0	$843,600	Includes cost for demolition, transport and disposal of building components including metal roof, walls and structural components at a Hazardous Waste Landfill (i.e. Subtitle C landfill). Building is assumed to be 152 feet long by 120 feet wide. Weight of building components is a rough guess for the purposes of feasibility study. Assumes building weighs 250 pounds per square feet.
Post-Cleanup Grading and Erosion Control										
38	Post-Cleanup Grading and Erosion Control	1	1	1	LS	$10,000	$10,000	$10,000	$10,000	Includes cost to grade the Site following cleanup to eliminate steep slopes, humps and depressions, and implement post-cleanup erosion and sediment control.
						Construction Subtotal	**$986,667**	**$1,098,867**	**$1,821,292**	Sum of construction line items
						Construction Total (Includes Sales Tax)	**$1,072,507**	**$1,194,468**	**$1,979,744**	Sales tax is assumed to be 8.7 percent of construction subtotal.

Item No.	Description	Alt 1	Alt 2	Alt 3	Unit	Unit Cost[2]	Alt 1	Alt 2	Alt 3	Notes and Assumptions
Professional Services										
	Project Management	6%	6%	6%	%		$59,200	$65,932	$109,278	Includes cost for planning and reporting, and bid and contract administration. Assumed to be 6% of construction subtotal.
	Engineering Design and Permitting	1	1	1	LS		$155,000	$155,001	$155,002	Includes cost for preparation of Engineering Design Report (EDR), plans and specifications, and permitting support.
	Construction Management and Monitoring	8%	8%	8%	%		$78,933	$87,909	$145,703	Includes cost for construction management tasks as well as monitoring and documentation of field activities and compliance with environmental requirements. Assumed to be 8 percent of construction subtotal.
						Professional Services Total	**$293,133**	**$308,842**	**$409,983**	
Contingency										
	Contingency	30%	30%	30%	%		$409,692.12	$450,993.24	$716,918.19	The estimate includes a contingency of 30 percent (%) to account for currently unidentified or unanticipated site conditions and/or construction requirements such as discovery of additional contamination that was not identified as part of recent investigation, additional management and/or monitoring required during construction to complete demolition, remediation, removal and disposal of site structures, etc.
						TOTAL PROJECT COST	**$1,775,000**	**$1,954,000**	**$3,107,000**	

Notes:

[1] Concept design level.

[2] Unit costs based on a combination of published engineering reference manuals (i.e., RS Means Heavy Construction Cost Data Manual); construction cost estimates solicited from applicable vendors and contractors; review of actual costs incurred during similar, applicable projects; and professional judgment.

[3] Cost is presented in 2021 dollars.

% = percent

LS = lump sum

SY = square yard

LF = linear foot

CY = cubic yard

Table 7

Evaluation of Alternatives

Carpenter Road Site
Lacey, Washington

Evaluation Criteria	Alternative 1	Alternative 2	Alternative 3
Relative Benefits Ranking (Scored from 1-lowest to 10-highest)			
Protectiveness *(overall protectiveness of human health and environment)*	**Score =** 8 All three alternatives score similar for overall protectiveness because all alternatives will result in the removal/cleanup of contaminated media from the Site, will achieve cleanup standards at the completion of cleanup construction and have similar restoration timeframe. All alternatives loose a couple points due to potential exposure to construction workers during cleanup construction.	**Score =** 8 All three alternatives score similar for overall protectiveness because all alternatives will result in the removal/cleanup of contaminated media from the Site, will achieve cleanup standards at the completion of cleanup construction and have similar restoration timeframe. All alternatives loose a couple points due to potential exposure to construction workers during cleanup construction.	**Score =** 8 All three alternatives score similar for overall protectiveness because all alternatives will result in the removal/cleanup of contaminated media from the Site, will achieve cleanup standards at the completion of cleanup construction and have similar restoration timeframe. All alternatives loose a couple points due to potential exposure to construction workers during cleanup construction.
Permanence *(permanent reduction of toxicity, mobility, or volume of hazardous substances)*	**Score =** 8 Alternative 1 and 2 score similar for permanence. Alternative 1 relies on Site treatment of lead contaminated soil and on Site cleanup of lead contaminated dust (if necessary) from salvageable building components to reduce toxicity, mobility and/or volume of hazardous substances. Salvageable building components will be recycled as part of this alternative. Both Alternatives 1 and 2 loose a couple points as non-salvageable building components will be transported off Site for disposal at a hazardous waste landfill (i.e. RCRA Subtitle C landfill) where the material will get macroencapsulated (permanently isolated from the surrounding landfill environment, including rain water, leachates, and any other materials) prior to disposal and which not necessarily results in a reduction of toxicity and volume of hazardous substances.	**Score =** 8 Alternative 1 and 2 score similar for permanence. Alternative 2 relies on off Site treatment of lead contaminated soil at the hazardous waste landfill (i.e. RCRA Subtitle C landfill) and on Site cleanup of lead contaminated dust (if necessary) from salvageable building components to reduce toxicity, mobility and/or volume of hazardous substances. Salvageable building components will be recycled as part of this alternative. Both Alternatives 1 and 2 loose a couple points as non-salvageable building components will be transported off Site for disposal at hazardous waste landfill (i.e. RCRA Subtitle C landfill) where the material will get macroencapsulated (permanently isolated from the surrounding landfill environment, including rain water, leachates, and any other materials) prior to disposal and which not necessarily results in a reduction of toxicity and volume of hazardous substances.	**Score =** 6 This alternative receives the lowest score for permanence because the reduction of toxicity, mobility and/or volume of hazardous substance is the lowest in this alternative when compared to the other two alternatives. Alternative 3 does not involve on Site treatment/cleanup to reduce toxicity, mobility and/or volume of hazardous substances. Both salvageable and non-salvageable building components will be transported off Site for disposal at a hazardous waste landfill (i.e. RCRA Subtitle C landfill) where the material will get macroencapsulated (permanently isolated from the surrounding landfill environment, including rain water, leachates, and any other materials) prior to disposal and which not necessarily results in a reduction of toxicity and volume of hazardous substances.
Long-Term Effectiveness (certainty for cleanup success, long-term reliability, magnitude of residual risk, management of treatment wastes, and management of wastes left untreated)	**Score =** 6 This alternative scores the lowest for long-term effectiveness because of the uncertainties associated with on Site treatment of lead contaminated soil. If on Site treatment is not successful or results in an unintended consequence (e.g., increase/decrease in soil geochemical properties such as pH above/below regulatory levels as a result of the addition of reagents, etc.) then the contaminated soil will require transport and disposal at a hazardous waste landfill (i.e. RCRA Subtitle C landfill) with additional treatment performed at the landfill, as necessary. Additionally, this alternative entails management of treatment waste that may be generated as a result of the on Site treatment/cleanup activities. All alternatives achieve a similar long-term reliability, low magnitude of residual risk and leaves no waste behind.	**Score =** 8 This alternative scores higher than Alternative 1 as it does not involve on Site treatment of lead contaminated soil and therefore eliminates the uncertainty associated with it. Lead contaminated soil will be transported off Site to a hazardous waste landfill (i.e. RCRA Subtitle C landfill) for treatment and disposal under this alternative which achieves a higher degree of certainty of treatment success. This alternative looses a couple points as it entails management of treatment waste that may be generated as a result of on Site cleaning of lead dust from building components, if performed. All alternatives achieve a similar long-term reliability, low magnitude of residual risk and leaves no waste behind.	**Score =** 10 This alternative scores highest for long-term effectiveness for the following reasons: 1) It does not involve on Site treatment of lead contaminated soil and therefore eliminates the uncertainty associated with it, and 2) It does not require management of treatment waste as it does not entail any on Site treatment/cleanup of salvageable materials. Lead contaminated soil and all building components will be transported off Site to a hazardous waste landfill (i.e. RCRA Subtitle C landfill) for treatment/macroencapsulation and disposal under this alternative which achieves a higher degree of certainty of cleanup success when compared to the other two alternatives. All alternatives achieve a similar long-term reliability, low magnitude of residual risk and leaves no waste behind.
Management of Short-Term Risks *(risk to human health and the environment associated with the alternative during construction and implementation)*	**Score =** 4 Short-term risk to human health (i.e. on Site workers) exist under all alternatives because all alternatives involve removal and handling of contaminated material. This alternatives scores the lowest as compared to other alternatives because of additional short-term risks to on Site workers associated with the treatment of lead contaminated soil and cleanup of lead contaminated dust from building components, if performed.	**Score =** 6 Short-term risk to human health (i.e. on Site workers) exist under all alternatives because all alternatives involve removal and handling of contaminated material. This alternatives score slightly higher than Alternative 1 because this alternative does not involve treatment of lead contaminated soil on Site and therefore, short-term risks are reduced.	**Score =** 8 Short-term risk to human health (i.e. on Site workers) exist under all alternatives because all alternatives involve removal and handlining of contaminated material. This alternative scores the highest as compared to other alternatives because all hazardous/contaminated materials are planned to be transported off site for disposal without on Site treatment/cleanup and therefore, short-term risks are lowest when compared to the other two alternatives.

Evaluation Criteria	Alternative 1	Alternative 2	Alternative 3
Technical and Administrative Implementability *(ability to be implemented including consideration of whether the alternative is technically and administratively possible)*	**Score = 4**	**Score = 6**	**Score = 8**
	All alternatives loose points due to technical challenges associated with the implementation of safe deconstruction/demolition practices that protect human health from potential air borne lead dust that may occur due to disturbance resulting from deconstruction/demolition. This alternative scores lowest on technical implementability as compared to other alternatives due to the additional technical challenges associated with on Site treatment of lead contaminated soil and management of treatment waste generated as a result of the cleanup of lead dust from building components, if performed. All alternatives score similar on administrative implementability.	All alternatives loose points due to technical challenges associated with the implementation of safe deconstruction/demolition practices that protect human health from potential air borne lead dust that may occur due to disturbance resulting from deconstruction/demolition. This alternative scores slightly higher than Alternative 1 because it does not involve treatment of lead contaminated soil on Site. However, may involve technical challenges associated with management of treatment waste generated as a result of the cleanup of lead dust from building components, if performed. All alternatives score similar on administrative implementability.	All alternatives loose points due to technical challenges associated with the implementation of safe deconstruction/demolition practices that protect human health from potential air borne lead dust that may occur due to disturbance resulting from deconstruction/demolition. This alternative scores highest as compared to the other alternatives for technical implementability because this alternative does not involve on Site treatment/cleanup of soil or cleanup of lead dust from building components and therefore, does not have the technical challenges associated with it. All alternatives score similar on administrative implementability.
Consideration of Public Concerns *(potential public concerns and extent to which the alternative addresses those concerns)*	**Score = 8**	**Score = 6**	**Score = 4**
	This alternative scores highest as compared to other alternatives for consideration of public concerns because it involves smallest (as compared to other alternatives) quantity of hazardous waste material being transported from the Site on City streets and State highways. To address public concerns, the contractor involved in the transport of hazardous waste will be required to have the required department of transportation (DOT) certification and the handling/transport of hazardous waste will be required to be completed in accordance with applicable State and Federal regulations. Since the Site is located in an commercial area with no residential development around it, it is anticipated that the public concerns will be limited regarding the on Site cleanup activities including demolition, remedial excavation and on Site treatment.	This alternatives scores slightly lower than Alternative 1 as it involves higher quantity of hazardous waste material being transported from the Site on City streets and State highways as compared to Alternative 1 and therefore, has slightly higher public concerns. To address public concerns, the contractor involved in the transport of hazardous waste will be required to have the required department of transportation (DOT) certification and the handling/transport of hazardous waste will be completed in accordance with applicable State and Federal regulations. Since the Site is located in an commercial area with no residential development around it, it is anticipated that the public concern will be limited regarding the on Site cleanup activities including demolition, remedial excavation and on Site treatment.	This alternative scores lowest as compared to other alternatives for consideration of public concerns because it involves largest (as compared to other alternatives) quantity of hazardous waste material being transported from the Site on City streets and State highways. To address public concerns, the contractor involved in the transport of hazardous waste will be required to have the required department of transportation (DOT) certification and the handling/transport of hazardous waste will be completed in accordance with applicable State and Federal regulations. However, the amount of potential public concern under this alternative is higher as compared to other alternatives.

Table 8

Summary of Evaluation and Ranking of Alternatives

Carpenter Road Site

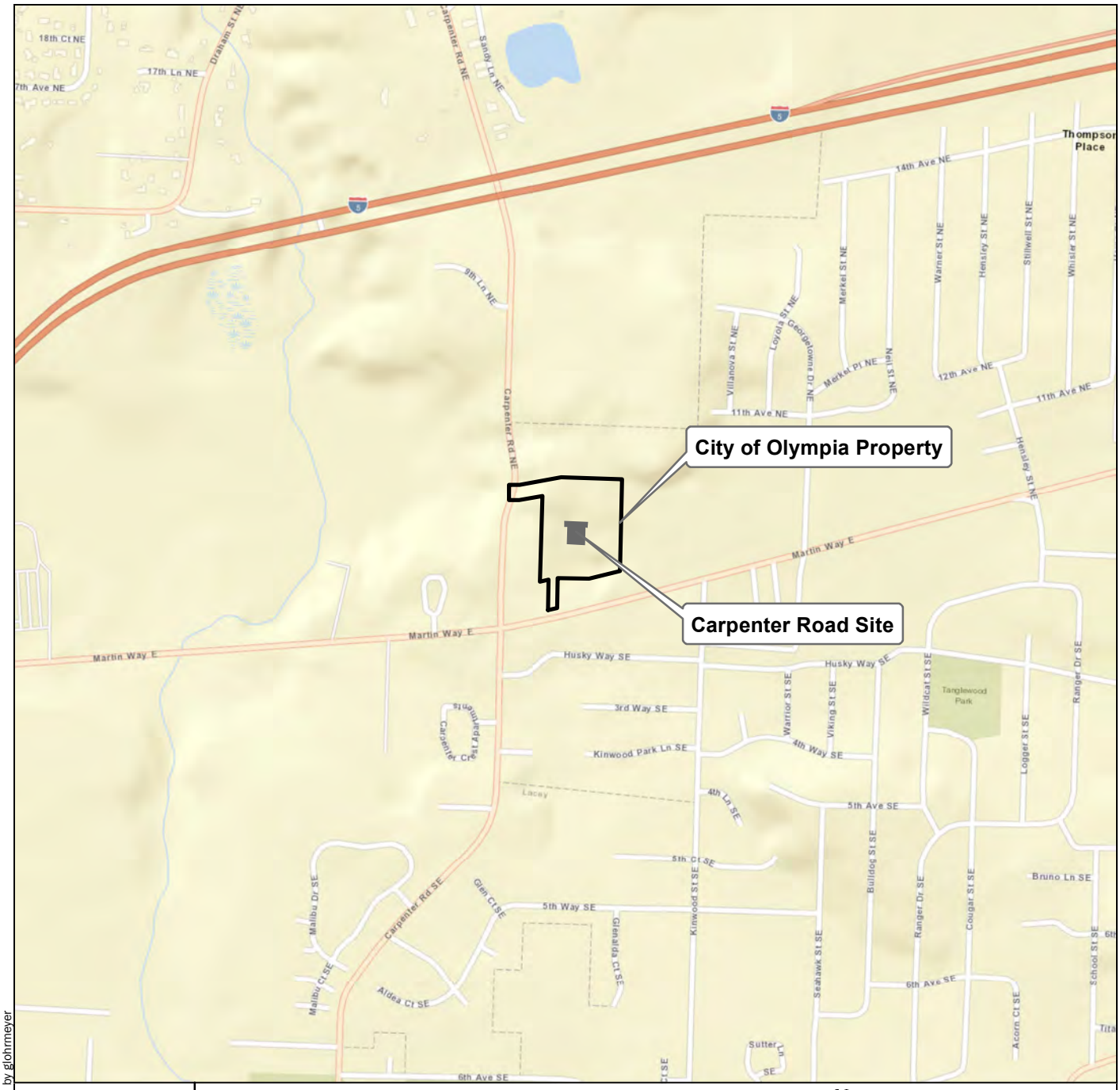
Lacey, Washington

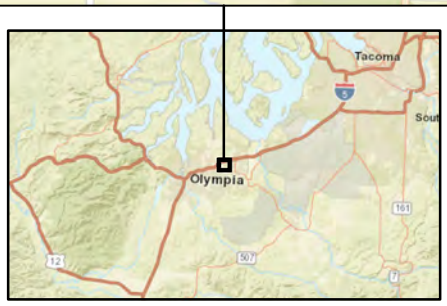
Remedial Alternative	Alternative 1	Alternative 2	Alternative 3
Evaluation			
Compliance with MTCA Threshold and Other Criteria	Yes	Yes	Yes
Restoration Time Frame	1 year	1 year	1 year
Weighted Relative Benefits Ranking[1]			
Protectiveness (weighted as 30%)	2.4	2.4	2.4
Permanence (weighted as 20%)	1.6	1.6	1.2
Long-Term Effectiveness (weighted as 20%)	1.2	1.6	2
Management of Short-Term Risks (weighted as 10%)	0.4	0.6	0.8
Technical and Administrative Implementability (weighted as 10%)	0.4	0.6	0.8
Consideration of Public Concerns (weighted as 10%)	0.8	0.6	0.4
Total	**6.8**	**7.4**	**7.6**
Cost			
Total Cleanup Cost (Accuracy +50%/-30%, rounded)	$1,775,000	$1,954,000	$3,107,000
Disproportionate Cost Analysis			
Relative Benefit to Cost Ratio[2]	3.8	3.8	2.4

Notes:

[1] Weightings were established by Ecology as referenced in Opinion Letter dated December 28, 2009.

[2] The relative benefit to cost ratio is calculated by dividing total weighted relative benefit ranking by total cleanup cost, which results in a number with a millionth decimal place for all alternatives. Therefore, the ratio includes a multiplying factor of one million to eliminate the non-significant zero digits (ex. 6.8 / 1,775,000 = 0.0000038 *1,000,000 = 3.8).





N
W E
S

1,000 0 1,000

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI

Projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Vicinity Map

Carpenter Road Waste Operations Facility
Lacey, Washington

GeoEngineers

Figure 1

P:\0\041506\GIS\MXD\041506801_F01_VM.mxd Date Exported: 01/13/22 by glohrmeyer

Notes:
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Data Source: Base map provided by Opsis Architecture

Projection: WGS 1984 Web Mercator Auxiliary Sphere

Legend

- Piezometer Name and Approximate Location
- Property Boundary
- Site Boundary

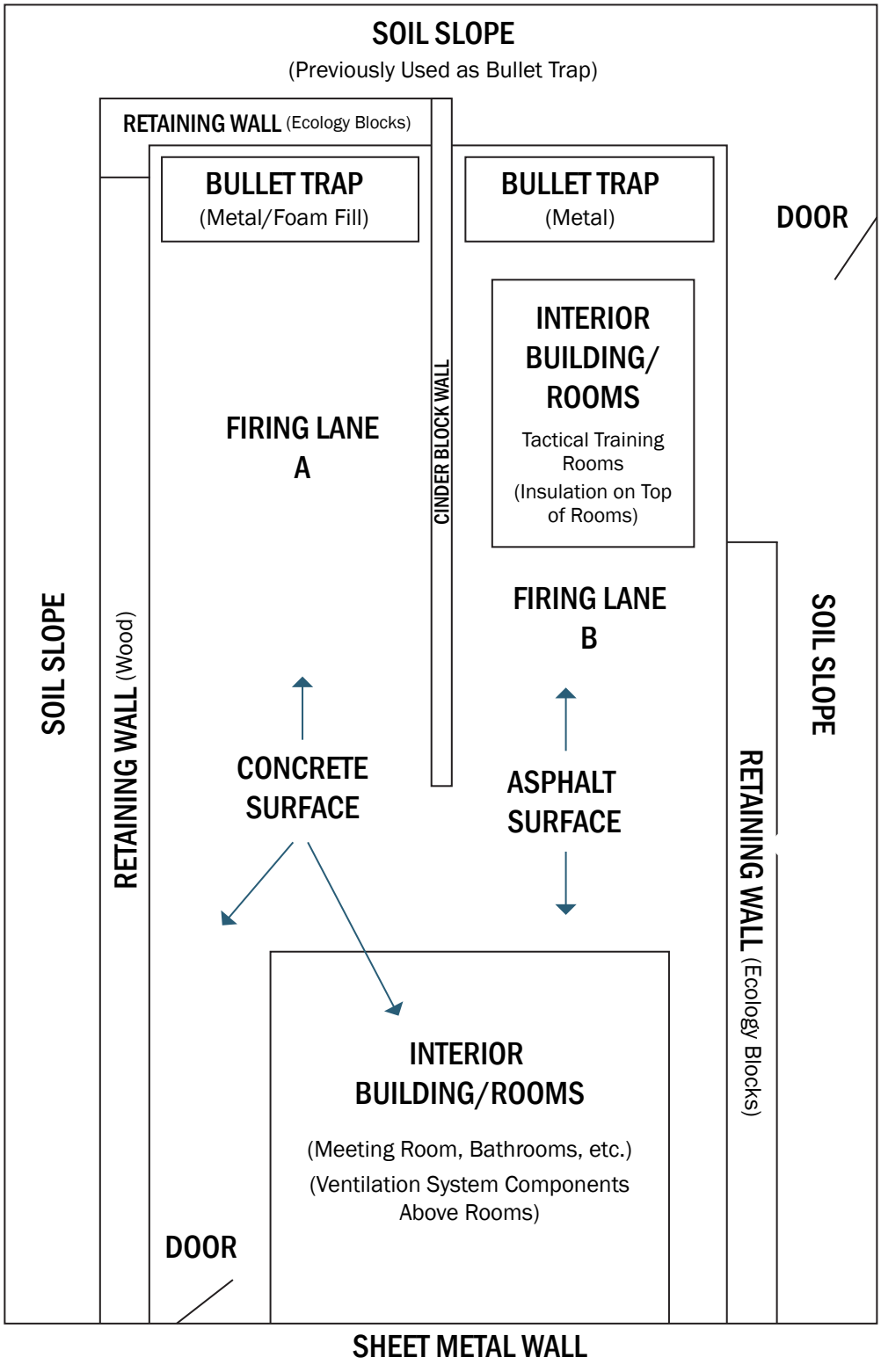
Property and Site Layout

Carpenter Road Site
Lacey, Washington

GeoEngineers

Figure 2

P:\0\0415068\GIS\MXD\0415068O1_F02_SP.mxd Date Exported: 01/13/22 by glohrmeyer



Not to Scale

Notes:

1. The location of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source:

Layout Inside Building

Cartpenter Road Site,
Lacey, Washington

GeoEngineers

Figure 3

P:\0\0415068\Graphics_Misc\041506801_F05_InsideBuilding.ai Exported 1/13/22 by spride

P:\0\0415068\GIS\MXD\041506801_F04_NorthernSite.mxd Date Exported: 01/13/22 by glohrmeyer

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Aerial Image from ArcGIS Data Online

Projection: WGS 1984 Web Mercator Auxiliary Sphere

Legend

B-1 Approximate Location of Direct Push Boring

N W E S

100 0 100

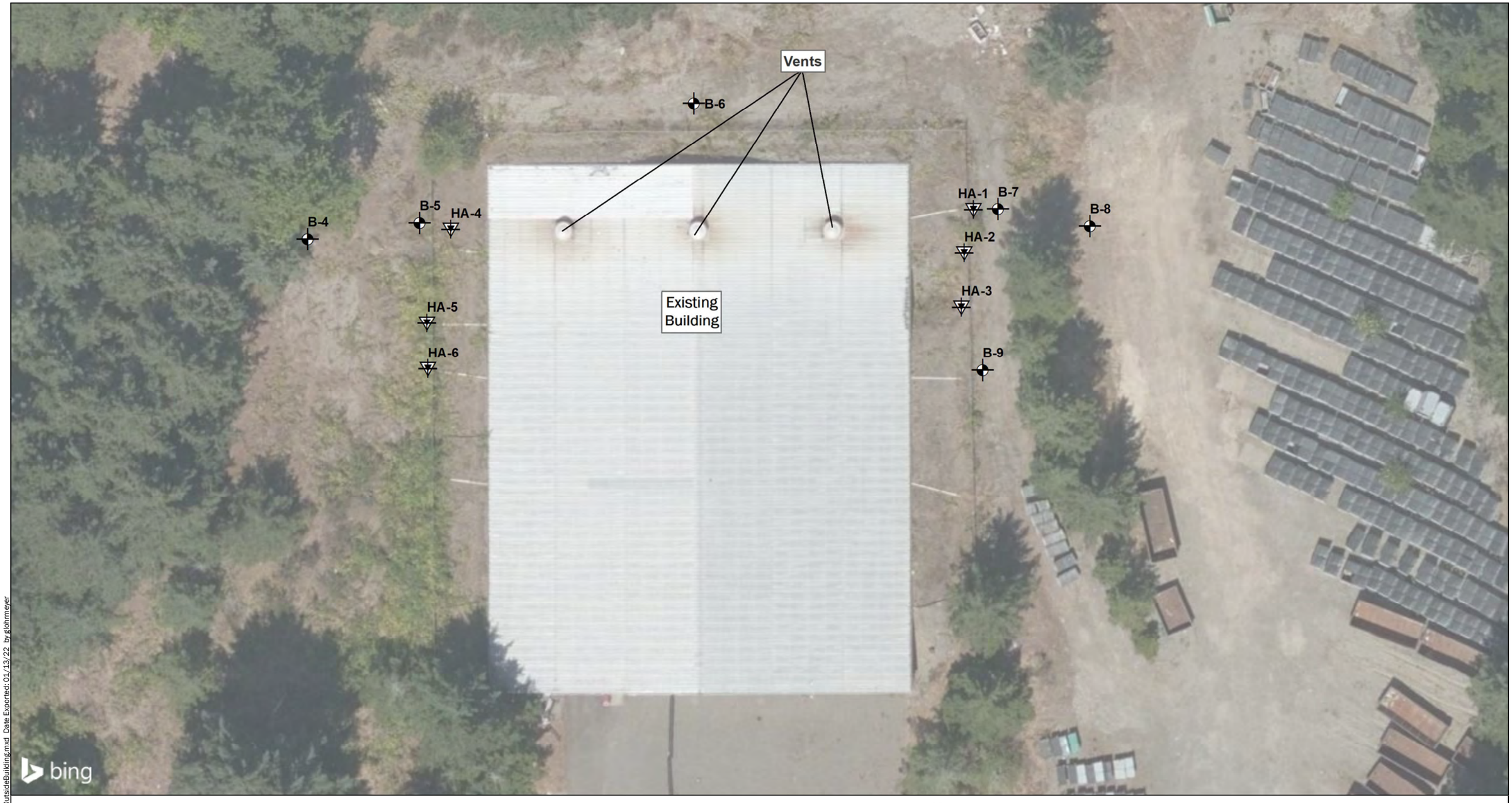
Feet

Sampling Locations – Northern Portion of the Property

Carpenter Road Site
Lacey, Washington

GeoEngineers

Figure 4



Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base map provided by the City of Olympia.

Projection: WGS 1984 Web Mercator Auxiliary Sphere

Legend

B-1 — Approximate Location of Direct Push Boring

HA-1 — Approximate Location of Hand Auger

N W E S

40 0 40

Feet

Sampling Locations – Outside Building

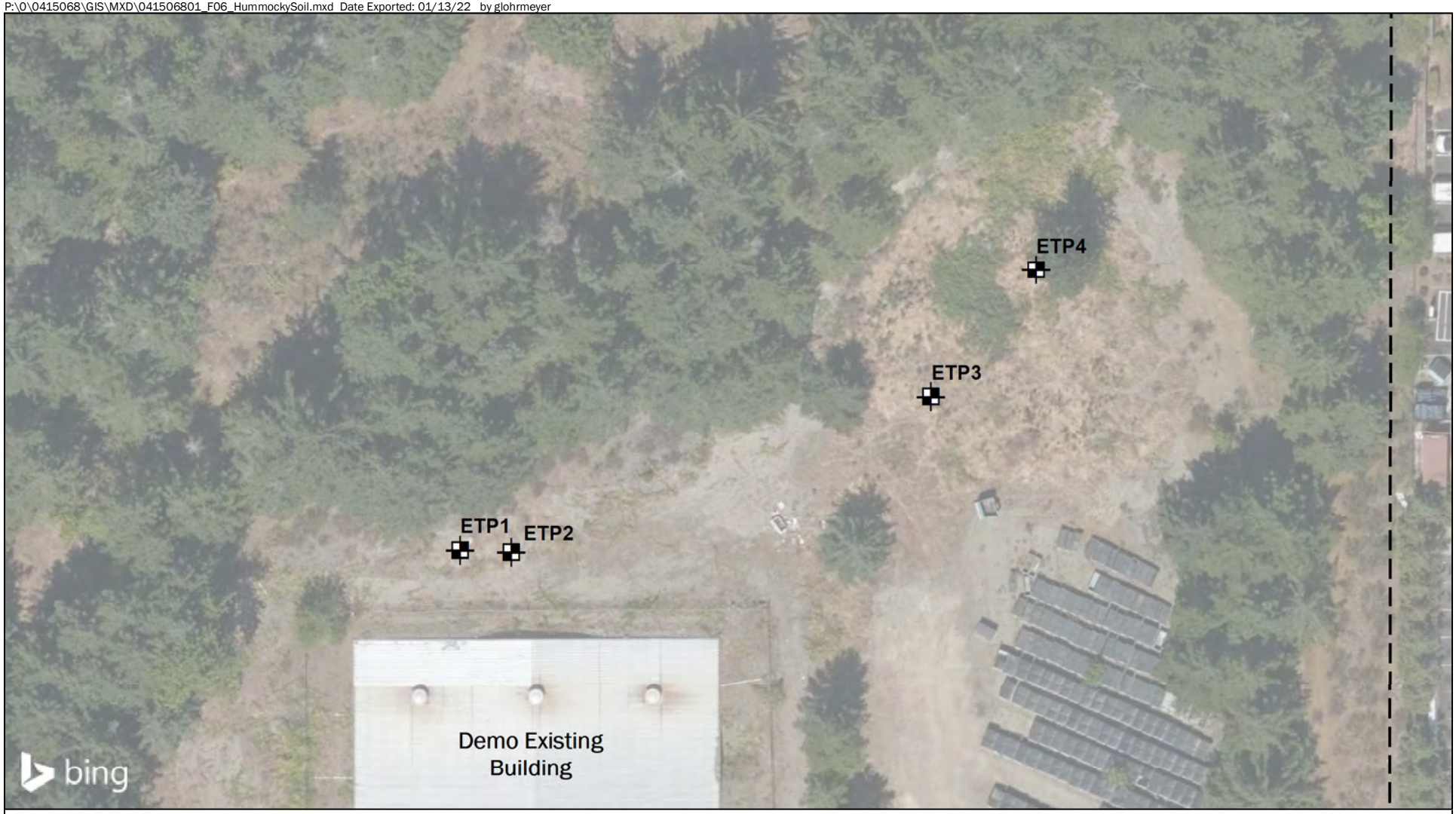
Carpenter Road Site
Lacey, Washington

GeoEngineers

Figure 5

P:\0\0415066\GIS\MXD\0415066801_F05_OutsideBuilding.mxd Date Exported: 01/13/22 by glohrmeyer

P:\0\0415068\GIS\MXD\041506801_F06_HummockySoil.mxd Date Exported: 01/13/22 by glohrmeyer



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Aerial Image from ArcGIS Data Online

Projection: WGS 1984 Web Mercator Auxiliary Sphere

Legend

EPT1 Approximate Location of Test Pit

N W E S

70 0 70

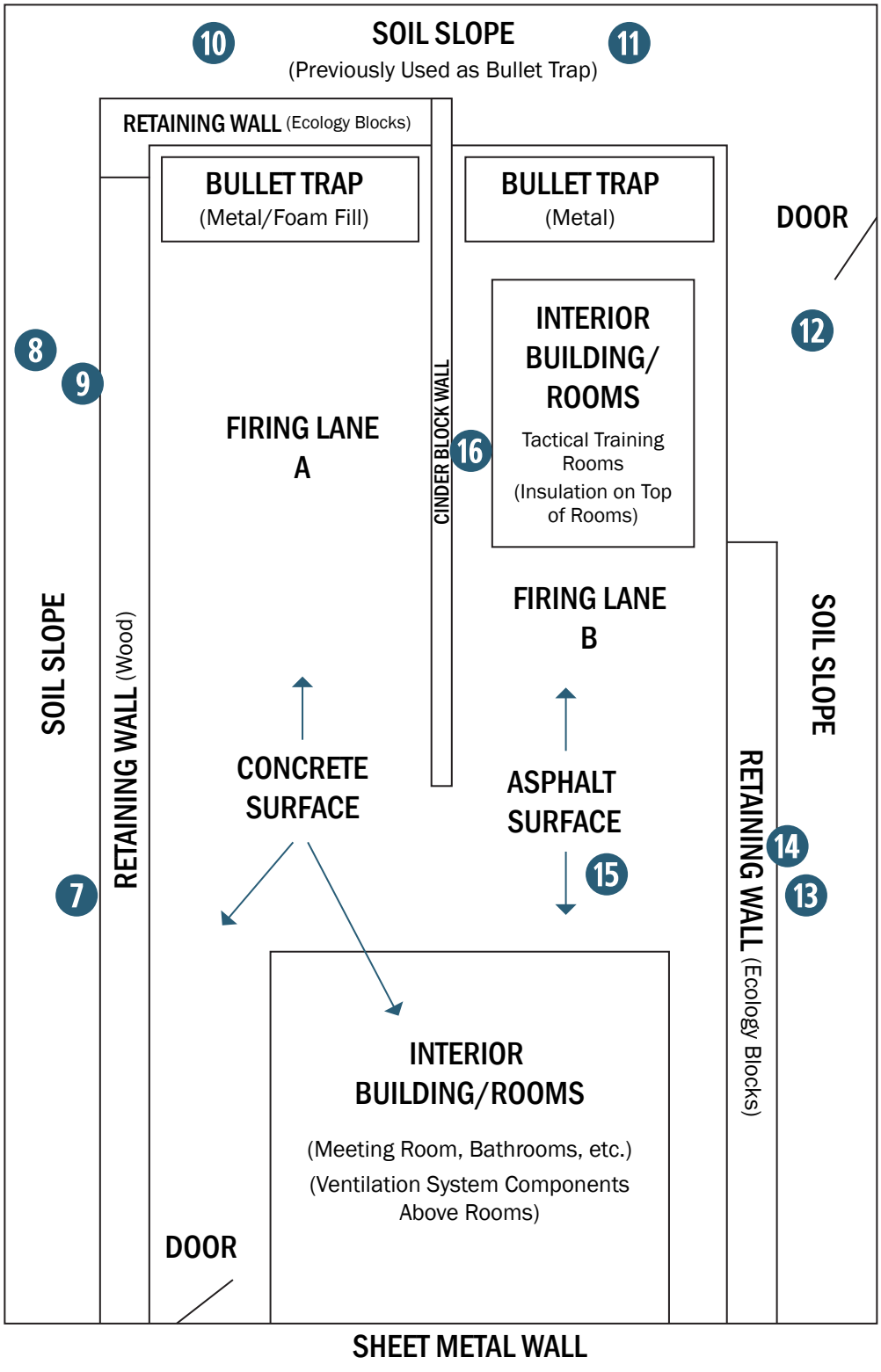
Feet

Sampling Locations – Hummocky Soil Piles

Carpenter Road Site
Lacey, Washington

GeoEngineers

Figure 6



N
W
E
S

Not to Scale

Legend

8 = Approximate location of Hand Auger Boring HA-8

Notes:

1. The location of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

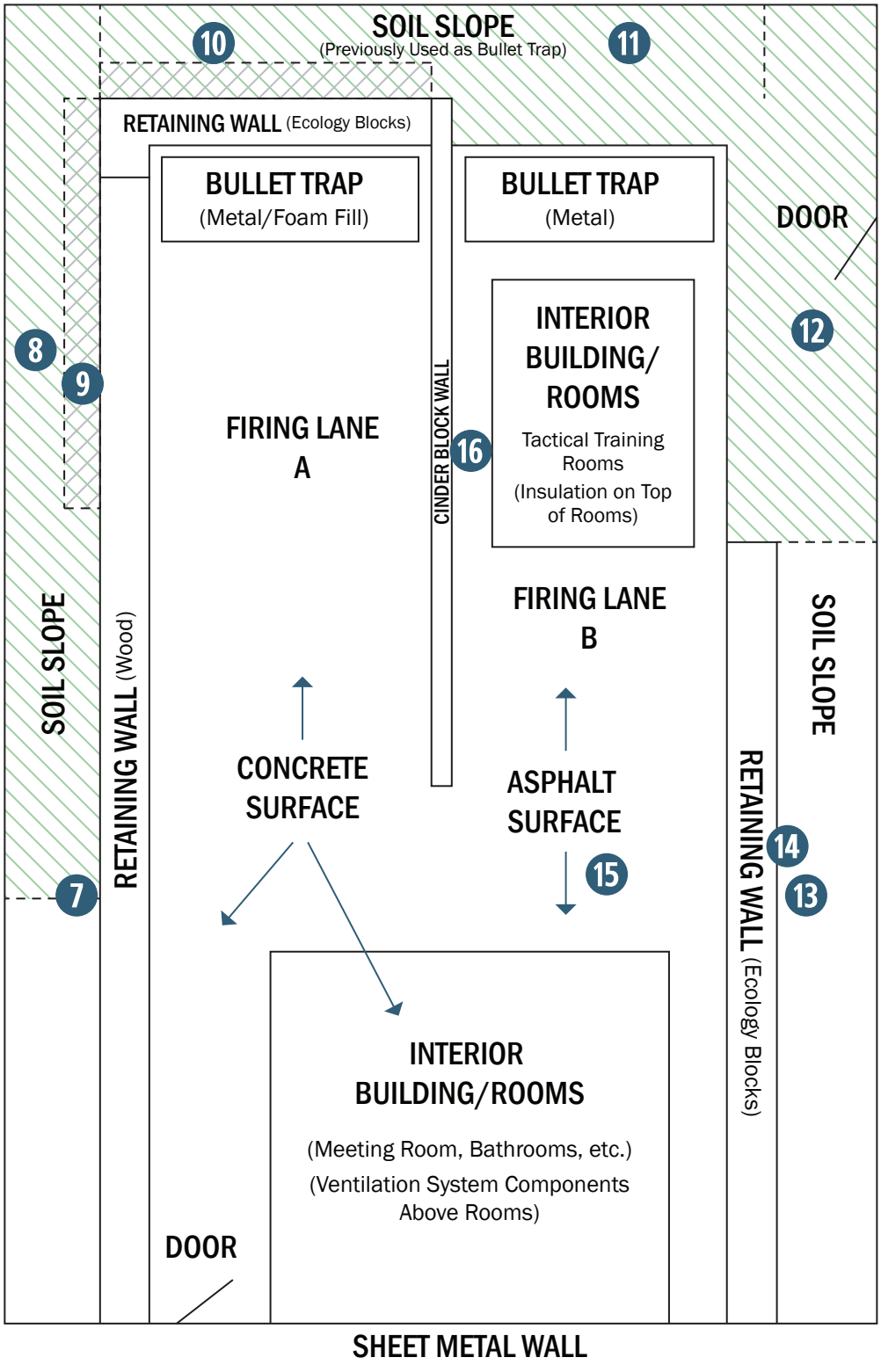
Data Source:

Sampling Locations - Inside Building

Cartpenter Road Site,
Lacey, Washington

GeoEngineers

Figure 7



N
W E
S

Not to Scale

Legend

8 Approximate location of Hand Auger Boring HA-8

Extent of Contamination Surface Soil Removal/Remediation Area

Extent of Contamination Slough Soil Removal/Remediation Area

Notes:

1. The location of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source:

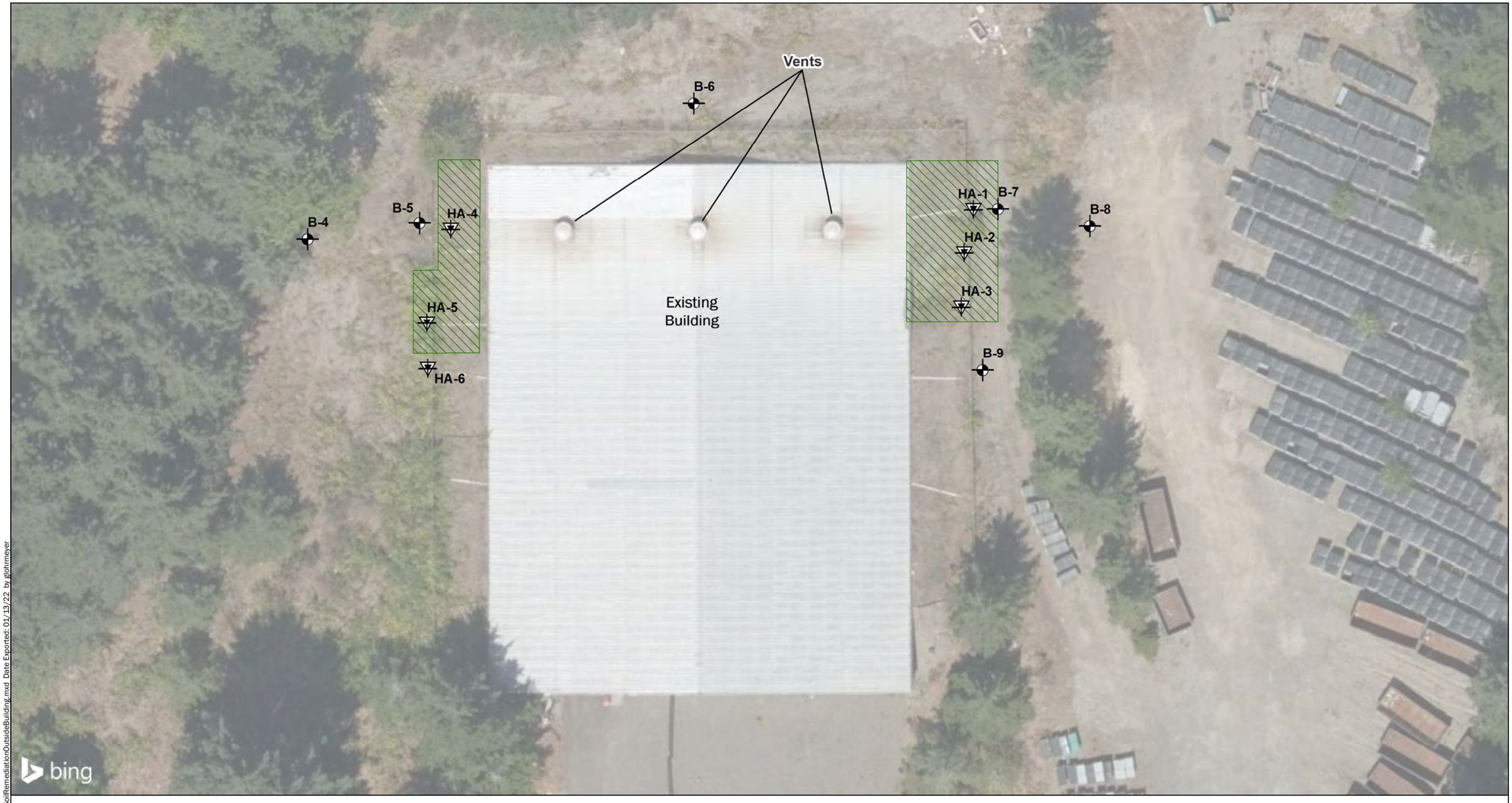
Extent of Contamination - Inside Building

Cartpenter Road Site,
Lacey, Washington

GeoEngineers

Figure 8

P:\0\0415068\Graphics_Misc\041506801_F07_SoilRemediation_InsideBuilding.ai Exported 1/13/22 by spride



Notes:
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Data Source: Base map provided by the City of Olympia.

Projection: WGS 1984 Web Mercator Auxiliary Sphere

Legend

Extent of Contamination

Soil Removal/Remediation Area

B-1 Approximate Location of Direct Push Boring

HA-1 Approximate Location of Hand Auger

N W E S

40 0 40

Feet

Extent of Contamination – Outside Building

Carpenter Road Site
Lacey, Washington

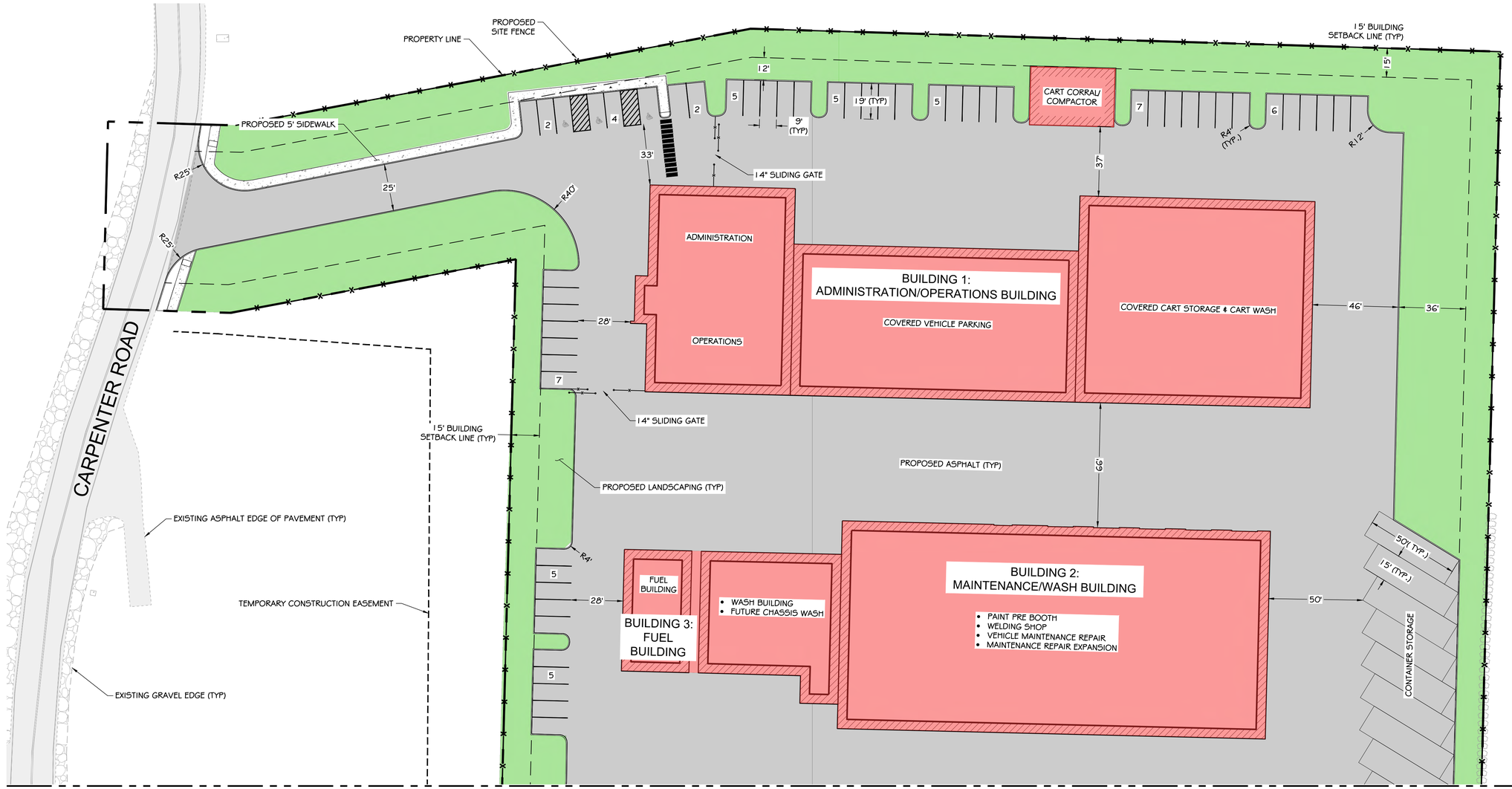
GeoEngineers

Figure 9

P:\O\0415066\GIS\MXD\0415066801_F09_SoilRemediationOutsideBuilding.mxd Date Exported: 01/13/22 by glohrmeyer

APPENDIX A
Preliminary Site Layout (Sheet C3.0 and C3.1)

SECTION 15, TOWNSHIP 18 NORTH, RANGE 1 WEST, W.M.
THURSTON COUNTY, WASHINGTON



MATCHLINE - SEE DWG C3.1

LEGEND

- ASPHALT PAVING
- LANDSCAPING
- ADA PARKING SYMBOL
- ADA VAN ACCESSIBLE PARKING
- GRAVEL ACCESS ROAD
- PROPERTY LINE
- BUILDING SETBACK LINE
- CONCRETE
- FENCE
- CROSSWALK
- BUILDING HATCH
- TEMPORARY CONSTRUCTION EASEMENT

SHEET INDEX

ALLOWABLE	DESIGN	AREA
70%	45%	MAX DEVELOPMENT AREA
110,373 SF (30%)	110,775 SF	MIN LANDSCAPING AREA
30%	19%	MAX BUILDING AREA

NOTES:

1. PARKING PROVIDED: 57 STANDARD SPACES
   4 ADA ACCESSIBLE SPACES
2. EXTERIOR UNCOVERED STORAGE PROVIDED: 38,250 SF
3. LANDSCAPING PROVIDED (110,373 SF OR 30% REQUIRED): 110,775 SF

0 30 60
SCALE

VERTICAL DATUM
NAVD 88

NO	DATE	BY	CHD	APPR	REVISION

THOMAS MISKOVIC MATTHEW TYLER — STATE OF WASHINGTON — 44782 — REGISTERED PROFESSIONAL ENGINEER

kpff
612 Woodland Square Loop, Suite 100
Lacey, WA 98503
360.292.7230
www.kpff.com

CALL UNDERGROUND LOCATE TWO (2) WORKING DAYS BEFORE YOU DIG 811

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DATE	JOB NO.
MTM/ATS	MTM/ATS	MTM	MRS	6-17-2020	180190090

CARPENTER ROAD WASTE RESOURCE FACILITY
OLYMPIA, WA

SITE PLAN - NORTH

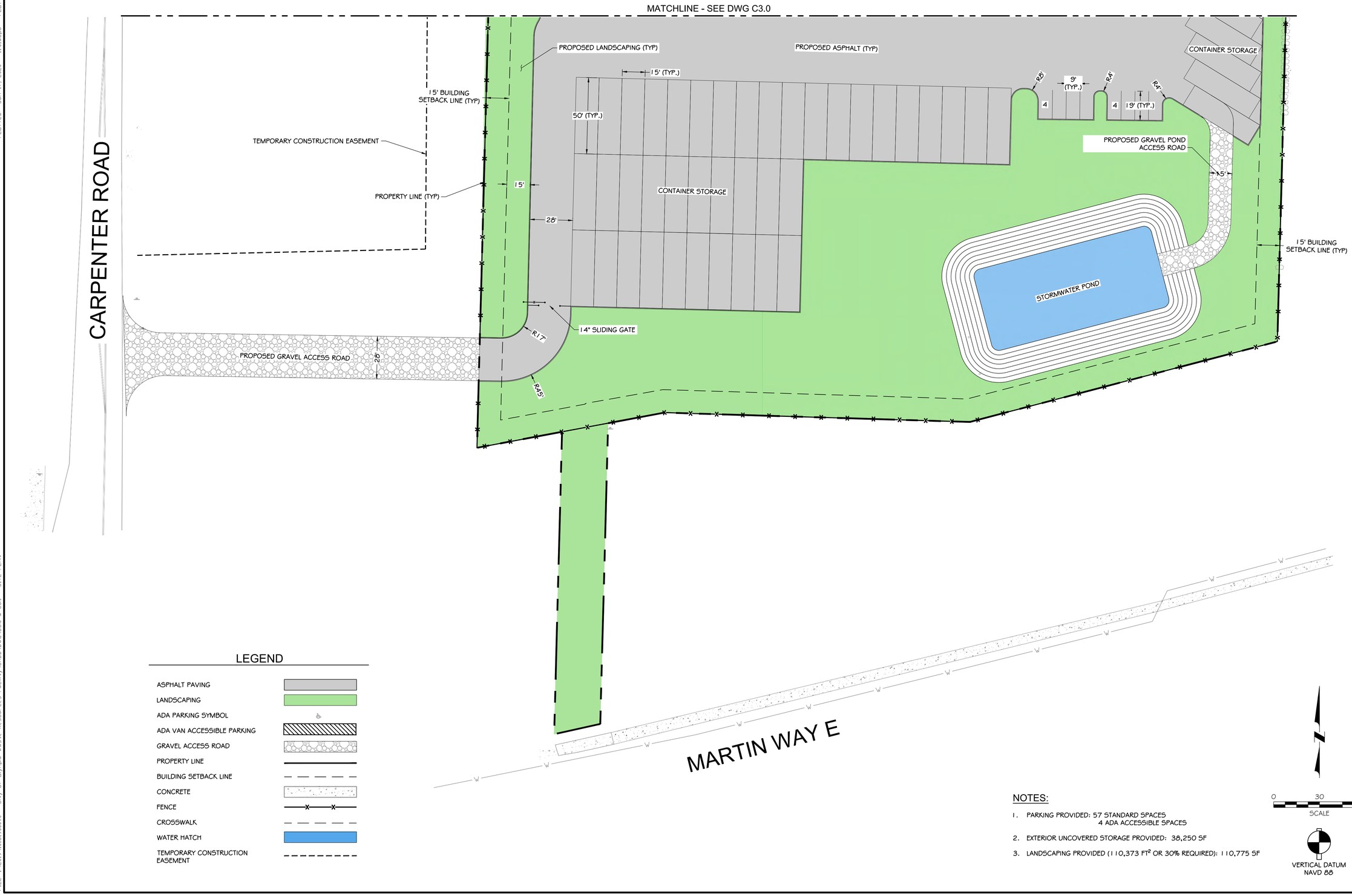
CONCEPTUAL DRAWING

C3.0

SHEET 4 OF 11

PLOTTED: Jun 17, 2020 - 11:00a6p6 PLOTTED BY: NoteA
FILE: I:\2019\180190090 - City of Olympia Waste Resources Facility\CADD\DWG\C3.0 & C3.1 - SITE PLAN

SECTION 15, TOWNSHIP 18 NORTH, RANGE 1 WEST, W.M.
THURSTON COUNTY, WASHINGTON



LEGEND

- ASPHALT PAVING
- LANDSCAPING
- ADA PARKING SYMBOL
- ADA VAN ACCESSIBLE PARKING
- GRAVEL ACCESS ROAD
- PROPERTY LINE
- BUILDING SETBACK LINE
- CONCRETE
- FENCE
- CROSSWALK
- WATER HATCH
- TEMPORARY CONSTRUCTION EASEMENT

NOTES:

1. PARKING PROVIDED: 57 STANDARD SPACES
   4 ADA ACCESSIBLE SPACES
2. EXTERIOR UNCOVERED STORAGE PROVIDED: 38,250 SF
3. LANDSCAPING PROVIDED (110,373 FT² OR 30% REQUIRED): 110,775 SF

0 30 60
SCALE

VERTICAL DATUM
NAVD 88

NO	DATE	BY	CHD	APPR	REVISION

THOMAS MISKOVIC MATTHEW — STATE OF WASHINGTON — 44782 — REGISTERED PROFESSIONAL ENGINEER

kpff
612 Woodland Square Loop, Suite 100
Lacey, WA 98503
360.292.7230
www.kpff.com

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DRAWN BY	DESIGNED BY	JOB NO:
MTM/ATS	MTM/ATS	1018190090
CHECKED BY	APPROVED BY	
MTM	MRS	
DATE		
6-17-2020		

CARPENTER ROAD WASTE RESOURCE FACILITY
OLYMPIA, WA

SITE PLAN - SOUTH

CONCEPTUAL DRAWING

C3.1

SHEET 5 OF 11

APPENDIX B
Piezometer Boring Logs and Transducer Data

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata

Approximate contact between soil strata

Material Description Contact

Contact between geologic units

Contact between soil of the same geologic unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PL	Point load test
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GeoEngineers

Figure A-1

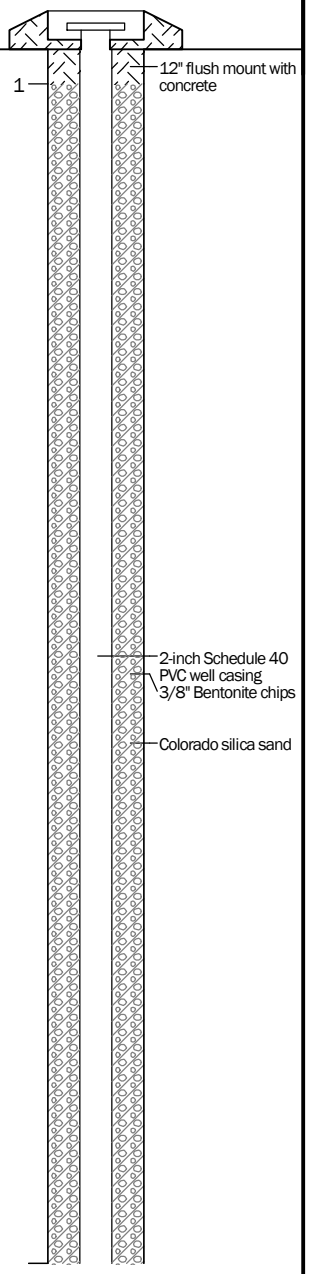
Drilled Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
11/26/2019	11/26/2019	53	SAH	SST	Holocene Drilling, Inc.	Hollow-stem Auger

Hammer Data: 140 (lbs) / 30 (in) Drop	Drilling Equipment: Diedrich D-50 Track Mounted	DOE Well I.D.: BLU275 A 2-in well was installed on 11/27/2019 to a depth of 50 ft. Well was developed on 11/27/2019.
Surface Elevation (ft) Vertical Datum: 158	Top of Casing Elevation (ft)	Groundwater: Date Measured 12/3/2019; Depth to Water (ft) 36.00; Elevation (ft) 122.00
Easting (X) Northing (Y)	Horizontal Datum	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
	0							GP-GM	Brown fine to coarse gravel with silt and sand and trace organic matter (fine roots) (very dense, moist) (fill)		
155											
	5	5	50/5"		1						
150											
	10	0	50/5"		2						
145								GW-GM	Gray fine gravel with silt and sand (very dense, wet) (outwash)		
	15	10	50/5"		3 SA					7	6
140											
	20	12	73		4				Grades to brown and gray		
135											
	25	6	50/4"		5			GP	Gray fine to coarse gravel with sand and trace silt (very dense, wet)		
130											
	30	8	50/6"		6			SP-SM	Brown fine to coarse sand with silt and gravel (very dense, wet)		
125											
	35							SP-SM	Gray and brown fine to medium sand with trace silt (very dense, wet)		

WELL LOG



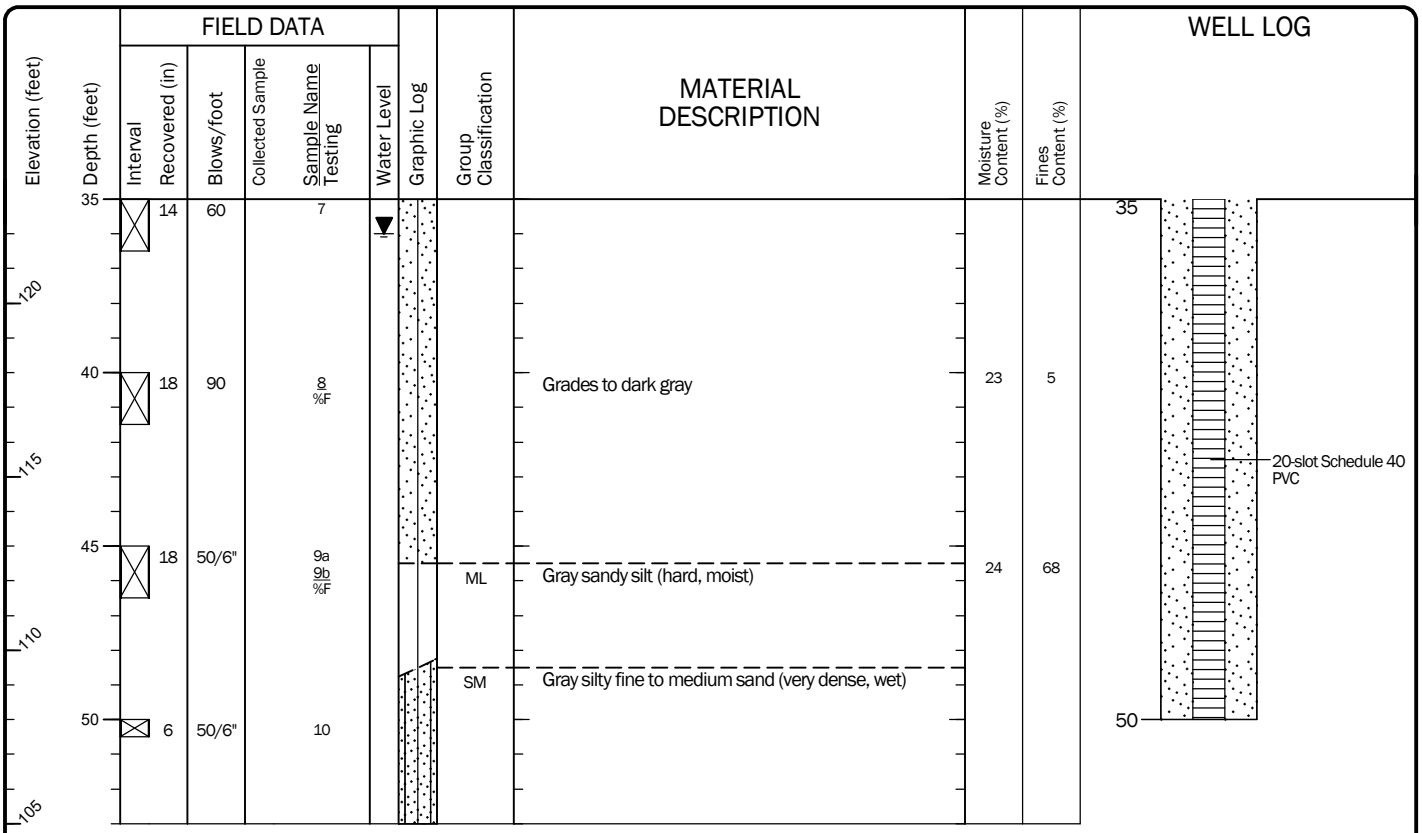
Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Piezometer P-1

GeoEngineers

Project: Carpenter Road Waste Operations Facility
Project Location: Lacey, Washington
Project Number: 0415-068-04

Figure A-2
Sheet 1 of 2



Log of Piezometer P-1 (continued)

GeoEngineers

Project: Carpenter Road Waste Operations Facility
Project Location: Lacey, Washington
Project Number: 0415-068-04

Figure A-2
Sheet 2 of 2

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	11/26/2019	11/26/2019	61.5	SAH	SST	Holocene Drilling, Inc.	Hollow-stem Auger

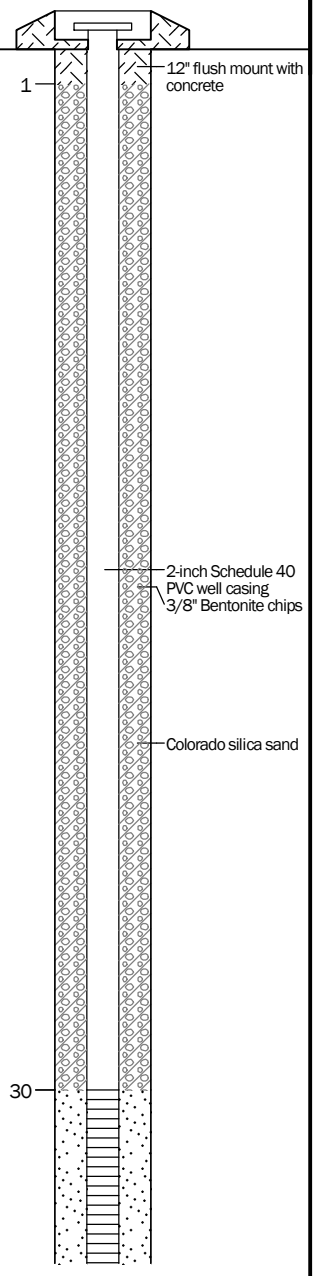
Hammer Data	140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D-50 Track Mounted
Surface Elevation (ft) Vertical Datum	158	Top of Casing Elevation (ft)	
Easting (X) Northing (Y)		Horizontal Datum	

DOE Well I.D.: BLU276
A 2-in well was installed on 11/27/2019 to a depth of 45 ft.
Well was developed on 11/27/2019.

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
12/3/2019	22.00	136.00

Notes:

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
155	0							SOD	3 inches sod		
								SP-SM	Gray fine to medium sand with silt and gravel (very dense, moist) (outwash)		
150	5	7	70		1						
145	10	0	50/5"		2						
140	15	6	50/6"		3 SA					6	8
135	20	9	50/6"		4	▼			Grades to wet		
130	25	6	50/4"		5						
								SM	Gray silty fine to medium sand (medium dense, wet)		
125	30	16	35		6						
	35										



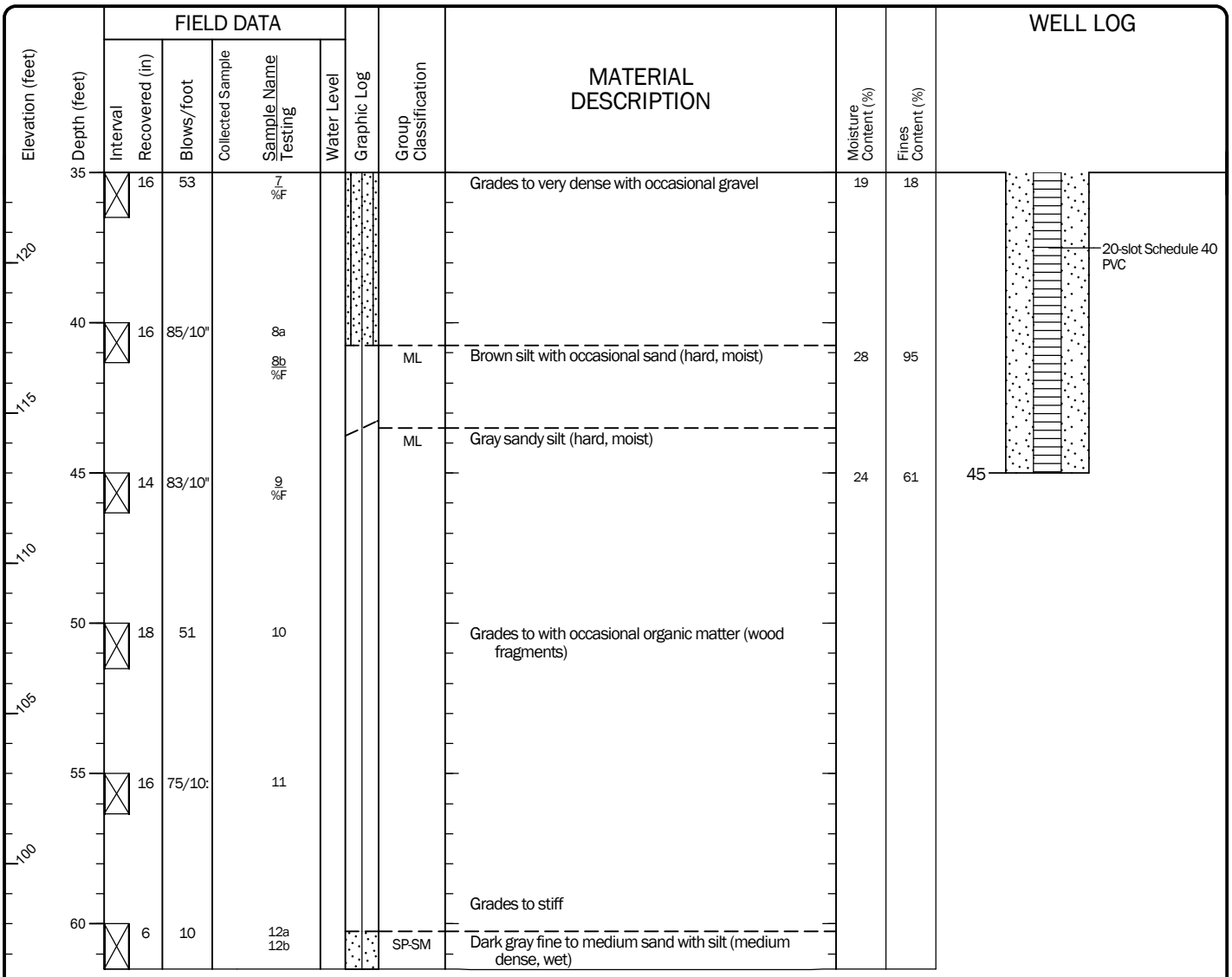
Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Piezometer P-2

GeoEngineers

Project: Carpenter Road Waste Operations Facility
Project Location: Lacey, Washington
Project Number: 0415-068-04

Figure A-3
Sheet 1 of 2



Date:12/9/21 Path:P:\0\0415068\GINT\041506804.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_WELL_%F

Log of Piezometer P-2 (continued)

GeoEngineers

Project: Carpenter Road Waste Operations Facility
Project Location: Lacey, Washington
Project Number: 0415-068-04

Figure A-3
Sheet 2 of 2

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	11/27/2019	11/27/2019	61	SAH	SST	Holocene Drilling, Inc.	Hollow-stem Auger

Hammer Data	140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D-50 Track Mounted
Surface Elevation (ft) Vertical Datum	164	Top of Casing Elevation (ft)	
Easting (X) Northing (Y)		Horizontal Datum	

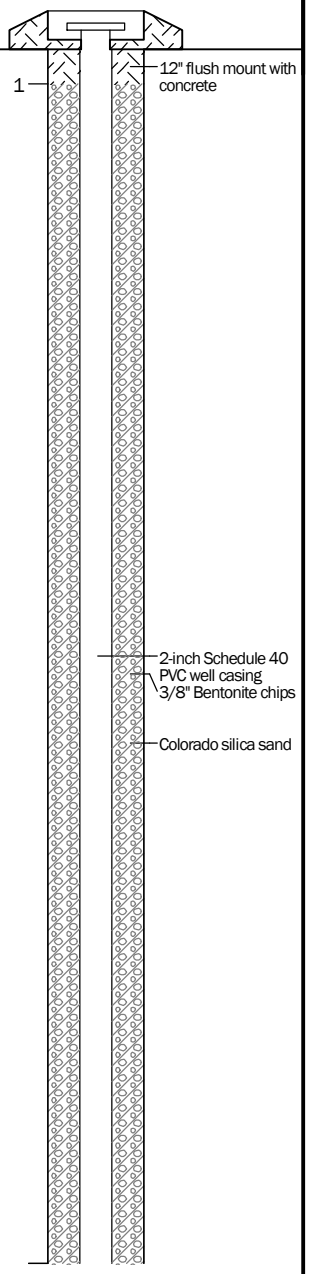
DOE Well I.D.: BLU277
A 2-in well was installed on 11/27/2019 to a depth of 50 ft.
Well was developed on 11/27/2019.

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
12/3/2019	20.00	144.00

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
164	0								SW-SM	Brown fine to coarse sand with silt and gravel (dense, moist) (outwash)		
160	5		14	48		1 SA					7	7
155	10		10	46		2						
150	15		10	22		3				Grades to medium dense, wet		
145	20		6	24		4	▼					
140	25		8	9		5				Grades to loose		
135	30		8	23		6				Grades to medium dense		
130	35											

WELL LOG



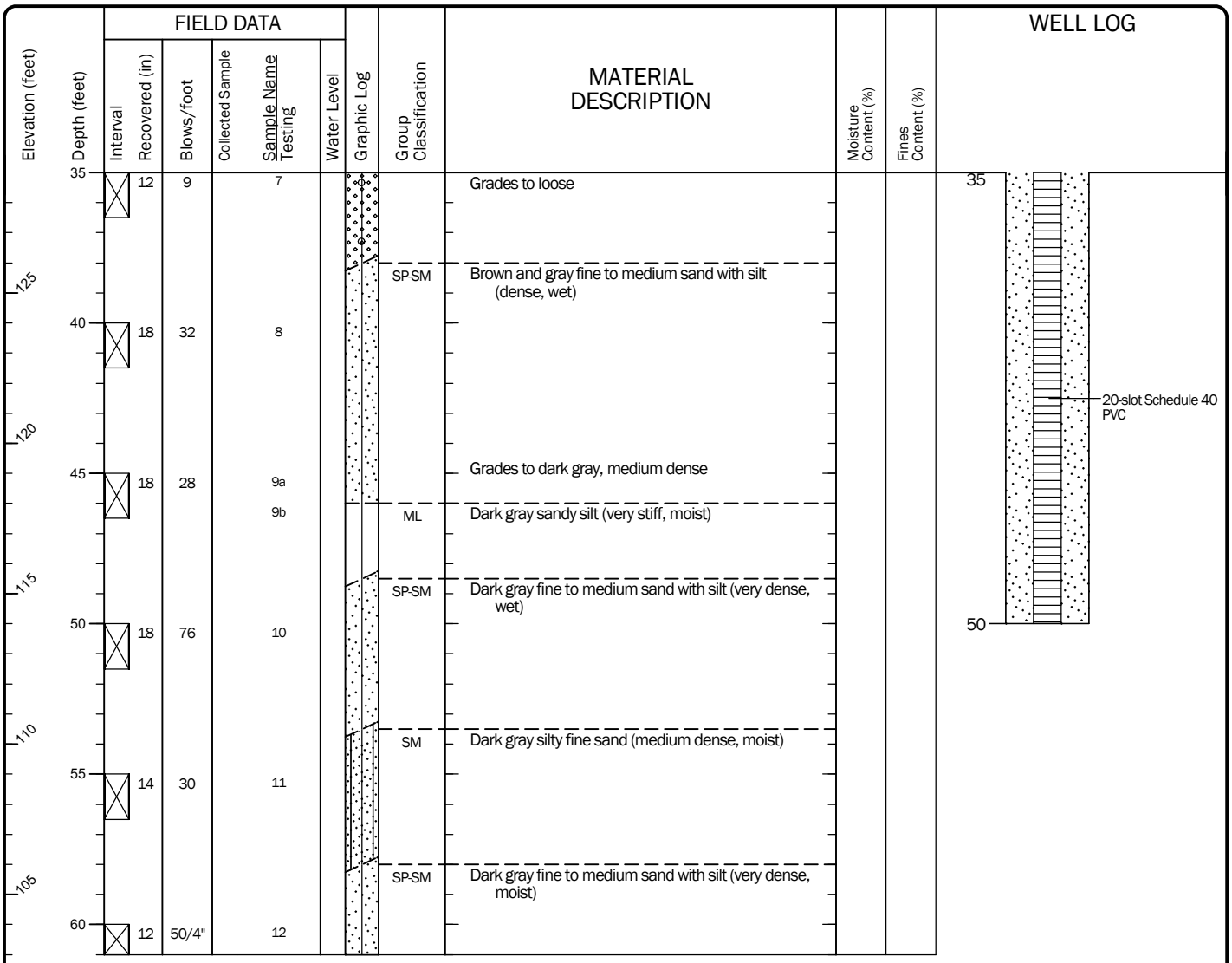
Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Piezometer P-3

GeoEngineers

Project: Carpenter Road Waste Operations Facility
Project Location: Lacey, Washington
Project Number: 0415-068-04

Figure A-4
Sheet 1 of 2

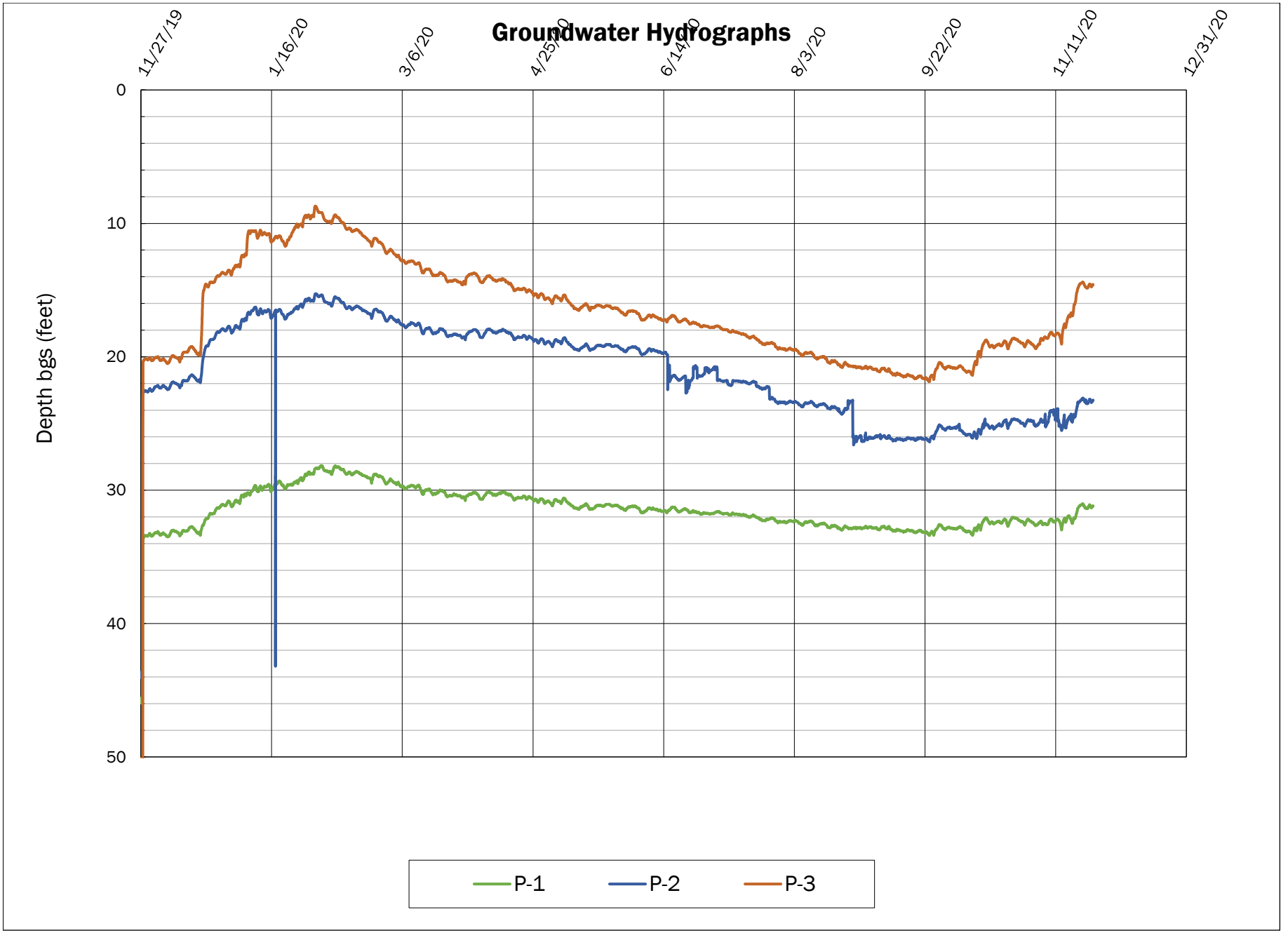


Log of Piezometer P-3 (continued)

GeoEngineers

Project: Carpenter Road Waste Operations Facility
Project Location: Lacey, Washington
Project Number: 0415-068-04

Figure A-4
Sheet 2 of 2


Groundwater Hydrographs
11/27/19
1/16/20
3/6/20
4/25/20
6/14/20
8/3/20
9/22/20
11/11/20
12/31/20
0
10
20
30
40
50
Depth bgs (feet)
P-1
P-2
P-3

APPENDIX C
University of Washington's Department of Environmental Health Report

SCHOOL OF PUBLIC HEALTH
UNIVERSITY of WASHINGTON
Department of Environmental and Occupational Health Science
Field Research and Consultation Group

May 16, 2016

Sergeant Rich Allen
Olympia Police Department
601 4th Avenue East
Olympia, WA 98501

RE: Air Monitoring Results (FRCG # 16.03)

Dear Rich,

At your request, the Field Research and Consultation Group (FRCG) of the University of Washington's Department of Environmental Health monitored police officer exposure to airborne lead at the OPD firing range. The assessment results from March 16, 2016 are presented in an attached report and are summarized as follows.

The monitoring results indicate that two employees exceeded the DOSH 8-hour TWA PEL of 50 $\mu g/m^3$, with a third worker exceeding the action level (30 $\mu g/m^3$). The exposures occurred during a typical training event conducted at the OPD firing range. In addition, most (81%) of the surfaces sampled in the range had a lead concentration that exceeded a 200 $\mu g/ft^2$ threshold.

Meeting the regulatory requirements when exposures exceed the action level of 30 $\mu g/m^3$ would require a considerable effort. Therefore, the best alternative for regulatory compliance, and more importantly, protecting workers from lead exposure, is to implement changes that will consistently reduce worker exposures below the action level. Reducing lead exposures could be accomplished through two means, installation of a ventilation system that meets US Navy criteria or the complete substitution of traditional ammunition with clean fire ammunition. Due to the time needed to select, design and install a new ventilation system, not to mention the cost, it is recommended that the use of clean fire ammunition be implemented immediately. Specific recommendations are presented in the report.

The monitoring results presented in this report reflect conditions at the time of our evaluation. If production processes, raw materials, or production levels change, we encourage you to re-assess the exposures in your workplace. Exposures above Washington State regulatory limits should be addressed as expeditiously as possible to avoid possible regulatory action or citation. I have included letters with individual exposure monitoring results to be distributed to each of the workers who participated in this exposure assessment, as well as a copy for your records. I have enjoyed working with you on this project; please contact me if you have any questions or comments.

Sincerely,

Gerry Croteau, MS, CIH
Research Industrial Hygienist

Enc.

4225 Roosevelt Way NE; Suite 100 (Campus Mail Box 354695) Seattle, WA 98105
Phone: 206-543-9711 Fax: 206-616-6240 Web: http://depts.washington.edu/frcg

Introduction

The City of Olympia Police Department (OPD) operates a 27,000 square foot indoor firing range facility that is used for training and firearms qualifications. The active range, which has 11 shooting lanes, is located on the left side of the building (A side), with a training area on the right (B side). The facility also has office and classroom areas that are located in the front of the building. Approximately 60 OPD officers receive firearms training about four to five times per year. The firearms training, which is typically a half day, entails various situational sessions where officers fire from standing, kneeling and prone positions. Officers use their assigned side arms as well as AR15 rifles, with some 300 to 500 rounds being fired per officer during an entire training session. Police officers are also required to demonstrate firearm proficiency through qualifications testing conducted twice annually. Depending on an individual officer's shooting performance, less than 50 rounds are typically discharged from a standing position during qualifications.

Clean fire ammunition manufactured by Speer-Lawman is used exclusively by OPD in their sidearms at the firing range, whereas conventional jacketed ammunition is used in the rifles. Clean fire ammunition doesn't use lead in the primer and the bullet, which is lead, is covered with a copper jacket designed to eliminate the aerosolization of lead during firing. Lead is however, aerosolized on impact at the bullet trap, but would not be anticipated to be carried an appreciable distance back up range. The facility is also used by 12 additional agencies that are required to also use clean fire ammunition; however, the range is at a remote location and it is difficult for OPD staff to confirm compliance with the clean fire ammunition requirements. In total, the range is used about 24 times per month by OPD and other law enforcement agencies.

The facility is equipped with a ventilation system to remove aerosol generated during firearm discharge. Supply air is introduced 17 feet behind the firing line by four, 2.5 by 4.0 foot air supply ducts positioned at equidistant locations across the width of the entire facility at a height of 12 feet. Air is subsequently exhausted directly to the outside atmosphere from three overhead ceiling mounted axial fans located about 10 feet behind the bullet trap. Air is exhausted through a covered exhaust port which directs the exhaust air downward onto the roof. The facility uses a shredded rubber tire berm as a bullet trap. The berm contents are removed by a contractor every five to six years.

Brass casings are manually collected from the floor by participating police staff, typically by using a broom to sweep the casings into a pile and then placing them in buckets. Nitrile gloves are worn when handling spent casings. Additional, range floor cleaning is not regularly scheduled and the floor might be wet mopped annually. Other range areas including the bathrooms and classroom area are cleaned weekly by a Boy Scouts Explorer Group.

The Olympia Police Department has requested that the University of Washington's Field Research & Consultation Group (Field Group) conduct an assessment to determine the potential for lead exposure. The resulting assessment, conducted on March 16, included personal air monitoring of officers participating in a firearms training, collection of surface wipe samples and a ventilation system assessment.

Methodology

Personal air monitoring was conducted for five individuals on March 16. Personal sampling pumps were used to collect air samples at a rate of 2.0 liters per minute onto a mixed cellulose ester filter, placed within each worker's breathing zone on their left lapel. Surface wipe samples were collected according to NIOSH Method 9100, using wipe sample media (Ghostwipes™) that meets the ASTM E1792 Guideline. A 100 square centimeter area was delineated using a cardboard template and wiped using an S-pattern.

At each location, a new wipe was used. After the surface sample was obtained, the wipe was carefully folded to minimize sample loss and then placed in a labeled, plastic sample bag. Air and surface wipe samples were hand delivered to the UW's Environmental Health Laboratory and subsequently analyzed using US EPA Method 6020A. The actual analytical testing results as received from the lab are presented in Appendix B.

The ventilation assessment relied primarily on the use of smoke tubes to determine airflow characteristics in the range. Smoke was released at various locations and was observed to determine the direction of airflow and the level of turbulence. The smoke test was also used to determine if the building was under positive or negative pressure. Lastly, an Alnor hot wire anemometer was used to determine the average air velocity and flowrate for one of the overhead supply ducts.

Monitoring Results

Air Monitoring Results

Elevated airborne lead exposures were found for all five monitored police officers (Table 1). Task based exposures during active firearms training ranged from 49 to 139 $\mu g/m^3$. An 8-hour time weighted average exposure was subsequently estimated for each of the monitored employees, as the full workshift exposure is the basis for occupational lead exposure regulations. In calculating the full shift exposures, it was assumed that the trainees would be exposed during a 190 minute firearm training session, with no additional exposure for the remainder of the 8-hour period. The instructor, who was only monitored for the first half of the day, was assumed to have the same exposure during the afternoon session that was conducted with another group of trainees. The resulting full shift exposures are quite high, with two workers exceeding the Washington Division of Occupational Safety and Health (DOSH) 8-hour TWA permissible exposure limit (PEL) of 50 $\mu g/m^3$, and another worker exceeding the DOSH action level (30 $\mu g/m^3$).

Table 1: Airborne Lead Personal Exposure Monitoring Results

Date	Job Description	Monitoring Period (h:m)	Exposure Level ($\mu g/m^3$) Task	8-hr TWA[a]
3/22/16	Firearms Instructor	3:11	71.0	**56.5**
	Firearms trainee 1	0:53	139.0	**55.0**
	Firearms trainee 2	3:09	70.2	27.6
	Firearms trainee 3	3:09	49.4	19.5
	Firearms trainee 4	2:11	106.0	42.0
			DOSH 8-hr TWA PEL→	50.0
			DOSH 8-hr TWA Action Level →	30.0

a - For trainees, assumes 190 min. exposure at task exposure level, with no Pb exposure for remainder of 8-hr period. For instructor, assumes 380 min. exposure at task exposure level, with no Pb exposure for remainder of 8-hr period.

The training session was considered to be typical with each participant firing on the order of two to three hundred rounds, distributed approximately equally between the officer's side arm and an AR15 rifle. With the clean fire ammunition only being used in the side arms, it is assumed that the airborne lead exposure was a largely derived from rifle use. The high lead exposures noted are an indication of the ventilation system's ineffectiveness.

Although lead exposures were elevated, the health hazard is likely minimal as the exposure is infrequent. On an annual basis, trainees would be exposed at these levels four to five times per year; instructors would be exposed on the order of ten times per year. Blood lead tests provide the best means of assessing

actual exposure and determining if exposure exceeds regulatory criteria or levels that might cause health effects.

Surface Lead Monitoring

Surface lead levels determined at 16 locations ranged from 60 to 6,141 µg/ft^2 (Table 2). Lead levels are noted to be considerably higher on the active range floor than peripheral work areas, an expected outcome. The relatively high surface lead levels found were also expected given the high level of range use, infrequent cleaning and ventilation system design. Surface lead levels in the defensive training (DT) classroom were relatively low, a welcome finding as the trainees spend considerable time moving around the DT mats in various positions. The transfer of lead to the trainee's clothing and the potential ingestion exposure and possibility to transfer the lead to other surfaces, including those in the home, are serious concerns. Consequently, the very high lead levels on the range floor are an exposure concern as the trainees spend considerable time in prone and sitting positions. Likewise, high surface lead levels in the office and near the microwave also pose an ingestion hazard.

Table 2: Surface Wipe Monitoring Results

Sample Date	Sample Location	Surface Sampled	Surface Lead Level (µg/ft^2)
1/29/16	Office	Desk, in front of computer	430
		Floor, at entrance	517
	Classroom	DT mat, middle 1	121
		DT mat, middle 2	60
		Desk top	141
	Classroom entry way	Table top, in front of microwave	724
	Bathroom	Floor, at entry	235
	Range, side B	Ammunition loading table	473
	Range, side A	Floor, 5 yard line center	1,096
		Floor, 5 yard line, left side	1,849
		Floor, 10 yard line center	589
		Floor, 10 yard line, left side	6,141
		Floor, 20 yard line center	3,029
		Floor, 20 yard line, left side	2,666
		Floor, 5 yards behind firing line, center	994
		Floor, 5 yards behind firing line, left side	741

There are no specific workplace regulations for interpreting surface lead monitoring results, although there is a general regulation under the lead standard that stipulates wherever lead is being used in the workplace, surfaces must be kept free as practicable of lead accumulation. Many groups, including Federal OSHA use a threshold of 200 µg/ft^2, which was developed by the Federal Department of Housing and Urban Development as a clean-up level for floors.

The "cleanability" of a surface, or how readily lead is removed, is another important perspective that DOSH considers when assessing a workplace. This semi-qualitative criterion is not only an indication that a surface can be cleaned, but also reflects the potential exposure that might occur through human contact and the ingestion exposure pathway. The cleanability is assessed by taking two consecutive wipe samples on the same surface, a high lead bearing initial wipe being an indication that the lead can be removed through cleaning. Although a second wipe sample was not collected at the OPD firing range,

lead particles have been found to be readily removed from the smooth, hard surfaces that were sampled, at the range using wet cleaning methods.

Ventilation System Assessment

A properly designed and operating indoor firing range ventilation system is not only necessary for limiting airborne lead exposures, but it is also essential for reducing the deposition of lead onto firing range surfaces. The more effective a ventilation system is at capturing lead generated during firearm use, the less lead that will be deposited on surfaces. Indoor firing range criteria developed by the US Navy, a generally accepted best-practices standard, stipulate the use of an air supply plenum behind the firing line that generates a consistent, laminar-like flow of air across the firing line at a velocity between 50 and 75 feet per minute. To meet these specifications, supply air needs to be distributed across a relatively large surface area behind the firing line. The best design provides for air being distributed across the entire cross sectional area of the firing range. Other less effective, but technically appropriate systems, deliver the supply air through a register located near the ceiling, across the width of the range.

The supply air, which carries the airborne contaminants away from the shooter, is subsequently exhausted from the far end of the facility. The US Navy indoor firing range criteria specify that the exhaust rate should be 15 percent more than that of the supply, thereby assuring the range is under negative pressure. A ventilation system that creates a positive pressure environment inside of the firing range will not effectively remove lead from the range resulting in the release of lead emitted during firearms discharge to areas outside of the range within the facility.

Upon initial observation, the supply air system is noted to not meet the design criteria needed to provide a uniform distribution of sweep air through the firing range. Supply air is distributed through four rectangular ducts (29 by 47 inches) that are located equidistant along the width of the range at a height of 12 feet. With the active firing range relegated to the southern half of the building (A side), supply air for this area is provided by just two of the four air supply ducts, which are located behind shooting lanes 1 and 6. The introduction of a large volume of air through a relatively small area would be anticipated to create non-uniform turbulent airflow.

Airflow measurements taken at the face of the southern most supply duct found a mean velocity of 550 feet per minute or a volumetric airflow rate of 5,200 cubic feet per minute (CFM). Assuming the other three supply ducts delivered a similar amount of air, the total fresh air supply is about 21,000 CFM. It was not possible to access the exhaust duct to determine the exhaust airflow rate. Some tests conducted at the building entrance indicated the building is under negative pressure.

The smoke test results conducted on the active firing range overall indicated poor transport and removal of the released smoke. At the 25 yard firing line, the smoke tests indicated upstream movement of air with considerable turbulence. Air flow at the 15 yard firing line was predominantly downrange, but the airflow was noted to be very turbulent. A neutral condition of minimal airflow was observed at the 5 yard firing line. The inadequate design and observed poor performance of the ventilation system are a certain cause of the elevated lead exposures and high surface lead levels.

Summary and Recommendations

The monitoring results indicate that two employees exceeded the DOSH 8-hour TWA PEL of 50 $\mu g/m^3$, with a third worker exceeding the action level (30 $\mu g/m^3$). The exposures occurred during a typical training event conducted at the OPD firing range. In addition, most (81%) of the surfaces sampled in the range had a lead concentration that exceeded the 200 $\mu g/ft^2$ threshold. The range floor surface lead levels in particular were very high.

Regulations regarding occupational lead exposures and ancillary requirements for protecting workers from exposure are contained in the General Industry Lead Standard (WAC 296-62-07521). As a starting point, the regulations require that an employer conduct air monitoring to establish airborne exposure levels. The resulting exposure monitoring data dictates the level of compliance required. Exposure levels that exceed the 8-hour action level of 30 $\mu g/m^3$ require comprehensive exposure reduction and air and biological monitoring measures that include: air monitoring for lead, blood lead testing, engineering controls, and housekeeping and hygiene practices. Exposure levels exceeding the 8-hour permissible exposure limit of 50 $\mu g/m^3$ require a similar set of requirements, albeit at a greater frequency. If the worker's airborne exposure is less than the action level, the hazard of lead exposure, and means of reducing exposure need to be addressed in the company's hazard communication program.

As noted, meeting the regulatory requirements when exposures exceed the action level of 30 $\mu g/m^3$ would require a considerable effort. Therefore, the best alternative for regulatory compliance, and more importantly, protecting workers from lead exposure, is to implement changes that will consistently reduce worker exposures below the action level. Reducing lead exposures could be accomplished though two means, installation of a ventilation system that meets US Navy criteria or the complete substitution of traditional ammunition with clean fire ammunition in combination with a thorough cleaning of the range. Due to the time needed to select, design and install a new ventilation system, not to mention the cost, it is recommended that the use of clean fire ammunition be implemented immediately. A cost/benefit analysis could be conducted at a later date to determine if the use of less expensive traditional ammunition would cover the cost of a new ventilation system. Specific recommendations are presented as follows.

- ***Require the use of clean-fire ammunition at range.*** Clean fire ammunition should be used in place of traditional ammunition immediately. Efforts also need to be made to ensure with certainty that other agencies using the range also comply with this requirement. This effort may require spot inspections by OPD to ensure visiting agencies are in compliance and are not using traditional ammunition.

- ***Test ammunition for lead content.*** If interested, the Field Group can facilitate the analysis of ammunition used at the range.

- ***Develop and implement a clean-up plan.*** Lead will need to be cleaned from surfaces throughout the entire OPD firing range facility. A plan should be developed as to how this cleaning will be accomplished and how workers would be protected during clean-up. Consideration might be given to using a contractor for the initial clean-up. Sweeping and compressed air should not be used, rather wet cleaning methods should be employed.

- ***Minimize lead transfer from the active range.*** Until the range has been shown to be clean, efforts should be made to minimize the transfer of lead from the range. The transfer of lead from the range floor during training exercises is especially a concern. Trainees should bring a second pair of clean clothes to change into immediately after they finish firearms training exercises. The dirty clothes should be placed in a plastic bag to be transferred home where the clothing should be carefully transferred to the washing machine and washed without non-lead contaminated clothing. Additionally, trainees that have been using the firing range should remove their shoes prior to entering the DT training classroom.

- ***Communication plan.*** The department should consider developing a communication plan to inform the officers that have used the range as to the findings in this report. As discussed earlier, the overall health risk would not be considered to be substantial given how infrequently individual officers use

the range. The communication should also present the intended plan for reducing exposure and cleaning the range. Lastly, given airborne lead exposures exceed the action level, the lead standard requires that blood lead testing be conducted.

- ***Future lead monitoring.*** Air monitoring should be conducted to assess lead exposure during the exclusive use of clean fire ammunition. Additionally, surface wipe sampling should be performed to ensure the facility has been adequately cleaned.

The monitoring results are reflective of conditions existing at the site on the day sampled. The exposure assessment should be representative of workers who perform the operation with the same equipment and under similar work practice and environmental conditions. Changes in process, equipment, or environment could result in an increase in worker exposures, and personal exposures should be reassessed at that time. FRCG is available to help with further exposure measurements or implementation of controls as described above. Exposures above Washington State regulatory limits should be addressed expeditiously to prevent possible injury or illness. It is the employer's responsibility to address overexposures, implement necessary controls, initiate scheduling of required periodic or follow-up monitoring, and otherwise comply with regulatory standards. The Department of Labor and Industries enforces safety and health standards and employers are subject to citation and penalty for non-compliance. If you have questions about our findings, please feel free to call at your earliest convenience.

Appendix A

Analytical Laboratory Results

Environmental Health Laboratory
Department of Environmental and Occupational Health Sciences
University of Washington

4/13/16

To Gerry Croteau
FRCG
DEOHS
BOX 354695
University of Washington
Seattle, WA

From Susan Tao

Subject ANALYSIS REPORT

EHL Reference	Client Reference	Sampling Site
11603017	16-03	Olympic Police Dept

	Sampling	Receipt	Preparation	Analysis
Dates	3/16/16	3/17/16	3/22/16	4/1/16

Method EHLSOP -11 Microwave Sample Preparation for IH Filter for Metal Analysis
EHLSOP - 07 Instrumental Analysis Of Elements by ICP-MS (Based On EPA 6020a Rev.1 2007)

Media MCE filter

Results

Sample ID	Pb (µg/sample)
1	15.0
2	26.8
3	18.7
4	27.5
5	28.3
6	< 0.03

Sample ID	Sampling Volume (L)	Units	Pb
1	107.988	mg/m3	0.139
2	381.402	mg/m3	0.0702
3	378.378	mg/m3	0.0494
4	387.253	mg/m3	0.071
5	266.913	mg/m3	0.106
6	NA	NA	NA

Quality Assurance

Parameter	Pb
R^2, Calibration	1.0000
Reporting Limit, (µg)	0.03
SR Efficiency	104.0%

Notes Results were not corrected for spike recovery efficiency.
Results were corrected for matrix blank values.

Field blanks, when submitted, are analyzed and reported as samples; no corrections are made for field blank values.
It is solely the submitter's decision on how to utilize the field blank values.
Results apply only to the samples tested.
Unless otherwise noted, the conditions of the samples as received were satisfactory.

Analyst Comments

Reviewed by R Dills 4/13/16
Susan Tao, Ph.D. QAC Date
206-221-4548
for

R Dills 4/13/16
Russell Dills, Ph.D. EHL Director Date
206-543-3263

Environmental Health Laboratory
Department of Environmental and Occupational Health Sciences
University of Washington

4/13/16

To
Gerry Croteau
FRCG
DEOHS
BOX 354695
University of Washington
Seattle, WA

From Susan Tao

Subject ANALYSIS REPORT

EHL Reference	Client Reference	Sampling Site
11603018	16-03	Olympic Police Dept

	Sampling	Receipt	Preparation	Analysis
Dates	3/16/16	3/17/16	3/22/16	4/1/16

Method EHLSOP -12 Open Vessel Microwave Sample Digestion of Surface Wipes
EHLSOP - 07 Instrumental Analysis Of Elements by ICP-MS (Based On EPA 6020a Rev.1 2007)

Media Ghost wipes

Results

Sample ID	Pb (ug/sample)
1	46.3
2	55.7
3	13.0
4	6.51
5	15.2
6	77.9
7	25.3
8	50.9
9	118
10	63.4
11	326
12	107
13	79.8
14	287
15	661
16	199

Quality Assurance

Parameter	Pb
R^2, Calibration	1.0000
Reporting Limit, (ng)	0.09
SR Efficiency	102.6%

Notes Results were not corrected for spike recovery efficiency.
Results were corrected for matrix blank values.

Field blanks, when submitted, are analyzed and reported as samples; no corrections are made for field blank values.
It is solely the submitter's decision on how to utilize the field blank values.
Results apply only to the samples tested.
Unless otherwise noted, the conditions of the samples as received were satisfactory.

Analyst Comments

Reviewed by

Susan Tao, Ph.D. QAC Date
206-221-4548

Russell Dills, Ph.D. EHL Director Date
206-543-3263

APPENDIX D
Regulated Building Materials Surveys

PACIFIC RIM ENVIRONMENTAL, INC.

Regulated Building Materials Survey

OPD Firing Range

6530 Martin Way
Lacey, WA

Performed for:

GeoEngineers, Inc.
8410 154th Avenue Northeast
Redmond, WA 98052

Prepared By:

Todd Carter, AHERA Inspector
DOC Lead Risk Assessor

Date Prepared: 05/04/2017 PacRim #: 16057

6510 Southcenter Blvd., Ste. #40
Seattle, WA 98188

pacrimenv.com

Phone: (206) 244-8965
Toll Free 800-245-8965

Table of Contents
OPD Firing Range | 6530 Martin Way | Lacey, WA

Section 1.0 Scope of Work
OPD Firing Range | 6530 Martin Way | Lacey, WA

On April 19, 2017, Todd Carter, an AHERA Building Inspector and DOC Certified Lead Inspector, of Pacific Rim Environmental, Inc. (PacRim) performed a regulated building material survey at the subject property located at 6530 Martin Way in Lacey, WA.

Site: The subject property is occupied by an approximately 18,270 square foot firing range and storage shed.

Limitations: No inspection or report limitations noted.

Field inspection, data collection, and report generation were performed according to the following **Scope of Work**:

> Provide AHERA Certified Building Inspector to perform a building inspection in accordance with Washington Administrative Code (WAC) 296-62-07721 and current PSCAA regulations. Provide a State of Washington Department of Commerce Lead Risk Assessor to perform a building inspection in accordance with WAC code 365-230-200.
>
> ***Asbestos-Containing Materials (ACM)***
> 1. Bulk sampling and analysis of suspect asbestos-containing materials (ACM).
> 2. Analysis of suspect ACM by a NVLAP accredited laboratory.
> 3. Quantity estimates of ACM.
> 4. Written report including recommendations based on the technician's observations, abatement (removal) cost estimates, sample descriptions, and sample location.
> 5. Statement of Compliance with W.A.C. 296-62-07721 Sign-off form.
>
> ***Lead-Based Paints (LBP)***
> 6. Perform survey for suspect lead-based paints utilizing a Niton XRF portable sampling device.
> 7. Prepare final report including: Sample descriptions, locations, analytical results, and recommendations.

This survey is intended to identify possible asbestos-containing materials (ACM) on the interior and exterior of the building. This inspection covered only those areas, which were exposed and/or physically accessible to the inspector. Materials uncovered during the course of demolition, renovation, or maintenance activities that are not identified in this inspection report must be presumed to contain asbestos until PLM analysis proves that the material is not asbestos-containing.

This survey is not intended for, nor should be used as a design specification. The Asbestos in Schools Hazard Amendment and Reauthorization Act (ASHARA), effective November 20, 1990, expanded accreditation requirements to apply to persons who work with asbestos in public and commercial buildings as well as schools. Specifically, ASHARA expanded the Toxic Substances Control Act (TSCA) Section 206 (a) (1) and (3) to require accreditation for any person who designs or conducts a response action with respect to friable ACM in a building. TSCA Section 207 provides for civil penalties of $5,000 for each day of a violation for not employing accredited individuals to design and conduct response actions. Sampling of suspect asbestos-containing materials was conducted as prescribed in 40 CFR 763.86.

Suspect asbestos-containing materials within the structure were identified and classified as a surfacing material, thermal system insulation, or miscellaneous materials. Surfacing materials are those, which are either spray applied or troweled-on for acoustical, decorative, or fireproofing purposes. Thermal system insulation (TSI) is insulation used to inhibit heat transfer or to prevent condensation on pipes, boilers, tanks, ducts and various other components. Miscellaneous materials include all other materials not included in the above categories such as floor tile, ceiling tile, roofing felt, cementitious materials, wallboard systems and products such as caulking, mastic and putty.

Bulk samples collected were submitted for sample analysis in accordance with method EPA-600/R-93/116: "Method for the Determination of Asbestos in Bulk Building Materials". Analyses were performed in Pacific Rim Environmental Inc.'s NVLAP Accredited Laboratory (Lab Code 101631-0). Materials are positive for asbestos if they are found to contain greater than 1% or 1% asbestos.

A total of twenty-one (21) bulk samples were collected and submitted for PLM laboratory analysis. None (0) of the samples were found to contain greater than 1% asbestos. One visual assessment was made and the material is PACM (presumed asbestos containing material).

Thermal Systems Insulation (TSI)

Suspect asbestos-containing **fiberglass insulation** was identified in walls and ceiling. The material was sampled and ***no asbestos was detected.*** (Sample # 11)

Suspect asbestos-containing **ceiling insulation** was identified in training room. The material was sampled and ***no asbestos was detected.*** (Sample # 13)

If during the course of work in the crawl space or wall, ceiling or floor demolition, any TSI materials that are not listed in this report are uncovered, sampling ***must*** be performed prior to disturbing these materials.

Surfacing Materials

Suspect asbestos-containing **texture on GWB** was identified in in the office, Amory room, training room wall, training room bathroom, and training room hallway. The material was sampled several times and ***no asbestos was detected.*** (Samples # 2, 6, 8, 9, 14)

Suspect asbestos-containing **acoustical ceiling texture** was identified in the Amory room. The material was sampled several times and ***no asbestos was detected.*** (Samples # 3, 4, 5)

If during the course of wall, ceiling or floor demolition, any surfacing materials not identified in this report are uncovered, sampling ***must*** be performed prior to disturbing these materials.

Miscellaneous Materials

Suspect asbestos-containing **cove base mastic** was identified in the office. The material was sampled and ***no asbestos was detected***. (Sample # 1)

Suspect asbestos-containing **carpet mastic** was identified on the training room floor. The material was sampled and ***no asbestos was detected.*** (Sample # 7)

Suspect asbestos-containing **sheet vinyl flooring** was identified in the bathroom. The material was sampled and ***no asbestos was detected.*** (Sample # 10)

Suspect asbestos-containing **particle board panels** were identified on the training room roof. The material was sampled and ***no asbestos was detected***. (Sample # 12)

Suspect asbestos-containing **putty or caulk** was identified in the on a roof panel at the ventilator, roof patch locations above range, and exterior training room windows. The material was sampled several times and ***no asbestos was detected***. (Samples # 15, 18, 19)

Suspect asbestos-containing **roofing mastic** was identified on roof patch locations above range side A. The material was sampled and ***no asbestos was detected***. (Sample # 16)

Miscellaneous materials continued

Suspect asbestos-containing **roofing tar** was identified on roof patch locations above range side A. The material was sampled and ***no asbestos was detected.*** (Sample # 17)

Suspect asbestos-containing **expansion joint** was identified in the range floor side A. The material was sampled and ***no asbestos was detected.*** (Sample # 20)

Suspect asbestos-containing **3-tab roofing, roof shingles** was identified on the storage shed roof. The material was sampled and ***no asbestos was detected.*** (Sample # 21)

Suspect asbestos-containing **laminate mastic on walls** was identified in the bathrooms. The material was visually inspected and **presumed *asbestos containing material.*** (Visual # V-01)

If during the course of wall, ceiling or floor demolition, any miscellaneous materials that are not listed in this report are uncovered, sampling ***must*** be performed prior to disturbing these materials.

Section 3.0 Asbestos Abatement Cost Estimate
OPD Firing Range | 6530 Martin Way | Lacey, WA

The following abatement costs are "best-effort" estimates and are based on current industry averages. The following estimates are subject to many variables beyond the control of PacRim. Such variables include, but are not limited to: project duration, contractor work schedule, hours of work allowed by the owner, contractor performance, regulatory agency interpretation of changing regulations, logistics of removal of material and miscellaneous delays. The estimate is meant only as a guideline to assist in the selection of an abatement contractor and may not reflect the actual final costs of asbestos removal. They do not include owner costs such as abatement project oversight and monitoring for compliance to law, and compliance to project plans and/or specifications. These estimates assume that adequate, professional plans and specifications are prepared. Generally, abatement costs are minimized by professional project management as well as utilizing the same asbestos abatement contractor to remove all asbestos containing materials during a single project. It is in no way intended to serve as, or replace, a comprehensive abatement specification. Estimates include permitting, removal and disposal.

Material (Location)	Approximate Quantity	@	Price per Sq. Ft. Ln. Ft. or Each	Total
Laminate mastic Storage shed bathroom walls	150 sq. ft.	@	NA*	NA*
			TOTAL	**NA***

***Contractors will typically have a minimum call-out fee. Unit pricing may not be applicable to small-scale, shore-duration projects such as this.**

Section 4.0 Statement of Compliance
OPD Firing Range | 6530 Martin Way | Lacey, WA

In accordance with W.A.C. 296-62-07721 and PSCAA Regulation III, Article 4, Pacific Rim Environmental, Inc. performed a survey for asbestos at the subject Property located at 6530 Martin Way in Lacey, WA. Should employees or contract personnel encounter any suspect asbestos-containing materials (ACM) it is their responsibility to:

1. Contact a representative of the owner.
2. Consult the inspection report to determine whether or not the suspect material contains asbestos.
3. If the suspect material does not appear in the inspection report, then that material was not sampled and must be presumed to contain asbestos until proven otherwise by sampling and PLM analysis.
4. Ensure that all employees and contractors are informed and advised of the location and type of materials that contain asbestos.

The following asbestos-containing materials were identified at the subject property:

- **PACM Laminate mastic (bathroom walls)**

I Hereby Attest:

The inspection report has been made available to me. I will inform all subcontractors of the location and types of materials containing asbestos. I am authorized to sign on behalf of my company.

Contractor:	_____	Owner's Rep:	_____
Signature:	_____	Signature:	_____
Print Name:	_____	Print Name:	_____
Title:	_____	Title:	_____
Date:	_____	Date:	_____

The inspection and testing performed on the interior painted surfaces of the subject Property **did not identify** lead-based paint above the EPA/HUD standard of 1.0 mg/m^2 on the following tested components.

All XRF sample results are provided in Appendix D.

If the building is to be renovated or remodeled there are procedures regarding the disturbance or removal of the lead-based paints that **can** be followed (i.e. initial air monitoring, clearance sampling, etc.). These procedures can be found in *HUD-0006700 Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*. It is not required that these regulations/procedures be utilized on this project, however because these are the only available guidelines for the removal of lead-based paints PacRim feels it necessary to inform you of these guidelines.

The only state rules or regulations that currently apply to lead-based paints are WAC 296-155-17603 Scope* and WAC 296-155-17607 Permissible Exposure Limit**. The WAC code states that if lead is detectable in the workplace in any quantity, initial air monitoring must be performed on employees doing demolition, renovation or remodeling work in areas found to have materials containing lead. Also, workers performing lead removal must be trained in accordance with WAC 296-155-17625.

The EPA/HUD standard uses a criterion of 5,000 parts per million (PPM) dry weight or 1.0 milligrams per square centimeter (1.0 mg/cm2) for lead-based paint. However, if lead is detected in any concentration, Federal OSHA and Washington State Department of Labor and Industries regulations will still apply, since neither agency has established a concentration of lead in paint below which the lead in construction standards do not apply.

LEAD TCLP SAMPLING

The samples were collected and placed in a sealable sample container and given a unique identification number and submitted to the laboratory for analysis under chain-of-custody procedures.

The regulatory limit for lead leachate for waste stream characterization and disposal is 5.0 mg/L or 5 PPM (Parts Per Million) The TCLP samples were submitted for waste stream characterization using the Toxicity Characteristic Leaching Procedure SW 846 6010B.

The sample results are summarized below in Table B. Refer to Appendix for laboratory analysis report.

TABLE B

Sample I.D.	Sample Location	Analyte	Result	Regulatory Limit
TCLP-1	Side A Floor	TCLP Lead	75 mg/L	5.0 mg/L
TCLP-2	Side B Floor	TCLP Lead	<0.4 mg/L	5.0 mg/L
TCLP-3	Building	TCLP Lead	21 mg/L	5.0 mg/L

DUST SAMPLING AND ANALYSIS

A total of three (3) wipe samples were collected from selected horizontal surfaces and submitted for lead analysis. The samples were collected and analyzed in accordance Method SW 846 3050B/7000B.

Dust samples were collected using a Ghost wipe. The Ghost wipe is a 15cm x 15cm sturdy wiping media moistened with DI water. The wipe meets ASTM E1792 specifications as required by the US EPA and AIHA policy on sampling for lead in surface dust. The wipe samples were collected in accordance with HUD/EPA protocol using single-surface sampling. No composite samples were collected.

The samples were collected from a 12" x 12" area for a same surface area of one square foot for each sample.

A fresh pair of disposable gloves was donned for each sample. Samples were placed into a sealed container and given a unique identification number. Samples were submitted to the analytical laboratory using chain-of custody procedures.

Comparison of the lead dust wipe samples results to the most stringent residential cleanup objectives is provided for informational purposes only to demonstrate that the surfaces tested are contaminated with lead dust.

The MTCA Cleanup Regulations 173-340-900 - Method A Soil Cleanup Levels for Unrestricted Land Uses for Lead is 250 mg/kg or PPM (parts per million)

Range users should be advised to use appropriate work practices and engineering controls during any activity that may generate or disturb dust. This can be accomplished through awareness training in accordance with **WAC 296-155-17625 *Employee Information and Training*** and training on the selection, use and maintenance of respirators in accordance with **WAC 296-155-17613 *Respiratory Protection.***

TABLE A

Date	Sample #	Sample Location	Sample Type	Result µg/ft²
4-19-17	WS-1	Top of HVAC Duct	Wipe	67,000
4-19-17	WS-2	Top of Training Room	Wipe	21,000
4-19-17	WS-3	Top of Eco Block	Wipe	14,000

Appendix A: Asbestos Sample Summary

Asbestos Sample Summary

PacRim

Client: **GeoEngineers, Inc.**
8410 154th Ave. NE
Redmond, WA 98052

Job Number: **16057**
Print Date: **May 11, 2017**

Project: **OPD Firing Range**
6530 Martin Way
Lacey, WA

Sample #	Sample Date	Sample Location	AHERA Category	Sample Description	Asbestos Type / %	Approximate Quant.
1	4/19/2017	Office	Miscellaneous	Cove Base Mastic	None Detected (Both Layers)	N/A
2	4/19/2017	Office	Surfacing	Texture on GWB	None Detected (Both Layers)	N/A
3	4/19/2017	Armory room	Surfacing	Acoustical Ceiling Texture	None Detected	N/A
4	4/19/2017	Armory room	Surfacing	Acoustical Ceiling Texture	None Detected	N/A
5	4/19/2017	Armory room	Surfacing	Acoustical Ceiling Texture	None Detected	N/A
6	4/19/2017	Armory room, wall	Surfacing	Texture on GWB	None Detected (Both Layers)	N/A
7	4/19/2017	Training room, floor	Miscellaneous	Carpet Mastic	None Detected	N/A
8	4/19/2017	Training room, wall	Surfacing	Texture on GWB	None Detected	N/A
9	4/19/2017	Training room, bathroom	Surfacing	Texture on GWB	None Detected (Both Layers)	N/A
10	4/19/2017	Bathroom	Miscellaneous	Sheet vinyl flooring	None Detected (Both Layers)	N/A
11	4/19/2017	Wall	TSI	Fiberglass Wall and ceiling insulation	None Detected (Both Layers)	N/A
12	4/19/2017	Training room, roof	Miscellaneous	Particle board panels	None Detected	N/A
13	4/19/2017	Training room	TSI	Ceiling Insulation	None Detected	N/A
14	4/19/2017	Training room, hallway	Surfacing	Texture on GWB	None Detected (Both Layers)	N/A
15	4/19/2017	Roof panel at ventilator	Miscellaneous	Putty or caulk	None Detected (Both Layers)	N/A
16	4/19/2017	Roof patch locations above range Side A	Miscellaneous	Roofing mastic	None Detected	N/A
17	4/19/2017	Roof patch locations above range Side A	Miscellaneous	Roofing tar	None Detected	N/A

Asbestos Sample Summary

PacRim

Client: **GeoEngineers, Inc.**
8410 154th Ave. NE
Redmond, WA 98052

Job Number: **16057**
Print Date: **May 11, 2017**

Project: **OPD Firing Range**
6530 Martin Way
Lacey, WA

Sample #	Sample Date	Sample Location	AHERA Category	Sample Description	Asbestos Type / %	Approximate Quant.
18	4/19/2017	Roof patch locations above range	Miscellaneous	Putty or caulk	None Detected (Both Layers)	N/A
19	4/19/2017	Exterior training Room windows	Miscellaneous	Putty or caulk	None Detected	N/A
20	4/19/2017	Range Floor Side A	Miscellaneous	Expansion Joint	None Detected (Both Layers)	N/A
21	4/19/2017	Storage shed, roof	Miscellaneous	3 tab roofing Roof shingles	None Detected (Both Layers)	N/A
V-01	4/19/2017	Storage shed, bathroom	Miscellaneous	Visual Laminate mastic on walls	PACM	150 Sq.Ft.

Appendix B: **Bulk Sample Analysis Report**

PACIFIC RIM ENVIRONMENTAL, INC.

BULK SAMPLE ANALYSIS REPORT

CLIENT:	**GeoEngineers, Inc.** 8410 154th Ave. NE Redmond, WA 98052	**PACRIM # :**	16057
		REPORT # :	2017-04-0162
		DATE RECEIVED :	04/20/2017
		ANALYST :	William F. Golloway
PROJECT:	**OPD Firing Range** 6530 Martin Way Lacey, WA	**DATE ANALYZED :**	04/24 & 04/26/2017
		REPORT BY :	Olivia Neira
		REPORT DATE :	04/27/2017
		TURNAROUND:	5 days
SAMPLE DATE:	04/19/2017	**PAGE :**	1 of 5

Attached are the results of analysis of 21 bulk samples submitted for asbestos identification: Lab ID #2017-04-0162 through 2017-04-0182.

The samples were analyzed in accordance with method EPA-600/R-93/116: "Method for the Determination of Asbestos in Bulk Building Materials".

Unless otherwise noted, the samples were inhomogeneous; subsamples of components were analyzed to achieve representative analysis. Separate layers of layered samples are analyzed and reported separately. Unless otherwise stated, asbestos content was quantified by calibrated visual estimation (CVES). CVES concentrations are reported in 2 to 3 percent ranges for fiber concentrations ranging from 1-10%, and 5 percent ranges for concentrations greater than 10%. Samples in which asbestos was not observed are reported as "none detected".

Limitations and Uncertainty:

Factors such as sample quality, sample size, interfering matrix material, fiber size, and fiber concentration contribute to the uncertainty of asbestos concentration measurements in bulk materials. Relative errors exceeding 100% may occur in samples containing <1-10% asbestos. Relative errors are typically below 30% in samples with greater than 10% asbestos, and approach zero as the asbestos concentration approaches 100%.

Asbestos fibers with diameters below approximately 0.25 micrometers are not detectable by PLM. These extremely fine fibers may occur in such products as floor tile, adhesives, and cement products. This limitation can be overcome, however, by the use of alternate analytical methods, such as Transmission Electron Microscopy (TEM).

This report cannot be represented by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full without written permission from the laboratory.

NVLAP Accredited LAB #: 101631-0
Samples submitted by: PacRim

Reports Reviewed By: _____
Approved Signatory

Pacific Rim Environmental, Inc.
BULK SAMPLE ANALYSIS REPORT

CLIENT:	**GeoEngineers, Inc.** 8410 154th Ave. NE Redmond, WA 98052	PACRIM # :	16057
		REPORT # :	2017-04-0162
		DATE RECEIVED :	04/20/2017
		ANALYST :	William F. Golloway
PROJECT:	**OPD Firing Range** 6530 Martin Way Lacey, WA	DATE ANALYZED :	04/24 & 04/26/2017
		REPORT BY :	Olivia Neira
		REPORT DATE :	04/27/2017
		TURNAROUND:	5 days
SAMPLE DATE:	04/19/2017	PAGE :	2 of 5

Client/Lab ID Number	Sample Location and Description	Asbestos Type(s) / %	Other Material(s)	Date Analyzed
1 2017-04-0162	**Office (Cove Base Mastic).** Blue, flexible cove base (layer 1) with light brown mastic (layer 2).	**Layer 1** (Cove base): None Detected. **Layer 2** (Mastic): None Detected.	**Layer 1:** Vinyl, Mineral Aggregate. **Layer 2:** Cellulose (<1%), Adhesive.	4/24/17
2 2017-04-0163	**Office (Texture on GWB).** White-painted, white, chalky texture (layer 1) on light gray, chalky drywall with brown paper (layer 2).	**Layer 1** (Texture): None Detected. **Layer 2** (Drywall): None Detected.	**Layer 1:** Cellulose (<1%), Binder, Mineral Aggregate, Paint. **Layer 2:** Cellulose (20-25%), Gypsum, Mineral Aggregate, Binder.	4/24/17
3 2017-04-0164	**Armory room (Acoustical Ceiling Texture).** White-painted, white, crumbled, popcorn texture.	None Detected.	Cellulose (<1%), Foam, Binder, Mineral Aggregate, Paint.	4/24/17
4 2017-04-0165	**Armory room (Acoustical Ceiling Texture).** White-painted, white, crumbled, popcorn texture.	None Detected.	Cellulose (<1%), Foam, Binder, Mineral Aggregate, Paint.	4/24/17
5 2017-04-0166	**Armory room (Acoustical Ceiling Texture).** White-painted, white, crumbled, popcorn texture.	None Detected.	Cellulose (<1%), Foam, Binder, Mineral Aggregate, Paint.	4/24/17
6 2017-04-0167	**Armory room, wall (Texture on GWB).** White-painted, white, chalky texture (layer 1) on light gray, chalky drywall with brown paper (layer 2).	**Layer 1** (Texture): None Detected. **Layer 2** (Drywall): None Detected.	**Layer 1:** Cellulose (<1%), Binder, Mineral Aggregate, Paint. **Layer 2:** Cellulose (10-15%), Fiberglass (1-3%), Gypsum, Mineral Aggregate, Binder.	4/24/17

Pacific Rim Environmental, Inc.
BULK SAMPLE ANALYSIS REPORT

CLIENT:	**GeoEngineers, Inc.**	PACRIM # :	16057
	8410 154th Ave. NE	REPORT # :	2017-04-0162
	Redmond, WA 98052	DATE RECEIVED :	04/20/2017
		ANALYST :	William F. Golloway
PROJECT:	**OPD Firing Range**	DATE ANALYZED :	04/24 & 04/26/2017
	6530 Martin Way	REPORT BY :	Olivia Neira
	Lacey, WA	REPORT DATE :	04/27/2017
		TURNAROUND:	5 days
SAMPLE DATE:	04/19/2017	PAGE :	3 of 5

Client/Lab ID Number	Sample Location and Description	Asbestos Type(s) / %	Other Material(s)	Date Analyzed
7 2017-04-0168	**Training room, floor (Carpet Mastic).** Light yellow mastic with adhering, white-painted, mud-like residue and carpet.	None Detected.	Cellulose (<1%), Synthetics (15-20%), Adhesive, Binder, Mineral Aggregate, Paint.	4/24/17
8 2017-04-0169	**Training room, wall (Texture on GWB).** White-painted, white, somewhat chalky texture.	None Detected.	Cellulose (<1%), Binder, Mineral Aggregate, Paint.	4/24/17
9 2017-04-0170	**Training room, bathroom (Texture on GWB).** White-painted, white, powdery-chalky mud (layer 1) on light pink, chalky drywall with light gray and brown paper (layer 2).	**Layer 1** (Mud): None Detected. **Layer 2** (Drywall): None Detected.	**Layer 1:** Cellulose (<1%), Binder, Mineral Aggregate, Paint. **Layer 2:** Cellulose (10-15%), Fiberglass (1-3%), Gypsum, Mineral Aggregate, Binder, Paint.	4/24/17
10 2017-04-0171	**Bathroom (Sheet vinyl flooring).** Gray sheet flooring with embedded, woven backing (layer 1) and white mastic (layer 2).	**Layer 1** (Flooring): None Detected. **Layer 2** (Mastic): None Detected.	**Layer 1:** Cellulose (40-45%), Binder. **Layer 2:** Cellulose (<1%), Adhesive, Mineral Aggregate.	4/24/17
11 2017-04-0172	**Wall (Fiberglass Wall and ceiling insulation).** White, vinyl wrap (layer 1) on light yellow, fibrous insulation (layer 2).	**Layer 1** (Wrap): None Detected. **Layer 2** (Insulation): None Detected.	**Layer 1:** Vinyl, Mineral Aggregate. **Layer 2:** Cellulose (<1%), Fibrous Glass (85-90%), Binder, Metal.	4/24/17

Pacific Rim Environmental, Inc.
BULK SAMPLE ANALYSIS REPORT

CLIENT:	**GeoEngineers, Inc.** 8410 154th Ave. NE Redmond, WA 98052	PACRIM # :	16057
		REPORT # :	2017-04-0162
		DATE RECEIVED :	04/20/2017
		ANALYST :	William F. Golloway
PROJECT:	**OPD Firing Range** 6530 Martin Way Lacey, WA	DATE ANALYZED :	04/24 & 04/26/2017
		REPORT BY :	Olivia Neira
		REPORT DATE :	04/27/2017
		TURNAROUND:	5 days
SAMPLE DATE:	04/19/2017	PAGE :	4 of 5

Client/Lab ID Number	Sample Location and Description	Asbestos Type(s) / %	Other Material(s)	Date Analyzed
12 2017-04-0173	**Training room, roof (Particle board panels).** Brown, fiberboard-like material. **Note:** Sample appears to be homogeneous.	None Detected.	Cellulose (90-95%), Animal Hair (<1%), Spider silk (<1%), Wood, Binder.	4/24/17
13 2017-04-0174	**Training room (Ceiling Insulation).** White, fibrous insulation material with adhering fibers.	None Detected.	Cellulose (<1%), Hair (<1%), Fibrous Glass (95-98%), Wood, Binder.	4/24/17
14 2017-04-0175	**Training room, hallway (Texture on GWB).** Light brown-painted, white, chalky texture (layer 1) on white-painted, brown paper with light gray, leveling compound (layer 2).	**Layer 1** (Texture): None Detected. **Layer 2** (Paper with drywall): None Detected.	**Layer 1:** Cellulose (<1%), Binder, Mineral Aggregate, Paint. **Layer 2:** Cellulose (40-45%), Gypsum, Mineral Aggregate, Binder.	4/24/17
15 2017-04-0176	**Roof panel at ventilator (Putty or caulk).** Clear to white, flexible caulking-like material (layer 1) on white, flexible caulking-like material (layer 2).	**Layer 1** (Caulking): None Detected. **Layer 2** (Caulking): None Detected.	**Layer 1:** Binder, Mineral Aggregate. **Layer 2:** Cellulose (<1%), Binder.	4/26/17
16 2017-04-0177	**Roof patch locations above range Side A (Roofing mastic).** Dark gray-brown to black putty-like material.	None Detected.	Cellulose (3-5%), Binder, Mineral Aggregate.	4/26/17

Pacific Rim Environmental, Inc.
BULK SAMPLE ANALYSIS REPORT

CLIENT:	**GeoEngineers, Inc.** 8410 154th Ave. NE Redmond, WA 98052	PACRIM # :	16057
		REPORT # :	2017-04-0162
		DATE RECEIVED :	04/20/2017
		ANALYST :	William F. Golloway
PROJECT:	**OPD Firing Range** 6530 Martin Way Lacey, WA	DATE ANALYZED :	04/24 & 04/26/2017
		REPORT BY :	Olivia Neira
		REPORT DATE :	04/27/2017
		TURNAROUND:	5 days
SAMPLE DATE:	04/19/2017	PAGE :	5 of 5

Client/Lab ID Number	Sample Location and Description	Asbestos Type(s) / %	Other Material(s)	Date Analyzed
17 2017-04-0178	**Roof patch locations above range Side A (Roofing tar).** Dark gray to black, flexible caulking-like material with gray surface hue.	None Detected.	Cellulose (<1%), Binder, Mineral Aggregate.	4/26/17
18 2017-04-0179	**Roof patch locations above range (Putty or caulk).** White, soft caulking-like material (layer 1) with light gray, soft caulking-like material (layer 2).	**Layer 1** (Caulking): None Detected. **Layer 2** (Caulking): None Detected.	**Layer 1:** Cellulose (<1%), Binder. **Layer 2:** Cellulose (<1%), Binder.	4/26/17
19 2017-04-0180	**Exterior training Room windows (Putty or caulk).** Gray, soft, tacky putty material. **Note:** Sample appears to be homogeneous.	None Detected.	Cellulose (<1%), Binder.	4/26/17
20 2017-04-0181	**Range Floor Side A (Expansion Joint).** White, flexible, caulking-like material with black surface residue (layer 1) on light gray caulking-like material (layer 2).	**Layer 1** (Caulking): None Detected. **Layer 2** (Caulking): None Detected.	**Layer 1:** Binder, Mineral Aggregate. **Layer 2:** Binder, Mineral Aggregate.	4/26/17
21 2017-04-0182	**Storage shed, roof (3-tab roofing Roof shingles).** Black, tar, 3-tab-like roofing with white gray gravel (layer 1) and black, tar, 3-tab-like roofing with black and light brown gravel and gray paint (layer 2).	**Layer 1** (Roofing): None Detected. **Layer 2** (Roofing): None Detected.	**Layer 1:** Cellulose (<1%), Fiberglass (10-15%), Mineral Aggregate, Tar. **Layer 2:** Cellulose (<1%), Fiberglass (10-15%), Mineral Aggregate, Tar, Paint.	4/26/17

Appendix C: **Site Photographs**

SITE PHOTOGRAPHS

Photo #1 – Range Area Side A

Photo #2 – Range Area Side B

SITE PHOTOGRAPHS

Photo #3 – Settled dust above training room

Photo #4 – Settled dust on fiberglass insulation

SITE PHOTOGRAPHS

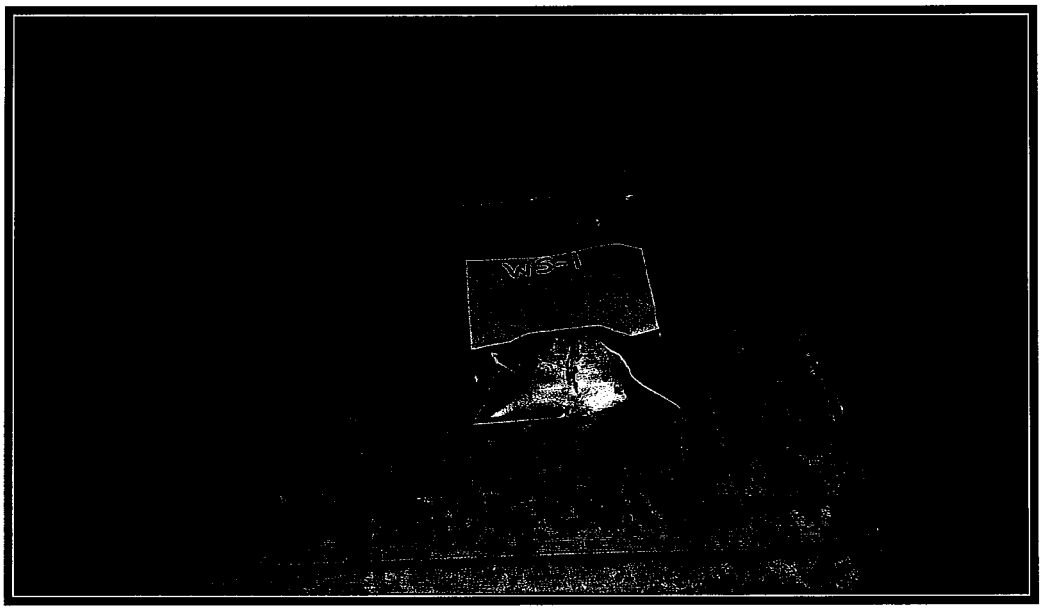


Photo #5 – Dust Sample on Ductwork

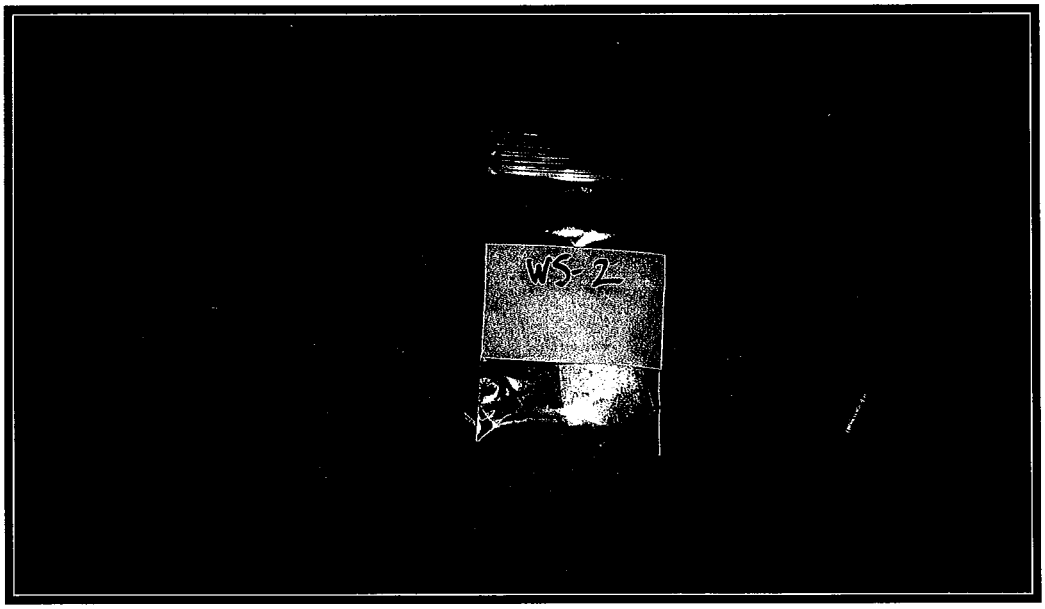


Photo #6 – Dust Sample above Training Room

SITE PHOTOGRAPHS

Photo #7 – Dust Sample on Eco Block

Appendix D: **XRF Data Sheets**

Lead-Based Paint (XRF) Data Sheet

PacRim

Client: **GeoEngineers, Inc.**
8410 154th Ave. NE
Redmond, WA 98052

Project: **OPD Firing Range**
6530 Martin Way
Lacey, WA

XRF Serial #: **XLP300-80662**
Inspection Date: **19-Apr-2017**
Inspection By: **Todd Carter**
PacRim Job#: **16057**

PacRim#	Test #	Substrate	Component / Side	Description / Location	Color	Result	Pbc mg/cm2
1	138	*First calibration check*				Positive	1.1
2	139	*First calibration check*				Null	1
3	140	*First calibration check*				Null	1
4	141	Metal	Exterior siding	Front of building	tan	Negative	0
5	142	Metal	Door frame	Front door	gray	Negative	0
6	143	Wood	Door jamb	Training room vestibule	blue	Negative	0.01
7	144	Metal	Door	Training room vestibule	white	Negative	0
8	145	Wood	Interior siding	Range office	tan	Negative	0
9	146	Concrete	Floor	Vestibule	gray	Negative	0.1
10	147	Metal	Column	Range area	red	Negative	0.03
11	148	Concrete	CMU wall	Divider wall, side A	tan	Negative	0
12	149	Metal	I-beam	Tactical side B	gray	Negative	0.01
13	150	Metal	Deflector	Small arms bullet trap	red	Negative	0.15
14	151	Metal	Wall beams	Range side B	red	Negative	0.01
15	152	Metal	Back stop	Side B, bullet trap	gray	Negative	0.6
16	153	Wood	Interior walls	Tactical side B	white	Negative	0.04
17	154	Concrete	Footing	Side A range	white	Negative	0.01
18	155	Metal	Back stop	Side A bullet trap	gray	Negative	0
19	156	*Last calibration check*				Positive	1.2
20	157	*Last calibration check*				Null	1
21	158	*Last calibration check*				Null	1

Report by: Olivia Neira
Date : April 20, 2017
Review by: Dale

Appendix E: **XRF Performance Characteristic Sheet**

Performance Characteristic Sheet

EFFECTIVE DATE: **September 24, 2004** **EDITION NO.: 1**

MANUFACTURER AND MODEL:

Make: *Niton LLC*
Tested Model: *XLp 300*
Source: ^{109}Cd
Note: This PCS is also applicable to the equivalent model variations indicated below, for the Lead-in-Paint K+L variable reading time mode, in the XLi and XLp series:

XLi 300A, XLi 301A, XLi 302A and XLi 303A.
XLp 300A, XLp 301A, XLp 302A and XLp 303A.
XLi 700A, XLi 701A, XLi 702A and XLi 703A.
XLp 700A, XLp 701A, XLp 702A, and XLp 703A.

Note: The XLi and XLp versions refer to the shape of the handle part of the instrument. The differences in the model numbers reflect other modes available, in addition to Lead-in-Paint modes. The manufacturer states that specifications for these instruments are identical for the source, detector, and detector electronics relative to the Lead-in-Paint mode.

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Lead-in-Paint K+L variable reading time mode.

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive)

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film).

If readings are outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instruments into control before XRF testing proceeds.

SUBSTRATE CORRECTION:

For XRF results using Lead-in-Paint K+L variable reading time mode, substrate correction is not needed for:

Brick, Concrete, Drywall, Metal, Plaster, and Wood

INCONCLUSIVE RANGE OR THRESHOLD:

K+L MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm^2)
Results not corrected for substrate bias on any substrate	Brick	1.0
	Concrete	1.0
	Drywall	1.0
	Metal	1.0
	Plaster	1.0
	Wood	1.0

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated from the EPA/HUD evaluation using archived building components. Testing was conducted in August 2004 on 133 testing combinations. The instruments that were used to perform the testing had new sources; one instrument's was installed in November 2003 with 40 mCi initial strength, and the other's was installed June 2004 with 40 mCi initial strength.

OPERATING PARAMETERS:

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Substrate correction is not needed for brick, concrete, drywall, metal, plaster or wood when using Lead-in-Paint K+L variable reading time mode, the normal operating mode for these instruments. If substrate correction is desired, refer to Chapter 7 of the HUD Guidelines for guidance on correcting XRF results for substrate bias.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing. Use the K+L variable time mode readings.

Conduct XRF retesting at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family housing a result is defined as the average of three readings. In multifamily housing, a result is a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF results.

Compute the average of all ten re-test XRF results.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

For the Lead-in-Paint K+L variable reading time mode, the instrument continues to read until it is moved away from the testing surface, terminated by the user, or the instrument software indicates the reading is complete. The following table provides testing time information for this testing mode. The times have been adjusted for source decay, normalized to the initial source strengths as noted above. Source strength and type of substrate will affect actual testing times. At the time of testing, the instruments had source strengths of 26.6 and 36.6 mCi.

Testing Times Using K+L Reading Mode (Seconds)

	All Data			Median for laboratory-measured lead levels (mg/cm^2)		
Substrate	25^{th} Percentile	Median	75^{th} Percentile	Pb < 0.25	0.25 ≤ Pb<1.0	1.0 ≤ Pb
Wood Drywall	4	11	19	11	15	11
Metal	4	12	18	9	12	14
Brick Concrete Plaster	8	16	22	15	18	16

CLASSIFICATION RESULTS:

XRF results are classified as positive if they are greater than or equal to the threshold, and negative if they are less than the threshold.

DOCUMENTATION:

A document titled *Methodology for XRF Performance Characteristic Sheets* provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. For a copy of this document call the National Lead Information Center Clearinghouse at 1-800-424-LEAD.

This XRF Performance Characteristic Sheet was developed by the Midwest Research Institute (MRI) and QuanTech, Inc., under a contract between MRI and the XRF manufacturer. HUD has determined that the information provided here is acceptable when used as guidance in conjunction with Chapter 7, Lead-Based Paint Inspection, of HUD's *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.*

Appendix F: **Lead Dust and TCLP Reports**

EMSL Analytical, Inc.
3317 3rd Ave S, Suite D 2nd floor, Seattle, WA 98134
Phone/Fax: 2062696310 / (206) 900-8789
http://www.emsl.com seattlelab@emsl.com

EMSL Order:	511701093
CustomerID:	PACR50
CustomerPO:	
ProjectID:	

Attn: **Todd Carter**
Pacific Rim Environmental, Inc.
6510 Southcenter Blvd., Suite 40
Tukwila, WA 98188

Phone:	(206) 244-8965
Fax:	(206) 244-9096
Received:	04/20/17 11:14 AM
Collected:	4/19/2017

Project: **16057**

Test Report: Lead in Dust by Flame AAS (SW 846 3050B/7000B)*

Client SampleDescription	*Collected*	*Analyzed*	*Area Sampled*	*RDL*	*Lead Concentration*
WS-1	4/19/2017	4/27/2017	144 in²	2500 µg/ft²	67000 µg/ft²
511701093-0001	Site: Range Area Top of Duct				
WS-2	4/19/2017	4/27/2017	144 in²	2500 µg/ft²	21000 µg/ft²
511701093-0002	Site: Range Area Top of Trianing				
WS-3	4/19/2017	4/27/2017	144 in²	1000 µg/ft²	14000 µg/ft²
511701093-0003	Site: Range Area Top of Eco Block				

Lauren Kerber, Laboratory Manager
or other approved signatory

*Analysis following Lead in Dust by EMSL SOP/ Determination of Environmental Lead by FLAA. Reporting limit is 10 ug/wipe. ug/wipe = ug/ft2 x area sampled in ft2. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities (such as volume sampled) or analytical method limitations. Samples received in good condition unless otherwise noted. The lab is not responsible for data reported in µg/ft² which is dependent on the area provided by non-lab personnel. The test results contained within this report meet the requirements of NELAC unless otherwise noted. "<" (less than) results signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Analytical, Inc. Seattle, WA

Initial report from 04/27/2017 09:39:38

LA Testing
5431 Industrial Drive, Huntington Beach, CA 92649
Phone/Fax: (714) 828-4999 / (714) 828-4944
http://www.LATesting.com gardengrovelab@latesting.com

LA Testing Order: 331708444
CustomerID: PACR50
CustomerPO:
ProjectID:

Attn: **Todd Carter**
Pacific Rim Environmental, Inc.
6510 Southcenter Blvd., Suite 40
Tukwila, WA 98188

Phone: (206) 244-8965
Fax: (206) 244-9096
Received: 04/21/17 10:10 AM
Collected: 4/19/2017

Project: **16057**

Test Report: Toxicity Characteristic Leaching Procedure (SW846, 1311/7420)

Client SampleDescription	*Collected*	*Analyzed*	*RDL*	*Lead Concentration*
TCLP-1	4/19/2017		4 mg/L	75 mg/L
331708444-0001	Site: Side A floor			
TCLP-2	4/19/2017		0.4 mg/L	<0.4 mg/L
331708444-0002	Site: Side B floor			
TCLP-3	4/19/2017		0.8 mg/L	21 mg/L
331708444-0003	Site: Building			

Michael Chapman

Michael Chapman, Laboratory Manager
or other approved signatory

This report relates only to those items tested. Sample received in acceptable condition unless otherwise noted.
Samples analyzed by LA Testing Huntington Beach, CA

Initial report from 04/25/2017 16:58:37

Appendix G: Inspector / Laboratory Certifications

Certificate of Completion

This is to certify that

Todd P. Carter

has satisfactorily completed
4 hours of refresher training as an

Asbestos Building Inspector

to comply with the training requirements of
TSCA Title II / 40 CFR 763 (AHERA)

Certificate #
157685

Instructor
EPA Provider Certificate #1085

ARGUS PACIFIC
TRAINING • CONSULTING
A Terracon COMPANY

Jun 15, 2016
Date(s) of Training
Exam Score: NA
Expiration Date: Jun 15, 2017

ARGUS PACIFIC, INC. • 1900 W NICKERSON ST, SUITE 315 • SEATTLE, WASHINGTON • 98119 • 206.285.3373 • WWW.ARGUSPACIFIC.COM

STATE OF WASHINGTON

Department of Commerce

Lead-Based Paint Program

Todd Carter

Has fulfilled the certification requirements of Washington Administrative code (WAC) 365-230 and has been certified to conduct lead-based paint activities pursuant to WAC 365-230-200 as a:

Risk Assessor

Certification #	Issuance Date	Expiration Date
0340	4/10/2015	4/10/2018

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101631-0

Pacific Rim Environmental, Inc.

Tukwila, WA

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2017-04-01 through 2018-03-31

Effective Dates

For the National Voluntary Laboratory Accreditation Program

NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Pacific Rim Environmental, Inc.
6510 Southcenter Boulevard
Suite #40
Tukwila, WA 98188
Mr. William F. Golloway
Phone: 206-244-8965 Fax: 206-244-9096
Email: fgolloway@pacrimenv.com
http://www.pacrimenv.com

ASBESTOS FIBER ANALYSIS — NVLAP LAB CODE 101631-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA 600/M4-82-020: Interim Method for the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

For the National Voluntary Laboratory Accreditation Program

November 24, 2021

GeoEngineers, Inc.
8410 154th Avenue Northeast
Redmond, WA 98052

SUPPLEMENTAL ASBESTOS SURVEY

OPD Firing Range
6530 Martin Way
Olympia, WA
PacRim # 17231

On November 10th, 2021, Matt DeDominces of Pacific Rim Environmental, Inc. (PacRim) returned to the OPD Firing Range Project for supplemental asbestos inspection and testing of suspect asbestos-containing materials located at 6530 Martin Way in Olympia, Washington. The scope of work was limited to suspect materials not previously identified or sampled.

Mr. DeDominces is an AHERA accredited building inspector, and the PacRim asbestos analytical laboratory is accredited by the National Voluntary Laboratory Accreditation Program (See Attachments).

This survey is not intended for, nor should it be used as a design specification. The Asbestos in Schools Hazard Amendment and Reauthorization Act (ASHARA), effective November 20, 1990, expanded accreditation requirements to apply to persons who work with asbestos in public and commercial buildings as well as schools. Specifically, ASHARA expanded the Toxic Substances Control Act (TSCA) Section 206 (a) (1) and (3) to require accreditation for any person who designs or conducts a response action with respect to friable ACM in a building. TSCA Section 207 provides for civil penalties of $5,000 for each day of a violation for not employing accredited individuals to design and conduct response actions.

Sampling of suspect asbestos-containing materials was conducted as prescribed in 40 CFR 763.86.

Suspect asbestos-containing materials within the structure were identified and classified as either surfacing material, thermal system insulation, or miscellaneous material. Surfacing materials are those, which are either spray applied or troweled-on for acoustical, decorative, or fireproofing purposes. Thermal system insulation (TSI) is insulation used to inhibit heat transfer or to prevent condensation on pipes, boilers, tanks, ducts and various other components. Miscellaneous materials include all other materials not listed in the above categories such as floor tile, ceiling tile, roofing felt, cementitious materials, wallboard systems and products such as caulking, mastics and putties.

Pacific Rim Environmental, Inc.

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Seattle, WA 98188

(206) 244-8965
www.pacrimenv.com

Three (03) samples were collected and submitted for PLM laboratory analysis. Two (02) of these samples were found to contain less than 1% asbestos.

AHERA category	Sample #	Sample Location	Material Description	Analytical Result
Miscellaneous	22	East bathroom, on East wall	Mastic under FRP	Layer 1: (Fiberboard) None Detected Layer 2: (Mastic) None Detected Layer 3: (White mud) Tremolite <1% Layer 4: (Lt brown paper) None Detected
Miscellaneous	23	West bathroom, on West wall	Mastic under FRP	Layer 1: (Fiberboard) None Detected Layer 2: (Mastic) None Detected Layer 3: (White texture) Tremolite <1%
Miscellaneous	24	Training classroom at Southwest corner	Cove base mastic on 4-inch blue cove base	None Detected (All Layers)

The results are provided in the attached Inspection Summary. Laboratory Analysis Report, Sample Location Drawing and Inspector/Laboratory Certifications are attached as well.

Bulk samples collected were submitted for sample analysis in accordance with method EPA-600/R-93/116: "Method for the Determination of Asbestos in Bulk building Materials". Analyses were performed in Pacific Rim Environmental Inc.'s NVLAP Accredited Laboratory (Lab Code 101631-0). Materials are positive for asbestos if they are found to contain greater than 1% or 1% asbestos. Materials that are less than one percent (<1%) asbestos, although not considered positive for asbestos, when removed must follow applicable Washington State regulations, guidelines are attached.

Materials uncovered during the course of demolition, renovation, or maintenance activities that are not identified in this inspection report must be presumed to contain asbestos until PLM analysis proves that this material is not asbestos-containing.

Universal Waste:

The Universal Waste Rule (UWR) establishes alternative, streamlined waste management standards in place of most of the Dangerous Waste Regulations, Chapter 173-303 WAC, except for, WAC 173-303-050, 173-303-145 and 173-303-960.

The following lamp types may be characterized as universal waste: fluorescent tubes, high intensity discharge (HID) lamps (mercury vapor, metal halide, high pressure sodium) and compact fluorescent lights. **Universal waste must be removed and properly disposed of or recycled prior to building demolition.**

Universal Waste Identified onsite:

- **Approximately 140 - 4' fluorescent tubes throughout the building**

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Seattle, WA 98188

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www.pacrimenv.com

Disposal of individual lamps is not regulated. However, disposal of large quantities of lamps is subject to dangerous waste regulations (WAC 173-303) and the waste stream must be subjected to TCLP (Toxicity Characteristic Leaching Procedure) analysis to determine the amount of mercury that could leach out of the waste. The TCLP limit for mercury is 0.2 mg/L.

PCBs belong to a broad family of organic chemicals known as chlorinated hydrocarbons. PCBs are produced by the combination of one or more chlorine atoms and a biphenyl molecule. PCBs range in consistency from heavy oily liquids to waxy solids. Prior to 1979, PCBs were widely used in electrical equipment such as transformers, capacitors, switches, and voltage regulators.

A copy of the Washington State Department of Ecology *Universal Waste Rule for Lamps WAC 173-303-573(5)*, Publication # 98-407.c, December 2005, is attached.

If you have any questions regarding this inspection, please do not hesitate to contact our office at (206) 244-8965.

Respectfully,

Allison Lewis

Allison Lewis
Project Manager
Pacific Rim Environmental, Inc.

Pacific Rim Environmental, Inc.

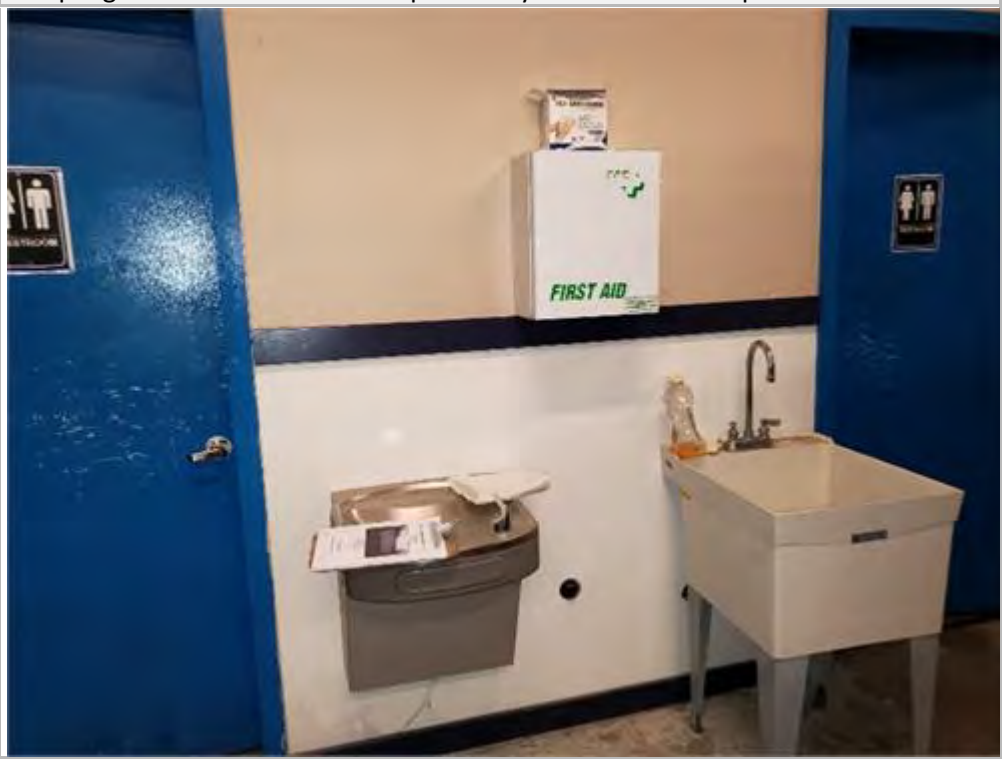
6510 Southcenter Blvd, Ste. #40
Seattle, WA 98188

(206) 244-8965
www.pacrimenv.com

ASBESTOS INSPECTION SUMMARY

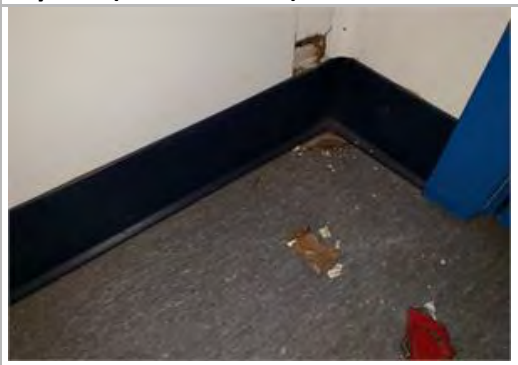
Pacific Rim Environmental Inc.
6510 Southcenter Blvd. Suite 40
Seattle, WA 98188
(206)244-8965 www.PacRimEnv.com

Inspection Summary

Project Information	
Job Number	17231
Project Name	OPD Range
Project Address:	6530 Martin Way, Olympia
Client:	GeoEngineers, Inc.
Date of Survey:	10-Nov-2021
PacRim Technician:	Matt DeDominces
Limitations:	Sampling limited to materials not previously identified or sampled.
Exterior Photo:	

Pacific Rim Environmental Inc.
6510 Southcenter Blvd. Suite 40
Seattle, WA 98188
(206)244-8965 www.PacRimEnv.com

Sample			Sample Date	10-Nov-2021
Project Name	OPD Range			
Sample Type	Physical Sample	**AHERA Category**	Miscellaneous	
Sample Number	22	**Homogenous Material Number**		
Material Description	Mastic under FRP.			
Homogenous Mtl Area	N/A			
Sample Location	East bathroom, on east wall.			
Quantity	250	**Unit of Measure**	Square Feet	
Asbestos Type/%	**Layer 1: (Painted fiberboard) None Detected** **Layer 2: (Orange/lt yellow mastic) None Detected** **Layer 3: (White mud) Tremolite <1%** **Layer 4: (Lt brown paper) None Detected**			
Sample Photo				

Sample			Sample Date	10-Nov-2021
Project Name	OPD Range			
Sample Type	Physical Sample	**AHERA Category**	Miscellaneous	
Sample Number	23	**Homogenous Material Number**		
Material Description	Mastic under FRP.			
Homogenous Mtl Area	N/A			
Sample Location	West bathroom, west wall.			
Quantity	See 22	**Unit of Measure**	Square Feet	
Asbestos Type/%	**Layer 1: (Painted fiberboard) None Detected** **Layer 2: (Lt orange/yellow mastic) None Detected** **Layer 3: (White texture) Tremolite <1%**			
Sample Photo				

Pacific Rim Environmental Inc.
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Seattle, WA 98188
(206)244-8965 www.PacRimEnv.com

Sample			Sample Date	10-Nov-2021
Project Name	OPD Range			
Sample Type	Physical Sample	**AHERA Category**	Miscellaneous	
Sample Number	24	**Homogenous Material Number**		
Material Description	Cove Base Mastic, on 4 inch blue cove base.			
Homogenous Mtl Area	The total reflects the material also seen in the North and south bathrooms.			
Sample Location	Training Classroom at Southwest corner.			
Quantity	210	**Unit of Measure**	Lineal Feet	
Asbestos Type/%	**None Detected (All Layers)**			
Sample Photo				

BULK SAMPLE ANALYSIS REPORT

Pacific Rim Environmental Inc.
Bulk Sample Analysis Report

Customer Name:	**GeoEngineers, Inc.** 600 Stewart St., Ste. 1700 Seattle WA 98101	**PacRim Number:**	17231
		Report Number:	2021-11-0109
		Date Received:	11/10/2021
		Analysis Start Date:	11/18/2021
Customer Project Number:	None Given	**Analysis End Date:**	11/18/2021
Project Name:	OPD Range	**Turnaround Time:**	3-5 Days
Project Address:	6530 Martin Way Olympia WA	**Report Date:**	11/18/2021
		Report By:	William F. Golloway
		Analyst(s):	William F. Golloway
PO Number:	None Given	**Samples Analyzed for this report**	
Sample Date:	10-Nov-2021	**Beginning Laboratory ID Number:**	**2021-11-0109**
Total Samples:	3	**Ending Laboratory ID Number:**	**2021-11-0111**
			Sample Set Number
			2021-3012

The bulk samples submitted were analyzed for asbestos content using Polarized Light Microscopy (PLM). Analysis was performed in accordance with Appendix E to Subpart E of 40 CFR Part 763 and EPA/600/R93/116.

The test results pertain only to the samples submitted for analysis. Unless otherwise noted, the samples were inhomogeneous; subsamples of components were analyzed to achieve representative analysis. Separate layers of layered samples were analyzed and reported separately. Unless otherwise stated, asbestos content was quantified by calibrated visual estimation (CVES). CVES concentrations are reported in two to three percent ranges for fiber concentrations ranging from one to ten percent, and usually five percent ranges for concentrations greater than ten percent. Samples in which asbestos was not observed are reported as “None Detected”.

Limitations and Uncertainty:

Factors such as sample quality, sample size, interfering matrix material, fiber size, and fiber concentration contribute to the uncertainty in asbestos concentration estimates in bulk materials. Relative errors exceeding 100% may occur in samples containing less than ten percent asbestos. Relative errors are typically below thirty percent in samples having greater than ten percent asbestos, and approach zero as asbestos concentrations approach 100%.

Asbestos fibers with diameters less than approximately 0.25 microns are not detectable by PLM. Fibers with larger diameters may not be visible if obscured by interfering matrix materials. These extremely fine fibers may occur in floor tiles, adhesives, products with cement binders, and other non-friable or semi-friable materials. This limitation can be overcome using alternate analytical methods, such as Transmission Electron Microscopy (TEM).

NVLAP Accredited Lab #: 101631-0
Samples Submitted by: PacRim

Report Reviewed by: 11-18-2021
Approved Signatory

Pacific Rim Environmental Inc.
Bulk Sample Analysis Report

Customer Name:	**GeoEngineers, Inc.**	**PacRim Number:**	17231
Customer Project Number:	None Given	**Report Number:**	2021-11-0109
Project Name:	OPD Range	**Date Received:**	11/10/2021
Sample Date:	10-Nov-2021	**Analysis Start Date:**	11/18/2021
Report Date:	11/18/2021	**Analysis End Date:**	11/18/2021
Report By:	William F. Golloway	**Analyst(s):**	William F. Golloway

Sample Set Number 2021-3012

Field Sample Number: 22 | **Field Sample Description:** Mastic, under FRP. | **Field Sample Location:** East bathroom, on east wall. | **Analyst:** WFG
Lab ID: **2021-11-0109** | **Analysis Date:** 11/18/2021

	Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Layer: 1	White-painted, light brown, fibrous, fiberboard-like material	**None Detected**	Cellulose 80-85%	Binder, Paint, Mineral Aggregate
Layer: 2	Orange to light yellow, brittle mastic	**None Detected**	Cellulose <1%	Adhesive, Mineral Aggregate, Binder
Layer: 3	White-painted, white, chalky mud	**Tremolite <1%**	Cellulose <1%	Mineral Aggregate, Binder, Paint
Layer: 4	Light brown paper	**None Detected**	Cellulose 95-98%	Binder, Mineral Aggregate

Field Sample Number: 23 | **Field Sample Description:** Mastic, under FRP. | **Field Sample Location:** West bathroom, west wall. | **Analyst:** WFG
Lab ID: **2021-11-0110** | **Analysis Date:** 11/18/2021

	Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Layer: 1	White-painted, light brown, fibrous, fiberboard-like material with adhering fibers	**None Detected**	Cellulose 80-85% Synthetics <1% Animal Hair <1%	Binder, Paint, Mineral Aggregate, Insect Remains
Layer: 2	Light orange-yellow, brittle mastic	**None Detected**	Cellulose <1%	Adhesive, Mineral Aggregate, Binder
Layer: 3	White-painted, white, chalky texture-like material	**Tremolite <1%**	Cellulose <1%	Mineral Aggregate, Binder, Paint

Field Sample Number: 24 | **Field Sample Description:** Cove Base Mastic, on 4 inch blue cove base. | **Field Sample Location:** Training Classroom, at south west corner. | **Analyst:** WFG
Lab ID: **2021-11-0111** | **Analysis Date:** 11/18/2021

	Lab Sample Description	Asbestos Type/%	Non-Asbestos Fibers	Non-Fibrous Materials
Layer: 1	Blue, flexible cove base	**None Detected**	Cellulose <1% Spider Silk <1% Animal Hair <1%	Vinyl, Mineral Aggregate, Binder
Layer: 2	White to light brown, pliable mastic	**None Detected**	Cellulose <1%	Adhesive, Mineral Aggregate, Binder
Layer: 3	White-painted, light brown paper with white, chalky mud-like residue	**None Detected**	Cellulose 50-55%	Paint, Binder, Mineral Aggregate

SAMPLE LOCATION DRAWING

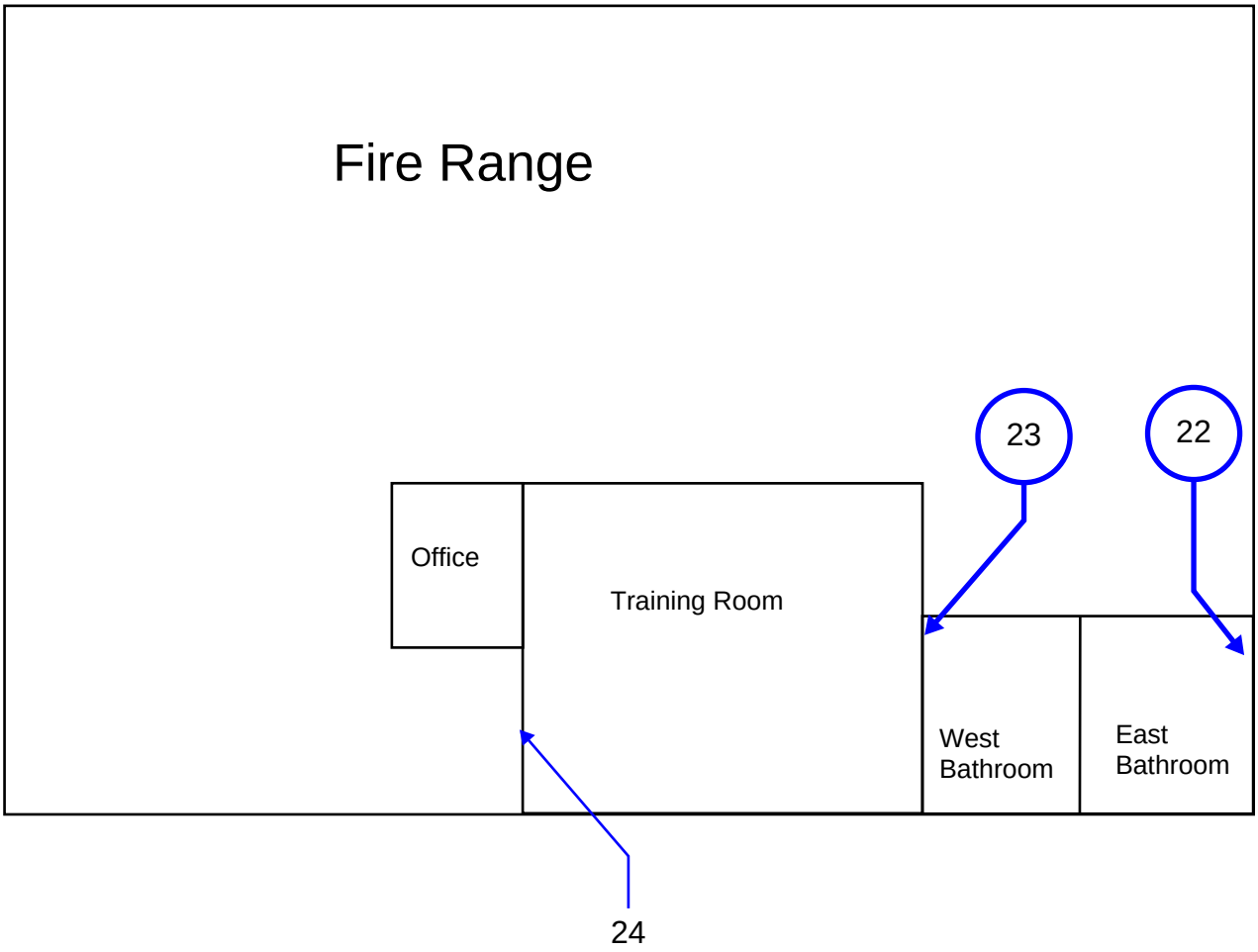
Site Sketch

Samples positive for Asbestos appear in squares EX: [#] →

Samples analyzed and non-detected/negative for asbestos appear as numbers only EX: # →

Samples containing less than one percent asbestos appear in circles EX: (#) →

Visually identified suspect materials assumed to be asbestos-containing appear in triangles EX: V-# →



N

GeoEngineers, Inc. **OPD Range** **6530 Martin Way** **Olympia, WA**	***Pacific Rim Environmental, Inc***. 6510 Southcenter Boulevard, #40 Seattle, WA 98188 Tel. (206) 244-8965 pacrimenv.com	**Project # : 17220** **Drawing # : 01 of 01** **Sampling Date: 10/28/2021** **Drawing by : M.Sandefur** **Drawing Not to Scale**

TECHNICIAN / LABORATORY CERTIFICATIONS

Certificate of Completion

This is to certify that

Matt R. DeDominces

has satisfactorily completed
4 hours of refresher training as an

AHERA Building Inspector

to comply with the training requirements of
TSCA Title II, 40 CFR 763 (AHERA)

EPA Provider # 1085

182645
Certificate Number

ARGUS PACIFIC
TRAINING • CONSULTING
A Terracon COMPANY

Oct 13, 2021 Expires in 1 year.
Date(s) of Training

Exam Score: N/A
(if applicable)

Instructor: John McCaslin

ARGUS PACIFIC, INC / 21905 64th AVE W, SUITE 100 / MOUNTLAKE TERRACE, WASHINGTON 98043 / 206.285.3373 / ARGUSPACIFIC.COM

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

Pacific Rim Environmental, Inc.
6510 Southcenter Boulevard
Suite #40
Tukwila, WA 98188
Mr. William F. Golloway
Phone: 206-244-8965 Fax: 206-244-9096
Email: fgolloway@pacrimenv.com
http://www.pacrimenv.com

ASBESTOS FIBER ANALYSIS

NVLAP LAB CODE 101631-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

For the National Voluntary Laboratory Accreditation Program

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 101631-0

Pacific Rim Environmental, Inc.

Tukwila, WA

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2021-04-01 through 2022-03-31

Effective Dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

For the National Voluntary Laboratory Accreditation Program

WA STATE GUIDELINES FOR <1% ASBESTOS MATERIAL

Summary of regulatory requirements for materials containing less than 1% asbestos:

Environmental Protection Agency

If less than 1% the EPA does not regulate it as an asbestos-containing material.

Washington State Department of Labor and Industries

Air Monitoring
Exposure Monitoring (NEA) - yes
Pre-abatement monitoring – unclear
Post abatement monitoring – unclear

Work Practices and working Area Control
Regulated area required – yes
Change area require – yes
Warning signs required – yes
Universal controls required – yes

- Wet Methods
- HEPA vacuums
- Prompt Disposal

Leak tight containers required – yes

Personal Protective Equipment
Respirator protection – yes, ½ mask APR with HEPA required until air monitoring results determine exposure below PELs
Medical surveillance required – yes, because of negative pressure APR use
Other personal protective equipment – yes, required until air monitoring results determine exposure below PELs
Communication of Hazard
Warning labels on in-place materials required – no
Warning labels on disposal containers – no
Training 2-hour awareness, hazard communication (specific to situation)
Competent Person required – yes

- Training – unclear how much training is required
- Must have knowledge and authority

Things that are not required:
Labeled bags
Worker or supervisor certification
No pre-demolition removal requirement
No notification to L&I or PSCA

UNIVERSAL WASTE RULE FOR LAMPS
WAC 173-303-573(5)

The Universal Waste Rule for Lamps
WAC 173-303-573(5)

Any business that generates dangerous waste must follow the dangerous waste rules, Chapter 173-303 WAC. In Washington State, the Universal Waste Rule allows less burdensome management of the following wastes:

- Batteries *(#98-407a)*
- Mercury-containing equipment *(#98-407b)*
- Lamps *(#98-407c)*

Businesses have the choice of managing these wastes as universal waste (UW) or dangerous waste. UW requirements for storage, transportation, and collection are less stringent.

This publication focuses on the UW requirements for lamps. Publication number 98-407, *The Universal Waste Rule* provides more details on these requirements and the advantages of UW management.

What types of lamps are considered Universal Waste?

The types of lamps that may be Universal Waste include:

- Fluorescent
- High Intensity Discharge (HID) (e.g., mercury vapor, metal halide, high pressure sodium)
- Compact fluorescent
- Neon[1]
- Any other lamps that are dangerous waste

How can I tell if my lamps are dangerous waste?

The process of determining if a waste is hazardous is called designation. Through EPA test procedures, lamps have been shown to designate as dangerous waste because of their mercury and/or lead content. A generator has three choices when determining if their spent lamps are a dangerous waste:

1. Assume that their lamps are a dangerous waste;
2. Use manufacturer's information, MSDS and other available information to designate by knowledge;
3. Designate by sampling and testing.

[1] "Neon" lamp manufacturers sometimes use gases other than neon, and lamps have been manufactured that contained up to 600 milligrams of mercury per tube.

Certain "green tip" lamps pass the EPA test and are not dangerous waste. Ask your lamp manufacturer or supplier for product testing information that shows these particular lamps are not a dangerous waste.

Some local governments may have landfill bans on disposal of mercury-containing lamps or other mercury-containing items. Check with your local health department, solid waste agency, or landfill for specific requirements, as well as recycling or disposal options.

What are the requirements for Universal Waste management of lamps?

Manage Universal Waste lamps the same as the other Universal Wastes, except for a few specific handling requirements. Because glass bulbs are easily broken, Universal Waste rules require specific handling procedures. Universal waste management requirements for lamps include:

Accumulation start date:

Both used and unused lamps become waste on the date the handler decides to discard them.

Accumulation and dating of Universal Waste lamps:

You can only accumulate lamps for one year from the date they are generated. To document this, the collection container or individual UW lamp is typically marked with the first date of accumulation. An extension to the one-year accumulation limit is allowed if the facility needs more time to collect enough items to facilitate proper recovery, treatment, or disposal.

Labeling and Marking:

Clearly label or mark individual lamps or containers with one of the following phrases:

- *Universal Waste – Lamps*
- *Waste Lamps*
- *Used Lamps*

Packaging:

Contain lamps in structurally sound containers such as cardboard boxes or fiber drums. In addition, keep containers closed when not adding lamps.

Clean up procedures:

Immediately clean up broken lamps and store debris in a closed container.

Large Quantity Handlers[2] of Universal Waste (LQHUW)

When a handler exceeds 11,000 pounds (or 2,200 pounds for lamps), they become an LQHUW and are subject to extra requirements, including:

- Notification to Ecology of LQHUW status, and which specific types of UW they manage.
- Tracking type and quantity of universal wastes received and shipped.
- Obtaining a RCRA Site Identification Number.

[2] Handlers are either the original generators of the UW or businesses that receive and consolidate UW from other handlers before shipping to another handler or to a destination facility.

Lamp crushing prohibited:
Lamps cannot be crushed under Universal Waste regulations. Lamp crushing is allowed as a dangerous waste treatment-by-generator activity, but not as a Universal Waste option.

Transporting Universal Waste lamps:
You may self-transport UW lamps, complying with applicable U.S. Department of Transportation regulations. Refer to Ecology publication number 98-407 "The Universal Waste Rule" for details.

Does the rule apply to me?

The following types of businesses may generate dangerous waste lamps and can take advantage of the Universal Waste regulations:

- Regulated generators[3] of dangerous waste (Medium Quantity and Large Quantity Generators)
- Businesses that generate or accumulate dangerous waste lamps in regulated quantities (this category may include commercial building/property owners that maintain the lighting for tenants)
- Businesses that provide collection and management services (e.g., lighting contractors)

A dangerous waste generator has the choice of managing lamps as UW or under the more stringent dangerous waste requirements. In most cases UW management is much easier and the preferable alternative to dangerous waste management. Note that businesses that generate and manage dangerous wastes and UWs are considered both a dangerous waste generator and a UW handler. Regardless if you are a generator or a handler, you are liable for ensuring your waste is properly managed once it leaves your site.

Where do I send them?

Universal wastes may be sent to either another handler (acting as a collection point) or to a destination facility. Another handler could include any business that is already managing UW, government-sponsored collections, or hazardous waste management firms. Businesses that recycle or dispose of UW are called destination facilities. Ultimately, all UW must go to a destination facility. They are subject to dangerous waste regulations for recyclers and hazardous waste disposal facilities. A facility that only accumulates UW would not be a destination facility.

Why do we care about lamps?

Nationally, about 680 million lamps are disposed of annually, most to solid waste disposal facilities, including landfills and solid waste incinerators. Fluorescent lamps contain a small

[3] Regulated generators of dangerous waste are those that generate over 220 pounds of dangerous waste per month or batch (or 2.2 pounds of extremely hazardous waste), or accumulate greater than 2,200 pounds of dangerous waste (or 2.2 pounds of extremely hazardous waste) at any time. As a point of reference, 4-four-foot long, linear fluorescent tubes weigh approximately 2.2 pounds. It would take about 400 of those tubes to equal 220 pounds and approximately 4,000 tubes to equal 2,200 pounds.

amount of mercury which is released when the lamp is broken. During waste handling and disposal, many lamps break, releasing mercury vapor and potentially exposing waste handlers to inhalation of those vapors. Waste incineration (not common in Washington State) of mercury-containing lamps also releases the mercury into the atmosphere. Mercury in the atmosphere is ultimately deposited back to the earth, rivers and lakes. From that point, mercury is then available to enter the food chain and eventually accumulates in fish.

The mercury content in newer fluorescent tubes ranges from 3.5 milligrams to 8 milligrams or more. Some older fluorescent tubes (pre-1999) contain up to 50 milligrams of mercury. HID lamps may contain up to 250 milligrams, depending on the lamp wattage.

Some lamps contain lead in the glass and lead solder in the base. Lead is a toxic metal that may leach from solid waste landfills into the ground water. Manufacturers are eliminating the lead by using non-leaded glass and solders in new lamps.

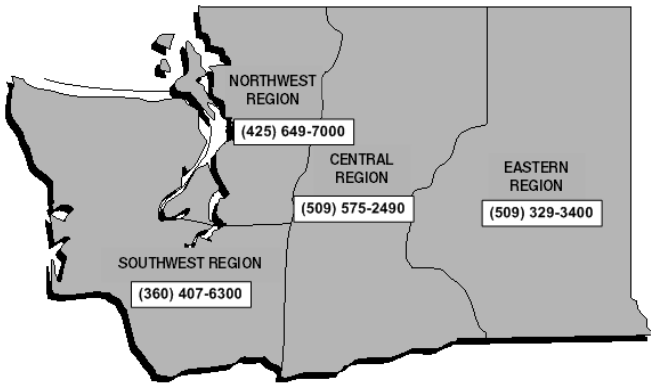
Although fluorescent and HID lamps contain toxic mercury and should be recycled, people are encouraged to continue using them because they use much less electricity and last much longer than other types of lighting. For this reason, fluorescents are a better long-term choice for the environment.

How do I manage lamps at home?

Homeowners are not required to manage their lamps as Universal Waste. They are strongly encouraged to take them to a local household hazardous waste collection facility or other appropriate recycling alternative, if available.

For More Information

Questions on this topic may be directed to your nearest regional office Dangerous Waste Specialist.



If you need this information in an alternate format, please call the Hazardous Waste and Toxics Reduction Program at 360-407-6700. If you are a person with a speech or hearing impairment, call 711, or 800-833-6388 for TTY.

APPENDIX E
Laboratory and Data Validation Reports

Data Validation Report

1101 Fawcett Avenue, Suite 200, Tacoma, Washington 98402, Telephone: 253.383.4940, Fax: 253.383.4923 www.geoengineers.com

Project: City of Olympia – Carpenter Road Waste Operations Facility
April 2017 Soil Samples

GEI File No: 00415-068-01

Date: November 10, 2021

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2A data validation (USEPA Document 540-R-08-005; USEPA, 2009) of analytical data from the analyses of soil samples collected as part of the April 2017 sampling event, and the associated laboratory quality control (QC) samples. The samples were obtained from the City of Olympia Carpenter Road site in Lacey, Washington.

Objective and Quality Control Elements

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2020) (National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

This data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Method Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory Duplicates

Validated Sample Delivery Groups

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory SDG	Samples Validated
580-67751-1	Comp C, Comp D, E-TP1-2-2.5-20170418, E-TP2-2-2.5-20170418, E-TP3-1-1.5-20170418, E-TP4-2-2.5-20170418, HA6-0-6-20170418, HA7-0-6-20170419, HA8-0-6-20170419, HA9-18-24-20170419, HA10-0-6-20170419, HA10-12-18-20170419, HA11-12-18-20170419, HA12-0-6-20170419, HA13-0-6-20170419, HA14-12-18-20170419, HA15-0-6-20170419, HA16-12-18-20170419
580-67751-3	Comp A, Comp B

Chemical Analysis Performed

Eurofins TestAmerica Laboratories, Inc. (TestAmerica), located in Tacoma, Washington, performed laboratory analyses on the samples using the following methods:

- Total Metals by Methods SW6020A and SW7471A

Data Validation Summary

The results for each of the QC elements are summarized below.

Data Package Completeness

TestAmerica provided the required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and the identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the samples when they were submitted on April 20, 2017. The instructions to the laboratory regarding specific discrete samples to be analyzed, and samples to be composited at the laboratory and analyzed were provided to the laboratory on April 21, 2017.

Compositing was performed as follows:

Samples HA1-0-6-20170418, HA1-6-12-20170418, HA1-12-18-20170418, HA2-0-6-20170418, HA2-6-12-20170418, HA2-12-18-20170418, HA2-18-24-20170418, HA3-0-6-20170418, and HA3-6-12-20170418 were composited to Sample Comp A.

Samples HA4-0-6-20170418, HA4-6-12-20170418, HA4-12-18-20170418, HA5-0-6-20170418, and HA5-6-12-20170418 were composited to Sample Comp B.

Samples HA9-0-6-20170419, HA9-6-12-20170419, and HA9-12-18-20170419 were composited to Sample Comp C.

Samples HA10-0-6-20170419, HA10-6-12-20170419, HA10-12-18-20170419, HA11-0-6-20170419, and HA11-6-12-20170419 were composited to Sample Comp D.

SDG 580-67751-1: The laboratory noted that for Samples E-TP1-2-2.5-20170418, E-TP2-2-2.5-20170418, E-TP3-1-1.5-20170418, and E-TP4-2-2.5-20170418 the sample ID on the COC was missing the depth intervals that were written on the sample vial labels. Per GeoEngineers' request, the samples were logged in as listed on the sample vial labels.

SDG 580-67751-3: The laboratory noted that Samples Comp A and Comp B were activated for SW6020A and SW7471B analysis on 4/27/2017.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for each analysis. The sample cooler arrived at the laboratory within the appropriate temperatures of between two and six degrees Celsius as identified on the COC.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For each sample batch, method blanks for the applicable methods were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks.

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a percent recovery is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the result values from the MS and MSD, the relative percent difference (RPD) is calculated. The percent recovery control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the percent recovery and RPD values were within the proper control limits, with the following exceptions:

SDG 580-67751-1: (Total Metals) The laboratory performed an MS/MSD sample set on Sample E-TP2-2-2.5-20170418. The percent recovery for total chromium was greater than the control limits in the MS/MSD digested on 4/25/2017. The positive result for this target analyte was qualified as estimated (J) in this sample.

Additionally, in the same MS/MSD sample set, the percent recoveries for total copper and total lead were greater than the control limits in the MS; however, the percent recoveries for these target analytes were within the control limits in the corresponding MSD. No action was required for these outliers.

The laboratory performed an MS/MSD sample set on Sample HA6-0-6-20170418. The percent recovery for total mercury was greater than the control limits in the MS digested on 4/26/2017; however, the percent recovery for this target analyte was within the control limits in the corresponding MSD. No action was required for this outlier.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, the LCS/LCSD control limits for accuracy and precision are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to each sample in the associated batch, instead of just the parent sample. The percent recovery control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the percent recovery and RPD values were within the proper control limit.

Laboratory Duplicates

Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two separate aliquots of a sample are analyzed as distinct samples in the laboratory and the RPD between the two results is calculated. Duplicate analyses should be performed once per analytical batch. If one or more of the samples used has a concentration less than five times the reporting limit for that sample, the absolute difference is used instead of the RPD. The RPD control limits are specified in the laboratory documents. Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria were met, with the following exceptions:

SDG 580-67751-1: (Total Metals) The laboratory performed a laboratory duplicate sample set on Sample E-TP2-2-2.5-20170418. The RPD values for total chromium, total copper, and total nickel were greater than the control limits in the laboratory duplicate digested on 4/25/2017. The positive results for these target analytes were qualified as estimated (J) in this sample.

The laboratory performed a laboratory duplicate sample set on Sample HA6-0-6-20170418. The RPD for total mercury was greater than the control limits in the laboratory duplicate digested on 4/26/2017. The positive result for this target analyte was qualified as estimated (J) in this sample.

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the LCS/LCSD and MS/MSD percent recovery values, with the exceptions noted above. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and laboratory duplicate RPD values, with the exceptions noted above.

The data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier	Reason
E-TP2-2-2.5-20170418	Total chromium	J	MS/MSD Recovery/Laboratory Duplicate Precision
	Total copper	J	Laboratory Duplicate Precision
	Total nickel	J	Laboratory Duplicate Precision
HA6-0-6-20170418	Total mercury	J	Laboratory Duplicate Precision

References

U.S. Environmental Protection Agency (USEPA), 2009. "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use," EPA-540-R-08-005. January 2009.

U.S. Environmental Protection Agency (USEPA), 2020. Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review, EPA-542-R-20-006. November 2020.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

TestAmerica Job ID: 580-67751-1
Client Project/Site: Carpenter Road Site A2/0415-068-01

For:
GeoEngineers Inc
1101 Fawcett, Suite 200
Tacoma, Washington 98402

Attn: Garrett Leque

Randee Arrington

Authorized for release by:
4/28/2017 10:53:49 AM

Randee Arrington, Project Manager II
(509)924-9200
randee.arrington@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 580-67751-1

Laboratory: TestAmerica Seattle

Narrative

Receipt
The samples were received on 4/20/2017 12:50 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 5.5º C.

Receipt Exceptions
The client submitted samples on hold 4-20-17. A spreadsheet with the discreet samples to be analyzed as well as the composite samples was submitted 4-21-17. The spreadsheet has a sample 'HA-8-18-27 that was not on the original COC nor was a sample container submitted for it.

The container label for the following samples did not match the information listed on the Chain-of-Custody (COC): E-TP1-20170418 (580-67751-20), E-TP2-20170418 (580-67751-21), E-TP3-20170418 (580-67751-22) and E-TP4-20170418 (580-67751-23). The container labels list the depth of each sample while the COC lists only the location. Per the client's request the samples were logged in per the container labels.

Container label:	COC:
E-TP1-2-2.5-20170418	E-TP1-20170418
E-TP2-2-2.5-20170418	E-TP2-20170418
E-TP3-1-1.5-20170418	E-TP3-20170418
E-TP4-2-2.5-20170418	E-TP4-20170418

The following samples were composited by the laboratory on 04/24/2017 as requested on the chain-of-custody: HA1-0-6-20170418 (580-67751-1), HA1-6-12-20170418 (580-67751-2), HA1-12-18-20170418 (580-67751-3), HA2-0-6-20170418 (580-67751-4), HA2-6-12-20170418 (580-67751-5), HA2-12-18-20170418 (580-67751-6), HA2-18-24-20170418 (580-67751-7), HA3-0-6-20170418 (580-67751-8) and HA3-6-12-20170418 (580-67751-9).

The following samples were composited by the laboratory on 04/21/2017 as requested on the chain-of-custody: HA4-0-6-20170418 (580-67751-11), HA4-6-12-20170418 (580-67751-12), HA4-12-18-20170418 (580-67751-13), HA5-0-6-20170418 (580-67751-14) and HA5-6-12-20170418 (580-67751-15).

The following samples were composited by the laboratory on 04/21/2017 as requested on the chain-of-custody: HA9-0-6-20170419 (580-67751-30), HA9-6-12-20170419 (580-67751-31) and HA9-12-18-20170419 (580-67751-32).

The following samples were composited by the laboratory on 04/21/2017 as requested on the chain-of-custody: HA10-0-6-20170419 (580-67751-34), HA10-6-12-20170419 (580-67751-35), HA10-12-18-20170419 (580-67751-36), HA11-0-6-20170419 (580-67751-37) and HA11-6-12-20170419 (580-67751-38).

The following samples were canceled by the client on 04/25/2017: HA1-0-6-20170418 (580-67751-1), HA2-6-12-20170418 (580-67751-5), HA3-12-18-20170418 (580-67751-10), HA4-6-12-20170418 (580-67751-12), HA5-12-18-20170418 (580-67751-16), Comp A (580-67751-55) and Comp B (580-67751-56).

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Qualifiers

Metals

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.
F3	Duplicate RPD exceeds the control limit

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: HA6-0-6-20170418
Date Collected: 04/18/17 12:00
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-17
Matrix: Solid
Percent Solids: 89.7

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.4		0.53		mg/Kg	☼	04/25/17 12:01	04/26/17 01:39	10
Antimony	1.5		0.21		mg/Kg	☼	04/25/17 12:01	04/26/17 01:39	10
Barium	38		0.53		mg/Kg	☼	04/25/17 12:01	04/26/17 01:39	10
Cadmium	ND		0.43		mg/Kg	☼	04/25/17 12:01	04/26/17 01:39	10
Chromium	19		0.53		mg/Kg	☼	04/25/17 12:01	04/26/17 01:39	10
Lead	140		0.53		mg/Kg	☼	04/25/17 12:01	04/26/17 01:39	10
Selenium	ND		1.1		mg/Kg	☼	04/25/17 12:01	04/26/17 01:39	10
Silver	ND		0.21		mg/Kg	☼	04/25/17 12:01	04/26/17 01:39	10
Copper	21		1.1		mg/Kg	☼	04/25/17 12:01	04/26/17 01:39	10
Nickel	18		0.53		mg/Kg	☼	04/25/17 12:01	04/26/17 01:39	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.031	F1	0.031		mg/Kg	☼	04/26/17 15:08	04/27/17 08:45	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89.7		0.1		%			04/26/17 09:24	1
Percent Moisture	10.3		0.1		%			04/26/17 09:24	1

Client Sample Results

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: E-TP1-2-2.5-20170418
Date Collected: 04/18/17 13:28
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-20
Matrix: Solid
Percent Solids: 88.1

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	5.2		0.55		mg/Kg	☼	04/25/17 12:01	04/26/17 01:43	10
Antimony	0.67		0.22		mg/Kg	☼	04/25/17 12:01	04/26/17 01:43	10
Barium	85		0.55		mg/Kg	☼	04/25/17 12:01	04/26/17 01:43	10
Cadmium	0.49		0.44		mg/Kg	☼	04/25/17 12:01	04/26/17 01:43	10
Chromium	25		0.55		mg/Kg	☼	04/25/17 12:01	04/26/17 01:43	10
Lead	67		0.55		mg/Kg	☼	04/25/17 12:01	04/26/17 01:43	10
Selenium	ND		1.1		mg/Kg	☼	04/25/17 12:01	04/26/17 01:43	10
Silver	ND		0.22		mg/Kg	☼	04/25/17 12:01	04/26/17 01:43	10
Copper	27		1.1		mg/Kg	☼	04/25/17 12:01	04/26/17 01:43	10
Nickel	25		0.55		mg/Kg	☼	04/25/17 12:01	04/26/17 01:43	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.092		0.032		mg/Kg	☼	04/26/17 15:08	04/27/17 08:59	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	88.1		0.1		%			04/26/17 09:24	1
Percent Moisture	11.9		0.1		%			04/26/17 09:24	1

Client Sample ID: E-TP2-2-2.5-20170418
Date Collected: 04/18/17 13:37
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-21
Matrix: Solid
Percent Solids: 91.0

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.5		0.53		mg/Kg	☼	04/25/17 12:01	04/26/17 00:45	10
Antimony	0.30		0.21		mg/Kg	☼	04/25/17 12:01	04/26/17 00:45	10
Barium	57		0.53		mg/Kg	☼	04/25/17 12:01	04/26/17 00:45	10
Cadmium	ND		0.42		mg/Kg	☼	04/25/17 12:01	04/26/17 00:45	10
Chromium	18	F1	0.53		mg/Kg	☼	04/25/17 12:01	04/26/17 00:45	10
Lead	28	F1	0.53		mg/Kg	☼	04/25/17 12:01	04/26/17 00:45	10
Selenium	ND		1.1		mg/Kg	☼	04/25/17 12:01	04/26/17 00:45	10
Silver	ND		0.21		mg/Kg	☼	04/25/17 12:01	04/26/17 00:45	10
Copper	18	F1	1.1		mg/Kg	☼	04/25/17 12:01	04/26/17 00:45	10
Nickel	16		0.53		mg/Kg	☼	04/25/17 12:01	04/26/17 00:45	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.034		0.028		mg/Kg	☼	04/26/17 15:08	04/27/17 09:01	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	91.0		0.1		%			04/26/17 09:24	1
Percent Moisture	9.0		0.1		%			04/26/17 09:24	1

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: E-TP3-1-1.5-20170418
Date Collected: 04/18/17 13:48
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-22
Matrix: Solid
Percent Solids: 78.1

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	6.5		0.60		mg/Kg	☼	04/25/17 12:01	04/26/17 01:48	10
Antimony	0.44		0.24		mg/Kg	☼	04/25/17 12:01	04/26/17 01:48	10
Barium	130		0.60		mg/Kg	☼	04/25/17 12:01	04/26/17 01:48	10
Cadmium	ND		0.48		mg/Kg	☼	04/25/17 12:01	04/26/17 01:48	10
Chromium	29		0.60		mg/Kg	☼	04/25/17 12:01	04/26/17 01:48	10
Lead	13		0.60		mg/Kg	☼	04/25/17 12:01	04/26/17 01:48	10
Selenium	ND		1.2		mg/Kg	☼	04/25/17 12:01	04/26/17 01:48	10
Silver	ND		0.24		mg/Kg	☼	04/25/17 12:01	04/26/17 01:48	10
Copper	24		1.2		mg/Kg	☼	04/25/17 12:01	04/26/17 01:48	10
Nickel	25		0.60		mg/Kg	☼	04/25/17 12:01	04/26/17 01:48	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.080		0.037		mg/Kg	☼	04/26/17 15:09	04/27/17 09:03	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	78.1		0.1		%			04/26/17 09:24	1
Percent Moisture	21.9		0.1		%			04/26/17 09:24	1

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: E-TP4-2-2.5-20170418
Date Collected: 04/18/17 14:05
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-23
Matrix: Solid
Percent Solids: 85.6

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.8		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 01:52	10
Antimony	0.95		0.20		mg/Kg	☼	04/25/17 12:01	04/26/17 01:52	10
Barium	88		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 01:52	10
Cadmium	ND		0.40		mg/Kg	☼	04/25/17 12:01	04/26/17 01:52	10
Chromium	20		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 01:52	10
Lead	24		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 01:52	10
Selenium	ND		1.0		mg/Kg	☼	04/25/17 12:01	04/26/17 01:52	10
Silver	ND		0.20		mg/Kg	☼	04/25/17 12:01	04/26/17 01:52	10
Copper	38		1.0		mg/Kg	☼	04/25/17 12:01	04/26/17 01:52	10
Nickel	19		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 01:52	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.030		mg/Kg	☼	04/26/17 15:09	04/27/17 09:05	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85.6		0.1		%			04/26/17 09:24	1
Percent Moisture	14.4		0.1		%			04/26/17 09:24	1

Client Sample ID: HA7-0-6-20170419

Date Collected: 04/19/17 09:35
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-24

Matrix: Solid
Percent Solids: 91.7

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.2		0.46		mg/Kg	☼	04/25/17 12:01	04/26/17 01:57	10
Antimony	0.89		0.18		mg/Kg	☼	04/25/17 12:01	04/26/17 01:57	10
Barium	57		0.46		mg/Kg	☼	04/25/17 12:01	04/26/17 01:57	10
Cadmium	ND		0.37		mg/Kg	☼	04/25/17 12:01	04/26/17 01:57	10
Chromium	19		0.46		mg/Kg	☼	04/25/17 12:01	04/26/17 01:57	10
Lead	16		0.46		mg/Kg	☼	04/25/17 12:01	04/26/17 01:57	10
Selenium	ND		0.92		mg/Kg	☼	04/25/17 12:01	04/26/17 01:57	10
Silver	ND		0.18		mg/Kg	☼	04/25/17 12:01	04/26/17 01:57	10
Copper	21		0.92		mg/Kg	☼	04/25/17 12:01	04/26/17 01:57	10
Nickel	20		0.46		mg/Kg	☼	04/25/17 12:01	04/26/17 01:57	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.032		0.030		mg/Kg	☼	04/26/17 15:09	04/27/17 09:08	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	91.7		0.1		%			04/26/17 09:24	1
Percent Moisture	8.3		0.1		%			04/26/17 09:24	1

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: HA8-0-6-20170419
Date Collected: 04/19/17 10:25
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-27
Matrix: Solid
Percent Solids: 95.4

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.9		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:01	10
Antimony	0.29		0.20		mg/Kg	☼	04/25/17 12:01	04/26/17 02:01	10
Barium	44		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:01	10
Cadmium	ND		0.40		mg/Kg	☼	04/25/17 12:01	04/26/17 02:01	10
Chromium	15		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:01	10
Lead	6.2		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:01	10
Selenium	ND		1.0		mg/Kg	☼	04/25/17 12:01	04/26/17 02:01	10
Silver	ND		0.20		mg/Kg	☼	04/25/17 12:01	04/26/17 02:01	10
Copper	14		1.0		mg/Kg	☼	04/25/17 12:01	04/26/17 02:01	10
Nickel	16		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:01	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.030		mg/Kg	☼	04/26/17 15:09	04/27/17 09:10	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	95.4		0.1		%			04/26/17 09:24	1
Percent Moisture	4.6		0.1		%			04/26/17 09:24	1

Client Sample ID: HA9-18-24-20170419
Date Collected: 04/19/17 10:15
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-33
Matrix: Solid
Percent Solids: 96.1

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	10		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:23	10
Antimony	43		0.18		mg/Kg	☼	04/25/17 12:01	04/26/17 02:23	10
Barium	82		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:23	10
Cadmium	ND		0.36		mg/Kg	☼	04/25/17 12:01	04/26/17 02:23	10
Chromium	21		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:23	10
Lead	1200		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:23	10
Selenium	ND		0.89		mg/Kg	☼	04/25/17 12:01	04/26/17 02:23	10
Silver	0.23		0.18		mg/Kg	☼	04/25/17 12:01	04/26/17 02:23	10
Copper	7800		89		mg/Kg	☼	04/25/17 12:01	04/27/17 16:00	1000
Nickel	18		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:23	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.029		mg/Kg	☼	04/26/17 15:09	04/27/17 09:12	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	96.1		0.1		%			04/26/17 09:24	1
Percent Moisture	3.9		0.1		%			04/26/17 09:24	1

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: HA10-0-6-20170419
Date Collected: 04/19/17 12:30
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-34
Matrix: Solid
Percent Solids: 98.1

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.6		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:28	10
Antimony	41		0.18		mg/Kg	☼	04/25/17 12:01	04/26/17 02:28	10
Barium	37		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:28	10
Cadmium	ND		0.36		mg/Kg	☼	04/25/17 12:01	04/26/17 02:28	10
Chromium	16		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:28	10
Lead	2200		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:28	10
Selenium	ND		0.91		mg/Kg	☼	04/25/17 12:01	04/26/17 02:28	10
Silver	ND		0.18		mg/Kg	☼	04/25/17 12:01	04/26/17 02:28	10
Copper	170		0.91		mg/Kg	☼	04/25/17 12:01	04/26/17 02:28	10
Nickel	18		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:28	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.029		mg/Kg	☼	04/26/17 15:09	04/27/17 09:14	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	98.1		0.1		%			04/25/17 16:23	1
Percent Moisture	1.9		0.1		%			04/25/17 16:23	1

Client Sample ID: HA10-12-18-20170419

Date Collected: 04/19/17 12:40
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-36

Matrix: Solid
Percent Solids: 96.9

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.2		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:32	10
Antimony	8.4		0.18		mg/Kg	☼	04/25/17 12:01	04/26/17 02:32	10
Barium	32		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:32	10
Cadmium	ND		0.36		mg/Kg	☼	04/25/17 12:01	04/26/17 02:32	10
Chromium	13		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:32	10
Lead	650		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:32	10
Selenium	ND		0.90		mg/Kg	☼	04/25/17 12:01	04/26/17 02:32	10
Silver	ND		0.18		mg/Kg	☼	04/25/17 12:01	04/26/17 02:32	10
Copper	49		0.90		mg/Kg	☼	04/25/17 12:01	04/26/17 02:32	10
Nickel	15		0.45		mg/Kg	☼	04/25/17 12:01	04/26/17 02:32	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.027		mg/Kg	☼	04/26/17 15:09	04/27/17 09:21	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	96.9		0.1		%			04/25/17 16:23	1
Percent Moisture	3.1		0.1		%			04/25/17 16:23	1

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: HA11-12-18-20170419
Date Collected: 04/19/17 13:00
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-39
Matrix: Solid
Percent Solids: 94.7

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1.9		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:37	10
Antimony	0.58		0.20		mg/Kg	☼	04/25/17 12:01	04/26/17 02:37	10
Barium	39		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:37	10
Cadmium	ND		0.40		mg/Kg	☼	04/25/17 12:01	04/26/17 02:37	10
Chromium	21		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:37	10
Lead	30		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:37	10
Selenium	ND		1.0		mg/Kg	☼	04/25/17 12:01	04/26/17 02:37	10
Silver	ND		0.20		mg/Kg	☼	04/25/17 12:01	04/26/17 02:37	10
Copper	24		1.0		mg/Kg	☼	04/25/17 12:01	04/26/17 02:37	10
Nickel	24		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:37	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.031		mg/Kg	☼	04/26/17 15:09	04/27/17 09:23	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	94.7		0.1		%			04/25/17 16:23	1
Percent Moisture	5.3		0.1		%			04/25/17 16:23	1

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: HA15-0-6-20170419
Date Collected: 04/19/17 11:30
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-40
Matrix: Solid
Percent Solids: 92.8

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.2		0.49		mg/Kg	☼	04/25/17 12:01	04/26/17 02:41	10
Antimony	0.48		0.19		mg/Kg	☼	04/25/17 12:01	04/26/17 02:41	10
Barium	40		0.49		mg/Kg	☼	04/25/17 12:01	04/26/17 02:41	10
Cadmium	ND		0.39		mg/Kg	☼	04/25/17 12:01	04/26/17 02:41	10
Chromium	24		0.49		mg/Kg	☼	04/25/17 12:01	04/26/17 02:41	10
Lead	13		0.49		mg/Kg	☼	04/25/17 12:01	04/26/17 02:41	10
Selenium	ND		0.97		mg/Kg	☼	04/25/17 12:01	04/26/17 02:41	10
Silver	ND		0.19		mg/Kg	☼	04/25/17 12:01	04/26/17 02:41	10
Copper	21		0.97		mg/Kg	☼	04/25/17 12:01	04/26/17 02:41	10
Nickel	25		0.49		mg/Kg	☼	04/25/17 12:01	04/26/17 02:41	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.027		mg/Kg	☼	04/26/17 15:09	04/27/17 09:25	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	92.8		0.1		%			04/25/17 16:23	1
Percent Moisture	7.2		0.1		%			04/25/17 16:23	1

Client Sample ID: HA16-12-18-20170419

Date Collected: 04/19/17 12:15
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-45

Matrix: Solid
Percent Solids: 93.6

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.7		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:46	10
Antimony	0.26		0.20		mg/Kg	☼	04/25/17 12:01	04/26/17 02:46	10
Barium	49		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:46	10
Cadmium	ND		0.40		mg/Kg	☼	04/25/17 12:01	04/26/17 02:46	10
Chromium	18		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:46	10
Lead	6.1		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:46	10
Selenium	ND		0.99		mg/Kg	☼	04/25/17 12:01	04/26/17 02:46	10
Silver	ND		0.20		mg/Kg	☼	04/25/17 12:01	04/26/17 02:46	10
Copper	26		0.99		mg/Kg	☼	04/25/17 12:01	04/26/17 02:46	10
Nickel	25		0.50		mg/Kg	☼	04/25/17 12:01	04/26/17 02:46	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.042		0.031		mg/Kg	☼	04/26/17 15:09	04/27/17 09:28	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	93.6		0.1		%			04/25/17 16:23	1
Percent Moisture	6.4		0.1		%			04/25/17 16:23	1

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: HA12-0-6-20170419
Date Collected: 04/19/17 13:30
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-46
Matrix: Solid
Percent Solids: 93.9

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.3		0.48		mg/Kg	☼	04/25/17 12:01	04/26/17 02:50	10
Antimony	3.3		0.19		mg/Kg	☼	04/25/17 12:01	04/26/17 02:50	10
Barium	42		0.48		mg/Kg	☼	04/25/17 12:01	04/26/17 02:50	10
Cadmium	ND		0.39		mg/Kg	☼	04/25/17 12:01	04/26/17 02:50	10
Chromium	12		0.48		mg/Kg	☼	04/25/17 12:01	04/26/17 02:50	10
Lead	86		0.48		mg/Kg	☼	04/25/17 12:01	04/26/17 02:50	10
Selenium	ND		0.96		mg/Kg	☼	04/25/17 12:01	04/26/17 02:50	10
Silver	ND		0.19		mg/Kg	☼	04/25/17 12:01	04/26/17 02:50	10
Copper	17		0.96		mg/Kg	☼	04/25/17 12:01	04/26/17 02:50	10
Nickel	16		0.48		mg/Kg	☼	04/25/17 12:01	04/26/17 02:50	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.029		mg/Kg	☼	04/26/17 15:09	04/27/17 09:30	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	93.9		0.1		%			04/25/17 16:23	1
Percent Moisture	6.1		0.1		%			04/25/17 16:23	1

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: HA13-0-6-20170419
Date Collected: 04/19/17 13:50
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-49
Matrix: Solid
Percent Solids: 92.5

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.8		0.47		mg/Kg	☼	04/25/17 12:01	04/26/17 02:55	10
Antimony	0.34		0.19		mg/Kg	☼	04/25/17 12:01	04/26/17 02:55	10
Barium	47		0.47		mg/Kg	☼	04/25/17 12:01	04/26/17 02:55	10
Cadmium	ND		0.38		mg/Kg	☼	04/25/17 12:01	04/26/17 02:55	10
Chromium	13		0.47		mg/Kg	☼	04/25/17 12:01	04/26/17 02:55	10
Lead	9.4		0.47		mg/Kg	☼	04/25/17 12:01	04/26/17 02:55	10
Selenium	ND		0.94		mg/Kg	☼	04/25/17 12:01	04/26/17 02:55	10
Silver	ND		0.19		mg/Kg	☼	04/25/17 12:01	04/26/17 02:55	10
Copper	15		0.94		mg/Kg	☼	04/25/17 12:01	04/26/17 02:55	10
Nickel	15		0.47		mg/Kg	☼	04/25/17 12:01	04/26/17 02:55	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.030		mg/Kg	☼	04/26/17 15:09	04/27/17 09:32	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	92.5		0.1		%			04/25/17 16:23	1
Percent Moisture	7.5		0.1		%			04/25/17 16:23	1

Client Sample ID: HA14-12-18-20170419

Date Collected: 04/19/17 14:20
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-54

Matrix: Solid
Percent Solids: 93.3

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.1		0.51		mg/Kg	☼	04/25/17 15:17	04/26/17 20:33	10
Antimony	0.73		0.20		mg/Kg	☼	04/25/17 15:17	04/26/17 20:33	10
Barium	40		0.51		mg/Kg	☼	04/25/17 15:17	04/26/17 20:33	10
Cadmium	ND		0.41		mg/Kg	☼	04/25/17 15:17	04/26/17 20:33	10
Chromium	13		0.51		mg/Kg	☼	04/25/17 15:17	04/26/17 20:33	10
Lead	51		0.51		mg/Kg	☼	04/25/17 15:17	04/26/17 20:33	10
Selenium	ND		1.0		mg/Kg	☼	04/25/17 15:17	04/26/17 20:33	10
Silver	ND		0.20		mg/Kg	☼	04/25/17 15:17	04/26/17 20:33	10
Copper	30		1.0		mg/Kg	☼	04/25/17 15:17	04/26/17 20:33	10
Nickel	13		0.51		mg/Kg	☼	04/25/17 15:17	04/26/17 20:33	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.060		0.024		mg/Kg	☼	04/26/17 15:09	04/27/17 09:34	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	93.3		0.1		%			04/25/17 16:23	1
Percent Moisture	6.7		0.1		%			04/25/17 16:23	1

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: Comp C
Date Collected: 04/19/17 00:00
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-57
Matrix: Solid
Percent Solids: 95.2

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	6.5		0.49		mg/Kg	☼	04/25/17 15:17	04/26/17 20:55	10
Antimony	16		0.20		mg/Kg	☼	04/25/17 15:17	04/26/17 20:55	10
Barium	63		0.49		mg/Kg	☼	04/25/17 15:17	04/26/17 20:55	10
Cadmium	ND		0.39		mg/Kg	☼	04/25/17 15:17	04/26/17 20:55	10
Chromium	18		0.49		mg/Kg	☼	04/25/17 15:17	04/26/17 20:55	10
Lead	480		0.49		mg/Kg	☼	04/25/17 15:17	04/26/17 20:55	10
Selenium	ND		0.98		mg/Kg	☼	04/25/17 15:17	04/26/17 20:55	10
Silver	ND		0.20		mg/Kg	☼	04/25/17 15:17	04/26/17 20:55	10
Copper	38		0.98		mg/Kg	☼	04/25/17 15:17	04/26/17 20:55	10
Nickel	23		0.49		mg/Kg	☼	04/25/17 15:17	04/26/17 20:55	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.029		mg/Kg	☼	04/26/17 15:09	04/27/17 09:36	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	95.2		0.1		%			04/25/17 16:47	1
Percent Moisture	4.8		0.1		%			04/25/17 16:47	1

Client Sample ID: Comp D

Date Collected: 04/19/17 00:00
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-58

Matrix: Solid
Percent Solids: 97.7

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.0		0.49		mg/Kg	☼	04/25/17 15:17	04/26/17 21:00	10
Antimony	22		0.19		mg/Kg	☼	04/25/17 15:17	04/26/17 21:00	10
Barium	44		0.49		mg/Kg	☼	04/25/17 15:17	04/26/17 21:00	10
Cadmium	ND		0.39		mg/Kg	☼	04/25/17 15:17	04/26/17 21:00	10
Chromium	13		0.49		mg/Kg	☼	04/25/17 15:17	04/26/17 21:00	10
Lead	1200		0.49		mg/Kg	☼	04/25/17 15:17	04/26/17 21:00	10
Selenium	ND		0.97		mg/Kg	☼	04/25/17 15:17	04/26/17 21:00	10
Silver	ND		0.19		mg/Kg	☼	04/25/17 15:17	04/26/17 21:00	10
Copper	57		0.97		mg/Kg	☼	04/25/17 15:17	04/26/17 21:00	10
Nickel	18		0.49		mg/Kg	☼	04/25/17 15:17	04/26/17 21:00	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.027		mg/Kg	☼	04/26/17 15:09	04/27/17 09:39	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	97.7		0.1		%			04/25/17 16:57	1
Percent Moisture	2.3		0.1		%			04/25/17 16:57	1

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 580-244111/22-A
Matrix: Solid
Analysis Batch: 244204

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 244111

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.50		mg/Kg		04/25/17 12:01	04/26/17 00:32	10
Antimony	ND		0.20		mg/Kg		04/25/17 12:01	04/26/17 00:32	10
Barium	ND		0.50		mg/Kg		04/25/17 12:01	04/26/17 00:32	10
Cadmium	ND		0.40		mg/Kg		04/25/17 12:01	04/26/17 00:32	10
Chromium	ND		0.50		mg/Kg		04/25/17 12:01	04/26/17 00:32	10
Lead	ND		0.50		mg/Kg		04/25/17 12:01	04/26/17 00:32	10
Selenium	ND		1.0		mg/Kg		04/25/17 12:01	04/26/17 00:32	10
Silver	ND		0.20		mg/Kg		04/25/17 12:01	04/26/17 00:32	10
Copper	ND		1.0		mg/Kg		04/25/17 12:01	04/26/17 00:32	10
Nickel	ND		0.50		mg/Kg		04/25/17 12:01	04/26/17 00:32	10

Lab Sample ID: LCS 580-244111/23-A
Matrix: Solid
Analysis Batch: 244204

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 244111

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	200	196		mg/Kg		98	80 - 120
Antimony	150	154		mg/Kg		103	80 - 120
Barium	200	204		mg/Kg		102	80 - 120
Cadmium	5.00	5.00		mg/Kg		100	80 - 120
Chromium	20.0	19.9		mg/Kg		100	80 - 120
Lead	50.0	48.0		mg/Kg		96	80 - 120
Selenium	200	196		mg/Kg		98	80 - 120
Silver	30.0	30.0		mg/Kg		100	80 - 120
Copper	25.0	22.5		mg/Kg		90	80 - 120
Nickel	50.0	46.4		mg/Kg		93	80 - 120

Lab Sample ID: LCSD 580-244111/24-A
Matrix: Solid
Analysis Batch: 244204

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 244111

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	200	195		mg/Kg		98	80 - 120	1	20
Antimony	150	152		mg/Kg		101	80 - 120	2	20
Barium	200	202		mg/Kg		101	80 - 120	1	20
Cadmium	5.00	5.04		mg/Kg		101	80 - 120	1	20
Chromium	20.0	19.5		mg/Kg		97	80 - 120	2	20
Lead	50.0	47.6		mg/Kg		95	80 - 120	1	20
Selenium	200	195		mg/Kg		98	80 - 120	1	20
Silver	30.0	29.7		mg/Kg		99	80 - 120	1	20
Copper	25.0	22.2		mg/Kg		89	80 - 120	1	20
Nickel	50.0	45.5		mg/Kg		91	80 - 120	2	20

Lab Sample ID: 580-67751-21 MS
Matrix: Solid
Analysis Batch: 244204

Client Sample ID: E-TP2-2-2.5-20170418
Prep Type: Total/NA
Prep Batch: 244111

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	3.5		205	211		mg/Kg	☼	101	80 - 120

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 580-67751-21 MS — **Client Sample ID: E-TP2-2-2.5-20170418**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 244204 — **Prep Batch: 244111**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.30		154	153		mg/Kg	☼	100	80 - 120
Barium	57		205	280		mg/Kg	☼	109	80 - 120
Cadmium	ND		5.12	5.41		mg/Kg	☼	103	80 - 120
Chromium	18	F1	20.5	50.3	F1	mg/Kg	☼	158	80 - 120
Lead	28	F1	51.2	94.1	F1	mg/Kg	☼	130	80 - 120
Selenium	ND		205	207		mg/Kg	☼	101	80 - 120
Silver	ND		30.7	31.3		mg/Kg	☼	102	80 - 120
Copper	18	F1	25.6	49.5	F1	mg/Kg	☼	123	80 - 120
Nickel	16		51.2	71.1		mg/Kg	☼	107	80 - 120

Lab Sample ID: 580-67751-21 MSD — **Client Sample ID: E-TP2-2-2.5-20170418**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 244204 — **Prep Batch: 244111**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	3.5		212	217		mg/Kg	☼	101	80 - 120	3	20
Antimony	0.30		159	155		mg/Kg	☼	97	80 - 120	1	20
Barium	57		212	288		mg/Kg	☼	109	80 - 120	3	20
Cadmium	ND		5.30	5.80		mg/Kg	☼	107	80 - 120	7	20
Chromium	18	F1	21.2	44.2	F1	mg/Kg	☼	124	80 - 120	13	20
Lead	28	F1	53.0	83.4		mg/Kg	☼	105	80 - 120	12	20
Selenium	ND		212	213		mg/Kg	☼	100	80 - 120	3	20
Silver	ND		31.8	32.1		mg/Kg	☼	101	80 - 120	2	20
Copper	18	F1	26.5	48.6		mg/Kg	☼	115	80 - 120	2	20
Nickel	16		53.0	72.5		mg/Kg	☼	106	80 - 120	2	20

Lab Sample ID: 580-67751-21 DU — **Client Sample ID: E-TP2-2-2.5-20170418**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 244204 — **Prep Batch: 244111**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Arsenic	3.5		3.70		mg/Kg	☼	6	20
Antimony	0.30		0.349		mg/Kg	☼	15	20
Barium	57		64.0		mg/Kg	☼	12	20
Cadmium	ND		ND		mg/Kg	☼	NC	20
Chromium	18	F1	22.8	F3	mg/Kg	☼	24	20
Lead	28	F1	31.7		mg/Kg	☼	14	20
Selenium	ND		ND		mg/Kg	☼	NC	20
Silver	ND		ND		mg/Kg	☼	NC	20
Copper	18	F1	24.2	F3	mg/Kg	☼	29	20
Nickel	16		22.7	F3	mg/Kg	☼	32	20

Lab Sample ID: MB 580-244152/22-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 244331 — **Prep Batch: 244152**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.50		mg/Kg		04/25/17 15:17	04/26/17 19:04	10
Antimony	ND		0.20		mg/Kg		04/25/17 15:17	04/26/17 19:04	10

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 580-244152/22-A
Matrix: Solid
Analysis Batch: 244331

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 244152

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Barium	ND		0.50		mg/Kg		04/25/17 15:17	04/26/17 19:04	10
Cadmium	ND		0.40		mg/Kg		04/25/17 15:17	04/26/17 19:04	10
Chromium	ND		0.50		mg/Kg		04/25/17 15:17	04/26/17 19:04	10
Lead	ND		0.50		mg/Kg		04/25/17 15:17	04/26/17 19:04	10
Selenium	ND		1.0		mg/Kg		04/25/17 15:17	04/26/17 19:04	10
Silver	ND		0.20		mg/Kg		04/25/17 15:17	04/26/17 19:04	10
Copper	ND		1.0		mg/Kg		04/25/17 15:17	04/26/17 19:04	10
Nickel	ND		0.50		mg/Kg		04/25/17 15:17	04/26/17 19:04	10

Lab Sample ID: LCS 580-244152/23-A
Matrix: Solid
Analysis Batch: 244331

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 244152

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	200	202		mg/Kg		101	80 - 120
Antimony	150	147		mg/Kg		98	80 - 120
Barium	200	196		mg/Kg		98	80 - 120
Cadmium	5.00	4.92		mg/Kg		98	80 - 120
Chromium	20.0	20.2		mg/Kg		101	80 - 120
Lead	50.0	50.1		mg/Kg		100	80 - 120
Selenium	200	200		mg/Kg		100	80 - 120
Silver	30.0	29.6		mg/Kg		99	80 - 120
Copper	25.0	24.7		mg/Kg		99	80 - 120
Nickel	50.0	50.5		mg/Kg		101	80 - 120

Lab Sample ID: LCSD 580-244152/24-A
Matrix: Solid
Analysis Batch: 244331

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 244152

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	200	198		mg/Kg		99	80 - 120	2	20
Antimony	150	146		mg/Kg		97	80 - 120	1	20
Barium	200	196		mg/Kg		98	80 - 120	0	20
Cadmium	5.00	5.11		mg/Kg		102	80 - 120	4	20
Chromium	20.0	19.9		mg/Kg		99	80 - 120	2	20
Lead	50.0	49.6		mg/Kg		99	80 - 120	1	20
Selenium	200	198		mg/Kg		99	80 - 120	1	20
Silver	30.0	29.4		mg/Kg		98	80 - 120	1	20
Copper	25.0	23.7		mg/Kg		95	80 - 120	4	20
Nickel	50.0	49.4		mg/Kg		99	80 - 120	2	20

Method: 7471A - Mercury (CVAA)

Lab Sample ID: MB 580-244292/22-A
Matrix: Solid
Analysis Batch: 244353

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 244292

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.030		mg/Kg		04/26/17 15:09	04/27/17 08:39	1

Lab Sample ID: LCS 580-244292/23-A
Matrix: Solid
Analysis Batch: 244353

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 244292

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury			0.167	0.152		mg/Kg		91	80 - 120		

Lab Sample ID: LCSD 580-244292/24-A
Matrix: Solid
Analysis Batch: 244353

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 244292

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury			0.167	0.153		mg/Kg		92	80 - 120	1	20

Lab Sample ID: 580-67751-17 MS
Matrix: Solid
Analysis Batch: 244353

Client Sample ID: HA6-0-6-20170418
Prep Type: Total/NA
Prep Batch: 244292

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury	0.031	F1	0.165	0.232	F1	mg/Kg	☼	121	80 - 120		

Lab Sample ID: 580-67751-17 MSD
Matrix: Solid
Analysis Batch: 244353

Client Sample ID: HA6-0-6-20170418
Prep Type: Total/NA
Prep Batch: 244292

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	0.031	F1	0.161	0.223		mg/Kg	☼	119	80 - 120	4	20

Lab Sample ID: 580-67751-17 DU
Matrix: Solid
Analysis Batch: 244353

Client Sample ID: HA6-0-6-20170418
Prep Type: Total/NA
Prep Batch: 244292

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Mercury	0.031	F1		0.209	F3	mg/Kg	☼			148	20

Method: D 2216 - Percent Moisture

Lab Sample ID: 580-67751-23 DU
Matrix: Solid
Analysis Batch: 244179

Client Sample ID: E-TP4-2-2.5-20170418
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	85.8			85.4		%				0.4	20
Percent Moisture	14.2			14.6		%				3	20

Lab Sample ID: 580-67751-34 DU
Matrix: Solid
Analysis Batch: 244179

Client Sample ID: HA10-0-6-20170419
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	98.1			97.8		%				0.3	20
Percent Moisture	1.9			2.2		%				14	20

Client Sample ID: HA6-0-6-20170418 — **Lab Sample ID: 580-67751-17**
Date Collected: 04/18/17 12:00 — **Matrix: Solid**
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244220	04/26/17 09:24	MRG	TAL SEA

Client Sample ID: HA6-0-6-20170418 — **Lab Sample ID: 580-67751-17**
Date Collected: 04/18/17 12:00 — **Matrix: Solid**
Date Received: 04/20/17 12:50 — **Percent Solids: 89.7**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244204	04/26/17 01:39	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:08	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 08:45	FCW	TAL SEA

Client Sample ID: E-TP1-2-2.5-20170418 — **Lab Sample ID: 580-67751-20**
Date Collected: 04/18/17 13:28 — **Matrix: Solid**
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244220	04/26/17 09:24	MRG	TAL SEA

Client Sample ID: E-TP1-2-2.5-20170418 — **Lab Sample ID: 580-67751-20**
Date Collected: 04/18/17 13:28 — **Matrix: Solid**
Date Received: 04/20/17 12:50 — **Percent Solids: 88.1**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244204	04/26/17 01:43	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:08	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 08:59	FCW	TAL SEA

Client Sample ID: E-TP2-2-2.5-20170418 — **Lab Sample ID: 580-67751-21**
Date Collected: 04/18/17 13:37 — **Matrix: Solid**
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244220	04/26/17 09:24	MRG	TAL SEA

Client Sample ID: E-TP2-2-2.5-20170418 — **Lab Sample ID: 580-67751-21**
Date Collected: 04/18/17 13:37 — **Matrix: Solid**
Date Received: 04/20/17 12:50 — **Percent Solids: 91.0**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA

Client Sample ID: E-TP2-2-2.5-20170418

Lab Sample ID: 580-67751-21
Date Collected: 04/18/17 13:37
Matrix: Solid
Date Received: 04/20/17 12:50
Percent Solids: 91.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	6020A		10	244204	04/26/17 00:45	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:08	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:01	FCW	TAL SEA

Client Sample ID: E-TP3-1-1.5-20170418

Lab Sample ID: 580-67751-22
Date Collected: 04/18/17 13:48
Matrix: Solid
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244220	04/26/17 09:24	MRG	TAL SEA

Client Sample ID: E-TP3-1-1.5-20170418

Lab Sample ID: 580-67751-22
Date Collected: 04/18/17 13:48
Matrix: Solid
Date Received: 04/20/17 12:50
Percent Solids: 78.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244204	04/26/17 01:48	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:03	FCW	TAL SEA

Client Sample ID: E-TP4-2-2.5-20170418

Lab Sample ID: 580-67751-23
Date Collected: 04/18/17 14:05
Matrix: Solid
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244220	04/26/17 09:24	MRG	TAL SEA

Client Sample ID: E-TP4-2-2.5-20170418

Lab Sample ID: 580-67751-23
Date Collected: 04/18/17 14:05
Matrix: Solid
Date Received: 04/20/17 12:50
Percent Solids: 85.6

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244204	04/26/17 01:52	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:05	FCW	TAL SEA

Client Sample ID: HA7-0-6-20170419
Date Collected: 04/19/17 09:35
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-24
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244220	04/26/17 09:24	MRG	TAL SEA

Client Sample ID: HA7-0-6-20170419
Date Collected: 04/19/17 09:35
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-24
Matrix: Solid
Percent Solids: 91.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244204	04/26/17 01:57	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:08	FCW	TAL SEA

Client Sample ID: HA8-0-6-20170419
Date Collected: 04/19/17 10:25
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-27
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244220	04/26/17 09:24	MRG	TAL SEA

Client Sample ID: HA8-0-6-20170419
Date Collected: 04/19/17 10:25
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-27
Matrix: Solid
Percent Solids: 95.4

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244204	04/26/17 02:01	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:10	FCW	TAL SEA

Client Sample ID: HA9-18-24-20170419
Date Collected: 04/19/17 10:15
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-33
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244220	04/26/17 09:24	MRG	TAL SEA

Client Sample ID: HA9-18-24-20170419
Date Collected: 04/19/17 10:15
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-33
Matrix: Solid
Percent Solids: 96.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA

Client Sample ID: HA9-18-24-20170419 — **Lab Sample ID: 580-67751-33**
Date Collected: 04/19/17 10:15 — **Matrix: Solid**
Date Received: 04/20/17 12:50 — **Percent Solids: 96.1**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	6020A		10	244204	04/26/17 02:23	FCW	TAL SEA
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		1000	244453	04/27/17 16:00	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:12	FCW	TAL SEA

Client Sample ID: HA10-0-6-20170419 — **Lab Sample ID: 580-67751-34**
Date Collected: 04/19/17 12:30 — **Matrix: Solid**
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244179	04/25/17 16:23	APR	TAL SEA

Client Sample ID: HA10-0-6-20170419 — **Lab Sample ID: 580-67751-34**
Date Collected: 04/19/17 12:30 — **Matrix: Solid**
Date Received: 04/20/17 12:50 — **Percent Solids: 98.1**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244204	04/26/17 02:28	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:14	FCW	TAL SEA

Client Sample ID: HA10-12-18-20170419 — **Lab Sample ID: 580-67751-36**
Date Collected: 04/19/17 12:40 — **Matrix: Solid**
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244179	04/25/17 16:23	APR	TAL SEA

Client Sample ID: HA10-12-18-20170419 — **Lab Sample ID: 580-67751-36**
Date Collected: 04/19/17 12:40 — **Matrix: Solid**
Date Received: 04/20/17 12:50 — **Percent Solids: 96.9**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244204	04/26/17 02:32	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:21	FCW	TAL SEA

Client Sample ID: HA11-12-18-20170419 — **Lab Sample ID: 580-67751-39**
Date Collected: 04/19/17 13:00 — **Matrix: Solid**
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244179	04/25/17 16:23	APR	TAL SEA

Client Sample ID: HA11-12-18-20170419 — **Lab Sample ID: 580-67751-39**
Date Collected: 04/19/17 13:00 — **Matrix: Solid**
Date Received: 04/20/17 12:50 — **Percent Solids: 94.7**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244204	04/26/17 02:37	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:23	FCW	TAL SEA

Client Sample ID: HA15-0-6-20170419 — **Lab Sample ID: 580-67751-40**
Date Collected: 04/19/17 11:30 — **Matrix: Solid**
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244179	04/25/17 16:23	APR	TAL SEA

Client Sample ID: HA15-0-6-20170419 — **Lab Sample ID: 580-67751-40**
Date Collected: 04/19/17 11:30 — **Matrix: Solid**
Date Received: 04/20/17 12:50 — **Percent Solids: 92.8**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244204	04/26/17 02:41	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:25	FCW	TAL SEA

Client Sample ID: HA16-12-18-20170419 — **Lab Sample ID: 580-67751-45**
Date Collected: 04/19/17 12:15 — **Matrix: Solid**
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244179	04/25/17 16:23	APR	TAL SEA

Client Sample ID: HA16-12-18-20170419 — **Lab Sample ID: 580-67751-45**
Date Collected: 04/19/17 12:15 — **Matrix: Solid**
Date Received: 04/20/17 12:50 — **Percent Solids: 93.6**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA

Lab Chronicle

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: HA16-12-18-20170419
Lab Sample ID: 580-67751-45
Date Collected: 04/19/17 12:15
Matrix: Solid
Date Received: 04/20/17 12:50
Percent Solids: 93.6

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	6020A		10	244204	04/26/17 02:46	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:28	FCW	TAL SEA

Client Sample ID: HA12-0-6-20170419
Lab Sample ID: 580-67751-46
Date Collected: 04/19/17 13:30
Matrix: Solid
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244179	04/25/17 16:23	APR	TAL SEA

Client Sample ID: HA12-0-6-20170419
Lab Sample ID: 580-67751-46
Date Collected: 04/19/17 13:30
Matrix: Solid
Date Received: 04/20/17 12:50
Percent Solids: 93.9

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244204	04/26/17 02:50	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:30	FCW	TAL SEA

Client Sample ID: HA13-0-6-20170419
Lab Sample ID: 580-67751-49
Date Collected: 04/19/17 13:50
Matrix: Solid
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244179	04/25/17 16:23	APR	TAL SEA

Client Sample ID: HA13-0-6-20170419
Lab Sample ID: 580-67751-49
Date Collected: 04/19/17 13:50
Matrix: Solid
Date Received: 04/20/17 12:50
Percent Solids: 92.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244111	04/25/17 12:01	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244204	04/26/17 02:55	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:32	FCW	TAL SEA

Client Sample ID: HA14-12-18-20170419
Lab Sample ID: 580-67751-54
Date Collected: 04/19/17 14:20
Matrix: Solid
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244179	04/25/17 16:23	APR	TAL SEA

Client Sample ID: HA14-12-18-20170419
Lab Sample ID: 580-67751-54
Date Collected: 04/19/17 14:20
Matrix: Solid
Date Received: 04/20/17 12:50
Percent Solids: 93.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244152	04/25/17 15:17	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244331	04/26/17 20:33	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:34	FCW	TAL SEA

Client Sample ID: Comp C
Lab Sample ID: 580-67751-57
Date Collected: 04/19/17 00:00
Matrix: Solid
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244179	04/25/17 16:47	APR	TAL SEA

Client Sample ID: Comp C
Lab Sample ID: 580-67751-57
Date Collected: 04/19/17 00:00
Matrix: Solid
Date Received: 04/20/17 12:50
Percent Solids: 95.2

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244152	04/25/17 15:17	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244331	04/26/17 20:55	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:36	FCW	TAL SEA

Client Sample ID: Comp D
Lab Sample ID: 580-67751-58
Date Collected: 04/19/17 00:00
Matrix: Solid
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244179	04/25/17 16:57	APR	TAL SEA

Client Sample ID: Comp D
Lab Sample ID: 580-67751-58
Date Collected: 04/19/17 00:00
Matrix: Solid
Date Received: 04/20/17 12:50
Percent Solids: 97.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244152	04/25/17 15:17	ADB	TAL SEA

Lab Chronicle

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Client Sample ID: Comp D

Date Collected: 04/19/17 00:00
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-58

Matrix: Solid
Percent Solids: 97.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	6020A		10	244331	04/26/17 21:00	FCW	TAL SEA
Total/NA	Prep	7471A			244292	04/26/17 15:09	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244353	04/27/17 09:39	FCW	TAL SEA

Laboratory References:

TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Laboratory: TestAmerica Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Washington	State Program	10	C553	02-17-18

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
6020A	3050B	Solid	Antimony
6020A	3050B	Solid	Arsenic
6020A	3050B	Solid	Barium
6020A	3050B	Solid	Cadmium
6020A	3050B	Solid	Chromium
6020A	3050B	Solid	Copper
6020A	3050B	Solid	Lead
6020A	3050B	Solid	Nickel
6020A	3050B	Solid	Selenium
6020A	3050B	Solid	Silver
D 2216		Solid	Percent Moisture
D 2216		Solid	Percent Solids

Sample Summary

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-67751-17	HA6-0-6-20170418	Solid	04/18/17 12:00	04/20/17 12:50
580-67751-20	E-TP1-2-2.5-20170418	Solid	04/18/17 13:28	04/20/17 12:50
580-67751-21	E-TP2-2-2.5-20170418	Solid	04/18/17 13:37	04/20/17 12:50
580-67751-22	E-TP3-1-1.5-20170418	Solid	04/18/17 13:48	04/20/17 12:50
580-67751-23	E-TP4-2-2.5-20170418	Solid	04/18/17 14:05	04/20/17 12:50
580-67751-24	HA7-0-6-20170419	Solid	04/19/17 09:35	04/20/17 12:50
580-67751-27	HA8-0-6-20170419	Solid	04/19/17 10:25	04/20/17 12:50
580-67751-33	HA9-18-24-20170419	Solid	04/19/17 10:15	04/20/17 12:50
580-67751-34	HA10-0-6-20170419	Solid	04/19/17 12:30	04/20/17 12:50
580-67751-36	HA10-12-18-20170419	Solid	04/19/17 12:40	04/20/17 12:50
580-67751-39	HA11-12-18-20170419	Solid	04/19/17 13:00	04/20/17 12:50
580-67751-40	HA15-0-6-20170419	Solid	04/19/17 11:30	04/20/17 12:50
580-67751-45	HA16-12-18-20170419	Solid	04/19/17 12:15	04/20/17 12:50
580-67751-46	HA12-0-6-20170419	Solid	04/19/17 13:30	04/20/17 12:50
580-67751-49	HA13-0-6-20170419	Solid	04/19/17 13:50	04/20/17 12:50
580-67751-54	HA14-12-18-20170419	Solid	04/19/17 14:20	04/20/17 12:50
580-67751-57	Comp C	Solid	04/19/17 00:00	04/20/17 12:50
580-67751-58	Comp D	Solid	04/19/17 00:00	04/20/17 12:50

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Chain of Custody Record

Client: GEOENGINEERS	Client Contact: Garrett Leque	Date: 4/20/17	Chain of Custody Number: 29093
Address: 1101 S. Fawcett Avenue Suite 200	Telephone Number (Area Code)/Fax Number: (253) 722-2413	Lab Number: 67751	Page 1 of 5
City: Tacoma / State: WA / Zip Code: 98402	Sampler: Roger Chang	Lab Contact:	
Project Name and Location (State): Carpenter Road Site (Olympia, WA)	Billing Contact:		
Contract/Purchase Order/Quote No.			

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: RCRA 8 Metals	TCLP Metals	Special Instructions/ Conditions of Receipt
HA1-0-6-20170418	4/18/17	913													Hold all samples
HA1-6-12-20170418	4/18/17	917													for analyses
HA1-12-18-20170418	4/18/17	924													request TBD
HA2-0-6-20170418	4/18/17	1014													4/21/17
HA2-6-12-20170418	4/18/17	1020													
HA2-12-18-20170418	4/18/17	1026													
HA2-18-24-20170418	4/18/17	1039													
HA3-0-6-20170418	4/18/17	1041													
HA3-6-12-20170418	4/18/17	1045													
HA3-12-18-20170418	4/18/17	1049													
HA4-0-6-20170418	4/18/17	1128													
HA4-6-12-20170418	4/18/17	1134													

TB ___ Cooler IR4 Cor 5.5 Unc 6.1
Cooler Dscl to 3 b/w @Lab
~~Wet Packs~~ Packing Cardboard
cl. do w/c.s.

Cooler: ☐ Yes ☐ No Cooler Temp: _____

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days): ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By Sign/Print: Roger Chang	4/20/17	1250	1. Received By Sign/Print: B. Hall B. Gall SEA TA	4.20.17	1250
2. Relinquished By Sign/Print			2. Received By Sign/Print		
3. Relinquished By Sign/Print			3. Received By Sig.		

Comments

580-67751 Chain of Custody

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

TAL-8274-580 (0210)
4/28/2017

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Chain of Custody Record

Client	Client Contact	Date	Chain of Custody Number
GEOENGINEERS	Garrett Leque	4/20/17	29094

Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page
1101 S. Fawcett Ave. Suite 200	(253) 722-2413		Page 2 of 3

City	State	Zip Code	Sampler	Lab Contact
Tacoma	WA	98402	Roger Chang	

Project Name and Location (State): Carpenter Road Site (Olympia, WA)
Billing Contact:
Contract/Purchase Order/Quote No.:

Analysis (Attach list if more space is needed): RCRA 8 metals; TCLP metals

Special Instructions/ Conditions of Receipt

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH	Special Instructions
HA4-12-18-20170418	4/18/17	1139											Hold all samples for analyses request TBD 4/21/17
HA5-0-6-20170418	4/18/17	1145											
HA5-6-12-20170418	4/18/17	1150											
HA5-12-18-20170418	4/18/17	1155											
HA6-0-6-20170418	4/18/17	1200											
HA6-6-12-20170418	4/18/17	1210											
HA6-12-18-20170418	4/18/17	1215											
E-TP1-20170418	4/18/17	1328											
E-TP2-20170418	4/18/17	1337											
E-TP3-20170418	4/18/17	1348											
E-TP4-20170418	4/18/17	1405											
	4/18/17												

Cooler: ☐ Yes ☐ No Cooler Temp: _____

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days): ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By Sign/Print: Per e-mail Roger Chang	4/20/17	1250	1. Received By Sign/Print: B. Heel B. Gell SEA TP	4.20.17	1250
2. Relinquished By Sign/Print			2. Received By Sign/Print		
3. Relinquished By Sign/Print			3. Received By Sign/Print		

Comments:

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

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Chain of Custody Record

Client	Client Contact	Date	Chain of Custody Number
GEOENGINEERS	Garrett Leque	4/20/17	29095
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 3 of 3 5**
1101 S. FAWCETT Ave. Suite 200	(253) 722-2413		
City / **State** / **Zip Code**	**Sampler**	**Lab Contact**	
Tacoma / WA / 98402	Roger Chang		
Project Name and Location (State)	**Billing Contact**		
Carpenter Road Site (Olympia, WA)			
Contract/Purchase Order/Quote No.			

	Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: RCRA 8 Metals	TCLP metals	Special Instructions/ Conditions of Receipt
4	HA7-0-6-20170419	~~4/19/17~~ 4/19/17	935													Hold all samples
5	HA7-6-12-20170419	~~4/19/17~~ 4/19/17	940													for analyses
6	HA7-12-18-20170419	4/19/17	945													request TBD
7	HA8-0-6-20170419	4/19/17	1025													4/21/17
8	HA8-6-12-20170419	4/19/17	1030													
9	HA8-12-18-20170419	4/19/17	1035													
10	HA9-0-6-20170419	4/19/17	955													
11	HA9-6-12-20170419	4/19/17	1000													
12	HA9-12-18-20170419	4/19/17	1010													
13	HA9-18-24-20170419	4/19/17	1015													
14	HA10-0-6-20170419	4/19/17	1230													
15	HA10-6-12-20170419	4/19/17	1235													

Cooler ☐ Yes ☐ No Cooler Temp: _____

Possible Hazard Identification ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days) ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other _____

QC Requirements (Specify)

1. Relinquished By Sign/Print	Date	Time	1. Received By Sign/Print	Date	Time
Roger Chang	4/20/17	1250	B. Gall B. Gall SFA TA	4.20.17	1250
2. Relinquished By Sign/Print	Date	Time	2. Received By Sign/Print	Date	Time
3. Relinquished By Sign/Print	Date	Time	3. Received By Sign/Print	Date	Time

Comments

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

TAL-8274-599 (0210)

4/28/2017

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Chain of Custody Record

Client: GeoEngineers	Client Contact: Garrett League	Date: 4/20/17	Chain of Custody Number: 29096
Address: 1101 S Fawcett Ave Suite 200	Telephone Number (Area Code)/Fax Number: (253) 722-2413	Lab Number:	Page 2 of 35
City: Tacoma / State: WA / Zip Code: 98402	Sampler: Roger Chang	Lab Contact:	Analysis (Attach list if more space is needed)
Project Name and Location (State): Carpenter Road Site Olympia, WA)	Billing Contact:		Special Instructions/ Conditions of Receipt
Contract/Purchase Order/Quote No.			

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH	RCRA 8 metals	TCLP metals	Special Instructions/ Conditions of Receipt
HA10-12-18-20170419	4/19/17	1240													Hold all samples
HA11-0-6-20170419		1250													for analyses
HA11-6-12-20170419		1255													request TBD
HA11-12-18-20170419		1300													4/21/17
HA15-0-6-20170419		1130													
HA15-6-12-20170419		1140													
HA15-12-18-20170419		1201													
HA16-0-6-20170419		1265													
HA16-6-12-20170419		1210													
HA16-12-18-20170419		1215													
HA12-0-6-20170419		1330													
HA12-6-12-20170419		1335													

Cooler: ☐ Yes ☐ No Cooler Temp: _____

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days): ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By Sign/Print: Roger Chang	4/20/17	1250	1. Received By Sign/Print: B. Gall SEATTA	4.20.17	1250
2. Relinquished By Sign/Print:			2. Received By Sign/Print:		
3. Relinquished By Sign/Print:			3. Received By Sign/Print:		

Comments:

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

TAL-8274-580 (0210)

4/28/2017

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Chain of Custody Record

Client: GeoEngineers	Client Contact: Garrett Leque	Date: 4/20/17	Chain of Custody Number: 29092
Address: 1101 S. Fawcett Ave Suite 200	Telephone Number (Area Code)/Fax Number: (253)722-2413	Lab Number:	Page 35 of 35
City: Tacoma / State: WA / Zip Code: 98402	Sampler: Roger Chang	Lab Contact:	
Project Name and Location (State): Carpenter Road Site (Olympia, WA)	Billing Contact:		
Contract/Purchase Order/Quote No.			

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: RCRA 8 metals	TCLP metals	Special Instructions/ Conditions of Receipt
48 HA12-12-18-20170419	4/19/17	1340													Hold all samples
49 HA13-0-6-20170419		1350													for analyses
50 HA13-6-12-20170419		1355													request TBD
51 HA13-12-18-20170419		1400													4/21/17
52 HA14-0-6-20170419		1410													
53 HA14-6-12-20170419		1415													
54 HA14-12-18-20170419	↓	1420													

Cooler: ☐ Yes ☐ No Cooler Temp: _____

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days): ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other _____

QC Requirements (Specify):

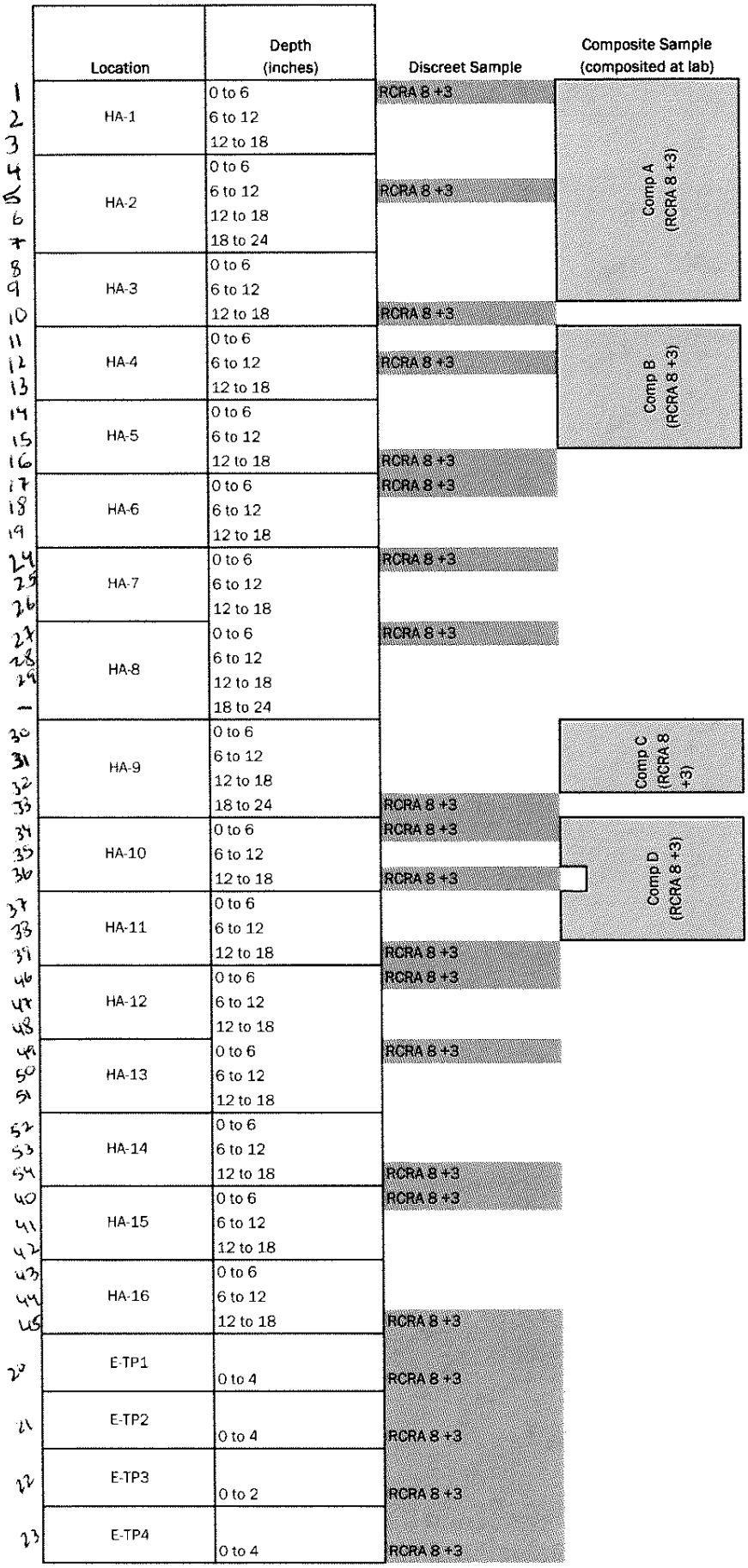
	Date	Time		Date	Time
1. Relinquished By Sign/Print: Roger Chang	4/20/17	1250	1. Received By Sign/Print: B. Hall B. Gall SEA TA	4.20.17	1250
2. Relinquished By Sign/Print:			2. Received By Sign/Print:		
3. Relinquished By Sign/Print:			3. Received By Sign/Print:		

Comments:

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

TAL-8274-580 (0210)

4/28/2017



Location	Depth (inches)	Discreet Sample	Composite Sample (composited at lab)
HA-1	0 to 6	RCRA 8 +3	Comp A (RCRA 8 +3)
	6 to 12		
	12 to 18		
HA-2	0 to 6		
	6 to 12	RCRA 8 +3	
	12 to 18		
	18 to 24		
HA-3	0 to 6		
	6 to 12		
	12 to 18	RCRA 8 +3	
HA-4	0 to 6		Comp B (RCRA 8 +3)
	6 to 12	RCRA 8 +3	
	12 to 18		
HA-5	0 to 6		
	6 to 12		
	12 to 18	RCRA 8 +3	
HA-6	0 to 6	RCRA 8 +3	
	6 to 12		
	12 to 18		
HA-7	0 to 6	RCRA 8 +3	
	6 to 12		
	12 to 18		
HA-8	0 to 6	RCRA 8 +3	
	6 to 12		
	12 to 18		
	18 to 24		
HA-9	0 to 6		Comp C (RCRA 8 +3)
	6 to 12		
	12 to 18		
	18 to 24	RCRA 8 +3	
HA-10	0 to 6	RCRA 8 +3	Comp D (RCRA 8 +3)
	6 to 12		
	12 to 18	RCRA 8 +3	
HA-11	0 to 6		
	6 to 12		
	12 to 18	RCRA 8 +3	
HA-12	0 to 6	RCRA 8 +3	
	6 to 12		
	12 to 18		
HA-13	0 to 6	RCRA 8 +3	
	6 to 12		
	12 to 18		
HA-14	0 to 6		
	6 to 12		
	12 to 18	RCRA 8 +3	
HA-15	0 to 6	RCRA 8 +3	
	6 to 12		
	12 to 18		
HA-16	0 to 6		
	6 to 12		
	12 to 18	RCRA 8 +3	
E-TP1	0 to 4	RCRA 8 +3	
E-TP2	0 to 4	RCRA 8 +3	
E-TP3	0 to 2	RCRA 8 +3	
E-TP4	0 to 4	RCRA 8 +3	

Login Sample Receipt Checklist

Client: GeoEngineers Inc

Job Number: 580-67751-1

Login Number: 67751
List Number: 1
Creator: Presley, Kim A

List Source: TestAmerica Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	False	Thermal preservation not required.
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	SEE NCM
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

TestAmerica Job ID: 580-67751-3
Client Project/Site: Carpenter Road Site A2/0415-068-01

For:
GeoEngineers Inc
1101 Fawcett, Suite 200
Tacoma, Washington 98402

Attn: Garrett Leque

Authorized for release by:
5/4/2017 4:01:00 PM

Randee Arrington, Project Manager II
(509)924-9200
randee.arrington@testamericainc.com

Table of Contents

Case Narrative

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-3

Job ID: 580-67751-3

Laboratory: TestAmerica Seattle

Narrative

Receipt
The samples were received on 4/20/2017 12:50 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 5.5º C.

Receipt Exceptions
The following samples were canceled by the client on 04/25/2017: HA1-0-6-20170418 (580-67751-1), HA2-6-12-20170418 (580-67751-5), HA3-12-18-20170418 (580-67751-10), HA4-6-12-20170418 (580-67751-12), HA5-12-18-20170418 (580-67751-16), Comp A (580-67751-55) and Comp B (580-67751-56).

The following sample composites were activated for 6010C and 7471B analysis by the client on 04/27/17: Comp A (580-67751-59) and Comp B (580-67751-60). The samples were composited according to the table provided by the client on 04/27/17.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-3

Client Sample ID: Comp A
Date Collected: 04/18/17 00:00
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-59
Matrix: Solid
Percent Solids: 82.2

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.2		0.55		mg/Kg	☼	05/01/17 14:21	05/02/17 17:48	10
Antimony	43		0.22		mg/Kg	☼	05/01/17 14:21	05/02/17 17:48	10
Barium	42		0.55		mg/Kg	☼	05/01/17 14:21	05/02/17 17:48	10
Cadmium	ND		0.44		mg/Kg	☼	05/01/17 14:21	05/02/17 17:48	10
Chromium	15		0.55		mg/Kg	☼	05/01/17 14:21	05/02/17 17:48	10
Lead	2500		0.55		mg/Kg	☼	05/01/17 14:21	05/02/17 17:48	10
Selenium	ND		1.1		mg/Kg	☼	05/01/17 14:21	05/02/17 17:48	10
Silver	ND		0.22		mg/Kg	☼	05/01/17 14:21	05/02/17 17:48	10
Copper	200		1.1		mg/Kg	☼	05/01/17 14:21	05/02/17 17:48	10
Nickel	14		0.55		mg/Kg	☼	05/01/17 14:21	05/02/17 17:48	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.036		mg/Kg	☼	05/01/17 10:28	05/01/17 17:09	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	82.2		0.1		%			04/28/17 09:11	1
Percent Moisture	17.8		0.1		%			04/28/17 09:11	1

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-3

Client Sample ID: Comp B
Date Collected: 04/18/17 00:00
Date Received: 04/20/17 12:50

Lab Sample ID: 580-67751-60
Matrix: Solid
Percent Solids: 83.3

Method: 6020A - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.4		0.59		mg/Kg	☼	05/01/17 14:21	05/02/17 17:52	10
Antimony	28		0.24		mg/Kg	☼	05/01/17 14:21	05/02/17 17:52	10
Barium	52		0.59		mg/Kg	☼	05/01/17 14:21	05/02/17 17:52	10
Cadmium	ND		0.47		mg/Kg	☼	05/01/17 14:21	05/02/17 17:52	10
Chromium	12		0.59		mg/Kg	☼	05/01/17 14:21	05/02/17 17:52	10
Lead	1100		0.59		mg/Kg	☼	05/01/17 14:21	05/02/17 17:52	10
Selenium	ND		1.2		mg/Kg	☼	05/01/17 14:21	05/02/17 17:52	10
Silver	ND		0.24		mg/Kg	☼	05/01/17 14:21	05/02/17 17:52	10
Copper	120		1.2		mg/Kg	☼	05/01/17 14:21	05/02/17 17:52	10
Nickel	13		0.59		mg/Kg	☼	05/01/17 14:21	05/02/17 17:52	10

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.071		0.030		mg/Kg	☼	05/01/17 10:28	05/01/17 17:11	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83.3		0.1		%			04/28/17 09:20	1
Percent Moisture	16.7		0.1		%			04/28/17 09:20	1

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 580-244639/20-A
Matrix: Solid
Analysis Batch: 244801

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 244639

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.25		mg/Kg		05/01/17 14:24	05/02/17 14:56	5
Antimony	ND		0.10		mg/Kg		05/01/17 14:24	05/02/17 14:56	5
Barium	ND		0.25		mg/Kg		05/01/17 14:24	05/02/17 14:56	5
Cadmium	ND		0.20		mg/Kg		05/01/17 14:24	05/02/17 14:56	5
Chromium	ND		0.25		mg/Kg		05/01/17 14:24	05/02/17 14:56	5
Lead	ND		0.25		mg/Kg		05/01/17 14:24	05/02/17 14:56	5
Selenium	ND		0.50		mg/Kg		05/01/17 14:24	05/02/17 14:56	5
Silver	ND		0.10		mg/Kg		05/01/17 14:24	05/02/17 14:56	5
Copper	ND		0.50		mg/Kg		05/01/17 14:24	05/02/17 14:56	5
Nickel	ND		0.25		mg/Kg		05/01/17 14:24	05/02/17 14:56	5

Lab Sample ID: LCS 580-244639/21-A
Matrix: Solid
Analysis Batch: 244801

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 244639

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	200	205		mg/Kg		103	80 - 120
Antimony	150	157		mg/Kg		104	80 - 120
Barium	200	207		mg/Kg		104	80 - 120
Cadmium	5.00	5.27		mg/Kg		105	80 - 120
Chromium	20.0	20.2		mg/Kg		101	80 - 120
Lead	50.0	48.9		mg/Kg		98	80 - 120
Selenium	200	211		mg/Kg		106	80 - 120
Silver	30.0	30.4		mg/Kg		101	80 - 120
Copper	25.0	25.7		mg/Kg		103	80 - 120
Nickel	50.0	50.0		mg/Kg		100	80 - 120

Lab Sample ID: LCSD 580-244639/22-A
Matrix: Solid
Analysis Batch: 244801

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 244639

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	200	205		mg/Kg		102	80 - 120	0	20
Antimony	150	154		mg/Kg		103	80 - 120	2	20
Barium	200	206		mg/Kg		103	80 - 120	1	20
Cadmium	5.00	5.05		mg/Kg		101	80 - 120	4	20
Chromium	20.0	20.3		mg/Kg		101	80 - 120	0	20
Lead	50.0	48.5		mg/Kg		97	80 - 120	1	20
Selenium	200	210		mg/Kg		105	80 - 120	1	20
Silver	30.0	30.4		mg/Kg		101	80 - 120	0	20
Copper	25.0	25.4		mg/Kg		102	80 - 120	1	20
Nickel	50.0	50.3		mg/Kg		101	80 - 120	1	20

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-3

Method: 7471A - Mercury (CVAA)

Lab Sample ID: MB 580-244576/19-A
Matrix: Solid
Analysis Batch: 244677

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 244576

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.030		mg/Kg		05/01/17 10:28	05/01/17 16:21	1

Lab Sample ID: LCS 580-244576/20-A
Matrix: Solid
Analysis Batch: 244677

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 244576

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury			0.167	0.165		mg/Kg		99	80 - 120		

Lab Sample ID: LCSD 580-244576/21-A
Matrix: Solid
Analysis Batch: 244677

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 244576

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury			0.167	0.166		mg/Kg		100	80 - 120	0	20

Lab Chronicle

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-3

Client Sample ID: Comp A
Lab Sample ID: 580-67751-59
Date Collected: 04/18/17 00:00
Matrix: Solid
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244461	04/28/17 09:11	JCV	TAL SEA

Client Sample ID: Comp A
Lab Sample ID: 580-67751-59
Date Collected: 04/18/17 00:00
Matrix: Solid
Date Received: 04/20/17 12:50
Percent Solids: 82.2

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244639	05/01/17 14:21	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244801	05/02/17 17:48	FCW	TAL SEA
Total/NA	Prep	7471A			244576	05/01/17 10:28	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244677	05/01/17 17:09	FCW	TAL SEA

Client Sample ID: Comp B
Lab Sample ID: 580-67751-60
Date Collected: 04/18/17 00:00
Matrix: Solid
Date Received: 04/20/17 12:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	244461	04/28/17 09:20	JCV	TAL SEA

Client Sample ID: Comp B
Lab Sample ID: 580-67751-60
Date Collected: 04/18/17 00:00
Matrix: Solid
Date Received: 04/20/17 12:50
Percent Solids: 83.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			244639	05/01/17 14:21	ADB	TAL SEA
Total/NA	Analysis	6020A		10	244801	05/02/17 17:52	FCW	TAL SEA
Total/NA	Prep	7471A			244576	05/01/17 10:28	ADB	TAL SEA
Total/NA	Analysis	7471A		1	244677	05/01/17 17:11	FCW	TAL SEA

Laboratory References:

TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: GeoEngineers Inc
TestAmerica Job ID: 580-67751-3
Project/Site: Carpenter Road Site A2/0415-068-01

Laboratory: TestAmerica Seattle

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Washington	State Program	10	C553	02-17-18

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
6020A	3050B	Solid	Antimony
6020A	3050B	Solid	Arsenic
6020A	3050B	Solid	Barium
6020A	3050B	Solid	Cadmium
6020A	3050B	Solid	Chromium
6020A	3050B	Solid	Copper
6020A	3050B	Solid	Lead
6020A	3050B	Solid	Nickel
6020A	3050B	Solid	Selenium
6020A	3050B	Solid	Silver
D 2216		Solid	Percent Moisture
D 2216		Solid	Percent Solids

Sample Summary

Client: GeoEngineers Inc
Project/Site: Carpenter Road Site A2/0415-068-01

TestAmerica Job ID: 580-67751-3

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-67751-59	Comp A	Solid	04/18/17 00:00	04/20/17 12:50
580-67751-60	Comp B	Solid	04/18/17 00:00	04/20/17 12:50

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Chain of Custody Record

Client: GEOENGINEERS	Client Contact: Garrett Leque	Date: 4/20/17	Chain of Custody Number: 29093
Address: 1101 S. Fawcett Avenue Suite 200	Telephone Number (Area Code)/Fax Number: (253) 722-2413	Lab Number: 67751	Page 1 of 5
City: Tacoma / State: WA / Zip Code: 98402	Sampler: Roger Chang	Lab Contact:	
Project Name and Location (State): Carpenter Road Site (Olympia, WA)	Billing Contact:		
Contract/Purchase Order/Quote No.			

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: RCRA 8 Metals	TCLP Metals	Special Instructions/ Conditions of Receipt
HA1-0-6-20170418	4/18/17	913													Hold all samples
HA1-6-12-20170418	4/18/17	917													for analyses
HA1-12-18-20170418	4/18/17	924													request TBD
HA2-0-6-20170418	4/18/17	1014													4/21/17
HA2-6-12-20170418	4/18/17	1020													
HA2-12-18-20170418	4/18/17	1026													
HA2-18-24-20170418	4/18/17	1039													
HA3-0-6-20170418	4/18/17	1041													
HA3-6-12-20170418	4/18/17	1045													
HA3-12-18-20170418	4/18/17	1049													
HA4-0-6-20170418	4/18/17	1128													
HA4-6-12-20170418	4/18/17	1134													

TB ___ Cooler IR4 Cor 5.5 Unc 6.1
Cooler Dscl t 3 b/w @Lab
~~Wet Packs~~ Packing Cardboard
cl. do w/c.s.

Cooler: ☐ Yes ☐ No Cooler Temp: _____

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days): ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By Sign/Print: Roger Chang	4/20/17	1250	1. Received By Sign/Print: B. Hall B. Gall SEA TA	4.20.17	1250
2. Relinquished By Sign/Print			2. Received By Sign/Print		
3. Relinquished By Sign/Print			3. Received By Sig.		

Comments

580-67751 Chain of Custody

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

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5/4/2017

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Chain of Custody Record

Client	Client Contact	Date	Chain of Custody Number
GEOENGINEERS	Garrett Leque	4/20/17	29094
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 2 of 3**
1101 S. Fawcett Ave. Suite 200	(253) 722-2413		
City / **State** / **Zip Code**	**Sampler**	**Lab Contact**	
Tacoma / WA / 98402	Roger Chang		
Project Name and Location (State)	**Billing Contact**		
Carpenter Road Site (Olympia, WA)			
Contract/Purchase Order/Quote No.			

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH	Analysis: RCRA 8 metals	TCLP metals	Special Instructions/ Conditions of Receipt
HA4-12-18-20170418	4/18/17	1139													Hold all samples
HA5-0-6-20170418	4/18/17	1145													for analyses
HA5-6-12-20170418	4/18/17	1150													request TBD
HA5-12-18-20170418	4/18/17	1155													4/21/17
HA6-0-6-20170418	4/18/17	1200													
HA6-6-12-20170418	4/18/17	1210													
HA6-12-18-20170418	4/18/17	1215													
E-TP1-20170418	4/18/17	1328													
E-TP2-20170418	4/18/17	1337													
E-TP3-20170418	4/18/17	1348													
E-TP4-20170418	4/18/17	1405													
	4/18/17														

Cooler
☐ Yes ☐ No Cooler Temp: _____

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
(A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days)
☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By Sign/Print: Per e-mail Roger Chang	4/20/17	1250	1. Received By Sign/Print: B. Heel B. Gell SEA TP	4.20.17	1250
2. Relinquished By Sign/Print			2. Received By Sign/Print		
3. Relinquished By Sign/Print			3. Received By Sign/Print		

Comments

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

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5/4/2017

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Chain of Custody Record

Client: GEOENGINEERS	Client Contact: Garrett Leque	Date: 4/20/17	Chain of Custody Number: 29095
Address: 1101 S. FAWCETT Ave. Suite 200	Telephone Number (Area Code)/Fax Number: (253) 722-2413	Lab Number:	Page 3 of 5
City: Tacoma / State: WA / Zip Code: 98402	Sampler: Roger Chang	Lab Contact:	
Project Name and Location (State): Carpenter Road Site (Olympia, WA)	Billing Contact:		
Contract/Purchase Order/Quote No.			

	Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: RCRA 8 Metals	TCLP metals	Special Instructions/ Conditions of Receipt
4	HA7-0-6-20170419	~~4/19/17~~ 4/19/17	935													Hold all samples
5	HA7-6-12-20170419	~~4/19/17~~ 4/19/17	940													for analyses
6	HA7-12-18-20170419	4/19/17	945													request TBD
7	HA8-0-6-20170419	4/19/17	1025													4/21/17
8	HA8-6-12-20170419	4/19/17	1030													
9	HA8-12-18-20170419	4/19/17	1035													
10	HA9-0-6-20170419	4/19/17	955													
11	HA9-6-12-20170419	4/19/17	1000													
12	HA9-12-18-20170419	4/19/17	1010													
13	HA9-18-24-20170419	4/19/17	1015													
14	HA10-0-6-20170419	4/19/17	1230													
15	HA10-6-12-20170419	4/19/17	1235													

Cooler: ☐ Yes ☐ No Cooler Temp: _____

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days): ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By Sign/Print: Roger Chang	4/20/17	1250	1. Received By Sign/Print: B. Gall B. Gall SFA TA	4.20.17	1250
2. Relinquished By Sign/Print:			2. Received By Sign/Print:		
3. Relinquished By Sign/Print:			3. Received By Sign/Print:		

Comments:

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

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Chain of Custody Record

Client: GeoEngineers	Client Contact: Garrett League	Date: 4/20/17	Chain of Custody Number: 29096
Address: 1101 S Fawcett Ave Suite 200	Telephone Number (Area Code)/Fax Number: (253) 722-2413	Lab Number:	Page 2 of 35
City: Tacoma / State: WA / Zip Code: 98402	Sampler: Roger Chang	Lab Contact:	Analysis (Attach list if more space is needed)
Project Name and Location (State): Carpenter Road Site Olympia, WA)	Billing Contact:		Special Instructions/ Conditions of Receipt
Contract/Purchase Order/Quote No.			

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH	RCRA 8 metals	TCLP metals	Special Instructions/ Conditions of Receipt
HA10-12-18-20170419	4/19/17	1240													Hold all samples
HA11-0-6-20170419		1250													for analyses
HA11-6-12-20170419		1255													request TBD
HA11-12-18-20170419		1300													4/21/17
HA15-0-6-20170419		1130													
HA15-6-12-20170419		1140													
HA15-12-18-20170419		1201													
HA16-0-6-20170419		1265													
HA16-6-12-20170419		1210													
HA16-12-18-20170419		1215													
HA12-0-6-20170419		1330													
HA12-6-12-20170419		1335													

Cooler: ☐ Yes ☐ No Cooler Temp: _____

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days): ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By Sign/Print: Roger Chang	4/20/17	1250	1. Received By Sign/Print: B. Gall SEATTA	4.20.17	1250
2. Relinquished By Sign/Print:			2. Received By Sign/Print:		
3. Relinquished By Sign/Print:			3. Received By Sign/Print:		

Comments:

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

TAL-8274-580 (0210)

5/4/2017

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Chain of Custody Record

Client	Client Contact	Date	Chain of Custody Number
GeoEngineers	Garrett Leque	4/20/17	29092
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page** 35 of 35
1101 S. Fawcett Ave Suite 200	(253)722-2413		
City / **State** / **Zip Code**	**Sampler**	**Lab Contact**	
Tacoma / WA / 98402	Roger Chang		
Project Name and Location (State)	**Billing Contact**		
Carpenter Road Site (Olympia, WA)			
Contract/Purchase Order/Quote No.			

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: RCRA 8 metals	TCLP metals	Special Instructions/ Conditions of Receipt
48 HA12-12-18-20170419	4/19/17	1340													Hold all samples
49 HA13-0-6-20170419		1350													for analyses
50 HA13-6-12-20170419		1355													request TBD
51 HA13-12-18-20170419		1400													4/21/17
52 HA14-0-6-20170419		1410													
53 HA14-6-12-20170419		1415													
54 HA14-12-18-20170419	↓	1420													

Cooler	Possible Hazard Identification	Sample Disposal	
☐ Yes ☐ No Cooler Temp: ____	☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown	☐ Return To Client ☐ Archive For ____ Months	☐ Disposal By Lab (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days)
☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☐ Other ____

QC Requirements (Specify)

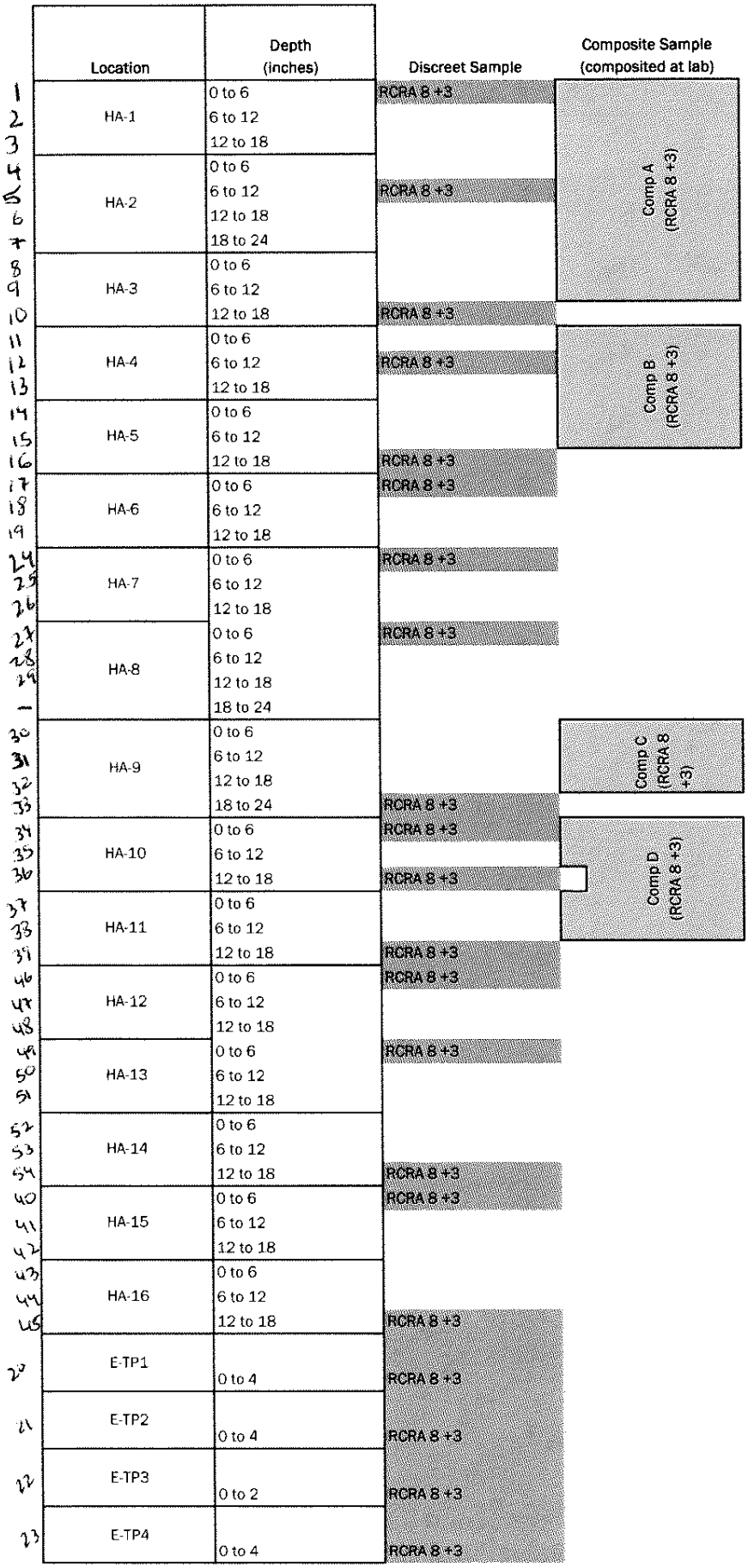
	Relinquished By Sign/Print	Date	Time	Received By Sign/Print	Date	Time
1.	Roger Chang	4/20/17	1250	B. Hall B. Gall SEA TA	4.20.17	1250
2.						
3.						

Comments

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

TAL-8274-580 (0210)

5/4/2017



Location	Depth (inches)	Discreet Sample	Composite Sample (composited at lab)
HA-1	0 to 6	RCRA 8 +3	Comp A (RCRA 8 +3)
	6 to 12		
	12 to 18		
HA-2	0 to 6		
	6 to 12	RCRA 8 +3	
	12 to 18		
	18 to 24		
HA-3	0 to 6		
	6 to 12		
	12 to 18	RCRA 8 +3	
HA-4	0 to 6		Comp B (RCRA 8 +3)
	6 to 12	RCRA 8 +3	
	12 to 18		
HA-5	0 to 6		
	6 to 12		
	12 to 18	RCRA 8 +3	
HA-6	0 to 6	RCRA 8 +3	
	6 to 12		
	12 to 18		
HA-7	0 to 6	RCRA 8 +3	
	6 to 12		
	12 to 18		
HA-8	0 to 6	RCRA 8 +3	
	6 to 12		
	12 to 18		
	18 to 24		
HA-9	0 to 6		Comp C (RCRA 8 +3)
	6 to 12		
	12 to 18		
	18 to 24	RCRA 8 +3	
HA-10	0 to 6	RCRA 8 +3	Comp D (RCRA 8 +3)
	6 to 12		
	12 to 18	RCRA 8 +3	
HA-11	0 to 6		
	6 to 12		
	12 to 18	RCRA 8 +3	
HA-12	0 to 6	RCRA 8 +3	
	6 to 12		
	12 to 18		
HA-13	0 to 6	RCRA 8 +3	
	6 to 12		
	12 to 18		
HA-14	0 to 6		
	6 to 12		
	12 to 18	RCRA 8 +3	
HA-15	0 to 6	RCRA 8 +3	
	6 to 12		
	12 to 18		
HA-16	0 to 6		
	6 to 12		
	12 to 18	RCRA 8 +3	
E-TP1	0 to 4	RCRA 8 +3	
E-TP2	0 to 4	RCRA 8 +3	
E-TP3	0 to 2	RCRA 8 +3	
E-TP4	0 to 4	RCRA 8 +3	

Table 1
XRF Results
Carpenters Road Gun Range
Olympia, Washington

Location	Depth (inches)	Discreet Sample	Composite Sample (composited at lab)	Composite Sample (composited at lab)
	level			
HA-1	0 to 6	Canceled	Canceled	A
	6 to 12			A
	12 to 18			
	18 to 24			A
HA-2	0 to 6			
	6 to 12	Canceled		
	12 to 18			
	18 to 24			
HA-3	0 to 6			
	6 to 12			
	12 to 18	Canceled		
	18 to 24			
HA-4	0 to 6			
	6 to 12	Canceled	Canceled	B
	12 to 18			
	18 to 24			B
HA-5	0 to 6			
	6 to 12			
	12 to 18	Canceled		
	18 to 24			
HA-6	0 to 6	RCRA 8 +3		
	6 to 12			
	12 to 18			
	18 to 24			
HA-7	0 to 6	RCRA 8 +3		
	6 to 12			
	12 to 18			
	18 to 24			
HA-8	Surface			
	1/4			
	0 to 6	RCRA 8 +3		
	6 to 12			
	12 to 18			
	18 to 24			
HA-9	0 to 6		Comp C	
	6 to 12			
	12 to 18			
	18 to 24	RCRA 8 +3		
HA-10	0 to 6	RCRA 8 +3	Comp D	
	6 to 12			
	12 to 18	RCRA 8 +3		
	18 to 24			
HA-11	Surface			
	1/4			
	0 to 6			
	6 to 12			
	12 to 18	RCRA 8 +3		
	18 to 24			
HA-12	0 to 6	RCRA 8 +3		
	6 to 12			
	12 to 18			
	18 to 24			
HA-13	Surface			
	0 to 6	RCRA 8 +3		
	6 to 12			
	12 to 18			
	18 to 24			
HA-14	0 to 6			
	6 to 12			
	12 to 18	RCRA 8 +3		
	18 to 24			
HA-15	0 to 6	RCRA 8 +3		
	6 to 12			
	12 to 18			
	18 to 24			
HA-16	0 to 6			
	6 to 12			
	12 to 18	RCRA 8 +3		
	18 to 24			
E-TP1	0 to 4	RCRA 8 +3		
E-TP2	0 to 4	RCRA 8 +3		
E-TP3	0 to 2	RCRA 8 +3		
E-TP4	0 to 4	RCRA 8 +3		
B1	0 to 6	RCRA 8 +3		
	6 to 8	RCRA 8 +3		
	24 to 32			
	60 to 66			
B2	0 to 5	RCRA 8 +3		
	6 to 12	RCRA 8 +3		
	24 to 30			
	60 to 66			
B3	0 to 6	RCRA 8 +3		
	6 to 12			
	24 to 30			
	60 to 66			
B4	0 to 6	RCRA 8 +3		
	24 to 30			
B5	0 to 6	RCRA 8 +3		
	24 to 30	RCRA 8 +3		
	48 to 60			
B6	0 to 6	RCRA 8 +3		
	24 to 28			
	60 to 66			
B7	0 to 6	RCRA 8 +3		
	24 to 30	RCRA 8 +3		
	60 to 66			
B8	0 to 6	RCRA 8 +3		
	24 to 30			
B9	0 to 5	RCRA 8 +3		
	24 to 30			
	60 to 66			

Originally requested to analyze on 4/21/17, but canceled on 4/25/17
Originally requested on 4/21/17 and now being analyzed
Additional discrete samples to be analyzed based on request on 4/27/17
A = Composite Comp D-6 inch interval from HA-1, HA-2, and HA-3. Use only what is needed from each jar, for potential future discreet sampling from each container.
B = Composite Comp D-6 inch interval from HA-4 and HA-5. Use only what is needed from each jar, for potential future discreet sampling from each container.

Login Sample Receipt Checklist

Client: GeoEngineers Inc

Job Number: 580-67751-3

Login Number: 67751

List Source: TestAmerica Seattle

List Number: 1

Creator: Presley, Kim A

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	False	Thermal preservation not required.
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	SEE NCM
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

APPENDIX F
Report Limitations and Guidelines for Use

APPENDIX F
REPORT LIMITATIONS AND GUIDELINES FOR USE[2]

This appendix provides information to help you manage your risks with respect to the use of this report.

Report Use and Reliance

This report has been prepared for City of Olympia. GeoEngineers structures its services to meet the specific needs of its clients. No party other than the City of Olympia may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Agreement with the Client dated October 6, 2021 and generally accepted environmental practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or Projects other than those identified in this report.

If changes to the Project or property occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations in the context of such changes. Based on that review, we can provide written modifications or confirmation, as appropriate.

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GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.

Conditions Can Change

This report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by events such as changes in regulatory requirements, construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Professional Judgment

It is important to recognize that the geoscience practices (geotechnical engineering, geology and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to its services, GeoEngineers includes these explanatory "limitations" provisions in its reports. Please confer with GeoEngineers if you need to know how these "Report Limitations and Guidelines for Use" apply to your Project or site.

[2] Developed based on material provided by GBA, GeoProfessional Business Association; www.geoprofessional.org.