REMEDIAL INVESTIGATION WORK PLAN

Maralco Property
7730 South 202nd Street, Kent WA

March 16, 2022

Prepared for:

BRIDGE

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7730 South 202nd Street, Kent WA

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Prepared by:

CRETE
CONSULTING, INC.

Professional Certification

Remedial Investigation Work Plan

Maralco Aluminum
7730 South 202nd Street
Kent, WA 98032

King County Parcel Number 6315000300

Ecology Facility Site ID No. 2067
Ecology Cleanup Site ID No. 5055

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Table of Contents

List of Tables

List of Figures

List of Appendices

Acronyms and Abbreviations

bgs	below ground surface
BHD	baghouse dust
Bridge	Bridge Industrial
BTEX	benzene, toluene, ethylbenzene, and xylenes
COC	consistent of concerns
COI	constituent of interest
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSM	conceptual site model
CUL	cleanup level
IHS	Indictor Hazardous Substance
Ecology	Washington Department of Ecology
EPA	United States Environmental Protection Agency
FBI	Friedman & Bruya, Inc
ft	foot
mg/kg	milligram per kilogram
mS/cm	milliSiemens/centimeter
MTCA	Model Toxics Control Act
Property	Maralco Property
QAPP	Quality Assurance Project Plan
RI/FS	Remedial Investigation/Feasibility Study
RCI	Reactivity, Corrosivity, Ignitability
RIWP	Remedial Investigation Work Plan
SL	Screening level
TCLP	Toxicity Characteristic Leachate Procedure
TEE	Terrestrial Ecological Evaluation
TPH	total petroleum hydrocarbons
WAC	Washington Administrative Code

1 Introduction

This Remedial Investigation Work Plan (RIWP) describes investigation activities to be conducted as part of efforts to develop a Remedial Investigation/Feasibility Study (RI/FS) report for the Maralco Property located at 7730 South 202nd Street in Kent, Washington (Property, Figure 1; King County Parcel Number 6315000300). This RIWP was prepared for Bridge Industrial (Bridge) for review by the Washington State Department of Ecology (Ecology). The Property was previously enrolled in the Voluntary Cleanup Program (VCP - NW2356) by Brown Dog Investments LLC.

Ecology has been engaged at the Property (Cleanup Site ID 5055) since 1987. Numerous investigations and two interim actions have been performed at the Property since that time. This information was most recently compiled in Phase I and Phase II Environmental Site Assessment Reports (Stantec 2015 and 2017) prepared on behalf of the City of Kent and the majority lienholder of the Property (Brown Dog Investments LLC). Since that time, the following reports have been prepared by Aerotech Environmental Consulting, Inc. (Aerotech) for the Property owner, the John P. Lyon & Gloria Lyon Irrevocable Trust:

- Stockpile Survey and Assessment – May 31, 2017
- Groundwater Well Survey – June 7, 2017
- Groundwater Monitoring Well Installation Report – August 15, 2017
- Site Summary Report prepared by Aerotech for GVA Kidder Mathews – October 31, 2017.

These reports are included in Appendix A.

Crete Consulting Incorporated (CRETE) has been working with Bridge, a prospective purchaser of the Property, since March 2021 to assess environmental conditions. CRETE supplemented the prior work by performing the following activities:

- Direct push soil and groundwater sampling, including assessment of soil conditions below the outdoor black dross pile
- Reassessment of the outdoor black dross pile volume
- Groundwater well sampling
- Off-Property sediment sampling
- Indoor stockpile measurement and sampling

Recent soil, groundwater, sediment and dross pile assessments results are summarized in this RIWP. Copies of analytical data collected to support this work are included in Appendix A.

After finalization of this RIWP, Bridge will implement the RIWP and continue work with Ecology to develop the RI/FS and draft Cleanup Action Plan. It is anticipated that Bridge will negotiate an Agreed Order with Ecology once they take ownership of the Property, anticipated in the 4th quarter of 2022.

2 Property Location and Description

The Property covers 12.05-acres. The Property includes a 45,000 square foot building near the western boundary that has been largely abandoned since 1986 (Figure 1).

Maralco Aluminum operated a secondary aluminum smelter at the Property from 1980 to 1986. The smelter produced aluminum ingots using the molten salt process from recycled aluminum cans, Kawecki-Berylco, Inc. (KBI) dross, and scrap metal. The wastes created from this process included black dross (or "salt cake") which was a mixture of salt, aluminum oxide, and impurities from the molten salt smelting process. Black dross produced between 1981 and 1986 is primarily located outside in a large covered stockpile while a fewer small piles are located inside the building (Figures 1 and 2). Maralco filed for bankruptcy in 1983 and ceased operations in November 1986.

An asphalt paved parking lot is located in the northwest corner and is currently leased by an adjacent property, Puget Sound Pipe and Supply, for the storage of steel pipe.

A wetland site assessment was completed in November 2020. The assessment identified wetland areas along the sides of and within Christopher Ditch and its tributary, designated as Wetland A. The extent of the wetland was estimated to be 34,360 square feet (Figure 3).

2.1 Previous Environmental Removals or Cleanups

In October 1991, interim remedial activities were performed at the site by Morrison Knudsen on behalf of Ecology. Ecology files did not include a copy of the *Interim Action Completion Letter Report* prepared by Morrison Knudsen but a summary of the work was compiled in the *Phase I Environmental Site Assessment Report* (Stantec 2015). The interim actions consisted of five activities: (1) fencing the site, (2) improvement of a stormwater collection pond, (3) rerouting of roof drains, (4) grading the plant area, and (5) covering the black dross piles with tarps.

- The fence and gates were installed around the perimeter of the Property (except the house on the northern side of the Property) to limit access. Warning signs were installed along the fence.

- The stormwater collection pond northwest of the warehouse building was improved; approximately two (2) feet of sediment and soil were removed from the pond. The depth of excavation was determined based on visual observation of dross-like materials in the bottom of the pond and previous surface soil analytical results from samples collected at the Property by Morrison Knudsen. Post-excavation confirmation samples were not collected. Materials excavated from the pond were drummed and stored on the Property until their subsequent removal and disposal.

- The roof drains of the warehouse building were re-routed to prevent stormwater from draining onto the dross piles.

- The outdoor dross pile was graded to prevent ponding of stormwater on their surface, and the piles were covered with 5-mil plastic tarping.

- The on-property ditch was re-routed and lined to reduce the potential for off-property migration of dross eroded from the outdoor stockpile.

In 1995, a 35,000-gallon diesel underground storage tank (UST) was removed from the northwest comer of the parking lot (Figure 1). Visual observations and soil and groundwater analytical results indicated that there had been an historical release from the UST system. Work was completed by Enviros, Inc. (Enviros) on behalf of Ecology and is documented in the report *Underground Storage Tank (UST) Decommissioning at the Maralco Aluminum Site*, as summarized below:

- The report documents the removal of a 35,000-gallon diesel UST.
- Visual inspection of the UST following its removal indicated it was generally in good condition, but did have three pin-point holes near its west end.
- Diesel was not detected in soil samples collected from the base, north sidewall, and east sidewall of the excavation.
- Diesel was detected at concentrations of 96 milligrams per kilogram (mg/kg) and 6,300 mg/kg in the west and south sidewalls, respectively.
- Diesel concentrations in three soil stockpile samples ranged from 1,200 mg/kg to 2,100 mg/kg.
- Following UST removal, all stockpiled soils were returned to the UST excavation (Enviros 1995).

2.2 Previous Field Investigations

As noted above, several previous site investigations have been completed at the site and are summarized in the October 31, 2017 Site Summary Report (Aerotech 2017d). CRETE supplemented the historical work by performing the following activities:

- Direct push soil and groundwater sampling, including assessment of soil conditions below the outdoor black dross pile
- Reassessment of the outdoor black dross pile volume
- Groundwater monitoring well sampling
- Off-Property sediment sampling
- Characterization of indoor stockpiles

This section presents a summary of the findings from the previous field efforts. Site investigation locations are identified on Figure 1, including historical sampling locations. Tables 1 through 10 provide a summary of waste pile, soil, groundwater, and sediment analytical results. Copies of analytical data reports collected in 2021 are included in Appendix A.

2.2.1 Waste Piles

Several waste piles remain on the Property from smelting aluminum between 1980 and 1986. Solid residues generated by aluminum smelting processes are often referred to as aluminum dross, which forms on the surface of molten aluminum through contact with oxygen during melting, holding, refining and transfer processes. Dross from the charge well of reverberatory furnaces at secondary aluminum processing facilities (also known as "black dross") typically contains a mixture of aluminum/alloy oxides and slag (a partially amorphous solid by-product of the smelting process), and contains approximately 12 to 18% recoverable aluminum and other metals such as arsenic, barium, copper, and mercury (USEPA 2015). Salt cake (fluorides and chlorides) is the residue remaining after the metallic value in dross or scrap has been thermally recovered in secondary aluminum processing facility rotary furnace. Baghouse dust (BHD) from smelting is generated from particulate air emissions collected in baghouse air pollution control equipment connected to a wide range of potential emission sources. The formation of BHD and the amount of BHD formed depend on several factors, such as type and quality of input material (e.g., aluminum scrap), operating conditions, and technology applied.

Some of the black dross was processed into aluminum oxide in 1990 with the intent of selling the aluminum oxide for use in an industrial process, such as cement manufacturing. A small portion of the outdoor stockpile at the northern end of the Property consists of aluminum oxide. Additional aluminum oxide is stockpiled inside the warehouse (Stockpiles A and E; Figure 2). Stockpiles B, C, and F may include black dross, oversized black dross screened prior to pilot testing, or furnace skimming. Stockpile D and the area immediately south of stockpile D contains KBI dross.

The bag house filters are still present as well as the previously documented bins containing BHD.

Outdoor Stockpile

The large outdoor stockpile was previously characterized as suitable for solid waste disposal at a permitted Subtitle D landfill (URS 2006; Ecology 2007). The majority of the pile contains black dross but some aluminum oxide is located at the northern tip of the pile. Volume and density estimates were provided in the Stockpile Survey and Assessment (Aerotech 2017a). Direct push boreholes were advanced through the pile in 2021 to better define the elevation of the base of the pile. This work resulted in an updated volume estimate of 29,300 cubic yards.

Indoor Stockpiles

The indoor stockpiles are a combination of black dross, washed oxides, KBI dross, and baghouse dust (bins).The interior piles are estimated to contain 1,100 CY in total.

Sampling of the indoor stockpiles was performed on November 30, 2021 to collect updated analytical data and to help identify the contents of each stockpile. Table 1 provides a

summary of the indoor stockpile data, including results from prior investigations. Based on these data, the contents of the stockpiles are assessed to be:

- Washed aluminum oxide – Stockpiles A and E
- Black dross or similar material, such as oversized black dross screened prior to pilot testing or furnace skimming - Stockpiles B, C, and F
- KBI dross – Stockpile D

BHD is contained in bins below the bag houses but was not sampled in 2021.

Extensive sampling and testing of the aluminum oxide was performed in 2021 (Table 2). The purpose of this sampling was to characterize the material for potential recycling at the Lafarge Cement plant in Richmond, British Columbia. The material was not accepted for recycling due to elevated sodium oxide, magnesium oxide, and chlorides. TCLP data (Table 1) are below Dangerous Waste criteria. Further data evaluation and sampling will be performed as needed to support waste disposal profiling.

The black dross stockpile data are generally consistent with results from the outdoor black dross pile (Table 1). TCLP data are below Dangerous Waste criteria, consistent with historical results. Further data evaluation and sampling will be performed as needed to support waste disposal profiling.

KBI dross and BHD were previously designated as Dangerous Waste due to rat and/or fish toxicity (E&E 1987, Ecology 2007). Further data evaluation and sampling will be performed as needed to support waste disposal profiling. The bag house filter media was sampled on November 30, 2021. Elevated metals were present and further sampling of this material to support waste disposal profiling will be performed.

2.2.2 Soil

Tables 3 through 6 provide a summary of available soil data from past sampling events.

In 2021, Direct push probes DPT-1 and DPT-2 (Figure 1) were advanced to assess petroleum impacts associated with the former diesel UST and associated piping. DPT-1 data and previous Phase II work (Stantec 2017) have confirmed that diesel-impacts in soil after UST removal in 1995 have attenuated. DPT-2 was advanced in a previously uninvestigated location associated with diesel piping that remains in-place, an in-ground vault (purpose unknown), and a possible former fuel dispenser location. Diesel was detected in soil at this location but at a concentration below the preliminary screening level.

Direct push probes DPT-3 through DPT-13 were advanced through the black dross pile in order to better estimate the dross volume and to assess the extent to which the dross pile may have impacted the underlying soil. Of the 7 samples collected and analyzed from immediately below the dross, all 7 had at least one analyte that exceeded a preliminary screening level. Aluminum, iron, and copper exceeded screening levels in 6, 7, and 5 samples,

respectively. Arsenic, cadmium, chromium, and zinc exceeded screening levels in 3 or fewer of the 7 samples.

Samples collected from 1 to 2 feet below the black dross pile were also analyzed in 5 of the 7 locations. Concentrations of all analytes generally decreased in these deeper samples. Aluminum and iron exceeded preliminary screening levels in all 5 samples. Only 1 location each for arsenic and copper slightly exceeded the preliminary screening level.

2.2.3 Groundwater

Six wells (MW-1 through MW-6) were installed in 1990. In 2017, three wells (MW-3A, MW-4A, and MW-5A) were installed as replacement wells for destroyed or missing wells. Monitoring well locations are shown on Figure 1. Groundwater has also been collected from direct push borings.

Historical data (Tables 7 and 8) indicate that aluminum, iron, arsenic, barium, chromium, lead, selenium, chloride, and fluoride exceeded cleanup levels from at least one location. Petroleum hydrocarbon and cPAH have also been detected in groundwater samples collected at the Property above screening levels.

In 2021 CRETE collected reconnaissance groundwater samples from push probe locations DPT-1 and DPT-2 (Figure 1, Table 7). Analysis for TPH using silica gel cleanup indicated that the TPH-Dx (without silica gel cleanup) concentration which exceeded the screening level at the former UST (DPT-1) is likely associated with TPH biodegradation byproducts or some other form of analytical interference (e.g. natural-occurring organics). Diesel was identified at DPT-2 at concentrations exceeding the preliminary screening level.

Monitoring well locations MW-3A, MW-4A, MW-5A, and MW-6 were located and sampled on June 3, 2021 (Figure 1, Table 7). The MW-2 location was overgrown and could not be accessed. MW-4, previously documented as missing (Aerotech 2017b), was located but could not be accessed. The monument at MW-5A was broken off but the well riser could still be accessed. Metals and salt ion (chloride and fluoride) samples were also collected from DPT-1 and DPT-2.

Figure 6 illustrates the estimated extent of groundwater that exceeds screening levels based on 2021 and previously collected data. Fluoride exceeds screening levels throughout the portion of the Property downgradient (northwest) of the dross pile except for the far northwest corner (MW-4A and DPT-1). Chloride exceedances of the screening level have the opposite distribution of fluoride, with the only exceedance occurring at MW-4A.

Metals (iron, arsenic, and manganese) exceeded screening levels at all locations analyzed except MW-3A. All 12 metals exceeded screening levels at MW-5A, although these results are likely biased high due to elevated turbidity in the sample. The only metal that exceeded the screening level at MW-6 and DPT-1 was copper.

2.2.4 Sediment

Figure 1 shows the historical sediment samples collected in the ditch/drainage features on and adjacent to the Property. Surface sediment samples (SS-1 and SS-2) were collected on October 28, 2016 from the drainage ditch. 2016 sampling results indicate that cadmium, chromium, copper, nickel, and silver exceeded cleanup levels in surface sediment samples collected adjacent to the dross pile.

Additional sampling was performed in 2021 and focused on estimating the extent of remaining sediment impacts in the stormwater pond and the off-Property ditch, shown on Figure 1 and Table 9. The sample collected from the stormwater pond indicated that some sediment remains that exceeds screening levels for metals (cadmium, copper, and zinc). The sample from the downstream end of the S. 202nd ditch had metal concentrations (cadmium, chromium, and copper) that exceeded the Sediment Cleanup Screening Level, while nickel also exceeds the Sediment Cleanup Objective (SCO).

Downstream of the S. 202nd ditch, a pipe conveys water beneath the Burlington Northern Santa Fe Railroad property to a wetland that is owned and managed by King County Drainage District #1. Samples were collected from the upstream (KCDD-S) and downstream (KCDD-N) ends of the wetland. All metals and salt ions were below screening levels at both locations.

2.3 Property Development

Currently the Property is being evaluated for potential cleanup and redevelopment. Cleanup activities are expected to include removing existing sources of contamination (including the dross piles) and removal and disposal of all above ground structures (warehouse and smaller support buildings and house). To facilitate redevelopment, work would include the realignment of the drainage ditch, wetland mitigation, and site grading. Figure 9 illustrates the conceptual development plan which includes a 178,000 square foot building.

3 Screening Levels and Constituents of Interest

Screening Levels (SLs) were developed in this RIWP to select constituents of interest (COIs) for further evaluation during the RI. COIs include any compound that has been detected above the screening level for each media. The RI/FS report will further evaluate these COIs to develop constituents of concern (COC) and Indictor Hazardous Substances (IHS), consistent with MTCA.

3.1 Soil Screening Levels

Soil SLs (Table 10) are protective of direct human contact (MTCA Method B) and soil leaching to groundwater (with subsequent discharge to surface water). Several SLs for metals are adjusted to natural background concentrations. The soil SLs for soil leaching to groundwater were calculated using the MTCA default assumptions. During the RI/FS, multiple lines of evidence related to exposure pathways and additional empirical data will be used to confirm or narrow the list of soil COIs to the COCs or IHSs.

3.1.1 Terrestrial Ecological Evaluation

Although the development plan has not been completed, it is anticipated that the Property and the eventual Site will be excluded from a terrestrial ecological evaluation (TEE) because all contaminated soil will be covered by buildings, pavement, or other physical barriers per WAC 173-340-7491(1)(b). As a result, potential TEE exposures were not incorporated into the soil SLs. The potential relevance of a TEE will be re-evaluated in the RI/FS.

3.2 Groundwater Screening Levels

Groundwater screening levels were developed consistent with the "most stringent surface water preliminary cleanup levels" according to Ecology Interim Policy 730: Taking into Account Federal Human Health Surface Water Quality Criteria under MTCA (Ecology January 11, 2021). Groundwater SLs (Table 11) are based on protection of fresh surface water (MTCA Method B and federal aquatic life and human health criteria) and protection of groundwater (MTCA Method B). Where relevant, the SLs have been adjusted upward based on PQLs or natural background concentrations. As with soil, the data collected in the RI/FS will be used to confirm or narrow the groundwater COI list to the groundwater COCs/IHSs.

3.3 Sediment

Fresh water Sediment Cleanup Objectives (SCOs; Table 12) were used as screening levels for ditch sediment samples.

3.4 COIs

The following COIs have been identified based on at least one detection over a screening level (Appendix B):

Soil:

- Metals (aluminum, antimony, arsenic, cadmium, chromium, cobalt, copper, iron, nickel, lead, silver, and zinc)
- TPH-Diesel (former UST area)

Water:

- Metals (aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, nickel, lead, and zinc)
- Chloride, fluoride, and ammonia
- TPH-Diesel (former UST area)

Sediment:

- Metals (arsenic, cadmium, chromium, copper, and nickel)

4 Conceptual Site Model and Data Gaps

This section presents a brief conceptual site model (CSM) based on currently-available information and identifies data gaps for the site. The field sampling planned to address the data gaps is discussed in Section 5.

4.1 Property Conditions

4.1.1 Physical Habitat Features

The Property is a 12.05-acre parcel located at 7730 South 202nd Street in Kent, Washington. The Property is developed with an approximately 45,000-square-foot building. An asphalt-paved parking lot is located between the building and the northern boundary of the Property. The Property is zoned for industrial development and the surrounding area includes predominantly industrial uses.

Christopher Ditch is located in the eastern portion of the Property. This ditch is considered a Minor Stream per Kent City Code (KCC). Category 2 and Category 3 Wetlands, under the KCC, have been delineated along portions of the ditch.

4.1.2 Geology and Hydrogeology

The Property is located in the lower Green River Valley, which runs north from Auburn to Renton. The valley is located within the Puget Sound Lowland. The physiography of this area has been dominated by the advance and retreat of continental glaciers during the Vashon Glaciation in the Pleistocene Epoch. The Vashon stade was the last glacial retreat and advance, which began to recede approximately 10,000 years before present (Stantec 2017).

Advance of the glaciers into western Washington carved out the Kent Valley while depositing outwash chiefly comprised of sand and gravel and dense compacted glacial till in the upland areas. Retreat of the glaciers left the valley as a deep marine embayment. The Green, White, and Cedar rivers deposited a thick accumulation of fluvial sediments, which were eroded from the glacial drift uplands into the valley. The remaining sediments consist of coarse sand and gravel near the mouth of the rivers at Auburn and Renton, and become finer toward the Kent area.

Data collected during environmental subsurface investigation activities at the Property indicates native unconsolidated sediments observed from the ground surface to the maximum depth explored (approximately 15 feet below ground surface (bgs)) are generally silty fine sand with some interbeds of fine and medium sand. Figures 4 and 5 present lithologic cross-sections of the Property.

The water table occurs at a depth of approximately 5 feet bgs. Previous reports indicate that groundwater migration is to the north-northwest. Local groundwater on the Property is likely

influenced by the ditches that cross the Property. Regionally, groundwater flow is to the northwest towards the Green River.

4.2 Sources

The primary source of contaminants of interest at the Property is the black dross pile, which has leached metals and salt to the subsurface. These compounds then migrate with the groundwater creating contamination observed in the shallow groundwater monitoring wells (Table 7). Concentrations are highest in the monitoring well (MW-5/5A) located to the north and west and immediately downgradient of the dross pile.

The Property is trisected by drainage ditches, portions of which run adjacent to the dross stockpile. Surface water runoff and erosion have transported dross into the ditches adjacent to the pile. Prior to interim actions, dross was transported downstream in the ditch and salts may have dissolved into the surface water. These processes may be continuing but to a much more limited extent. Stormwater in the drainage ditch is conveyed off of the Property to the west and eventually discharges to an unnamed tributary to Springbrook Creek.

4.3 Nature and Extent of Contaminants

Extent of Groundwater Impacts

Figure 6 illustrates the estimated extent of groundwater that exceeds screening levels based on 2021 and previously collected data. Fluoride exceeds screening levels throughout the portion of the Property downgradient (northwest) of the dross pile except for the far northwest corner (MW-4A and DPT-1). Chloride exceedances of the screening level have the opposite distribution of fluoride, with the only exceedance occurring at MW-4A.

Metals (iron, arsenic, and manganese) exceeded screening levels at all locations analyzed except MW-3A. All 12 metals exceeded screening levels at MW-5A, although these results are likely biased high due to elevated turbidity in the sample. The only metal that exceeded the screening level at MW-6 and DPT-1 was copper.

Data collected from perimeter wells (MW-3A, MW-4A and MW-6) located along the northwest and western Property boundary contain concentrations of contaminants associated with the dross stockpile (fluoride and metals) above regulatory standards and indicate that contaminants are migrating of the Property towards the north and northwest (Aerotech 2017c) as shown on Figure 1.

Diesel was identified at DPT-2 at concentrations exceeding the preliminary screening level. DPT-2 is upgradient from the former UST, suggesting that the extent of diesel impacts is limited to the former fuel dispenser area.

Extent of Soil Impacts

The extent of soil contamination is limited to locations under the dross pile. Soils under the exterior black dross pile are contaminated with metal COIs to a depth of 2 feet below the pile footprint.

Samples collected from the former UST and fuel dispenser indicate that TPH contamination may be present at the fuel dispenser. Additional data is needed to define the extent of this contamination in soil.

Extent of Sediment Impacts

Sediment sample locations from the ditch and tributaries are shown on Figure 6. Data collected confirms that runoff from the black dross pile has carried source material into the ditch. Additional data is needed to define the extent of this contamination.

4.4 Potential Transport Mechanisms

Contaminant release mechanisms refer to the manner in which contaminants are released from the primary source. Primary release mechanisms are associated with dross pile and the former UST area. Urban and industrial sources outside the Property could also have resulted in releases to sediment, soil, groundwater, stormwater, or air within or adjacent to the Property boundaries. Potential transport mechanisms include the following:

- Soil leaching to groundwater – The primary groundwater metals plume is coincident with these soil impacts suggesting that soil leaching to groundwater may be occurring in this area of the Property.
- Groundwater transport and potential discharge to surface water - Groundwater metal concentrations have the potential to migrate to sediment and surface water through the drainage ditch which ultimately flows into the Green River.
- Surface Water Runoff – Currently there are no stormwater catch basins or controls on the Property. Surface water flowing across the Property has the potential to flow into one of the wetlands or drainage ditch (and tributaries) which ultimately flows into the Green River. Sediment has the potential to be transported with surface water flow into the wetlands or drainage ditch (and tributaries).

4.5 Potential Ecological and Human Receptors

Potential human exposure scenarios are described qualitatively below. If required, subsequent quantitative analysis may occur as part of the RI.

Ecological and human receptors could be directly or indirectly exposed to contaminants in soil, sediment, and surface water as follows:

- Direct contact or ingestion with soil – Direct contact (incidental ingestion and dermal contact) could occur in areas where soil or source material (dross) is currently exposed or where soil could become exposed during construction.
- Surface water and sediment – Direct contact (incidental ingestion and dermal contact) could occur in areas where soil or source material (dross) has deposited within the sediment or is dissolved in surface water.

There is no direct contact with groundwater at the Property (i.e., groundwater is not currently being used for drinking water), nor is there any reasonable expectation of direct contact in the future. Drinking water for the site is and the surrounding area is supplied by the local public utility district (PUD). The City of Kent obtains its water from the water supply wells throughout the city limits. The closet well to the site is upgradient of the site and drilled 100 feet below ground surface, in alluvial materials (Washington State Well Report Survey, accessed on 2/3/2022).

4.6 Data Gaps

Based on historical operations and data previously collected at the Property, the following data gaps have been identified for evaluation during the RI:

- **Indoor Stockpile Characterization:** Additional data is needed to profile the indoor stockpiles for disposal.
- **Potential Diesel Source:** The reconnaissance groundwater sample collected at DPT-1 and DPT-2 (2021) identified SL exceedances for TPH-diesel range compounds in groundwater and one detection of TPH-Dx in soil (DTP-2, saturated sample 2021). Additional soil and groundwater data is needed in the vicinity of DPT-2 to define the source of the TPH and possible extents.
- **Replacement of Existing Wells:** Several site wells are damaged (MW-5A, MW-2, MW-4A) and all wells are small diameter wells (1-inch wells) that have not been maintained. Future construction will require wells to be abandoned and installed in locations that remain accessible. Most monitoring wells will be abandoned and replaced. All wells will meet the standards of WAC 173-160.
- **Extent of Metals Contamination:** Based on groundwater results from Property boundary wells (MW-3, MW-4A, and MW-6), groundwater contaminated with metals and fluoride are potentially migrating the west and northwest of the Property. MW-1, located upgradient of the source, has not been sampled since 1990. This well should be developed and re-sampled to confirm the detections present in data collected in 1990. Additional groundwater samples are required along the Property line and or downgradient of the Property boundary to provide further information to delineate the groundwater plume.
- **S. 202nd Right-of-Way Ditch:** Contaminated sediment has been identified on the Property and in the downstream ditch in the S. 202nd right-of-way. Additional

samples will help to fully delineate the extent of sediment exceeding cleanup levels in S. 202nd Street ditch.

5 RI Field Sampling Plan

Based on data gaps identified in Section 4.5, additional soil, groundwater and sediment data collection is proposed in this RIWP. Additional environmental samples are shown on Figures 7 and 8. Table 13 summarizes sample locations. Specific sampling protocols are described in the QAPP (Appendix C) and health and safety protocols are included in the project Health and Safety Plan (Appendix D).

5.1 Monitoring Well Abandonment and Installation

5.1.1 Monitoring Well Abandonment

Existing site monitoring wells (MW-1 through MW-6, including MW-3A, MW-4A and MW-5A) will be evaluated and potentially decommissioned. Wells will be decommissioned in accordance with the Ecology's Water Well Construction Act (1971), RCW 18.104 (WAC 173-160-460).

5.1.2 Monitoring Well Installation

Wells will be installed in accordance with Washington Administrative Code (WAC) 173-160. As the soil cuttings are removed, field staff will log visual observations, similar to those for soil sampling, on a well log/well construction diagram.

5.2 Soil Sampling

For subsurface soil sample collection, a Washington-licensed driller will complete direct push borings or a hollow stem auger using a 2-inch diameter sampler. Drill rigs tools (augers and push probe) will be decontaminated before each use. Drill cuttings and decontamination water will be drummed for appropriate disposal. Surface soil samples will be collected using disposable sampling spoons, new spoons at each sample location and depth.

For direct push borings, soil will be removed from the subsurface in 5-ft sleeves. Each sleeve will be cut open on a table and positioned with the upper end at the same side of the table each time. A photograph of the open sleeve placed next to a tape measure will be taken of each 5-foot sleeve. Percent recovery for the sleeve as a whole, and for any specific portions of the sleeve that differ from the general recovery will be recorded on a field form/boring log. As soon as feasible after the core sleeve is opened, the photo-ionization detector will be scanned over the soil for a qualitative indication of soil quality. Any areas with measurement spikes will be evaluated more closely. For hollow stem auger, split spoons samples will be collected every 2.5 feet. Information will be recorded similar to the direct push borings.

Subsurface and surface soil will be visually classified, and the following information will be recorded:

- Depth of visual observations and sample collection, with sample ID

- Physical soil description (soil type and color, stratification per ASTM 2488)
- Other distinguishing characteristics or features, such as debris or concrete
- If odors are noted, a photo-ionization detector reading will be recorded by placing soil in a plastic bag, shaking it, and inserting the probe into the bag; indigo-blue dye test kits may also be used for soils exhibiting gasoline- or diesel-like odors.
- Qualitative moisture content (dry, damp, moist, wet, saturated).

Gloves will be changed between samples. Stainless steel spoons will be decontaminated prior to each use (and between samples). Sample containers will be clearly labeled with sample ID, collection date and time, and project name, and then placed in an iced cooler for delivery to the laboratory within 24 hours of sample collection. Chain of custody will be maintained. The sample ID is the boring name (including initials for the subarea) and the depth below ground surface.

5.3 Groundwater Sampling from Soil Boring Locations

Groundwater samples collected from soil boring locations will be collected with a temporary screen, placed to intercept the water table, and peristaltic pump as follows:

- Lower the new, clean polyethylene tubing into the well until the tubing intake is in the middle of the screened interval, or slightly above the middle of the screened interval. Secure the tubing to the top of the well and leave approximately 5 feet of tubing outside the well. Attach a 1-foot length of silicon tubing that is appropriate for a peristaltic pump to the polyethylene tubing.
- Attach the silicon tubing to the peristaltic pump. Purge (remove with pump) water from the well into a calibrated 5-gallon pail or similar and monitor flow rate.
- Purge at approximately 100-300 milliliters (0.03-0.09 gallons) per minute until turbidity has decreased. The goal is to create minimal screen velocities during purging such that fines, which may bias sampling results, are not captured. This goal may be difficult to achieve under some circumstances and may require adjustment based on site-specific conditions and professional judgment.
- Sampling may begin when turbidity has stabilized. Other field parameters at the time of sampling will be recorded. Field instruments are to be calibrated prior to use, according to the manufacturer's instructions.
- Collect samples of water for laboratory analysis in a manner that minimizes volatilization of potential contaminants from the water into the air. Hands and clothing will be clean when handling sampling equipment and during sampling.
- Clean, disposable, latex, nitrile, or equivalent–material gloves will be worn when filling bottles for analyses. Gloves will be changed when dirty and between samples.

- All water samples will be collected from the pump discharge lines directly into the appropriate sample containers following the procedures described for filling sampling containers from monitoring wells (Section 5.5).

Dissolved metals samples will be field filtered. All sample preparations for TPH-diesel analysis will use silica gel cleanup. Specific sampling protocols are described in the QAPP (Appendix C).

5.4 Sampling from Monitoring Wells

Following well installation, the well will be developed by surging and bailing or pumping until turbidity has decreased and stabilized. At least three casing volumes should be purged during development. Field measurements (turbidity, temperature, pH) collected during well development and the volume of water removed will be recorded on a field form. The well will be allowed to sit for a minimum of seven days prior to sampling to allow bentonite seals to set.

Groundwater sampling will include measurement of field parameters to evaluate stability of groundwater collected from wells and in support of fate and transport analyses. Field water quality instruments will be calibrated at the beginning (prior to sampling) and middle of each day. Calibration data will be recorded on a field form or log book.

New, disposable, polyethylene tubing will be used to draw water from each monitoring well. The following tasks will be performed at each well:

- Measure and record static water level (distance from top of casing) to the nearest 0.01 foot using an electric well sounder and measuring tape.
- Use the EPA Low-Flow Groundwater Sampling Procedure (EPA, 2010b). This procedure includes several steps and can be summarized as follows. First, purge groundwater at a low rate (~100-200 mL/min). Second, monitor the discharge water for temperature, pH, and specific conductance at least three times during the purging period. Third, measure the purge volume using a calibrated bucket. Fourth, record purge water volume, time, and field parameter values in the field notes.
- Sampling may begin after three consecutive field parameter measurements (temperature, specific conductance, and pH) are stable. Continue purging water until three consecutive stable measurements are recorded. Sampling may be conducted without stabilization if the parameter trends are reasonably attributed to in-aquifer variability such as tidal flux.
- Collect samples of water for laboratory analysis in a manner that minimizes volatilization of constituents. Hands and clothing will be clean when handling sampling equipment and during sampling. Clean, disposable, latex gloves will be worn when filling bottles for analyses. Gloves will be changed when dirty and between samples. All water samples will be collected from the pump discharge

lines directly into the appropriate sample containers. Samples submitted for dissolved metals analyses only will be filtered in the field prior to filling the sample container.

Stable is defined as:

- Specific conductance and temperature that do not indicate a trend (continuously increase or decrease between readings) and do not vary by more than 10 percent between readings.
- pH measurements that do not vary by more than 0.1 pH units between readings.

Dissolved metals samples will be field filtered. All sample preparations for TPH-diesel analysis will use silica gel cleanup. Specific sampling protocols and the container and preservative requirements are listed in the QAPP (Appendix C).

5.5 Surface Sediment Sampling

Ditch sediment samples will be collected with a handheld tool, such as a trowel, to collect surficial soil (0 to 0.5 ft bgs) into a stainless steel bowl. Samples will also be collected 0.5-1 and 0.5-1.0 ft bgs, these will be sampled with a hand auger or similar tool that will be decontaminated prior to use at each sample location.

5.6 Indoor Stockpile Sampling

The indoor stockpiles are a combination of black dross, washed aluminum oxide, KBI dross, and BHD. The indoor stockpiles require additional characterization under 173-303-090 WAC and 173-303-100 WAC.

Six distinct stockpiles and several metal bins are located in the building. The KBI dross and BHD were previously designated as Dangerous Waste (E&E 1987). Recent sampling of these piles is documented in Section 2.2.1. Some additional sampling and analysis is required to profile the waste for disposal. The sampling methods proposed are consistent will the Ecology-approved sampling approach for the outdoor stockpile (URS 2005).

The indoor stockpiles will be separated into decision units of 600 cubic yards or less of waste. In June 2021, the indoor stockpiles were measured and estimated to be less than 180 cubic yards each. Waste material from each decision unit will be sampled and analyzed for: total metals; potassium, sodium, chloride cations/anions; toxicity characteristic leachate procedure (TCLP); reactivity, corrosivity, and ignitability (RCI); pH; and total chromium, copper, nickel, and zinc. If sample results trigger additional analysis, fish toxicity (bioassay) will be completed for the most contaminated samples. Additional analyses may be requested by the disposal facility and will be determined at a later date.

Samples from piles Pile-A through Pile-F will be grab samples. For each pile, the sampling will be conducted through the entire depth of the pile at the given sample location using a hand

auger. Waste material will be laid out in sequence on plastic sheeting for inspection and sampling. Maximum stockpile high is estimated to be 6 feet. Each auger bucket of waste material will be emptied in sequence from top to bottom on the plastic sheeting.

Up to 8 small bins of BHD may be present in the building. For these bins, representative composite samples will be collected by hand augering through the waste in each bin.

6 References

Aerotech 2017a. Stockpile Survey and Assessment performed for Former Maralco Aluminum Site. May 31, 2017.

Aerotech 2017b. Groundwater Well Survey performed for Former Maralco Aluminum Site. June 7, 2017.

Aerotech 2017c. Groundwater Monitoring Well Installation Report performed for Former Maralco Aluminum Site. August 15, 2017.

Aerotech 2017d. Site Summary Report performed for Former Maralco Aluminum Site. October 31, 2017.

Ecology and Environment 1987. Site Assessment Report, Maralco Aluminum, Kent, Washington. October 1987.

EMR Incorporated 2003. Revised Wetland Delineations for Maralco Site, Kent, Washington. April 2003.

Environmental Management Resources 2003. Remedial Investigation/Feasibility Study for the Former Maralco Site, Kent, Washington.

Enviros 1995. Underground Storage Tank Decommissioning at the Maralco Aluminum Site, 7730 South 202nd Street, Kent, Washington.

Morrison-Knudsen Environmental Services 1991. Draft Phase I Remedial Investigation Report, Maralco Site. Kent, WA.

Stantec 2015. Phase I ESA, Former Maralco Aluminum Site, 7730 South 202nd Street, Kent, Washington.

Stantec 2017. Limited Phase II Environmental Site Assessment Report. March 31, 2017.USEPA 2015. Secondary Aluminum Processing Waste: Baghouse Dust Characterization and Reactivity. EPA/600/R-15/204. April 2015.

URS Corporation 2000. Black Dross Pile Characterization, Maralco Aluminum Site, Kent, Washington. August 31, 2000

URS Corporation 2004. Draft Cleanup Action Plan, Maralco Redevelopment Project.

URS Corporation 2005. Sampling and Analysis Plan/Quality Assurance Project Plan, Maralco Restoration Project, 7730 South 202nd Street, Kent, Washington. September 9, 2005.

URS Corporation 2006. Draft Dross Sampling and Waste Determination, Maralco Restoration Project, Kent, Washington. April 27, 2006.

URS Corporation 2011. Proposal, Environmental Services, Maralco Restoration Project, South 202nd Street, Kent, Washington.

Washington State Department of Ecology 2007. Hazardous Waste and Toxics Reductions Program, Maralco Project File: Maralco Site Waste Characterization Project, June 2004 to February 2007. August 30, 2007.

Tables

Table 1 - Stockpile Data Summary
Maralco Property - Kent, WA

Sample ID:		Bags	Pile-A	Pile-B	Pile-C	Pile-D	Pile-E	Pile-F	C1	C1 Duplicate	C2	G1	G2	C3	C4	BH-1	BH-2	BD-5	BD-6	BD-8	BD-9	BD-10	BD-11	BD-12	BD-13	BD-14	BD-15	BD-16	BD-17
Date:		11/30/2021	11/30/2021	11/30/2021	11/30/2021	11/30/2021	11/30/2021	11/30/2021	June-87	June-87	June-87	June-87	June-87	June-87	June-87	January-90	January-90	January-90	January-90	January-90	January-90	January-90	January-90	January-90	January-90	January-90	January-90	January-90	January-90
Source Report:			*CRETE 2021-2022*						*Site Assessment Report, E&E 1987*							*Draft Phase I Remedial Investigation Report, MKE 1991*														
Material Pile:		Indoor	Indoor	Indoor	Indoor	Indoor	Indoor	Indoor			Aluminum Oxide		Yellow Dross	KBI Dross	Baghouse Dust	Baghouse Dust	Baghouse Dust	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor
		Filter Bag Media	Washed Oxides			KBI Dross	Washed Oxides		Outdoor Dross	Outdoor Dross	Outdoor Dross	Gray Substance	Outdoor Dross	Indoor Dross	Indoor Dross	Indoor Dross	Indoor Dross	Black Dross	Black Dross	Black Dross	Black Dross	Black Dross	Black Dross	Black Dross	Black Dross	Black Dross	Black Dross	Black Dross	Black Dross	Black Dross
pH	S.U.	**4.5**	**8.7**	**8.2**	**8**	**8**	**8.7**	**8.4**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Total Sulfide	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Fluoride	mg/kg	**150**	----	**1,400**	**2,200**	**340**	----	**460**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Potassium	mg/kg	**1,240**	----	**47,100**	**8,330**	**29,200**	----	**8,640**	----	----	----	----	----	----	----	**190,000**	**86,600**	**17,300**	**43,400**	**115,000**	**70,700**	**27,900**	**57,000**	**29,000**	**22,400**	**33,600**	**17,500**	**42,000**	**22,000**
Chloride	mg/kg	**14,000**	----	**85,000**	**20,000**	**59,000**	----	**6,700**	----	----	----	----	----	----	----	**140,642**	**150,755**	**15,752**	**59,427**	**131,988**	**95,593**	**2,025**	**41,901**	**20,541**	**30,614**	**5,728**	**1,655**	**80**	**108**
Ammonia	mg/kg	**2,010**	----	**180**	----	**958**	----	**33.2**	----	----	----	----	----	----	----	**292**	**188**	**153**	**686**	**149**	**95**	**26**	**109**	**46**	**101**	**197**	**145**	**61**	**109**
Kjeldahl Nitrogen	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**884**	**677**	**4,089**	**3,006**	**554**	**664**	**398**	**824**	**684**	**856**	**879**	**777**	**646**	**795**
Cyanide	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**0.67**	**0.42**	**1.3**	**1.5**	**0.66**	**0.56**	**1.04**	**1.07**	**1.53**	**1.08**	**1.51**	**0.7**	**0.74**	**1.49**
Calcium	mg/kg	----	**116,100**	----	----	----	**11,100**	----	----	----	----	----	----	----	----	**2840**	**4200**	**6,800**	**4,340**	**5,120**	**5,000**	**23,000**	**7,600**	**12,500**	**4,700**	**6,700**	**7,350**	**13,900**	**10,100**
Metals - Method SW6010/6020																						Metals - Method SW6010/6020							
Aluminum	mg/kg	**169,000**	**15,100**	**134,000**	**178,000**	**194,000**	**144,000**	**210,000**	----	----	----	----	----	----	----	**172,000**	**130,000**	**211,000**	**155,000**	**130,000**	**140,000**	**194,000**	**147,000**	**185,000**	**153,000**	**166,000**	**175,000**	**145,000**	**18,600**
Boron	mg/kg	**19.5**	----	**151**	**17.2**	**651**	----	**241**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	mg/kg	**122,000**	----	**3,350**	**4,020**	**3,500**	----	**6,290**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Magnesium	mg/kg	2.6 U	**20,100**	**11,000**	**2,800**	**4,800**	**19,200**	**7,300**	----	----	----	----	----	----	----	**19,200**	**15,000**	**21,600**	**20,500**	**24,800**	**22,800**	**30,000**	**27,500**	**39,600**	**19,700**	**24,300**	**33,200**	**38,200**	**61,700**
Sodium	mg/kg	**1,320**	----	**49,100**	**58,800**	**25,100**	----	**9,020**	----	----	----	----	----	----	----	**93,100**	**65,000**	----	----	----	----	----	----	----	----	----	----	----	----
Strontium	mg/kg	**1.64**	**355**	**156**	**35.3**	**258**	**300**	**167**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Titanium	mg/kg	**89.2**	**2590**	**543**	**245**	**181**	**2560**	**377**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Metals - Method SW6010/6020																						Metals - Method SW6020							
Antimony	mg/kg	**23.9**	**21**	**18.4**	**17.8**	**5.49**	**18**	**7.9**	**19**	**16**	**57**	**3.1**	**20**	**2.9**	**107**	3.15 ND	----	2.88 ND	2.89 ND	----	2.78 ND	**4.65**	----	**3.9**	----	**3**	----	----	----
Arsenic	mg/kg	**3.23**	**8**	**3.93**	1 U	**1.15**	**7**	**3.65**	**8.6**	**7.2**	**4.1**	**3.9**	**4.5**	**1.5**	**3.8**	0.633 ND	----	**0.722**	**2.75**	----	**1.94**	**8.61**	----	**4.87**	----	**5.25**	----	----	----
Barium	mg/kg	----	**115**	----	----	----	**112**	----	----		----	----	----	----	----	**65.2**	**81.2**	**91.5**	**66.1**	**61.5**	**76.4**	**120**	**128**	**152**	**66.8**	**86.6**	**105**	**167**	**236**
Beryllium	mg/kg	----	**3**	----	----	----	**3**	----	**6**	**7.2**	**26**	**14**	**6**	**3.9**	2.0 ND	**1.26**	----	**2.6**	**1.88**	----	**1.94**	**8.377**	----	**5.65**	----	**2.8**	----	----	----
Cadmium	mg/kg	**5.46**	**4.4**	**4.35**	**1.93**	**9.23**	**4.3**	**4.55**	**7.5**	**6.8**	**3.4**	**1.2**	**4.1**	**13**	**19**	**2.05**	----	**5.19**	**2.31**	----	**2.36**	**6.98**	----	**7.8**	----	**5.07**	----	----	----
Chromium	mg/kg	**583**	**231**	**201**	**86.1**	**2,350**	**214**	**171**	**588**	**637**	**442**	**233**	**186**	**975**	**21**	**153**	**189**	**196**	**119**	**412**	**120**	**349**	**140**	**1,860**	**1,200**	**324**	**146**	**322**	**207**
Cobalt	mg/kg	20 U	4	**2.59**	**1.29**	**3.65**	**4**	**2.58**	----		----	----	----	----	----	**4.1**	----	**7.36**	**3.47**	----	**11**	**6.28**	----	**8.38**	----	----	**7.52**	----	----
Copper	mg/kg	**8,350**	**2,340**	**5,010**	**4,810**	**5,430**	**2,340**	**4,460**	**13,300**	**27,800**	**2610**	**2190**	**2710**	**5120**	**198**	**1,200**	**1,420**	**2,860**	**1,660**	**1,200**	**746**	**4,600**	**2,100**	**2,180**	**1,600**	**5,400**	**1,290**	**2,100**	**1,300**
Iron	mg/kg	----	**9,900**	----	----	----	**10,200**	----	----		----	----	----	----	----	**3,630**	----	**8100**	**3040**	----	**6700**	**6500**	----	**6000**	----	----	**7200**	----	----
Lead	mg/kg	**345**	**165**	**235**	**192**	**106**	**163**	**94.3**	**861**	**241**	**226**	**146**	**176**	**307**	**587**	**110**	**108**	**144**	**115**	**93.1**	**97.2**	**116**	**129**	**214**	**103**	**81.1**	**70**	**172**	**176**
Manganese	mg/kg	**1,340**	**1,340**	**1,160**	**403**	**3,240**	**1,280**	**1,640**	----		----	----	----	----	----	**1510**	**1100**	**19,600**	**1,070**	**1,000**	**986**	**893**	**827**	**1,060**	**1,200**	**841**	**1,220**	**879**	**1,270**
Mercury	mg/kg	----	0.5 U	----	----	----	0.5 U	----	0.2 ND	0.2 ND	0.2 ND	0.1 ND	**0.27**	**0.44**	**0.49**	**0.26**	----	**0.351**	**0.064**	----	**0.059**	**0.238**	----	**0.155**	----	----	**0.076**	----	----
Nickel	mg/kg	**318**	**67**	**111**	**59.2**	**61.2**	**69**	**66**	**438**	**355**	**118**	**110**	**47**	**81**	**15**	**31.5**	----	**67.9**	**39.1**	----	**36.1**	**115**	----	**56.5**	----	----	**57.7**	----	----
Selenium	mg/kg	----	**<3**	----	----	----	**<3**	----	0.3 ND	0.3 ND	0.3 ND	0.3 ND	**0.48**	0.2 ND	**1.5**	0.633 ND	----	0.577 ND	0.578 ND	----	0.555 ND	0.931 ND	----	0.780 ND	----	----	0.700 ND	----	----
Silver	mg/kg	----	**1**	----	----	----	**1**	----	3.0 ND	3.0 ND	3.0 ND	3.0 ND	3.0 ND	0.2 ND	**6.9**	1.57 ND	----	1.44 ND	1.45 ND	----	1.39 ND	2.33 ND	----	1.95 ND	----	----	1.75 ND	----	----
Thallium	mg/kg	----	0.5 U	----	----	----	0.5 U	----	0.5 ND	0.5 ND	0.5 ND	0.5 ND	0.5 ND	0.4 ND	**0.71**	0.633 ND	----	0.577 ND	0.578 ND	----	0.555 ND	0.931 ND	----	0.780 ND	----	----	0.700 ND	----	----
Vanadium	mg/kg	----	**199**	----	----	----	**197**	----	----		----	----	----	----	----	**84.7**	----	**137**	**84.8**	----	**197**	**98.4**	----	**280**	----	----	**124**	----	----
Zinc	mg/kg	**5,070**	**1,950**	**2,950**	**3,270**	**1,030**	**1,860**	**1,480**	**7,600**	**6,960**	**1,760**	**1,140**	**1,130**	**3,020**	**16,500**	**773**	**871**	**2,000**	**1,060**	**952**	**634**	**6,100**	**1,730**	**2,000**	**780**	**2,820**	**1,320**	**1,870**	**960**
TCLP Metals - Method SW6020, 1311																						TCLP Metals - Method SW6020							
Aluminum	mg/L	----	----	----	----	----	----	----	----		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	mg/L	1 U	0.002 U	1 U	1 U	1 U	0.002 U	1 U	0.002 ND	0.002 ND	0.002 ND	0.002 ND	0.002 ND	0.002 ND	0.002 ND	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	mg/L	1 U	**0.09**	1 U	1 U	1 U	**0.09**	1 U	**0.82**	**0.82**	**0.01**	**0.29**	**0.66**	**0.60**	**0.30**	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	mg/L	1 U	**0.010**	1 U	1 U	1 U	**0.012**	1 U	**0.14**	**0.01**	**0.016**	**0.01**	**0.05**	**0.01**	**0.25**	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	mg/L	1 U	**0.018**	1 U	1 U	1 U	**0.012**	1 U	**0.1**	**0.08**	**0.05**	**0.03**	**0.014**	**0.047**	**0.024**	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cr(VI)	mg/L	----	----	----	----	----	----	----	----		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	mg/L	----	**5.2**	----	----	----	**5**	----	**38**	**27.0**	**6.20**	**1.10**	**2.50**	**13.0**	**0.29**	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	mg/L	**2.1**	0.05 U	1 U	1 U	1 U	0.05 U	1 U	**1.6**	**1.30**	**0.11**	**0.05**	0.05 ND	**0.20**	**0.12**	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	mg/L	0.1 U ht	0.001 U	0.1 U ht	0.1 U ht	0.1 U ht	0.001 U	0.1 U ht	0.002 ND	0.002	0.001 ND	**0.001**	0.001 ND	**0.001**	**0.002**	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Selenium	mg/L	1 U	**0.003**	1 U	1 U	1 U	0.002 U	1 U	0.002 ND	0.002 ND	0.002 ND	**0.002**	0.002 ND	0.002 ND	**0.004**	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	mg/L	1 U	0.005 U	1 U	1 U	1 U	0.005 U	1 U	0.01 ND	0.01 ND	0.01 ND	**0.01**	0.01 ND	0.01 ND	**0.08**	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	mg/L	----	**8.3**	----	----	----	**7.4**	----	**78**	**16**	**16**	**2.20**	**7.70**	**23**	**605**	----	----	----	----	----	----	----	----	----	----	----	----	----	----

NOTES:
Bold - analyte detected
Value exceeds WAC 173-303 Toxicity Maximum Concentration.
---- not analyzed/no data
U - not detected at listed reporting limit
NA - not available or not applicable; insufficient results to calculate
ND - not detected (reporting limit not available)
J - laboratory estimated value
ht - Laboratory analysis performed outside the method holding time.

Table 1 - Stockpile Data Summary
Maralco Property - Kent, WA

Sample ID:		BD-18	TC-1	TC-2	TC-3	TC-4	TC-5	HA-2-9.5	Composite 1	Composite 2	Composite 3	Composite 4	DP-1-1'	DP-2-3'	DP-3-3'	DP-4-3'	B-1-S	B-1-S DUP	B-1-D	B-2-S	B-2-D	B-3-S	B-3-D	B-4-S	B-4-M	B-4-D	B-5-S	B-5-D	B-6-S	B-6-M	B-7-S	B-7-M	B-7-M DUP	B-7-D	B-8-S	B-8-M
Date:		January-90	9/11/90	9/11/90	9/11/90	9/11/90	9/11/90	07/06/90	07/06/00	07/06/00	07/06/00	07/06/00	02/04/03	02/04/03	02/04/03	02/04/03	10/19/05	10/19/05	10/19/05	10/19/05	10/19/05	10/19/05	10/19/05	10/19/05	10/19/05	10/19/05	10/19/05	10/19/05	10/20/05	10/20/05	10/20/05	10/20/05	10/20/05	10/20/05	10/19/05	10/19/05
Source Report:								*Black Dross Pile Characterization, URS 2000*					*Draft RI/FS, EMR 2003*				*Dross Sampling and Waste Determination, URS 2006*																			
Material Pile:		Outdoor	Presumably Black Dross					Outdoor Black Dross					Outdoor			Outdoor	Outdoor											Outdoor							
		Black Dross	For TCLP only during Pilot Plant										Black Dross			Washed Oxides	Black Dross											Black Dross							
pH	S.U.	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Total Sulfide	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Fluoride	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Potassium	mg/kg	**21,700**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**38,000**	**45,300**	**23,600**	**42,600**	**38,200**	**4,110**	**6,260**	**7,210**	**6,850**	**12,000**	**32,200**	**47,800**	**112,000**	**108,000**	**120,000**	**140,000**	**142,000**	**123,000**	**20,900**	**101,000**
Chloride	mg/kg	**81**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	5.81 UJ	**209 J**	**14**	**523**	**32.9**	**21.4**	**106**	**11.6**	**39.7**	**16.4**	**6,550**	**104,000**	**283,000**	**213,000**	**169,000**	**276,000**	**261,000**	**258,000**	**781**	**176,000**
Ammonia	mg/kg	**64**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	6.73 U	4.33 U	8.15 U	5.69 U	7.10 U	6.75 U	3.74 U	6.47 U	5.38 U	4.37 U	4.75 U	**15.3**	**88.3 J**	**280 J**	**261 J**	**449**	**336**	**276 J**	**4.87**	**113**
Kjeldahl Nitrogen	mg/kg	**658**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cyanide	mg/kg	**1.43**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Calcium	mg/kg	**1,000**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Metals - Method SW6010/6020																																				
Aluminum	mg/kg	**181,000**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Boron	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Magnesium	mg/kg	**45,000**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Sodium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**23,600**	**24,700**	**20,900**	**27,200**	**26,200**	**4,590**	**4,500**	**7,200**	**7,240**	**8,550**	**18,800**	**41,500**	**119,000**	**81,300**	**74,900**	**101,000**	**108,000**	**116,000**	**12,100**	**67,500**
Strontium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Titanium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Metals - Method SW6010/6020																																				
Antimony	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	mg/kg	**289**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Beryllium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	mg/kg	**172**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cobalt	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	mg/kg	**1,100**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**2,180 J**	**1,870 J**	**1,000**	**4,760**	**2,740**	**1,090**	**2,480**	**2,320**	**5,730**	**1,770**	**1,520**	**2,470**	**797**	**1,160**	**864**	**1,320 J**	**2,460 J**	**535**	**1,470**	**1,220**
Iron	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	mg/kg	**168**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	mg/kg	**1,100**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**48.2 J**	**60.6 J**	**35.2**	**142**	**67.2**	**34.8**	**100**	**72.8**	**110**	**45.5**	**39**	**74.6**	**37.8**	**32.5**	**26.7**	**27.1**	**24.7**	**16.8**	**51.5**	**35.3**
Selenium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Thallium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	mg/kg	**864**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**3,520 J**	**1,500 J**	**767**	**4,250**	**1,780**	**529**	**1,670**	**1,360**	**2,210**	**846**	**700**	**1,180**	**865**	**780**	**609**	**696 J**	**1,000 J**	**524**	**882**	**1830**
TCLP Metals - Method SW6020, 1311													Metals - Method 7030/7020/7061																							
Aluminum	mg/L	----	----	----	----	----	----	----	----	----	----	----	**3,000**	**1,400**	**2,000**	**2,300**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	mg/L	----	0.2 ND	----	0.2 ND	----	0.2 ND	0.5 ND	0.5 ND	0.5 ND	0.5 ND	0.5 ND	ND	ND	ND	ND	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Barium	mg/L	----	1.0 ND	----	1.0 ND	----	1.0 ND	1.0 ND	1.0 ND	1.0 ND	1.0 ND	1.0 ND	----	----	----	----	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Cadmium	mg/L	----	0.05 ND	----	0.05 ND	----	0.05 ND	0.005 ND	0.005 ND	**0.000711**	**0.00651**	0.005 ND	ND	ND	ND	ND	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Chromium	mg/L	----	0.1 ND	----	0.1 ND	----	0.1 ND	0.001 ND	**0.012**	**0.0173**	**0.0196**	**0.0212**	----	----	----	----	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Cr(VI)	mg/L	----	ND	----	ND	**0.087**	**0.092**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	mg/L	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	mg/L	----	**0.2**	----	0.1 ND	----	0.1 ND	0.2 ND	0.2 ND	0.2 ND	0.2 ND	0.2 ND	----	----	----	----	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Mercury	mg/L	----	0.001 ND	----	0.001 ND	----	0.001 ND	0.001 ND	0.001 ND	0.001 ND	0.001 ND	0.001 ND	----	----	----	----	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U
Selenium	mg/L	----	0.05 ND	----	0.05 ND	----	0.05 ND	0.15 ND	0.15 ND	0.15 ND	0.15 ND	0.15 ND	----	----	----	----	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Silver	mg/L	----	**0.07**	----	0.05 ND	----	0.05 ND	0.05 ND	0.05 ND	0.05 ND	0.05 ND	0.05 ND	----	----	----	----	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Zinc	mg/L	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

NOTES:
Bold - analyte detected
Value exceeds WAC 173-303 Toxicity Maximum Conc
---- not analyzed/no data
U - not detected at listed reporting limit
NA - not available or not applicable; insufficient resul
ND - not detected (reporting limit not available)
J - laboratory estimated value
ht - Laboratory analysis performed outside the metho

Table 1 - Stockpile Data Summary
Maralco Property - Kent, WA

Sample ID:		B-8-D	B-9-S	B-9-M	B-10-S	B-10-M	B-11-S	B-11-M	B-12-S	B-12-M	B-12-D	B-13-S	B-13-D	B-14-S	B-14-D	B-15-S	B-15-D	B-15-D DUP	B-16-S	B-16-M	B-16-D	B-17-S	B-17-M	B-17-D	B-18-S	COMP-1	COMP-2	COMP-3	COMP-4	COMP-5	COMP-6	COMP-7
Date:		10/19/05	10/20/05	10/20/05	10/20/05	10/20/05	10/20/05	10/20/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/21/05	10/19/05	10/19/05	10/20/05	10/20/05	10/20/05	10/21/05	10/21/05
Source Report:		*Dross Sampling and Waste Determination, URS 2006*																								*Dross Sampling and Waste Determination, URS 2006*						
Material Pile:		Outdoor Black Dross																	Outdoor Black Dross							Outdoor Black Dross						
																										B-1, B-2, B-3	B-4, B-5	B-6, B-7	B-8, B-10	B-9, B-11	B-12, B-13, B-14	B-15, B16, B17
pH	S.U.	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**9.31 J**	**8.81 J**	**8.73**	**9.00**	**8.68**	**9.25 J**	**9.08 J**
Total Sulfide	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	56.1 U	58.5 U	23.2 U	28.1	24.8 U	27.2 U	**28.0**
Fluoride	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Potassium	mg/kg	**159,000**	**67,500**	**125,000**	**117,000**	**110,000**	**23,700**	**86,900**	**29,600**	**31,600**	**128,000**	**31,400**	**114,000**	**27,100**	**83,500**	**90,400**	**138,000**	**119,000**	**145,000**	**130,000**	**90,500**	**102,000**	**122,000**	**84,200**	**13,700**	----	----	----	----	----	----	----
Chloride	mg/kg	**186,000**	**152,000**	**209,000**	**243,000**	**221,000**	**149**	**124,000**	**211**	**3,860**	**101,000**	**36,900**	**106,000**	**157,000**	**107,000**	**139,000**	**167,000**	**206,000**	**196,000**	**259,000**	**163,000**	**167,000**	**213,000**	**136,000**	**86.8**	----	----	----	----	----	----	----
Ammonia	mg/kg	**214**	**223 J**	**300 J**	**104 J**	**107 J**	7.04 UJ	**54.3 J**	6.44 UJ	**138 J**	**243 J**	**142 J**	**309 J**	**129 J**	**325 J**	**216 J**	**334**	**322**	**84.4**	**174**	**252**	**242**	**288**	**339**	6.28 U	----	----	----	----	----	----	----
Kjeldahl Nitrogen	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cyanide	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**1.16**	**0.74**	0.580 U	0.574 U	0.624 U	0.657 U	0.604 U
Calcium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Metals - Method SW6010/6020																																
Aluminum	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Boron	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Magnesium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Sodium	mg/kg	**44,000**	**75,000**	**108,000**	**86,700**	**97,000**	**16,400**	**62,900**	**17,100**	**15,100**	**38,400**	**19,200**	**42,000**	**15,000**	**43,100**	**35,100**	**59,200**	**72,200**	**49,200**	**107,000**	**75,400**	**70,200**	**84,900**	**53,100**	**6,950**	----	----	----	----	----	----	----
Strontium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Titanium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Metals - Method SW6010/6020																																
Antimony	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Beryllium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cobalt	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	mg/kg	**1,470**	**1,200**	**876**	**1,270**	**428**	**3,030**	**1,270**	**3,210**	**1,930**	**2,950**	**1,360**	**1,340**	**1,490**	**1,670**	**1,660**	**1,400**	**1,620**	**918**	**1,240**	**1,090**	**1,030**	**766**	**9,610**	**2,010**	----	----	----	----	----	----	----
Iron	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	mg/kg	**44.4**	**37.8**	**33.3**	**47.5**	**22.4**	**98.1**	**36.1**	**80.2**	**57.9**	**145**	**40.9**	**64**	**55.9**	**52.8**	**40.6**	**49.6**	**38.3**	**27.9**	**28**	**45.7**	**35.8**	**27**	**109**	**56.6**	----	----	----	----	----	----	----
Selenium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Thallium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	mg/kg	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	mg/kg	**885**	**761**	**589**	**931**	**356**	**3,040**	**1,200**	**3,470**	**1,650**	**2,150**	**934**	**1,400**	**1,000**	**1,400**	**1,270**	**1,200 J**	**1,850 J**	**739**	**584**	**858**	**735**	**661**	**6,730**	**1,580**	----	----	----	----	----	----	----
TCLP Metals - Method SW6020, 1311																																
Aluminum	mg/L	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	mg/L	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	----	----	----	----	----	----	----
Barium	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	----	----	----	----	----	----	----
Cadmium	mg/L	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	----	----	----	----	----	----	----
Chromium	mg/L	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	----	----	----	----	----	----	----
Cr(VI)	mg/L	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	mg/L	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	mg/L	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	----	----	----	----	----	----	----
Mercury	mg/L	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	0.00250 U	----	----	----	----	----	----	----
Selenium	mg/L	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	----	----	----	----	----	----	----
Silver	mg/L	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	----	----	----	----	----	----	----
Zinc	mg/L	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

NOTES:
Bold - analyte detected
Value exceeds WAC 173-303 Toxicity Maximum Conc
---- not analyzed/no data
U - not detected at listed reporting limit
NA - not available or not applicable; insufficient resul
ND - not detected (reporting limit not available)
J - laboratory estimated value
ht - Laboratory analysis performed outside the metho

Table 2 - Washed Oxide Stockpile Testing Results
Maralco Property - Kent, WA

Parameter	Units	PILE-A	PILE-E	PILE-OUTDOOR-WASHED
Date		11/30/2021	11/30/2021	11/30/2021
Physical Tests (Soil)				
Moisture	%	22.4	8.7	50.2
Metals (Soil)				
Aluminum (Al)	mg/kg	151,000	144,000	110,000
Antimony (Sb)	mg/kg	21	18	47
Arsenic (As)	mg/kg	8	7	7
Barium (Ba)	mg/kg	115	112	217
Beryllium (Be)	mg/kg	3	3	10
Bismuth (Bi)	mg/kg	10	11	17
Cadmium (Cd)	mg/kg	4.4	4.3	5.5
Calcium (Ca)	mg/kg	11,600	11,100	13,800
Chromium (Cr)	mg/kg	231	214	296
Cobalt (Co)	mg/kg	4	4	5
Copper (Cu)	mg/kg	2,340	2,340	2,030
Iron (Fe)	mg/kg	9,900	10,200	6,600
Lead (Pb)	mg/kg	165	163	169
Lithium (Li)	mg/kg	52	47	196
Magnesium (Mg)	mg/kg	20,100	19,200	31,700
Manganese (Mn)	mg/kg	1,340	1,280	840
Mercury (Hg)	mg/kg	<0.5	<0.5	<0.5
Molybdenum (Mo)	mg/kg	<9.9	<9.6	<9.8
Nickel (Ni)	mg/kg	67	69	85
Phosphorus (P)	mg/kg	290	240	250
Selenium (Se)	mg/kg	<3	<3	<3
Silver (Ag)	mg/kg	1	1	2
Strontium (Sr)	mg/kg	355	300	499
Sulfur (S)	mg/kg	400	400	400
Tellurium (Te)	mg/kg	7.55	6.14	7.24
Thallium (Tl)	mg/kg	<0.5	<0.5	<0.5
Tin (Sn)	mg/kg	43.8	44.2	47.8
Titanium (Ti)	mg/kg	2,590	2,560	3,550
Tungsten (W)	mg/kg	<5	<5	5
Uranium (U)	mg/kg	<5	<5	<5
Vanadium (V)	mg/kg	199	197	158
Zinc (Zn)	mg/kg	1,950	1,860	1,670
Hg + Cd + Tl	mg/kg	5.4	5.3	6.5
As+Ni+Co+Mn+Zn+Pb+Sb+V+Be	mg/kg	3757	3601	2991
TCLP Metals				
Antimony	mg/L	<0.005	<0.005	0.030
Arsenic	mg/L	<0.002	<0.002	<0.002
Barium	mg/L	0.09	0.09	<0.05
Beryllium	mg/L	0.004	0.003	0.022
Boron	mg/L	3.9	4.3	0.3
Cadmium	mg/L	0.010	0.012	0.014
Chromium	mg/L	0.018	0.012	0.058
Cobalt	mg/L	0.010	0.010	0.011
Copper	mg/L	5.2	5.0	0.5
Iron	mg/L	0.1	<0.1	1.0
Lead	mg/L	<0.05	<0.05	<0.05
Mercury	mg/L	<0.001	<0.001	<0.001
Nickel	mg/L	0.28	0.24	0.12
Selenium	mg/L	0.003	<0.002	<0.002
Silver	mg/L	<0.005	<0.005	<0.005
Thallium	mg/L	<0.0005	<0.0005	<0.0005
Uranium	mg/L	<0.005	<0.005	<0.005
Vanadium	mg/L	0.02	0.02	0.03
Zinc	mg/L	8.3	7.4	6.1
Zirconium	mg/L	<0.01	<0.01	<0.01
pH Initial	S.U.	8.7	8.7	8.2
pH Final	S.U.	5.8	6.0	5.6
Hydrocarbons				
EPH 10-32	ug/g	232	539	115
HEPH	ug/g	212	519	95
LEPH	ug/g	<20	<20	<20
Bulk Oxides				
Aluminum (as Al2O3)	%	41.4	39.6	44.9
Barium (as BaO)	%	0.0233	0.0229	0.0303
Calcium (as CaO)	%	2.26	2.35	2.06
Chromium (as Cr2O3)	%	0.0453	0.0533	0.0699
Copper (as CuO)	%	0.306	0.320	0.269
Iron (as Fe2O3)	%	1.91	1.94	1.04
Magnesium (as MgO)	%	6.09	5.60	9.00
Manganese (as MnO)	%	0.172	0.166	0.137
Phosphorus (as P2O5)	%	<0.10	<0.10	<0.10
Potassium (as K2O)	%	1.89	1.80	4.81
Silicon (as SiO2)	%	19.8	19.6	12.4
Sodium (as Na2O)	%	2.45	2.43	4.03
Strontium (as SrO)	%	0.0487	0.0518	0.0736
Titanium (as TiO2)	%	0.674	0.738	0.715
Zinc (as ZnO)	%	0.210	0.229	0.212
Zirconium (as ZrO2)	%	0.0384	0.100	0.165
Loss of Ignition @ 900C	%	14.2	13.7	8.73
Total (Whole Rock)	%	91.5	88.6	88.6
Miscellaneous				
Chloride - Acid Soluble	%	0.795	0.750	0.080
Total Organic Carbon (TOC)	%	1.10	1.05	0.67
Additional Tests as needed Dependent on Site Assessment				
PAH (Total/sum)	ug/g	0.93	0.83	0.42

NOTES:

NA - not analyzed
NC - no criterion
mg/kg - milligrams per kilogram
For < values, used numerical value regardless for summation purposes

mg/L - milligrams per liter
% = percent
ug/g = micrograms per gram
S.U. = scientific unit

Table 3 - 2017-2021 Soil Data Summary
Maralco Property - Kent, WA

Analyte	Screening Level	MW-3A (5') 7/21/17	MW-4A (6.5') 7/21/17	MW-6 (6.5') 7/21/17	DPT-1 5-6' 5/24/21	DPT-2 6-7.5' 5/24/21	DPT-5 0.3-0.9' 5/24/21	DPT-6 1.5-2' 5/24/21	DPT-6 2.6-3.1' 5/24/21	DPT-8 8.2-8.4' 5/24/21	DPT-8 9.4-10' 5/24/21	DPT-9 13.2-13.8' 5/24/21	DPT-9 14.5-15' 5/24/21	DPT-11 2.1-3.1' 5/24/21	DPT-11 4.5-5' 5/24/21	DPT-12 8.6-9.2' 5/24/21	DPT-13 7.2-8.2' 5/24/21	DPT-13 9.3-10' 5/24/21
Aluminum	8,000	**7,800**	**5,600**	**9,700**	NA	NA	**7,460**	**14,500**	**10,800**	**17,400**	**37,500**	**48,100**	**15,400**	**17,100**	**15,400**	**16,500**	**14,700**	**11,800**
Iron	500	NA	NA	NA	NA	NA	**9,000**	**12,400**	**11,200**	**15,300**	**37,300**	**19,600**	**21,700**	**18,600**	**16,500**	**18,200**	**16,400**	**9,420**
Barium	16,000	5 U	5 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	1.25	NA	NA	NA	NA	NA	2 U	2 U	2 U	2 U	2 U	**4.83**	2 U	2 U	2 U	2 U	2 U	2 U
Arsenic	8.8	**1.1**	1 U	**1.6**	NA	NA	5 U	**10.9**	**2.91**	**11.3**	**1.74**	10 U	**7.51**	5 U	**2.1**	5 U	5 U	**3.15**
Cadmium	0.25	1 U	1 U	1 U	NA	NA	1 U	1 U	1 U	1 U	1 U	**2.37**	1 U	1 U	1 U	1 U	1 U	1 U
Chromium	48	**1.2**	1 U	**4**	NA	NA	**12**	**10.6**	**8.31**	**17**	**7.32**	**4,530**	**13.8**	**25.7**	**19.4**	**18.4**	**19.8**	**9.81**
Cobalt	24	NA	NA	NA	NA	NA	5 U	5 U	**3.35**	**6.65**	**2.66**	10 U	**4.97**	**6.3**	**6.59**	**6.21**	**6.1**	**4.59**
Copper	36	NA	NA	NA	NA	NA	25 U	**43.6**	**33.3**	**56.5**	**7.75**	**1,530**	**19.4**	**58.1**	25 U	**26.7**	**29.3**	**12.2**
Lead	150	1 U	1 U	**1.6**	NA	NA	**2.19**	**14.5**	**3.69**	**8.28**	**2.95**	**108**	**3.43**	**5.17**	**2.78**	**5.72**	**2.77**	**10.1**
Manganese	3,700	NA	NA	NA	NA	NA	**80.9**	**140**	**92.7**	**194**	**81**	**1,860**	**135**	**242**	**230**	**229**	**253**	**85**
Nickel	68	NA	NA	NA	NA	NA	**6.38**	**8.46**	**6.25**	**14**	**5.31**	**32.6**	**9.51**	**27.4**	**22.5**	**21.8**	**20.6**	**7.71**
Zinc	120	NA	NA	NA	NA	NA	25 U	**353**	**47**	**56**	**13.6**	**364**	**26.6**	**60.7**	**32**	**50.8**	**35**	**29.9**
Mercury	2	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	400	2 U	2 U	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH-G	30	2 U	2 U	2 U	5 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH-D	2,000	NA	NA	NA	50 U	**1,100**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH-O	2,000	NA	NA	NA	250 U	250 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.02	NA	NA	NA	0.02 U	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	0.24	NA	NA	NA	0.02 U	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	0.4	NA	NA	NA	0.02 U	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	16,000	NA	NA	NA	0.06 U	0.06 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1016	NC	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1221	NC	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1232	NC	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1242	NC	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1248	NC	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1254	NC	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1260	NC	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1262	NC	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1268	NC	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCB Aroclors	1	NA	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:
All units in mg/kg.
mg/kg - milligrams per kilogram
Bold - analyte detected
NC - no criteria
ND - not detected
NA - not analyzed
Reported concentration exceeds the screening level

Table 4 - 2016 Soil Data Summary
Maralco Property - Kent, WA

Sample ID	Screening Level	B-1-5	B-1-17	B-2-4	B-2-16.5	B-3-6	B-3-16	B-4-7	B-4-9	B-4-15	B-5-8	B-5-10	B-5-15	B-6-7.5	B-6-9.5	B-6-15
Sample depth (ft bgs)		5	17	4	16.5	6	16	7	9	15	8	10	15	7.5	9.5	15
Dated Collected		10/27/16	10/27/16	10/27/16	10/27/16	10/27/16	10/27/16	10/27/16	10/27/16	10/27/16	10/27/16	10/27/16	10/27/16	10/27/16	10/27/16	10/27/16
NWTPH-Dx	2,000	4.4 U	5.38 U	4.61 U	5.04 U	45.1 U	5.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-Dx	2,000	11 U	13.5 U	11.5 U	12.6 U	113 U	13.8 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
NWTPH-Gx	30	NA	0.1 U	NA	NA	NA	0.1 U	NA	0.1 U	NA	NA	0.1 U	NA	NA	0.1 U	NA
Benzene	0.02	NA	**0.000522**	NA	NA	NA	**0.000205 J**	NA	**0.00132**	NA	NA	**0.000604**	NA	NA	**0.00014 J**	NA
Toluene	0.4	NA	0.005 U	NA	NA	NA	0.005 U	NA	**0.000476 B J**	NA	NA	**0.000557 BJ**	NA	NA	0.005 U	NA
Ethylbenzene	0.24	NA	0.0005 U	NA	NA	NA	0.0005 U	NA	0.0005 U	NA	NA	0.0005 U	NA	NA	0.0005 U	NA
Xylenes, Total	16,000	NA	0.0015 U	NA	NA	NA	0.0015 U	NA	0.0015 U	NA	NA	0.0015 U	NA	NA	0.0015 U	NA
Chloride	NC	NA	NA	NA	NA	NA	NA	**44.4**	NA	**309**	**41.4**	NA	**4,280**	**212**	NA	**183**
Fluoride	4,800	NA	NA	NA	NA	NA	NA	**5.03**	NA	**2.75**	**31.8**	NA	**0.544 J P1**	**7.72**	NA	**35.9**
Nitrate	130,000	NA	NA	NA	NA	NA	NA	**2.25**	NA	1.37 U	**0.954 J**	NA	1.38 U	1.31 U	NA	1.45 U
Ammonia Nitrogen	NC	NA	NA	NA	NA	NA	NA	**15.2**	NA	**5.92 J**	5.27U	NA	**33.1**	**27.7**	NA	**9.72 J6**
Aluminum	8,000	NA	NA	NA	NA	NA	NA	**9,370 O1 V**	NA	**12,200**	**5,730**	NA	**8,840**	**16,600**	NA	**19,800**
Arsenic	8.8	NA	NA	NA	NA	NA	NA	2.34 U	NA	**2.73**	**3.46**	NA	2.77 U	**2.47 J**	NA	**2.88 J**
Barium	16,000	NA	NA	NA	NA	NA	NA	**39.6**	NA	**55.7**	**19.1**	NA	**42.1**	**70.2**	NA	**52.2**
Cadmium	0.25	NA	NA	NA	NA	NA	NA	**0.115 J**	NA	**0.128 J**	**0.0759 J**	NA	0.692 U	**0.153 J**	NA	**0.234 J**
Chromium	48	NA	NA	NA	NA	NA	NA	**13**	NA	**14.5**	**8.32**	NA	**11.4**	**18**	NA	**20.1**
Lead	1,000	NA	NA	NA	NA	NA	NA	**2.37**	NA	**3.26**	**2.14**	NA	**2.57**	**4.35**	NA	**6**
Mercury	2	NA	NA	NA	NA	NA	NA	**0.023 J**	NA	**0.0288**	0.0211 U	NA	**0.0281**	**0.141**	NA	**0.0163 J**
Selenium	400	NA	NA	NA	NA	NA	NA	2.34 U	NA	**1.41 J**	2.11 U	NA	2.77 U	**2.62**	NA	**1.11 J**
Silver	0.69	NA	NA	NA	NA	NA	NA	1.17 U	NA	1.37 U	1.05 U	NA	1.38 U	**1.31**	NA	1.45 U
Anthracene	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	0.00676 U	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	0.00676 U	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	0.00676 U	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)Anthracene*	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.000687 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)Pyrene*	3.9	0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.000855 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(B)Fluoranthene*	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.00114 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(G,H,I)Perylene	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.00184 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(K)Fluoranthene*	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	0.00676 U	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene*	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.00153 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(A,H)Anthracene*	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	0.00676 U	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.00111 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	0.00676 U	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-Cd)Pyrene*	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.000801 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NC	0.022 U	**0.00473 J**	0.0231 U	0.0252 U	0.0225 U	0.0275 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NC	0.0066 U	**0.000954 J**	**0.00132 J**	0.00756 U	**0.00198 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NC	0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.00159 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	NC	0.022 U	0.0269 U	0.0231 U	0.0252 U	0.0225 U	0.0275 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NC	0.022 U	0.0269 U	0.0231 U	0.0252 U	**0.00249 J**	0.0275 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NC	0.022 U	0.0269 U	0.0231 U	0.0252 U	0.0225 U	0.0275 U	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
All units in mg/kg.
mg/kg - milligrams per kilogram
* carcinogenic polycyclic aromatic hydrocarbons
P1: Relative % Difference value not applicable for sample concentrations less than 5 times the reporting limit
BOLD - constituent detected
ft bgs - feet below ground surface
NA - not analyzed

U - Constituent not detected at associated reporting level.
J - The identification of the analyte is acceptable; the reported value is an estimate.
B - Analyte found in the associated blank.
O1 - Analyte failed the method required serial dilution test and/or subsequent post-spike criteria. This indicates matrix interference.
V - Sample concentration is too high to evaluate accurate spike recoveries.
J6 - Sample matrix interfered with the ability to make any accurate determination; spiked value is low.
ft bgs - feet below ground surface

Reported concentration exceeds the screening level

Table 5 - Prior to 2016 Soil Data Summary
Maralco Property - Kent, WA

Analyte (mg/kg)	Screening Level	S1 Surface Jun-87	S2 Surface Jun-87	S3 Surface Jun-87	S4 Surface Jun-87	S5 Surface Jun-87	MW-5 5 ft bgs 1/22/03	MW-5 10 ft bgs 1/22/03	MW-5 15 ft bgs 1/22/03	DP-1 1 ft bgs 2/4/03	DP-2 1 ft bgs 2/4/03	DP-2 3 ft bgs 2/4/03	DP-3 1 ft bgs 2/4/03	DP-3 3 ft bgs 2/4/03	DP-4 3 ft bgs 2/4/03	DP-5 1 ft bgs 2/4/03	DP-5 2.5 ft bgs 2/4/03
Aluminum	8,000	NA	NA	NA	NA	NA	NA	NA	NA	**3,000**	NA	**1,400**	NA	**2,000**	**2,300**	NA	**1,400**
Antimony	1.25	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	8.8	**2.8**	**4.3**	**12.0**	**11.0**	**9.2**	NA	NA	NA	5 U	ND*	5 U	ND*	5 U	5 U	ND*	5 U
Beryllium	63	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.25	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	48	**19.0**	**21.0**	**10.0**	**13.0**	**11.0**	NA	NA	NA	1 U	ND*	1 U	ND*	1 U	1 U	ND*	1 U
Copper	36	**19.0**	**29.0**	**21.0**	**21.0**	**18.0**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1,000	10 U	**26.0**	**44.0**	**27.0**	**27.0**	**18***	ND	**13.9***	ND	ND*	ND*	ND*	ND*	ND*	ND*	ND*
Nickel	68	**23.0**	**25.0**	**14.0**	**13.0**	**14.0**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NC	0.4 U	0.4 U	0.4 U	0.5 U	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	120	**55.0**	**57.0**	**56.0**	**60.0**	**66.0**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	2	0.99 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA	NA	ND	ND*	ND*	ND*	ND*	ND*	ND*	ND*
Silver	0.69	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	400	0.2 U	**0.34**	0.2 U	0.2 U	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:
Bold - analytes detected
Reported concentration exceeds the screening level
mg/kg - milligrams per kilogram
NC - no criteria
ND - not detected (detection limits not reported)
NA - not analyzed
N - SRM recovery not within control limits
U - not detected above reporting limit
B - compound detected in blank (sample value is less than 10 times that value)
May 1990 samples ID HB-1 through HB-3 representative of dross samples that were moved to the larger pipe, these are not included on this table.
*Analyzed by XRF

Table 6 - Soil Data Summary UST Area
Maralco Property - Kent, WA

Analyte	Screening Level	UST PE-1	UST PE-2	UST PE-3	UST PE-4	UST PE-5	SP-1	SP-2	SP-3	UST SB-1	UST SB-1 WATER	UST SB-1	UST SB-2
		8-10 ft bgs	8-10 ft bgs	8-10 ft bgs	8-10 ft bgs	~17 ft bgs	stockpile	stockpile	stockpile	5 ft bgs	8 ft bgs	15 ft bgs	5 ft bgs
		6/29/1995	6/29/1995	6/29/1995	6/29/1995	6/29/1995	6/29/1995	6/29/1995	6/29/1995	1/22/2003	1/22/2003	1/22/2003	1/22/2003
TPH-Dx - Soil (mg/kg)	2,000	**6,300**	**96**	25 U	25 U	25 U	**1,800**	**2,100**	**1,200**	**1,100**	NA	**1,800**	25 U
TPH-D - Groundwater (ug/L)	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.450**	NA	NA

NOTES:
Bold - analyte detected
Reported concentration exceeds the screening level
mg/kg - milligrams per kilogram
ug/L - micrograms per liter
NA - not analyzed, not applicable
U - not detected above reporting limit
UST - underground storage tank
ft bgs - feet below ground surface

Table 7 - Monitoring Well Groundwater Data Summary
Maralco Property - Kent, WA

Analyte (ug/L)	Screening Level	MW-3A 6/3/21	MW-4 10/1/90	MW-4 1/24/03	MW-4A 7/26/17	MW4A 6/3/21	DUP OF MW4A 6/3/21	MW-5 1/24/03	MW5A 7/26/17	MW5A 6/3/21	MW6 7/26/17	MW6 6/3/21
Aluminum	16,000	**2,160**	**27,500**	**3,600**	**61**	100 U	100 U	**28,000**	**93,000**	**32,200**	**130**	**273**
Iron	1,000	**304**	NA	NA	NA	**62,900**	**64,500**	NA	NA	**157,000**	NA	**47,700**
Antimony	5.6	2 U	NA	NA	NA	2 U	2 U	NA	NA	4 U	NA	2 U
Arsenic	8.8	1 U	**17.1**	**19**	5 U	**9.45**	**9.37**	**11**	**6**	**73.2**	5 U	**18.3**
Barium	1,000	1 U	**605**	**77**	50 U	NA	NA	**170**	50 U	--	50 U	NA
Cadmium	1	1 U	ND	ND	5 U	1 U	1 U	ND	5 U	4.60 U	5 U	1 U
Chromium	10	1 U	**25**	**22**	10 U	1 U	**1.01**	**38**	**10**	**98.6**	10 U	**2.13**
Cobalt	4.8	1 U	NA	NA	NA	1 U	1 U	NA	NA	**34.6**	NA	**2.77**
Copper	11	**6.73**	NA	NA	NA	**8.56**	**9.51**	NA	NA	**589**	NA	**19.0**
Lead	2.5	1 U	**9.51**	**9.0**	2 U	1 U	1 U	**8.0**	**2**	**53.7**	2 U	1 U
Manganese	50	**37.5**	NA	NA	NA	**2,660**	**2,750**	NA	NA	**2,510**	NA	**1,590**
Mercury	0.77		**0.077**	ND	0.5 U	--	NA	ND	0.5 U	NA	0.5 U	NA
Nickel	52	1 U	NA	NA	NA	**1.06**	**1.06**	NA	NA	**76.7**	NA	**2.71**
Silver	3.2		ND	ND	10 U	NA	NA	ND	10 U	NA	10 U	NA
Selenium	5		ND	ND	50 U	NA	NA	ND	50 U	NA	50 U	NA
Zinc	100	5 U	NA	NA	NA	5 U	5 U	NA	NA	**431**	NA	5 U
Chloride (mg/L)	230	**14.2**	NA	**92.0**	**290**	**275**	**280**	**442**	**150**	**81.3**	**270**	**207**
Fluoride (mg/L)	0.96	**19.8**	NA	**6.89**	0.200 U	0.800 U	0.800 U	**2.10**	**0.230**	**1.92**	**4.1**	**16.0**
Nitrate-Nitrogen (mg/L)	1,000	NA	NA	ND	NA	NA	NA	**1.50**	NA	NA	NA	NA
Ammonia-Nitrogen (mg/L)	NC	NA	**6.683**	**1.71**	NA	NA	NA	**1.52**	NA	NA	NA	NA
TPH-Gasoline	100	NA	NA	NA	NA	100 U	100 U	NA	NA	NA	NA	100 U
Diesel Range Oil - SGC	500	NA	NA	NA	NA	50 U	50 U	NA	NA	NA	NA	50 U
Residual Range Oil - SGC	500	NA	NA	NA	NA	250 U	250 U	NA	NA	NA	NA	250 U
Diesel Range Oil	500	NA	NA	NA	20 U	**200** x	**210** x	NA	NA	NA	NA	50 U
Residual Range Oil	500	NA	NA	NA	50 U	250 U	250 U	NA	NA	NA	NA	250 U

NOTES:
Units - ug/L for except mg/L for chloride, fluoride, nitrate-nitrogen, and ammonia-nitrogen
1990 GW sample data is not included in this table.
Bold - analyte detected
Reported concentration exceeds screening level
SGC - with silica gel cleanup
J - Reported value is an estimate.
U - not detected at reporting limit
NA - not analyzed
ND - not detected (reporting limit not readily available)
ug/L - micrograms per liter
mg/L - milligrams per liter
x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

Table 8 - Grab Groundwater Data Summary
Maralco Property - Kent, WA

Analyte (ug/L)	Screening Level	B-1-GW 10/27/16	B-2-GW 11/2/16	B-3-GW 11/2/16	B-4-GW 11/2/16	B-6-GW 11/2/16	B-5-GW 11/2/16	DPT-1-0521 5/24/21	DPT-2-0521 5/24/21
Aluminum	16,000	**151,000**	**159,000**	**11,000**	**363,000 J**	**43,500**	**7,880**	**405**	**1,160**
Arsenic	8.8	**68.6**	**45.2**	**33.8**	**65.9**	**64**	**43.9**	**13.3**	**13.6**
Barium	1,000	**608**	**590**	**164**	**676**	**325**	**3,850**	NA	NA
Cadmium	1	**1.13 J**	**1.5 J**	2 U	**1.56 J**	2 U	2 U	1 U	1 U
Chromium	10	**86.6**	**124**	**15.4**	**108**	**44.3**	**18.7**	**2.41**	**1.74**
Lead	2.5	**41.9**	**49.3**	**6.73**	**28.5**	**40.3**	**9.4**	1 U	1
Mercury	0.77	**0.0726 J**	**0.234**	0.2 U	**0.0681 J**	**0.338**	**0.0502 J**	NA	NA
Selenium	5	10 U	10 U	10 U	10 U	10 U	10 U	NA	NA
Silver	3.2	5 U	5 U	5 U	5 U	5 U	5 U	NA	NA
Manganese	50	NA	NA	NA	NA	NA	NA	**2,720**	**379**
Iron	1,000	NA	NA	NA	NA	NA	NA	**32,200**	**10,300**
Antimony	5.6	NA	NA	NA	NA	NA	NA	2 U	2 U
Cobalt	4.8	NA	NA	NA	NA	NA	NA	**4.29**	1 U
Copper	11	NA	NA	NA	NA	NA	NA	**11.1**	**9.63**
Nickel	52	NA	NA	NA	NA	NA	NA	**8.14**	**1.02**
Zinc	100	NA	NA	NA	NA	NA	NA	5 U	5 U
Chloride (mg/L)	230	**265**	**177**	**341**	**109**	**111**	**8,970**	**224**	**51.6**
Fluoride (mg/L)	0.96	**0.428**	**0.850**	**0.496**	**5.09**	**52.9**	**7.74**	0.800 U	**1.38**
Nitrate-nitrogen (mg/L)	1,000	**0.488**	**0.177**	**0.0556 J**	**0.363**	0.100 U	0.100 U	NA	NA
Ammonia-nitrogen (mg/L)	NC	**4.070**	**4.570**	**7.030**	**4.150**	**0.516**	**39.8**	NA	NA
TPH-Gasoline	100	NA	NA	NA	NA	NA	NA	100 U	100 U
Diesel Range Oil	500	**160 J**	250 U	**235 J**	250 U	250 U	250 U	**850** x	**12,000**
Residual Range Oil	500	500 U	500 U	500	500 U	500 U	500 U	**370** x	**1,700**
Diesel Range Oil - SGC	500	NA	NA	NA	NA	NA	NA	**140** x	**4,500**
Residual Range Oil - SGC	500	NA	NA	NA	NA	NA	NA	250 U	**430** x
Benzene	0.44	NA	NA	NA	NA	NA	NA	1 U	1 U
Ethylbenzene	29	NA	NA	NA	NA	NA	NA	1 U	1 U
Toluene	57	NA	NA	NA	NA	NA	NA	1 U	1 U
Total Xylenes	1600	NA	NA	NA	NA	NA	NA	3 U	3 U
Anthracene	NA	0.05 U	0.05 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Acenaphthene	NA	**0.112**	0.05 U	**0.459**	0.1 U	0.1 U	0.1 U	NA	NA
Acenaphthylene	NA	**0.0136 J**	0.05 U	**0.0735 J**	0.1 U	0.1 U	0.1 U	NA	NA
Benzo(A)Anthracene*	NA	0.05 U	0.05 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Benzo(A)Pyrene*	0.1 (Method A)	**0.0812**	0.05 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Benzo(B)Fluoranthene*	NA	0.05 U	0.05 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Benzo(G,H,I)Perylene	NA	0.05 U	0.05 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Benzo(K)Fluoranthene*	NA	0.05 U	0.05 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Chrysene*	NA	0.05 U	0.05 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Dibenz(A,H)Anthracene*	NA	0.05 U	0.05 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Fluoranthene	NA	0.05 U	0.05 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Fluorene	NA	**0.0431 J**	0.05 U	**0.483**	0.1 U	0.1 U	0.1 U	NA	NA
Indeno(1,2,3-Cd)Pyrene*	NA	0.05 U	0.05 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
Naphthalene	160 (Method A)	**0.167 J**	**0.0429 J**	**0.614**	0.5 U	0.5 U	0.5 U	NA	NA
Phenanthrene	NA	**0.0124 J**	0.05 U	**0.0249 J**	0.1 U	0.1 U	0.1 U	NA	NA
Pyrene	NA	0.05 U	0.05 U	0.1 U	0.1 U	0.1 U	0.1 U	NA	NA
1-Methylnaphthalene	NA	**0.147 J**	**0.0167 J**	**2.38**	0.5 U	0.5 U	0.5 U	NA	NA
2-Methylnaphthalene	NA	**0.0585 J**	**0.0165 J**	**0.226 J**	0.5 U	0.5 U	0.5 U	NA	NA
2-Chloronaphthalene	NA	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Total cPAH concentration (ND = 0)	0.1 (Method A)	**0.0812**	0.05 U	0.05 U	0.05 U	0.05 U	0.1 U	NA	NA

NOTES:

All units in ug/L for except mg/L for chloride, fluoride, nitrate-nitrogen, and ammonia-nitrogen.

1990 GW sample data is not included in this table.

Bold - constituent detected

Reported concentration exceeds screening level

SGC - with silica gel cleanup

U - Constituent not detected at reporting limit.

J - Reported value is an estimate.

NA - not analyzed

ug/L - micrograms per liter

mg/L - milligrams per liter

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

* carcinogenic polycyclic aromatic hydrocarbons

Table 9 - Sediment Data Summary
Maralco Property - Kent, WA

	Fresh Water Sediment Screening Level		Stormwater Pond	S. 202nd ROW							KCDD#1 Wetland	
Sample ID			SED-01	SS-1	SS-1	SS-900	SED-02	SED-02	SED-03	SED-03	KCDD-S	KCDD-N
Sample depth (ft bgs)			---	---	---	---	0-0.5	0.5-1	0-0.5	0.5-1	0.5-1	0.5-1
Dated Collected	**SCO**	**CSL**	6/3/21	10/28/16	10/28/16	10/28/16	6/9/21	6/9/21	6/9/21	6/9/21	8/24/21	8/24/21
Aluminum	NC	NC	**46,900**	**55,500**	**22,200**	**81,100**	**12,000**	**12,100**	**23,200**	**115,000**	**18,400**	**23,600**
Iron	NC	NC	**12,200**	NA	NA	NA	**19,000**	**16,500**	**81,800**	**29,000**	NA	NA
Antimony	NC	NC	**8.79**	NA	NA	NA	2 U	2 U	8 U	**55.4**	**2.89**	**2.95**
Arsenic	14	120	**4.32**	**6.78**	**4.3 J**	**9.47**	**3.79**	**2.18**	**19.2**	**7.21**	**18.9**	**10.8**
Cadmium	2.1	5.4	**5.37**	**0.619 J**	**2.74**	**5.56**	1 U	1 U	2 U	**11.8**	2 U	**2.01**
Chromium	72	88	**68.4**	**36.3**	**54.4**	**112**	**11.6**	**10.1**	**31.4**	**208**	**38.7**	**23.1**
Cobalt	NC	NC	**6.1**	NA	NA	NA	**4.21**	**2.85**	10 U	10 U	**6.81**	**5.27**
Copper	400	1,200	**627**	NA	NA	NA	**41.2**	**20.2**	**159**	**1,410**	**64.6**	**98.6**
Lead	360	>1,300	**158**	**42**	**53.7**	**113**	**10.4**	**8.24**	**40.2**	**189**	**60.6**	**54.7**
Mercury	0.66	0.8	NA	**0.0564**	**0.116**	**0.158**	NA	NA	NA	NA	NA	NA
Manganese	NC	NC	**193**	NA	NA	NA	**222**	**80.3**	**321**	**346**	**295**	**201**
Nickel	26	110	**35.1**	NA	NA	NA	**10.7**	**7.54**	**25.5**	**64.2**	**20.8**	**14.7**
Silver	0.57	1.7	NA	1.57 U	**0.776 J**	**3.14**	NA	NA	NA	NA	2 U	1 U
Zinc	3,200	>4,200	**957**	NA	NA	NA	**109**	**58.1**	**325**	**2,190**	NA	NA
Chloride	NC	NC	**49.4**	**82.3**	**26,800**	**29,900**	**17.0**	**24.6**	**45.7**	**40.6**	**9.72**	**155**
Fluoride	NC	NC	**45.1**	**226**	**383**	**579**	**6.28**	**4.73**	**6.99**	**31.8**	**6.08**	**22.8**
Nitrate	NC	NA	NA	**3.62**	**13.8**	**8.21**	NA	NA	NA	NA	NA	NA
Ammonia-Nitrogen	230	300	NA	**4.26 J P**	**6.65 J**	15.6 U	NA	NA	NA	NA	NA	NA

NOTES:
Bold - analyte detected
Reported concentration exceeds the SCO
Reported concentration exceeds the CSL
mg/kg - milligrams per kilogram dry weight
SCO - fresh water sediment cleanup objective
CSL - fresh water sediment cleanup screening level
NC - no criterion
NA - not analyzed or not available
J - Reported value is an estimate.
U - not detected at reporting limit
Samples collected in 1987 and 1991 are not included in this summary since site conditions have changed since that time.

Table 10 - Soil Screening Levels
Maralco, 7730 S 202nd St, Kent WA

		Saturated Soil Screening Level (SL)		SL Derivation Steps (right to left)						
				Select Highest Concentration as SL			Select Lowest Concentration as Minimum MTCA Level			
Parameter Group	**Chemical**	**Value**	**Derived from:**	**Natural Background**	**PQL**	**Minimum MTCA Level - from blue**	**Unrestricted Land Use - Method B Carcinogen**	**Soil Protective of Groundwater as drinking water source**	**Unrestricted - Method B Non-carcinogen**	**Soil Protective of Groundwater->SW Vadose @ 13 degrees C Fresh Water (mg/kg)**
Metals (mg/kg)	Aluminum	8,000	MTCA B		50	8,000			8,000	
	Antimony	1.25	PQL		1.25	0.3		0.270	32	5.1
	Arsenic	8.8	NB	7.3	1	0.67	0.67		24	2.9
	Cadmium	0.25	PQL	0.8	0.25	0.035		0.035	80	0.099
	Chromium (III)	1,500	Soil Protect. SW Vadose	48.2	1	1,500			120,000	1,500
	Chromium (VI)	48	NB	48.2	0.5	3.8			240	3.8
	Cobalt	24	MTCA B		1	24			24	
	Copper	36	NB	36.4	5	4.9			3,200	4.9
	Iron	500	Soil Protect. SW Vadose		50	500			56,000	500
	Lead	150	Soil Protect GW	16.8	1	1,000		150		Method A Industrial - 1,000
	Manganese	3,700	MTCA B		1	3,700			3700	
	Mercury	0.1	PQL	0.07	1 / 0.1	0		0.1		Method A Industrial - 2.0
	Nickel	48	Soil Protect. SW Vadose	48	1	7		6.5	1,600	68
	Silver	0.69	Soil Protect GW		0.25	14		0.69	400	14
	Zinc	120	Soil Protect. SW Vadose	85.1	5	120			24,000	120
PCBs (mg/kg)	Total PCBs	1	MTCA B		0.02	0.5	0.5			
TPH (mg/kg)[b]	TPH, diesel range organics	2,000	Method A		50	Method A				
	TPH, heavy oils	2,000	Method A		250	Method A				
	TPH, mineral oil	4,000	Method A			Method A				
	TPH, gasoline range organics, benzene present	30	Method A		5	Method A				
VOCs (mg/kg)	Benzene	0.02	PQL		0.02	0.0024	18		320	0.0024
	Toluene	0.4	Soil Protect. SW Vadose		0.02	0.4			6,400	0.4
	Ethylbenzene	0.24	Soil Protect. SW Vadose		0.02	0.24			8,000	0.24
	o-Xylene	16,000	MTCA B		0.06	16,000			16,000	
Other	Chloride	NC								
	Nitrate	130,000	MTCA B			130,000			130,000	
	Ammonia Nitrogen	NC								
	Fluoride	4,800	MTCA B			4,800			4,800	

NOTES:

1. All values are based on February 2021 CLARC tables (except for background values and PQLs).
2. A simplified terrestrial ecological evaluation indicates that the Site does not pose a threat to terrestrial ecological receptors.
3. The SL (green) is the lowest of the Method C and groundwater protection columns (blue) under WAC 173-340-7491(1)(b), adjusted upward to the higher of the PQL or natural background (purple).
4. "Soil protective of groundwater" is a calculated value using MTCA equations below and the groundwater SL from Table 3-3.
   MTCA Equation 747-1 was used with default values and saturated conditions.
   MTCA Equation 747-2 used the default Koc and the site-specific soil fraction organic carbon (foc) of 0.3%.
5. Blank cells indicate where a PQL was not necessary to adjust the SL, natural background was not available, or ARARs/MTCA criteria were not available in Ecology's CLARC database.
6. Metals natural background values are Puget Sound 90th Percentiles from Table 1 of Ecology 1994. Natural Background Soil Metals Concentrations in Washington State. Publication #94-115. October 1994.
7. Dioxin/furan natural background level (on a TEQ basis) is from Ecology 2010. Natural Background for Dioxins/Furans in WA Soils. Technical Memorandum #8. August 9, 2010.
8. PQLs are based on values provided by Friedman & Bruya (April 2021).
9. SL codes: GW Prot = Soil Protective of Groundwater; NB = natural background; PQL = practical quantitation limit.

a. The Toxics Substance Control Act provides an ARAR for total PCBs: 10 mg/kg. This value was used in this table because it is lower than the Method C - Carcinogen value of 66 mg/kg.

b. TPH SLs are MTCA Method A. When benzene is not present, 100 mg/kg may be used as the TPH-gasoline SL.

c. PQL value dependant on analytical method. Values are Method 6020 / Method 1631.

Table 11- Groundwater Screening Levels
Maralco, 7730 S 202nd St, Kent WA

		Screening Level (SL)		ISL Derivation Steps (right to left)														
				Select Highest Concentration for SL			Protection of Human Health from Seafood Consumption and Protection of Aquatic Life: Use Lowest Federal ARAR. If no Sufficiently Protective Federal ARAR, use the Lowest MTCA Method B Value.[b]											
Parameter Group	Chemical	Value (ug/L)	Derived from:	PQL (ug/L)	Natural Background (ug/L)	Minimum from Ground Water and Surface Water Pathways Criterias (ug/L)	Retained Surface Water Screening Level (ug/L)	Ground Water Method A/B Noncancer (µg/L)	Ground Water Method A/B Cancer (µg/L)	Surface Water Method B Noncancer (µg/L)	Surface Water Method B Cancer (µg/L)	Surface Water Aquatic Life Fresh/Acute 173-201A WAC (µg/L)	Surface Water Aquatic Life Fresh/Acute CWA §304 (µg/L)	Surface Water Aquatic Life Fresh/Chronic 173-201A WAC (µg/L)	Surface Water Aquatic Life Fresh/Chronic CWA §304 (µg/L)	Surface Water Human Health Fresh Water 173-201A WAC (µg/L)	Surface Water Human Health Fresh Water 40 CFR 131.45 (µg/L)	Surface Water Human Health Fresh Water CWA §304 (µg/L)
Metals	Aluminum	16,000	MTCA B GW	50		16,000	16,000	16,000										
	Antimony	5.6	SW-HH-CWA	1		5.6	5.6	6.4		1,000						12	6	5.6
	Barium	1,000	SW-HH-CWA					2,000								1,000		
	Arsenic	8.8	NB	1	8	0.018	0.018	5	0	18	0	360	340	190	150	10	0.018	0.018
	Cadmium	1	PQL	1		0.72	0.72			41		3.7	1.8	1	0.72			
	Chromium, Total	1	PQL	1		0	0.000											
	Chromium (III)	74	SW-AL-CWA			74	74	24,000		240,000		550	570	180	74			
	Chromium (VI)	10	SW-AL-173/CWA	0.045		10	10	48		490		15	16	10	11			
	Cobalt	4.8	MTCA B GW	1		4.8	4.8	4.8										
	Copper	11	SW-AL-173	5		11	11	640		2,900		17		11		1,300		1,300
	Iron	1,000	SW-AL-CWA	50		1,000	1,000	11,000							1,000			
	Lead	2.5	SW-AL-173/CWA	1		2.5	2.5					65	65	2.5	2.5			
	Manganese	50	SW-HH-CWA	1		50	50	750										50
	Mercury	1	SW-AL-173/CWA	0.2		1	0.770	2				2.1		1.4	0.77			
	Nickel	52	SW-AL-CWA	1		52	52	320		1,100		1,400	470	160	52	150	80	610
	Silver	3.2	SW-AL-173/CWA					80				3.4		3.2				
	Selenium	5	SW-AL-173/CWA					80				20			5			
	Zinc	100	SW-AL-173	5		100	100	4,800		17,000		110	120	100	120	2,300	1,000	7,400
PCBs	Total PCBs	0.1	PQL	0.1							0.0001	2		0	0.014	0.00017	0.000007	0.000064
SVOCs/PAHs	1-Methylnaphthalene	0.2	PQL	0.2														
	2-Methylnaphthalene	0.2	PQL	0.2														
	Acenaphthene	0.0	SW-HH-40CFR	0.02						640						110	30	70
	Anthracene	0.0	SW-HH-40CFR	0.02						26,000						3,100	100	300
	Fluorene	0.0	SW-HH-40CFR	0.02						3,500						420	10	50
	Naphthalene	0.2	Prot. of Indoor Air	0.2						4,900								
	Pyrene	0.0	SW-HH-40CFR	0.02						2,600						310	8	20
TPH [a]	TPH, diesel range organics	500	Method A	50														
	TPH, heavy oil	500	Method A	250														
	TPH, gasoline range organics, benzene present	1,000	MTCA A GW	100				1000/800										
VOC	Benzene	0.44	SW-HH-173	0.35/1 [c]		0.44	0.44	32	1	2,000	23					0.44		0.58
	Toluene	57	SW-HH-CWA	1		57	57	640		19,000						180	72	57
	Ethylbenzene	29	SW-HH-40CFR	1		29	29	800		6,900						200	29	68
	o-Xylene	1,600	MTCA B GW	3		1,600	1,600	1,600										
	m-Xylene	1,600	MTCA B GW	1		1,600	1,600	1,600										
Other	Chloride	230,000	SW-AL-173/CWA			230,000	230,000					860,000	860,000	230,000	230,000			
	Ammonia	6.50	SW-AL-173/CWA															
	Fluoride	960	SW-AL-173/CWA			960	960	960										

NOTES:

1. All values are based on February 2021 CLARC tables (except for background values and PQLs).
2. SLs are based on non-potable groundwater exposures.
3. The selected SL is based on the MTCA Method B cleanup level approach (WAC 173-340-720(4)(b)).
   The SL is the minimum of the aquatic life protection ARAR (blue), the human health fish consumption value (orange), and the indoor air protection value (gray) , compared against the PQL and natural background
   If an human health federal ARAR ARAR does not exist, the MTCA Method B default standard formula value is used for the retained surface water protection value (orange)
4. Blank cells indicate where a PQL was not necessary to adjust the SL, natural background was not available, or ARARs/MTCA criteria were not available in Ecology's CLARC database
5. Arsenic natural background level is MTCA Method A.
6. PQLs are based on values provided by Friedman & Bruya (April 2021).
7. Protection of indoor air SLs from February 2021 CLARC Tables and in concurrence with Ecology 2009. Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action. Publication No. 09-09-047. October 2009
8. SL codes: AL = aquatic life; B = MTCA Method B Surface Water; C = MTCA Method C Indoor Air; Ca = carcinogen; CWA = Clean Water Act; HH = human health; NB = natural background; NC = non-carcinogen; NTR = National Toxics Rule; PQL = practical quantitation limit; SW = surface water

a. TPH SLs are MTCA Method A.
b. MTCA value only shown when there is no federal human health seafood consumption ARAR.
c. First value is by Method 8260D / Second value is Method 8021B

Table 12 - Sediment Screening Levels
Maralco Property - Kent, WA

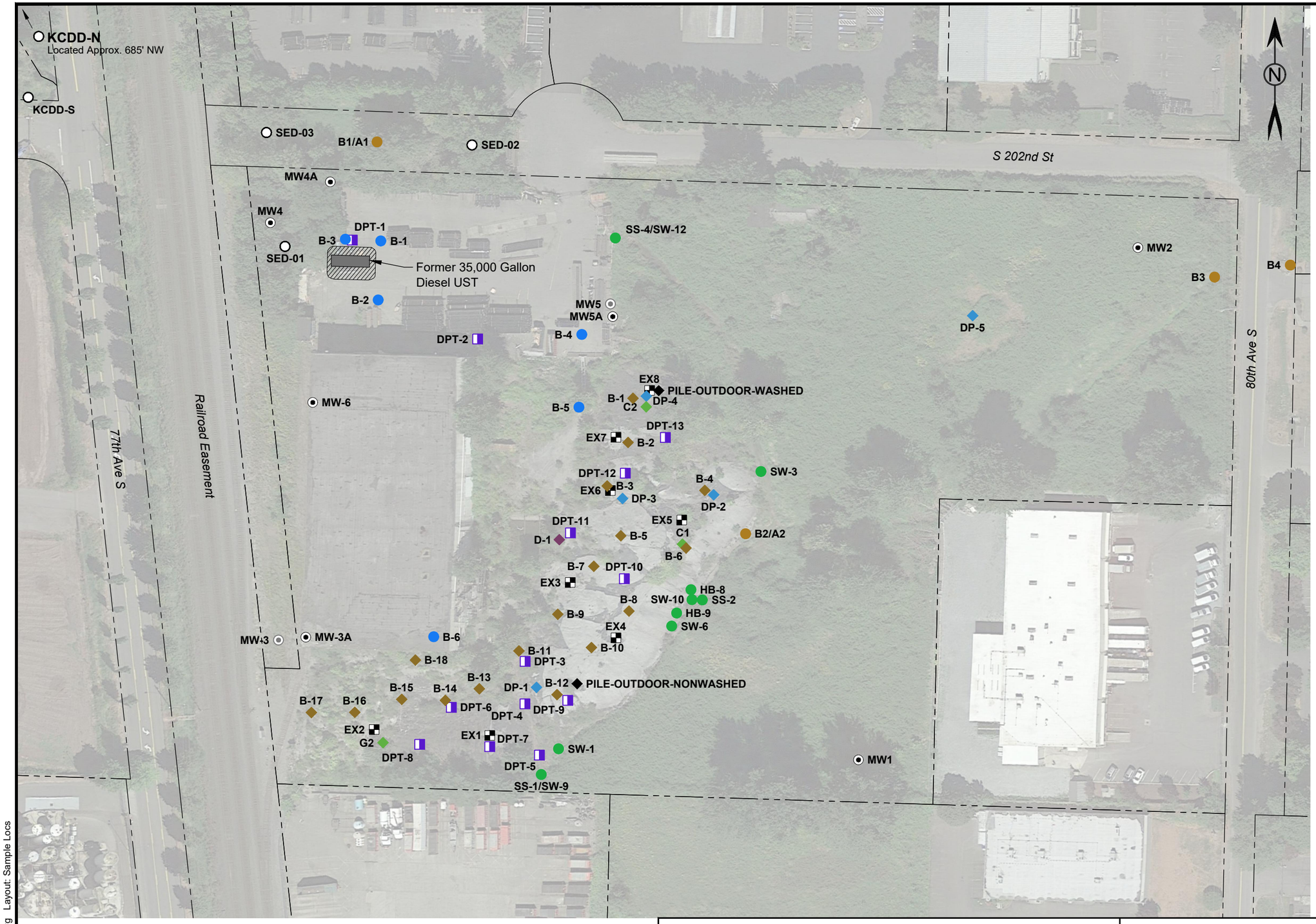
	Screening Level	Fresh Water Sediment	
		SCO	CSL
Aluminum	NC	NC	NC
Iron	NC	NC	NC
Antimony	NC	NC	NC
Arsenic	14	14	120
Cadmium	2.1	2.1	5.4
Chromium	72	72	88
Cobalt	NC	NC	NC
Copper	400	400	1,200
Lead	360	360	>1,300
Mercury	0.66	0.66	0.8
Manganese	NC	NC	NC
Nickel	26	26	110
Silver	0.57	0.57	1.7
Zinc	3,200	3,200	>4,200
Chloride	NC	NC	NC
Fluoride	NC	NC	NC

NOTES:
SCO - fresh water sediment cleanup objective
CSL - fresh water sediment cleanup screening level
NC - no criterion

Table 13 Summary of Proposed RIWP Field Work

Data Gap	Sample Type	Sample ID and Analysis
Indoor Stockpile Characterization: Additional data is needed to profile these stockpiles for disposal.	Representative grab samples from each stockpile. One sample per 600 cubic yards of material, consistent with previous profiling efforts at the property.	Sample ID: Pile-A through Pile-F and BHD bins Analysis: Soil – Metals, TCLP, RCI, pH, Fish Bioassay, and additional analysis TBD by landfill requirements
Potential Diesel Source: Additional soil and groundwater data is needed in the vicinity of DPT-2 to define the source of the TPH and extent.	Direct push soil and grab groundwater samples in the vicinity of DPT-2. Locations will be spaced on 50 ft centers and step outs based on the field screening results. Soil sampling will be extended to 20 ft bgs, based on the estimated depth of the UST removal. Groundwater samples will be collected from temporary well screens.	Sample ID: SB-UST-01 through SB-UST -04 (final number will depend on field screening) Analysis: Soil - TPH-Dx and Metals GW - TPH-Dx, metals, and chloride/fluoride/ammonia
Resampling MW-1: Last sampled in 1990	MW-1 will be redeveloped and resampled to confirm detections observed in the 1990 groundwater sampling event.	Analysis: GW - metals, and chloride/fluoride/ammonia
Evaluation and replacement of existing wells: All site monitoring wells will be evaluated and it is anticipated that several will be abandoned and replaced.	Existing wells MW-1 through MW-6 will be evaluated. Wells that are damaged or cannot product a clear groundwater sample abandoned. New monitoring wells will be installed per installation guidelines in WAC-173-160.	Well IDs will have 'R' for replacement or will start as a higher number, starting at MW-7. See Figure 7.
Extent of Metals Contamination: Additional soil and groundwater samples from wells and boreholes. Direct push boreholes will be focused of northern Property boundary and will likely extend off-Property to the west (77th Ave S) and north (S 202nd St).	Groundwater samples from monitoring wells and vadose and smear zone soil samples from any new well boreholes. Vadose and smear zone soil samples and groundwater samples from temporary wells using a direct push probe.	Sample ID: DPT-14 through DPT-21 (final number will depend on field screening) Analysis: Soil and GW - metals and chloride/fluoride/ammonia.
Sediment/Ditch Delineation: Additional samples are needed to fully delineate sediment impacts in the S. 202nd right-of-way ditch.	Sediment samples will be collected along 2 transections at the outflow end of the ditch shown on Figure 8.	Sample ID: SED-04 through SED-13 Analysis: Soil - metals and chloride/fluoride.

Figures



File: Maralco Site.dwg Layout: Sample Locs

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Maralco Property
7730 South 202nd Street, Kent, Washington
March 2022

Figure 1
Site Location Map

N

LEGEND

A — Approximate Stockpile Locations

— — — — Parcel Boundary

0 40 80

SCALE IN FEET

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Maralco Property
7730 South 202nd Street, Kent, Washington
March 2022

Figure 2
Warehouse Stockpiles

File: Maralco Site.dwg Layout: Warehouse Stockpile

LEGEND

- Wetland Flag
- Wetland Boundary
- Wetland Buffer, 50 Feet
- Parcel Boundary

NOTE

Wetland survey provided by AHBL, dated December 30, 2020.

0 100 200

SCALE IN FEET

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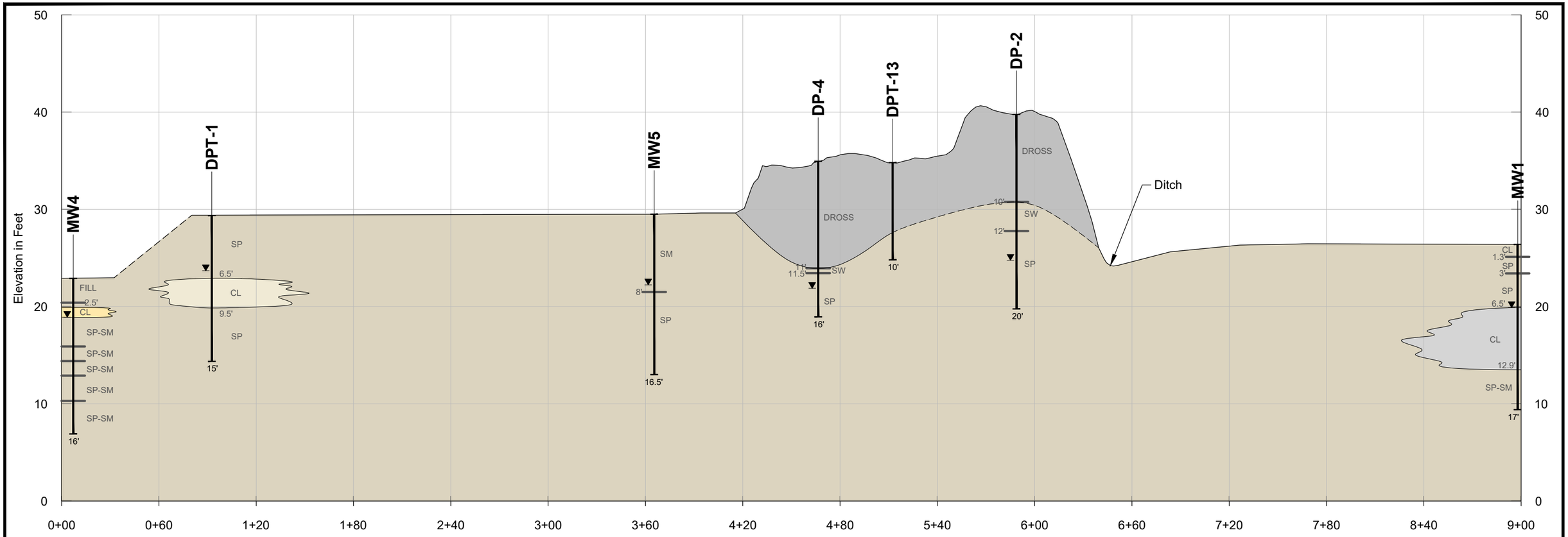
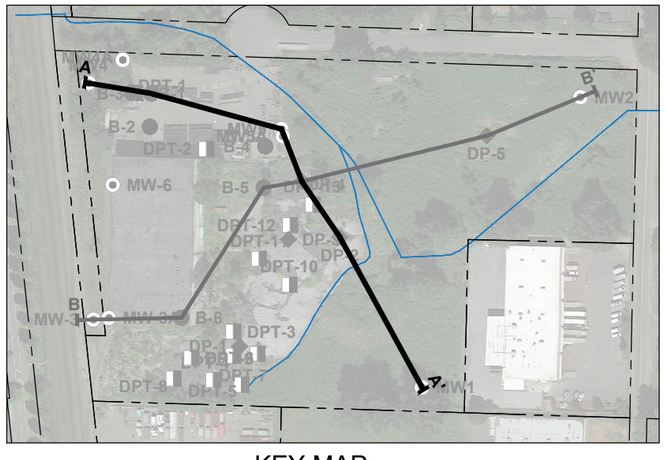
Maralco Property
7730 South 202nd Street, Kent, Washington
March 2022

Figure 3
2020 Wetland Survey

File: Maralco Site.dwg Layout: Wetland





KEY MAP

LEGEND

B-1	Exploration Designation
2'	Noted Lithologic Contact Depth Below Ground Surface (in Feet)
SM	Unified Soil Classification System
▼	Water Level Observed at Time of Drilling
	Approximate Distinct Lithologic Contact
16.5'	Depth of Exploration (in Feet)

0 10 20
VERTICAL SCALE IN FEET

0 60 120
HORIZONTAL SCALE IN FEET
VERTICAL EXAGGERATION = 6X

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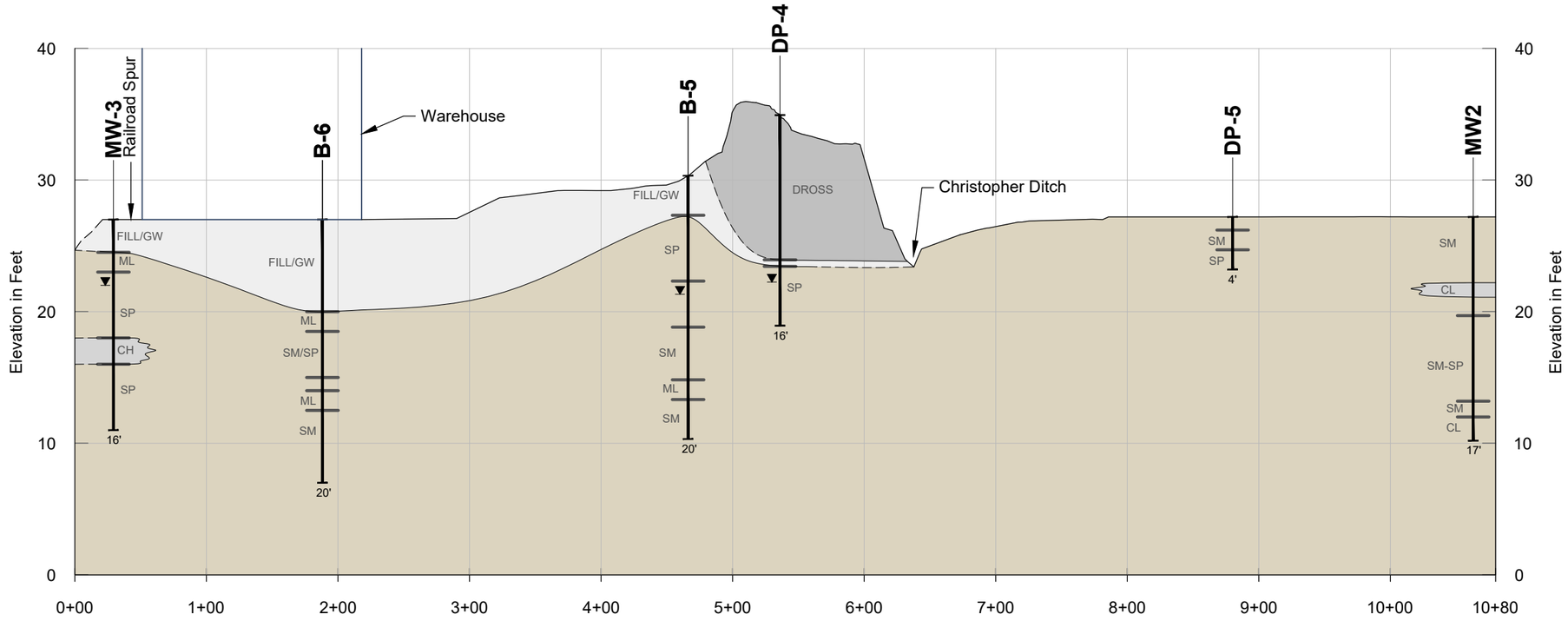
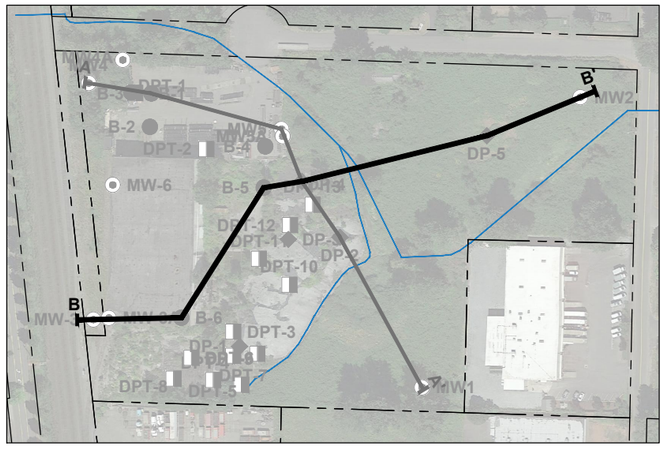
Maralco Property
7730 South 202nd Street, Kent, Washington
March 2022

Figure 4
Lithologic Cross-Section A-A'

File: Maralco Site.dwg Layout: Section A





KEY MAP

LEGEND

B-1 Exploration Designation

2' Noted Lithologic Contact Depth Below Ground Surface (in Feet)

SM Unified Soil Classification System

Water Level Observed at Time of Drilling

Approximate Distinct Lithologic Contact

16.5' Depth of Exploration (in Feet)

0 10 20
VERTICAL SCALE IN FEET

0 100 200
HORIZONTAL SCALE IN FEET
VERTICAL EXAGGERATION = 10X

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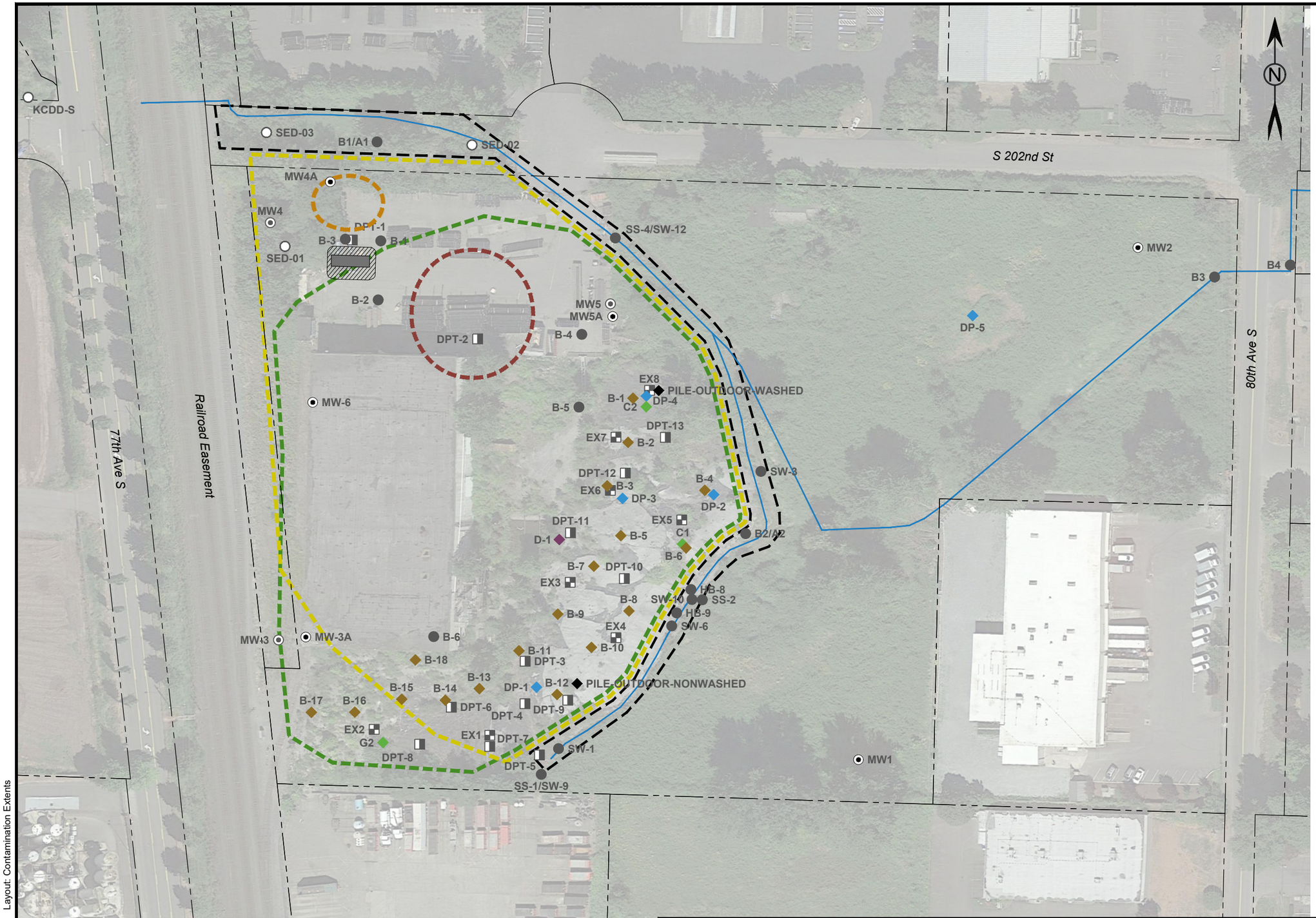
Maralco Property
7730 South 202nd Street, Kent, Washington
March 2022

Figure 5
Lithologic Cross-Section B-B'

File: Maralco Site.dwg Layout: Section B



LEGEND

- Estimated Extent of Diesel in Groundwater
- Estimated Extent of Fluoride in Groundwater
- Estimated Extent of Chloride in Groundwater
- Estimated Extent of Metals in Groundwater
- Estimated Extent of Sediment Impacts
- Approximate Ditch Location
- Sediment Sample (Crete, 2021)
- DPT Locations (Crete, 2021)
- Test Pits (Aerotech, 2017)
- Monitoring Wells (Aerotech, 2017)
- Former Monitoring Wells
- Historic Boring and Sediment Sample Locations
- Dross Grab (Crete, 2021)
- Dross Composite (Stantec, 2017)
- URS Dross (URS, 2006)
- DP Dross (EMR, 2003)
- E&E Dross (E&E, 1987)
- Former UST
- Former Excavation Location
- Parcel Boundary

0 100 200

SCALE IN FEET

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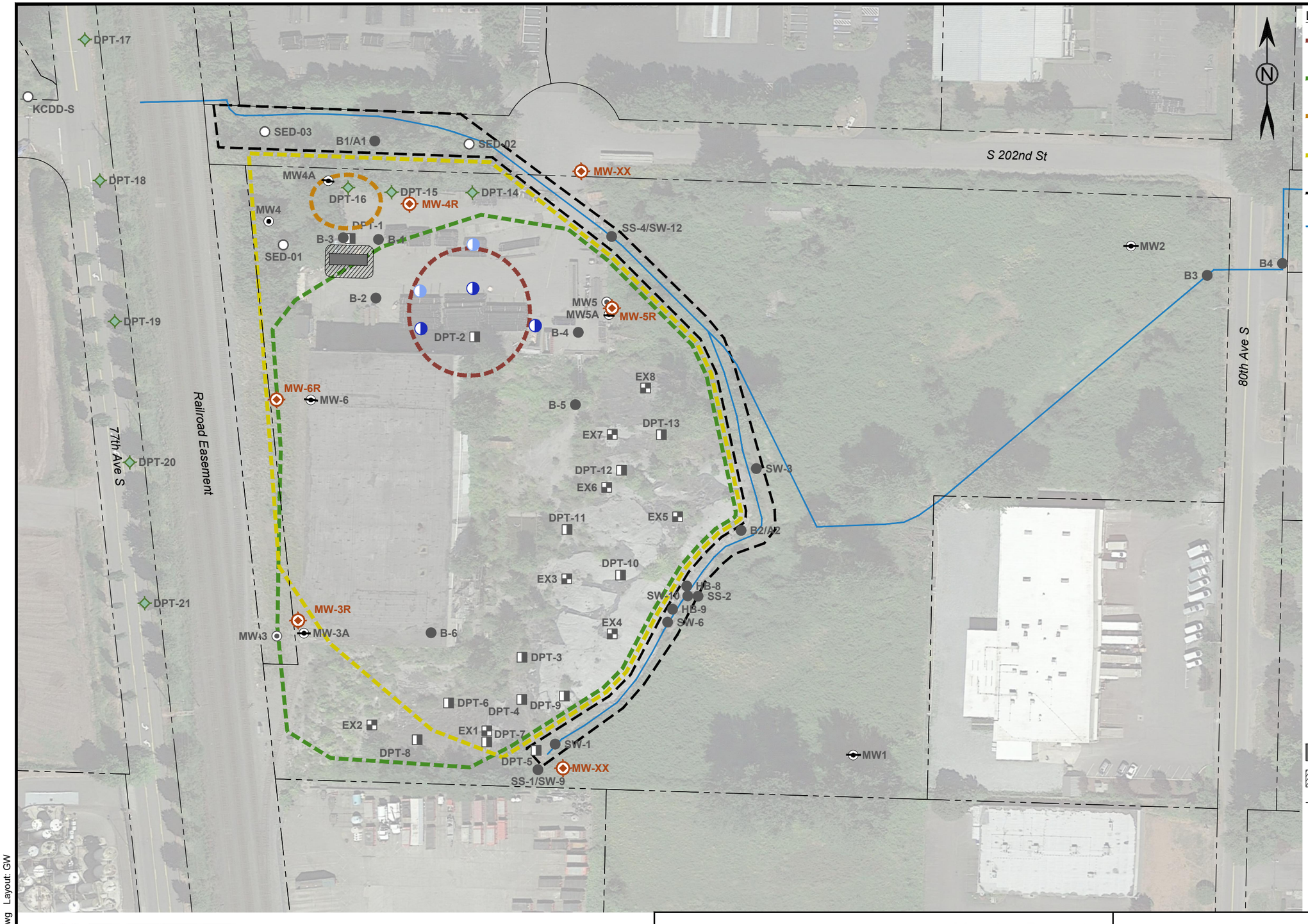
Maralco Property
7730 South 202nd Street, Kent, Washington
March 2022

Figure 6
Extent of Groundwater and Sediment Contamination

File: Maralco Site.dwg Layout: Contamination Extents



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Maralco Property
7730 South 202nd Street, Kent, Washington
March 2022

Figure 7
Proposed Soil and Groundwater Sample Locations

File: Maralco Site.dwg Layout: GW

Transection A-A'
Sample A-1 through A-5

Transection B-B'
Sample B-1 through B-5

SED-03
B1/A1
SED-02
S 202nd St
MW-XX
DPT-18
MW4A
DPT-16
DPT-15
DPT-14
MW-4R
MW4
DPT-1
B-3
B-1
SED-01
SS-4/SW-12
B-2
MW5
MW5A
MW-5R
B-4
DPT-2
DPT-19
Railroad Easement
77th Ave S
MW-6R
MW-6
EX8
PILE-OUTDOOR-WASHED
B-1
DP-4
C2
B-5
DPT-13
EX7
B-2
DPT-12
B-3
EX6
DP-3
B-4
DP-2
DPT-20

LEGEND

- Transect Line
- Approximate Ditch Location
- Proposed Monitoring Well
- Proposed Geoprobe Borings
- Groundwater Grab borings
- Sediment Sample (Crete, 2021)
- DPT Locations
- Test Pits (Aerotech, 2017)
- Monitoring Wells (Aerotech, 2017)
- Monitoring Well to be Abandoned
- Former Monitoring Wells
- Historic Boring and Sediment Sample Locations
- Former UST
- Former Excavation Location
- Parcel Boundary

LEGEND

Samples collected along the transections will be collected at three intervals - 0-0.5, 0.5-1 and 1-1.5 ft bgs. Samples will be collected at the mid point of the drainage channel, along the base of the channel, and mid way up on the sides of the channel for a total of 5 sample locations.

0 50 100
SCALE IN FEET

File: Maralco Site.dwg Layout: Sediment

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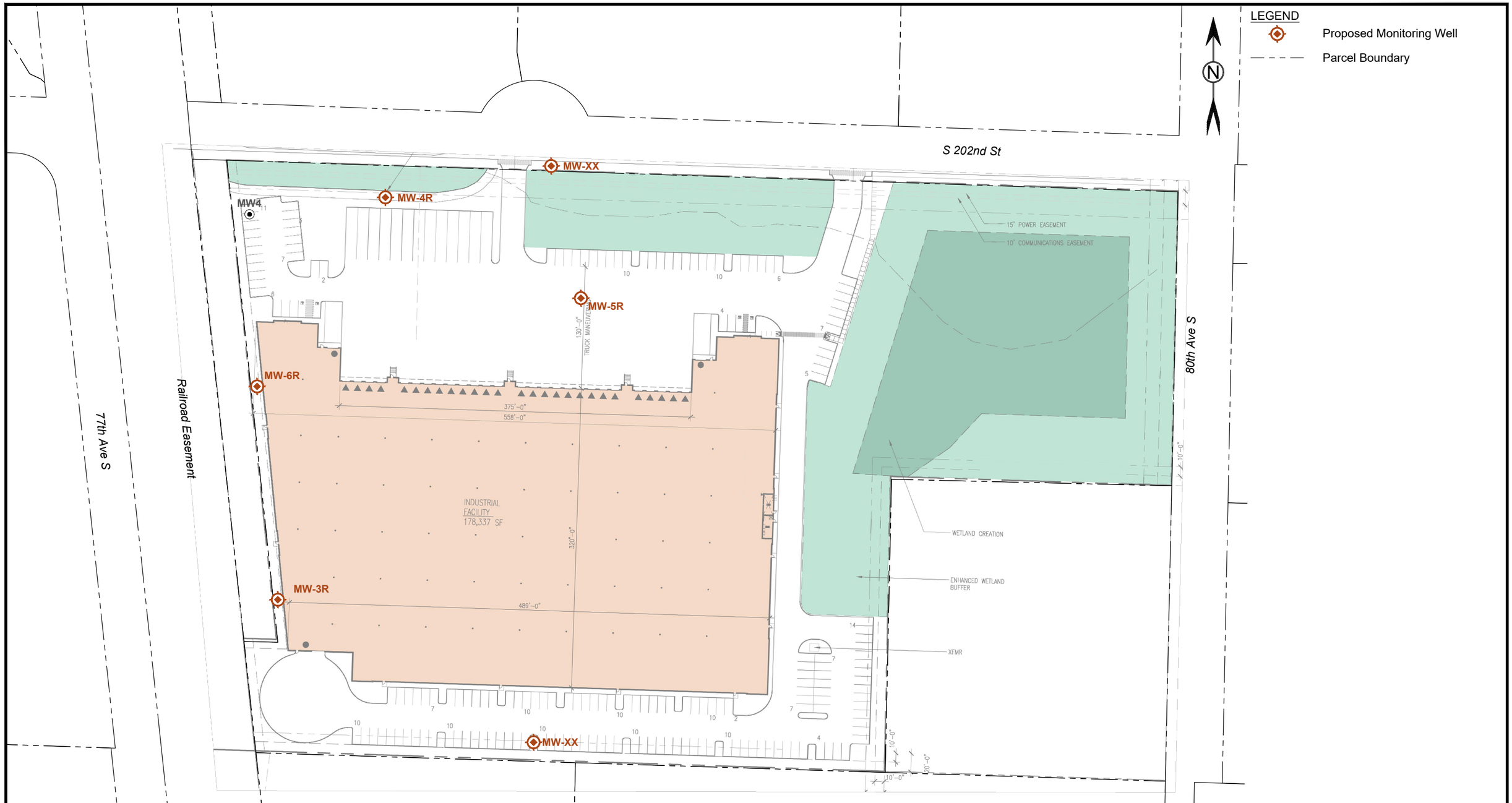
Maralco Property
7730 South 202nd Street, Kent, Washington
March 2022

Figure 8
Proposed Sediment / Ditch Sample Locations



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Maralco Property
7730 South 202nd Street, Kent, Washington
March 2022

Figure 9
Conceptual Site Development

File: Maralco Site.dwg Layout: New bldg

Appendix A Recent Analytical Data Reports and Historical Reports Not Provided to Ecology

STOCKPILE SURVEY AND ASSESSMENT

Performed for:
Former Maralco Aluminum Site
7730 South 202nd Street
Kent, Washington 98032

May 31, 2017

Performed by:

AEROTECH Environmental Consulting Inc.
13925 Interurban Avenue South, Suite No. 210
Seattle, Washington 98168
Fax (206) 402-3872
(866) 800-4030
www.AeroTechEnvironmental.com

STOCKPILE SURVEY AND ASSESSMENT

performed for:

FORMER MARALCO
ALUMINUM SITE
7730 South 202nd Street
Kent, Washington 98032

Clients:	**JOHN P. LYON & GLORIA LYON IRREVOCABLE TRUST**
Point of Contact:	John P. Lyon 601 South Figueroa Street Suite No. 1370 Los Angeles, California 90017 (818)422-2018
Property:	**FORMER MARALCO ALUMINUM SITE** 7730 South 202nd Street Kent, Washington 98032
County:	King County, Washington Parcel Number: 6315000300
Commercial Activity:	Vacant Property
Licensed Geologist:	Justin Foslien (Washington State License No. 2540)
Report Date:	May 31, 2017

EXECUTIVE SUMMARY

The Former Maralco Aluminium Site Property (King County Parcel Identification Number 6315000300) includes approximately 12.05 acres of land and is located at 7730 South 202nd Street in Kent, Washington (Figures 1 and 2). Currently zoned for industrial development, the property contains a 45,000 square foot warehouse building constructed in 1981 and a former farmhouse with several out-buildings constructed between 1960 and 1968. An asphalt-paved parking lot is located in the northwest corner of the parcel. Puget Sound Pipe and Supply, a business located on a north adjacent property, currently utilized for storage of steel pipe. The eastern portion of the Property is covered in blackberry bushes and other shrubbery. The surrounding area is predominantly occupied by heavy industrial properties.

According to Stantec's 2017 Phase II Investigation and 2015 Phase I ESA, the Property operated from 1980 to 1986 as a smelting facility processing aluminum scrap into ingots for recycling. After the smelting process, the salt flux became a waste product consisting of aluminum oxide and impurities from the molten salt smelting process called "black dross" or "salt cake." During the first year of operation the black dross was hauled offsite for disposal at a solid waste landfill. It was stored on-site in a consolidated stockpile located on the south and east sides of the warehouse building for all successive operations. The black dross has remained on-site since the plant closed in 1986.

Aerotech collected 32 discrete samples from the stockpiles and surveyed the site with an aerial drone to estimate the quantity of material stockpiled and it's density for the purpose of determining disposal costs for the property. Aerotech also observed, Brian Green of Azure Green Consultants ("AG") conduct an Aerial Drone Survey of the Site on May 8, 2017.

A total of 32 discrete soil samples were collected on May 17, 2017 from eight excavation locations. The locations are identified by EX1 through EX8 on Figure 2. A table summarizing the recorded mass of each sample and the calculated density converted from gallons per pound to cubic yards per US ton may be found in Table 1.

The collection of samples resulted in a wide range of density values from 0.76 to 1.14 tons per cubic yard. Several factors have likely caused the variability of density throughout the Site. They include but are not limited to: 1) varying moisture and water content; 2) the approximate measure of 5-gallons of the material; 3) variability in the content of the sample (i.e. concrete and or cobbles); 4) and varying measurement output from the scale. To accurately estimate the cost of disposing the stockpile present at the Site, Aerotech recommends utilizing the entire range of the data when predicting the cost of removing the dross stockpile from the Site.

Dross Stockpile Survey and Assessment:

AG provided a calculated estimate of 25,177 cubic yards comparing the elevation of the base surface estimated from the toe of the stockpile and the elevation and current area the stockpile occupies at the Site. Once this material is excavated and placed on trucks for transport, air will bulk up the volume as it has been compacted on the Site since 1986. The range of density measured from 32 samples at 8 locations from 0.76 to 1.14 tons per cubic yard. Multiplying the density yields a tonnage of stockpiled dross range of 19,135 to 28,702 US tons[1].

[1]State of Washington Courts have occasionally held that an "estimate" should be anticipated to be within 18% of the actual cost of the estimated activity. Due to the number of variables present in the response and/or remediation work, the Client or User of this document should be aware that any of the "estimates" contained within this document or communicated by Aerotech Environmental Consulting, Inc. may or may not be within 18% of the actual cost of the work.

TABLE OF CONTENTS

INTRODUCTION

Mr. John P. Lyon, retained Aerotech Environmental Consulting, Inc. ("Aerotech") of Seattle, Washington to survey and assess the current stockpiles of dross waste at the subject property. Aerotech collected 28 discrete samples from the stockpiles and surveyed the site with an aerial drone to estimate the quantity of material stockpiled and it's density for the purpose of determining disposal costs for the property.

SECTION I.

SITE DESCRIPTION

Property Exterior Description:

The Property (King County Parcel Identification Number 6315000300) includes approximately 12.05 acres of land and is located at 7730 South 202nd Street in Kent, Washington (Figures 1 and 2). Currently zoned for industrial development, the property contains a 45,000 square foot warehouse building constructed in 1981 and a former farmhouse with several out-buildings constructed between 1960 and 1968. An asphalt-paved parking lot is located in the northwest corner of the parcel. Puget Sound Pipe and Supply, a business located on a north adjacent property, currently utilized for storage of steel pipe. The eastern portion of the Property is covered in blackberry bushes and other shrubbery. The surrounding area is predominantly occupied by heavy industrial properties.

Site History and Background:

According to Stantec's 2017 Phase II Investigation and 2015 Phase I ESA, the Property operated from 1980 to 1986 as a smelting facility processing aluminum scrap into ingots for recycling. After the smelting process, the salt flux became a waste product consisting of aluminum oxide and impurities from the molten salt smelting process called "black dross" or "salt cake." During the first year of operation the black dross was hauled offsite for disposal at a solid waste landfill. It was stored on-site in a consolidated stockpile located on the south and east sides of the warehouse building for all successive operations. The black dross has remained on-site since the plant closed in 1986.

SECTION II.

FIELD WORK

Aerial Drone Survey:

Aerotech observed, Brian Green of Azure Green Consultants ("AG") conduct an Aerial Drone Survey of the Site on May 8, 2017. The survey consisted of an aerial drone fitted with a Zenmuse X5 15 mm camera. AG placed photo/ground control points across the Site and uploaded a grid flight pattern for the drone to follow measuring the elevation of the ground surface at the Site. A hard copy and electronic version of the map of the survey data is included in the Appendix.

No historical photos of the Site were available with elevation data to compare the present location of the stockpile to the original grade elevation. Therefore, a base surface was defined using the approximate toe of the stockpile slope. A volume calculation of 25,177 cubic yards is the result of comparing the elevation of the base surface and the elevation and current area the stockpile occupies at the Site.

Pix 4D Mapper and Autodesk Civil 3D were utilized by AG to for the map creation and to calculate the approximate volume of the dross stockpile. Sparse vegetation was filtered from the calculated stockpile surface utilizing the Civil 3D CreateSurfaceFromPointCloud command with Kriging interpolation. Heavily vegetated areas were clipped from the point cloud prior to creating the surface. Topographic data within heavily vegetated areas was interpolated by the software. A Quality Report from the Pix 4D Mapper and selected aerial photos from the survey are included in the Appendix.

Excavation Activities:

At the direction of Aerotech, Garrison Creek Landscaping used a Kubota KX121-3 Mini Excavator to dig 7 pits and one side cut excavation at the Site on May 17, 2017. Each pit was back filled upon the completion of sample collection at each location to match the surrounding grade.

Sampling Methodology:

An all-terrain cart was utilized to move to and from each location at the Site with standard 5-gallon buckets and a Health o meter® Weight Tracking Scale (Model HDM651DQ-63). A 5-gallon bucket was used to contain the samples which minimized the weight of the sample while still evaluating a large enough amount of stockpile material to obtain a representative sample. Aerotech directed the excavation of pits advanced to approximately 10 feet below grade (EX1, EX2, and EX4 thru EX8) and one side cut excavation to approximately 17 feet below grade (EX3). Each sample was handled with a fresh pair of clean latex gloves. Samples were then placed into 5-gallon buckets, weighed and recorded.

Variation:

Each sample of dross was placed into 5-gallon bucket to measure approximate mass. Several variables affecting the measurement of the dross material mass are present in the assessment that lead to a wide range of results. They include but are not limited to: 1) varying moisture and water content; 2) the approximate measure of 5-gallons of the material; 3) variability in the content of the sample (i.e. concrete and or cobbles); 4) and varying measurement output from the scale.

A key reason for using the cart was to have a flat and relatively level surface to measure the mass of each 5-gallon bucket. While every precaution was taken to ensure a level surface; however, the uneven terrain on the stockpiles and surrounding area may have contributed to slight errors in the recorded mass of each sample. To further minimize this error, the samples were measured at least three times to ensure the correct value of mass was recorded.

SECTION III.

FIELD RESULTS

Density Calculation of Dross Material:

A total of 28 discrete soil samples were collected on May 17, 2017 at eight excavation locations. The locations are identified by EX1 through EX8 on Figure 2. A table summarizing the recorded mass of each sample and the calculated density converted from gallons per pound to cubic yards per US ton may be found in Table 1.

The collection of samples resulted in a wide range of density values from 0.76 to 1.14 tons per cubic yard. As discussed in the previous section several factors have likely caused the variability of density throughout the Site. To accurately estimate the cost of disposing the stockpile present at the Site, Aerotech recommends utilizing the entire range of the data when predicting the cost of removing the dross stockpile from the Site.

Stockpile Volume Calculation:

AG provided a calculated estimate of 25,177 cubic yards comparing the elevation of the base surface estimated from the toe of the stockpile and the elevation and current area the stockpile occupies at the Site. Once this material is pulled up and put on trucks for transport, air will bulk up the volume as it has been compacted on the Site since 1986.

Utilizing the density values measured from 32 samples collected at the Property that range from 0.76 to 1.14 tons per cubic yard, the calculated a range of tonnage for the dross stockpile is 19,135 to 28,702 US tons.

Limitations:

State of Washington Courts have occasionally held that an "estimate" should be anticipated to be within 18% of the actual cost of the estimated activity. Due to the number of variables present in the response and/or remediation work, the Client or User of this document should be aware that any of the "estimates" contained within this document or communicated by Aerotech Environmental Consulting, Inc. may or may not be within 18% of the actual cost of the work.

STATEMENT OF QUALITY ASSURANCE

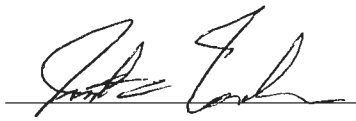
I have performed this Remedial Investigation in accordance with generally accepted environmental practices, procedures, and regulatory requirements, as of the date of this Report. I have employed the degree of care and skill ordinarily exercised under similar circumstances by reputable environmental professionals practicing in this area.

STATEMENT OF THE LICENSED GEOLOGIST

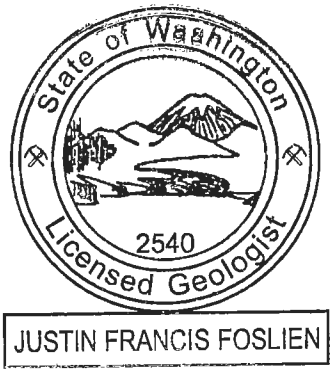
As stipulated in the Regulatory Code of the State of Washington Title 18, Chapter 18.220, the undersigned is a licensed Geologist in the State of Washington, and has met the statutory requirements of RCW § 18.220.060 for such licensing including, but not limited to, educational requirements, work and field experience, examination proficiency, and acceptance by the State Licensing Board.

The undersigned Licensed Geologist has supervised the geological work performed as described in attached Report – a majority of said work being performed by employees of the firm which employs undersigned Licensed Geologist – as delineated in RCW Title 18, Chapter 18.220, Paragraph 190.

Signature of Licensed Washington Geologist:



Signature – Justin Francis Foslien (License No. 2540)



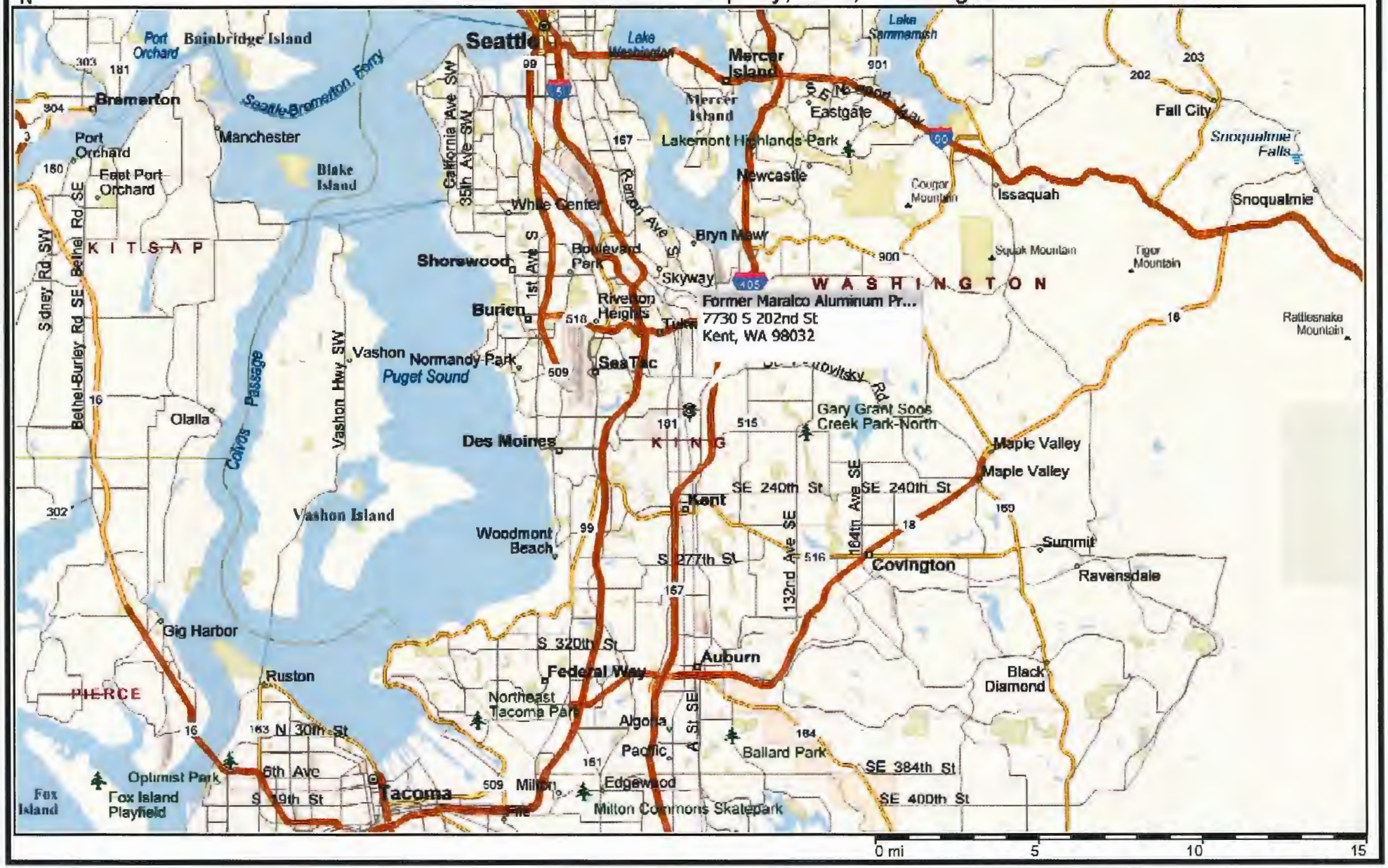
REPORT ENDNOTES

APPENDIX

- Photographs
- Survey Map
- Pix4D Mapper Quality Report
- Aerial Survey Photographs

• Figures

Former Maralco Aluminum Property, Kent, Washington



AEROTECH ENVIRONMENTAL CONSULTING	**SITE VICINITY MAP**	Former Maralco Aluminum Property 7730 South 202nd Street Kent, Washington

Date: 05/27/17
By: Nick Gerkin
Figure: 1

EXPLANATION

Extent of Figure 3

Property Boundary

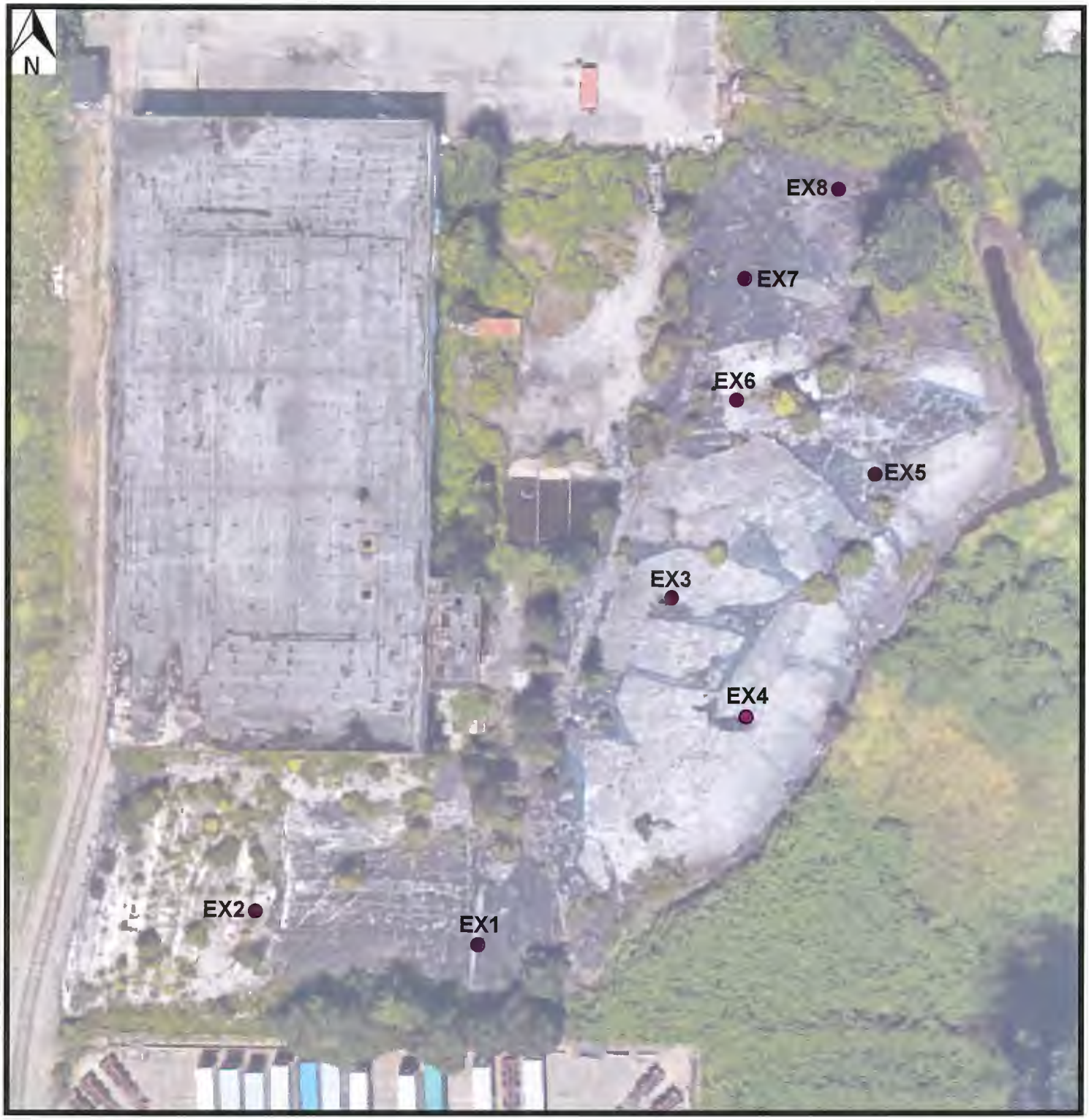
AEROTECH ENVIRONMENTAL CONSULTING

SITE OVERVIEW

Former Maralco Aluminum Property
7730 South 202nd Street
Kent, Washington

0 125 250
SCALE (feet)

Date: 05/27/17
By: Nick Gerkin
Figure: 2



EXPLANATION

EX8 Test Pit Location

0 60 120

SCALE (feet)

AEROTECH ENVIRONMENTAL CONSULTING

TEST PIT LOCATION MAP

Former Maralco Aluminum Property
7730 South 202nd Street
Kent, Washington

Date: 05/27/17
By: Nick Gerkin
Figure: 3

• Tables

TABLE 1
DROSS DENSITY VALUES
Former Maralco Aluminum Site
7730 South 202nd Street
Kent, Washington

Sample Location	Approximate Sample Depth (ft)	Mass of Sample (lbs)/5gal	Mass per gallon(lbs/gal)	Mass per cubic yard (lbs/cubic yard)	Mass per cubic yard (ton/cubic yard)
EX1	2	44.1	8.82	1781.41	0.89
	5	45	9	1817.77	0.91
	8	43	8.6	1736.98	0.87
	10	46	9.2	1858.16	0.93
EX2	2	43.1	8.62	1741.02	0.87
	5	44	8.8	1777.37	0.89
	8	48.4	9.68	1955.11	0.98
	10	45.2	9.04	1825.84	0.91
EX3	2	39.4	7.88	1591.56	0.80
	7	38.4	7.68	1551.16	0.78
	12	37.6	7.52	1518.84	0.76
	17	38.6	7.72	1559.24	0.78
EX4	2	41.8	8.36	1688.50	0.84
	5	45.1	9.02	1821.81	0.91
	7	47.8	9.56	1930.87	0.97
	10	48.2	9.64	1947.03	0.97
EX5	2	37.6	7.52	1518.84	0.76
	5	43.6	8.72	1761.21	0.88
	7	38	7.6	1535.00	0.77
	10	39	7.8	1575.40	0.79
EX6	2	39.8	7.96	1607.71	0.80
	5	45.4	9.08	1833.92	0.92
	7	46.8	9.36	1890.48	0.95
	10	48.2	9.64	1947.03	0.97
EX7	2	42	8.4	1696.58	0.85
	5	43.4	8.68	1753.13	0.88
	7	44.8	8.96	1809.69	0.90
	10	51.8	10.36	2092.45	1.05
EX8	2	41	8.2	1656.19	0.83
	5	41	8.2	1656.19	0.83
	7	45.8	9.16	1850.08	0.93
	10	56.2	11.24	2270.19	1.14

ft = feet
lbs = pounds
gal = gallon
Volume of sample = 5 gallons

• Photographs

Aerial Drone, Prior to Takeoff

Example of Dross Material Near EX1

View of Southern Stockpile toward the West, South of the Warehouse Building

Example of Dross Material in the Vicinity of EX5

View of Eastern Stockpile looking North

View Looking North to the Top of the Highest Stockpile

View of Excavation Pit at EX1

Sample from EX2 in a 5-gallon bucket, on the Scale within the Utility Cart

Excavator digging pit at EX24

Excavator Cutting into the Side of the Stockpile at EX3

Backfilling Area of EX3 after Cutting into Side of Stockpile

Excavator Digging a pit at EX8, 5-gallon sample buckets in the foreground

• Survey Map

MARACLO SITE

KENT, Washington

Stockpile Volume

Name	2d Area	Stockpile Volume
Volume	107107 Sq. Ft.	25177 Cu. Yd.

Data Collection & Volume Caluclation:

Capture Date: 5/8/17
Aircraft: DJI Inspire 1 Pro
Pilot: Brian Green 3929935
Camera: Zenmuse X5 15mm
Ground Control Points: Aeropoints
Photogrammetry Software: Pix 4d Mapper
Volume Calculation software and method: Autodesk Civil 3d
The base surface was defined by a TIN created using the approximate toe of the stockpile slope. Sparse vegetation was automatically filtered from the calculated stockpile surface using the Civil 3d CreateSurfaceFromPointCloud command with Kriging interpolation. Heavily vegetated areas were clipped from the point cloud prior to creating the surface. Topographic data in heavily vegetated areas was interpolated by the software.
Contours and Spot Elevations: Spot Elevations and Contour Elevation labels on the map denote the elevation of the stockpile above (+) or below (-) the base surface.

N
W E
S

1" = 30'

Maraclo Aerial Mapping and Stockpile Volume Calculation

AEROTECH
Environmental Consulting, Inc.
13925 Interurban Avenue South, Suite No.210
Seattle, WA 98168
Phone (206) 257-4123

AZURE GREEN CONSULTANTS

DRAWING

SHEET 1
OF 1

• Pix4D Mapper Quality Report

Quality Report

Generated with Pix4Dmapper Pro version 3.1.23

Important: Click on the different icons for:

Help to analyze the results in the Quality Report

Additional information about the sections

Click here for additional tips to analyze the Quality Report

Summary

Project	maradio
Processed	2017-05-08 14:04:31
Camera Model Name(s)	FC550_DJIMFT15mmF1.7ASPH_15.0_4608x3456 (RGB)
Average Ground Sampling Distance (GSD)	2.15 cm / 0.84 in
Area Covered	0.0574 km^2 / 5.738 ha / 0.0222 sq. mi. / 14.1863 acres
Time for Initial Processing (without report)	01h:17m:55s

Quality Check

Images	median of 52104 keypoints per image	✓
Dataset	365 out of 365 images calibrated (100%), 1 images disabled	✓
Camera Optimization	2.38% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 22776.3 matches per calibrated image	✓
Georeferencing	yes, 6 GCPs (6 3D), mean RMS error = 0.017 ft	✓

Preview

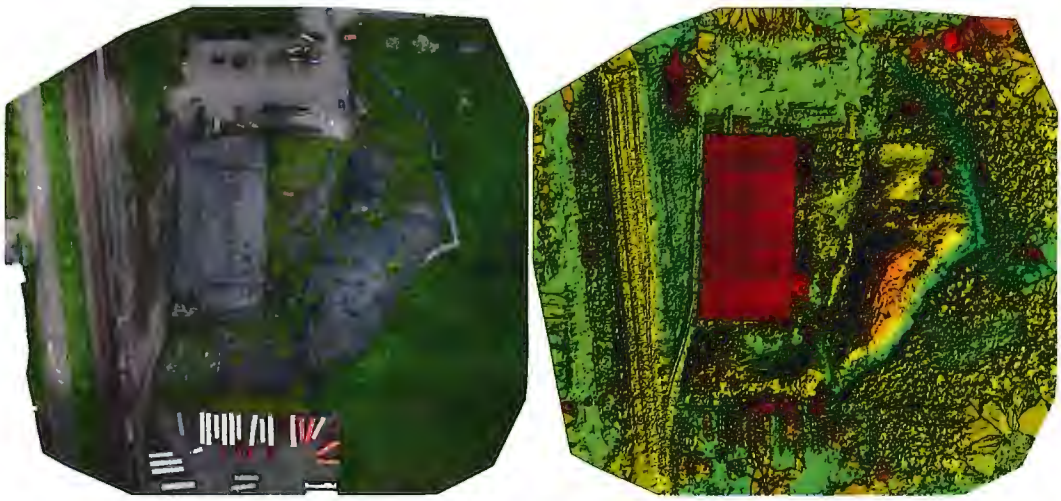


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	365 out of 366
Number of Geolocated Images	366 out of 366

Initial Image Positions

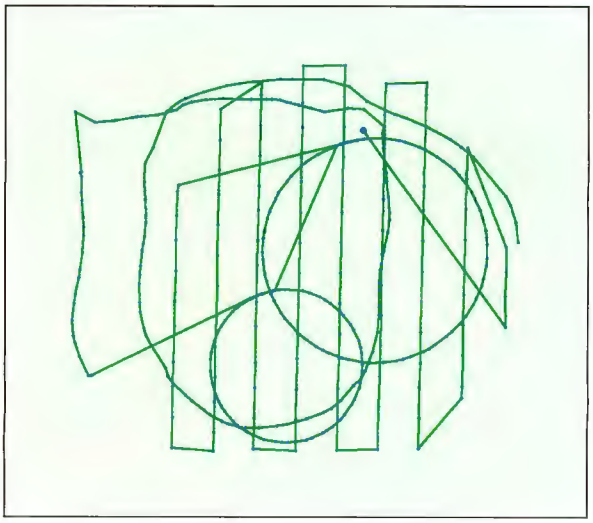
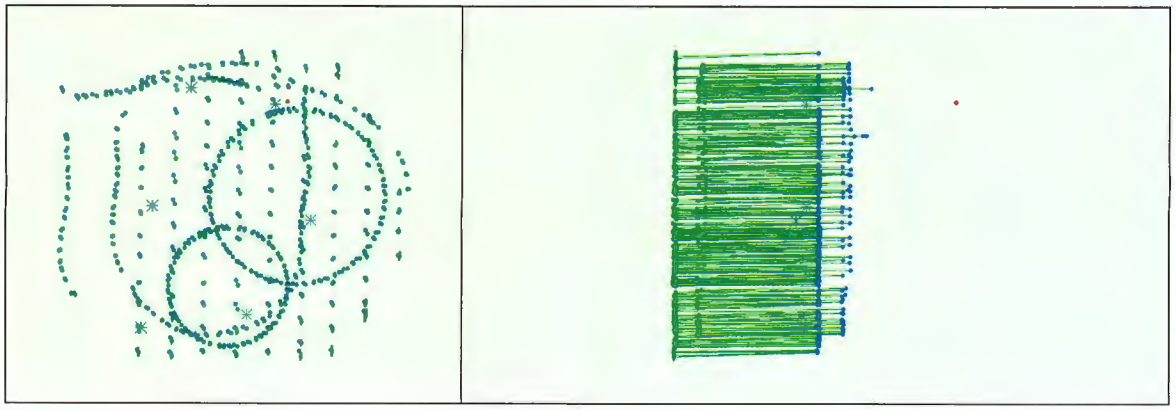


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



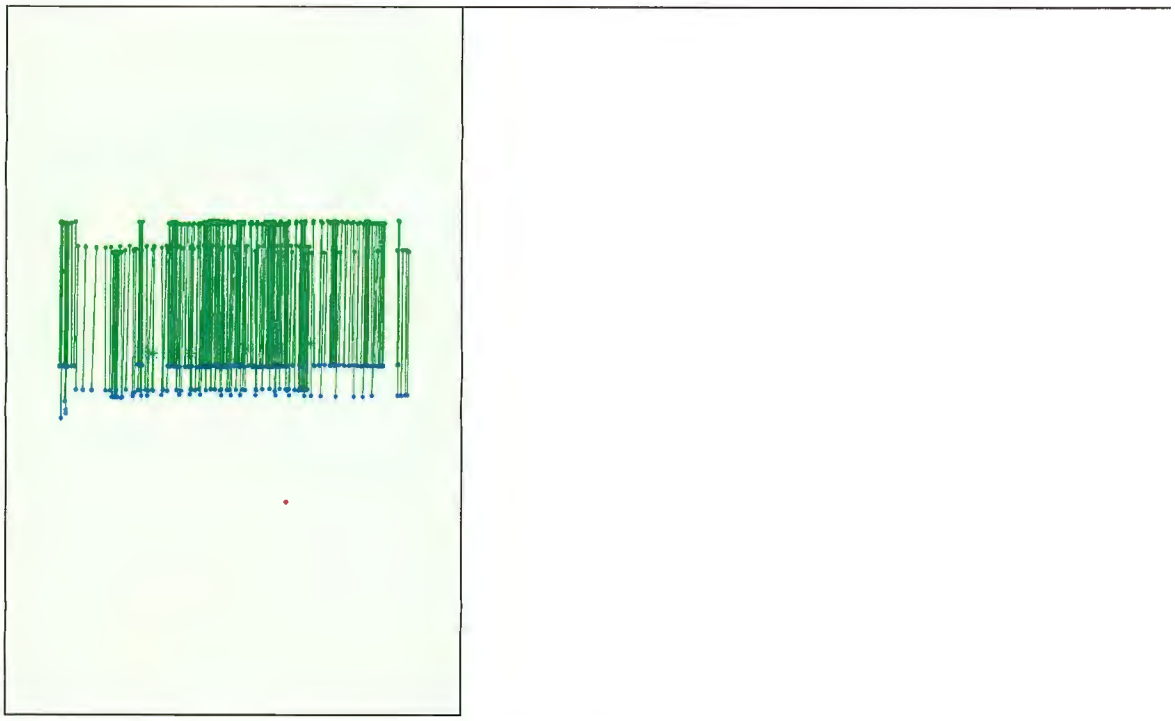


Figure 3: Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane). Red dots indicate disabled or uncalibrated images. Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

Absolute camera position and orientation uncertainties

	X [ft]	Y [ft]	Z [ft]	Omega [degree]	Phi [degree]	Kappa [degree]	Camera Displacement X [ft]	Camera Displacement Y [ft]	Camera Displacement Z [ft]
Mean	0.150	0.234	0.183	0.052	0.032	0.017	0.035	0.033	0.141
Sigma	0.057	0.222	0.029	0.045	0.016	0.009	0.009	0.006	0.089

Overlap

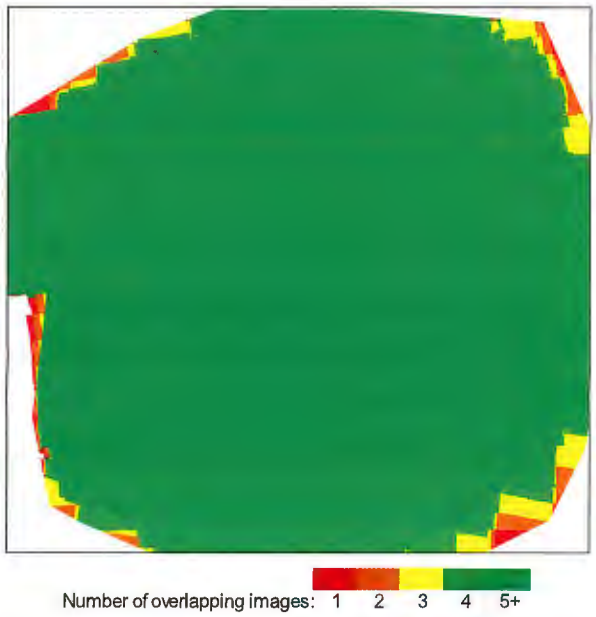


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint matches is also sufficient for these areas (see Figure 5 for keypoint matches).

Bundle Block Adjustment Details

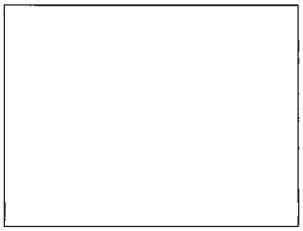
Number of 2D Keypoint Observations for Bundle Block Adjustment	7917007
Number of 3D Points for Bundle Block Adjustment	1646927
Mean Reprojection Error [pixels]	0.228

Internal Camera Parameters

FC550_DJIMFT15mmF1.7ASPH_15.0_4608x3456 (RGB). Sensor Dimensions: 17.500 [mm] x 13.125 [mm]

EXIF ID: FC550_DJIMFT15mmF1.7ASPH_15.0_4608x3456

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3969.470 [pixel] 15.075 [mm]	2278.330 [pixel] 8.653 [mm]	1757.020 [pixel] 6.673 [mm]	-0.004	-0.001	0.004	-0.000	-0.001
Optimized Values	4064.174 [pixel] 15.435 [mm]	2262.934 [pixel] 8.594 [mm]	1715.615 [pixel] 6.515 [mm]	-0.002	0.007	-0.007	-0.000	-0.002
Uncertainties (Sigma)	2.234 [pixel] 0.008 [mm]	0.378 [pixel] 0.001 [mm]	2.070 [pixel] 0.008 [mm]	0.001	0.003	0.004	0.000	0.000



The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to the see the average direction and magnitude of the re-projection error for each pixel. Note that the vectors are scaled for better visualization.

2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	52104	22776
Min	31573	4559
Max	67672	36362
Mean	50383	21690

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	794435
In 3 Images	299846
In 4 Images	153690
In 5 Images	92886
In 6 Images	61403
In 7 Images	43541
In 8 Images	31700
In 9 Images	24326
In 10 Images	18800
In 11 Images	14922
In 12 Images	12375
In 13 Images	10209
In 14 Images	8492
In 15 Images	7365
In 16 Images	6294
In 17 Images	5493
In 18 Images	4730
In 19 Images	4205

In 20 Images	3705
In 21 Images	3382
In 22 Images	2998
In 23 Images	2731
In 24 Images	2428
In 25 Images	2240
In 26 Images	2071
In 27 Images	1854
In 28 Images	1753
In 29 Images	1588
In 30 Images	1378
In 31 Images	1358
In 32 Images	1199
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In 46 Images	593
In 47 Images	530
In 48 Images	544
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In 63 Images	276
In 64 Images	236
In 65 Images	235
In 66 Images	225
In 67 Images	247
In 68 Images	229
In 69 Images	196
In 70 Images	209
In 71 Images	156
In 72 Images	194
In 73 Images	171
In 74 Images	163
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In 76 Images	163
In 77 Images	165
In 78 Images	160

In 79 Images	131
In 80 Images	152
In 81 Images	135
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In 128 Images	3
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In 130 Images	5
In 131 Images	2
In 132 Images	2
In 133 Images	2
In 134 Images	4
In 136 Images	1
In 138 Images	2
In 139 Images	1

2D Keypoint Matches

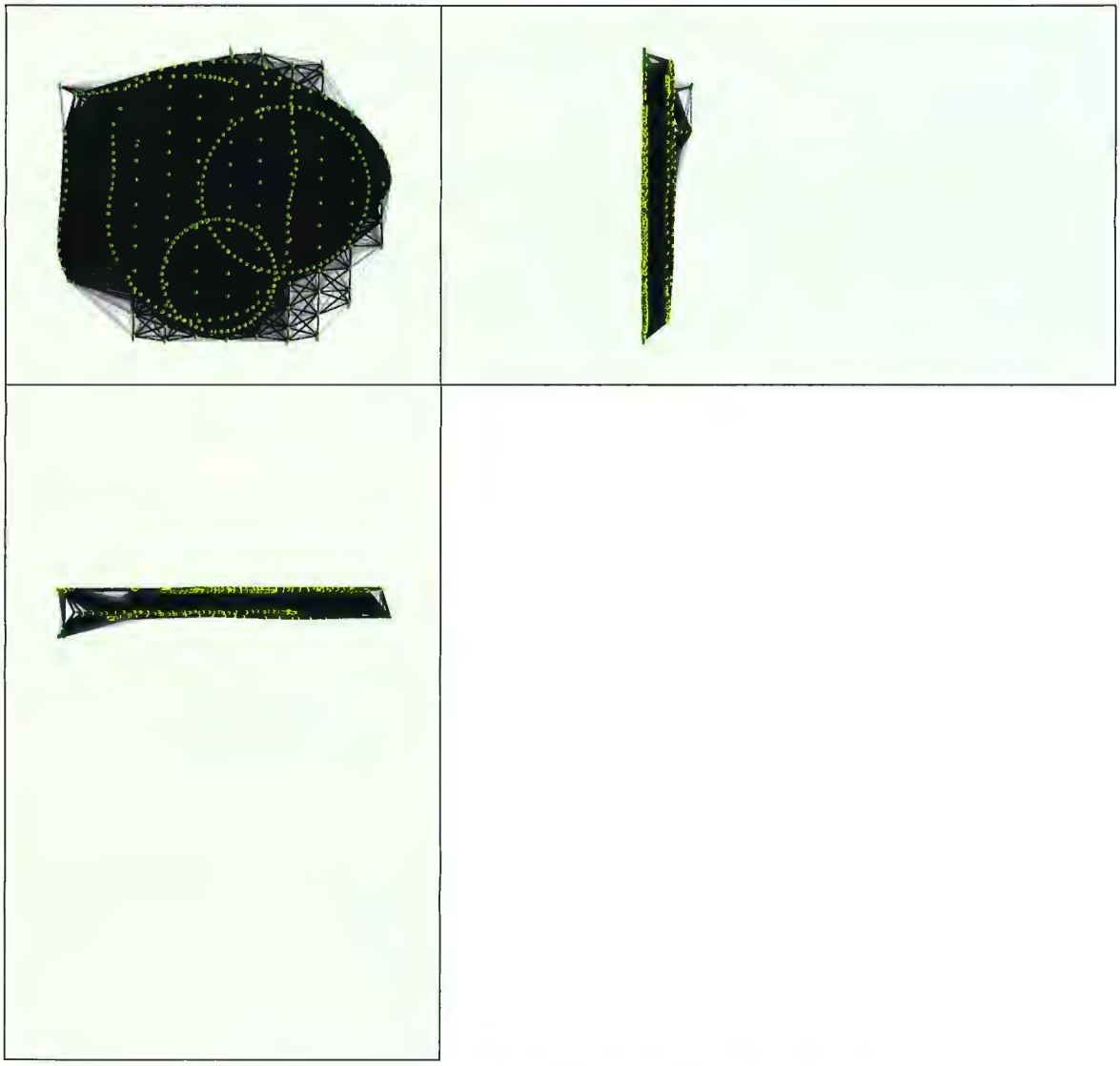


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty of the bundle block adjustment result.

Relative camera position and orientation uncertainties

	X [ft]	Y [ft]	Z [ft]	Omega [degree]	Phi [degree]	Kappa [degree]	Camera Displacement X [ft]	Camera Displacement Y [ft]	Camera Displacement Z [ft]
Mean	0.145	0.230	0.089	0.053	0.033	0.018	0.039	0.038	0.142
Sigma	0.056	0.224	0.038	0.046	0.016	0.009	0.009	0.007	0.091

Geolocation Details

Ground Control Points

GCP Name	Accuracy XY/Z [ft]	Error X [ft]	Error Y [ft]	Error Z [ft]	Projection Error [pixel]	Verified/Marked
12873149 (3D)	0.020/ 0.020	0.010	-0.006	0.025	0.707	37 / 37
12873135 (3D)	0.020/ 0.020	0.017	0.020	-0.038	1.026	23 / 23
12873406 (3D)	0.020/ 0.020	-0.013	-0.030	0.026	0.571	17 / 17
12873609 (3D)	0.020/ 0.020	0.002	0.001	-0.033	0.417	19 / 19
12873343 (3D)	0.020/ 0.020	-0.001	-0.009	-0.008	0.689	35 / 35
12873581 (3D)	0.020/ 0.020	-0.002	0.011	0.023	0.692	36 / 36
Mean [ft]		0.002206	-0.002206	-0.000692		
Sigma [ft]		0.009451	0.016031	0.027318		
RMS Error [ft]		0.009705	0.016182	0.027327		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.

Absolute Geolocation Variance

Min Error [ft]	Max Error [ft]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-15.00	0.00	0.00	0.00
-15.00	-12.00	0.27	0.00	0.00
-12.00	-9.00	0.27	0.55	0.00
-9.00	-6.00	2.19	6.85	1.64
-6.00	-3.00	6.03	9.86	7.40
-3.00	0.00	34.25	30.41	34.25
0.00	3.00	49.32	36.44	55.07
3.00	6.00	6.30	8.77	1.37
6.00	9.00	1.37	6.58	0.27
9.00	12.00	0.00	0.55	0.00
12.00	15.00	0.00	0.00	0.00
15.00	-	0.00	0.00	0.00
Mean [ft]		-3.345983	4.400357	-316.784118
Sigma [ft]		2.437732	3.659152	2.126507
RMS Error [ft]		4.139824	5.722982	316.791255

Min Error and Max Error represent geolocation error intervalsbetween -1.5 and 1.5 times the maximum accuracy of all the images. Columns X, Y, Z show the percentage of images with geolocation errors within the predefined error intervals. The geolocation error is the difference between the intial and computed image positions. Note that the image geolocation errors do not correspond to the accuracy of the observed 3D points.

Geolocation Bias	X	Y	Z
Translation [ft]	-3.345983	4.400357	-316.784118

Bias between image initial and computed geolocation given in output coordinate system.

Relative Geolocation Variance

Relative Geolocation Error	Images X [%]	Images Y [%]	Images Z [%]
[-1.00, 1.00]	94.79	80.27	100.00
[-2.00, 2.00]	99.73	99.45	100.00
[-3.00, 3.00]	100.00	100.00	100.00
Mean of Geolocation Accuracy [ft]	5.000000	5.000000	10.000000
Sigma of Geolocation Accuracy [ft]	0.000000	0.000000	0.000000

Images X, Y, Z represent the percentage of images with a relative geolocation error in X, Y, Z.

Geolocation Orientational Variance	RMS [degree]

Omega	1.348
Phi	1.223
Kappa	5.931

Geolocation RMS error of the orientation angles given by the difference between the initial and computed image orientation angles.

Rolling Shutter Statistics

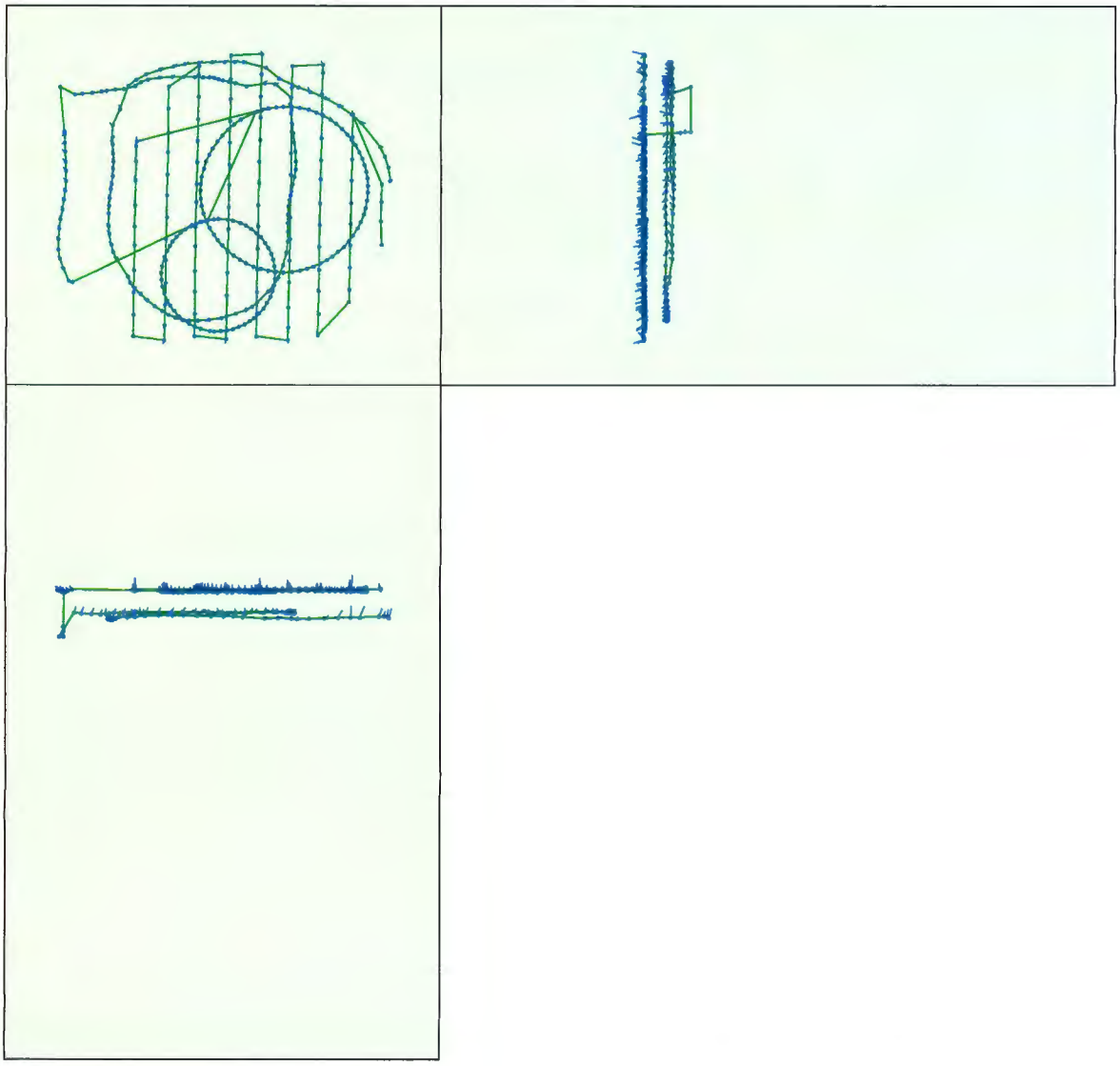


Figure 6: Camera movement estimated by the rolling shutter camera model. The green line follows the computed image positions. The blue dots represent the camera position at the start of the exposure. The blue lines represent the camera motion during the rolling shutter readout, re-scaled by a project dependant scaling factor for better visibility.

Median Camera Speed	10.9576 [ft/s]
Median Camera Displacement During Sensor Readout)	0.88 [ft]
Median Rolling Shutter Readout Time	78.8966 [ms]

Initial Processing Details

System Information

Hardware	CPU: Intel(R) Core(TM) i7-6950X CPU @ 3.00GHz RAM: 128GB GPU: NVIDIA GeForce GTX 1080 (Driver: 21.21.13.7849)

Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS84 (egm96)
Ground Control Point (GCP) Coordinate System	NAD_1983_StatePlane_Washington_North_FIPS_4601_Feet (egm96)
Output Coordinate System	NAD_1983_StatePlane_Washington_North_FIPS_4601_Feet (egm96)

Processing Options

Detected Template	No Template Available
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
Advanced: Matching Strategy	Use Geometrically Verified Matching: no
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, yes Bundle Adjustment: Classic

Point Cloud Densification details

Processing Options

Image Scale	multiscale, 1 (Original image size, Slow)
Point Density	Optimal
Minimum Number of Matches	5
3D Textured Mesh Generation	no
Advanced: Matching Window Size	7x7 pixels
Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Advanced: Limit Camera Depth Automatically	no
Time for Point Cloud Densification	06h:46m:27s

Results

Number of Generated Tiles	4
Number of 3D Densified Points	68558834
Average Density (per m^3)	41.74

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (2.15 [cm/pixel])
DSM Filters	Noise Filtering: yes Surface Smoothing: yes, Type: Sharp
Raster DSM	Generated: yes Method: Inverse Distance Weighting Merge Tiles: yes
Orthomosaic	Generated: yes Merge Tiles: yes GeoTIFF Without Transparency: no Google Maps Tiles and KML: yes

Raster DTM	Generated: yes Merge Tiles: yes
DTM Resolution	5 x GSD (2.15 [cm/pixel])
Time for DSM Generation	26m:33s
Time for Orthomosaic Generation	31m:59s
Time for DTM Generation	02m:47s

• Aerial Survey Photographs

KNIGHT
CMA CGM
KNIGHT

GROUNDWATER MONITORING WELL INSTALLATION REPORT

Performed at:
Former Maralco Aluminum Property
7730 South 202nd Street
Kent, Washington 98032

AEROTECH
Environmental Consulting Inc.

August 15, 2017

Anchorage Seattle Portland

Cost-effective environmental solutions
for the western United States and Alaska

www.AerotechEnvironmental.com

AEROTECH
Environmental Consulting Inc.

13925 Interurban Avenue South, Suite No.210
Seattle, Washington 98168
(360)710-5899

2916 NW Bucklin Hill Road, Suite No.126
Silverdale, Washington 98383
(866) 800-4030

512 W. International Airport Road, Suite No.201Anchorage, Alaska 99518

5319 SW Westgate Dr., Suite No.24
Portland, Oregon 97221

June 7, 2017

John P. Lyon
601 South Figuero Street
Suite No. 1370
Los Angeles, California 90017

SUBJECT **Groundwater Well Survey**
Former Maralco Aluminum Site
7730 South 202nd Street
Kent, Washington 98032

Mr. Lyon,

At your request Aerotech Environmental Consulting, Inc. ("Aerotech") conducted a Groundwater Well Survey to determine the current status of the wells located at the above referenced Site. Aerotech utilized existing maps of the Site and a metal detector with the goal of locating the steel well vaults for missing groundwater monitoring wells MW3 and MW4. Select photographs taken during the survey have been enclosed with this letter.

The current condition of the wells:

- MW1 is presumed to be located in the southeastern corner of the Site. Large equipment would be necessary to access this location due to the overgrowth of blackberries and weeds. Current status was not verified at this time.

- MW2 is located in the northeast corner of the Site. This well was recently sampled in October of 2016 by Stantec after redevelopment, since it had not been sampled in the 12 years previous.

- MW3 is presumed to be located near the southwest corner of the Site very near the southwest corner of the warehouse building. Aerotech surveyed the area with a metal detector only to find railroad associated metal and metal trash. MW3 is presumed to be destroyed.

- MW4 is presumed to be located near the northwest corner of the Site. Aerotech surveyed the area with a metal detector and found no evidence of the well vault. This area appears to have been cleared by heavy equipment in October of 2016 and no well was found. MW4 is presumed destroyed.

- MW5 is currently pulled approximately 4 feet above the ground with the casing still in the ground. It is not usable and should be decommissioned according to Washington State regulations.

Aerotech suggests new monitoring wells installed at the site to replace the destroyed locations. Additionally a groundwater well network will be necessary to verify previously groundwater flow direction and to assess the extent of impacted groundwater.

Please do not hesitate to contact the President of Aerotech, Alan Blotch, at (360) 710-5899 with any questions.

Sincerely,

Justin Foslien
Licensed Geologist WA #2504
Email: justin@dirtydirt.us

ENCLOSURE

Selected photographs of the Groundwater Well Survey

City of Kent
Phase II ESA, Former Maralco Alumir

Project Location
7730 S. 202nd St.,
Kent, Washington

Prep
Technical Re
Independent Re

0 50 100 Feet
1:1,200 (At original document size of 11x17)

Legend

- Property Location
- Approximate location of former 35,000-g Diesel UST excavation
- Groundwater Grab Sample, Stantec 201
- Surface Water Sample, Stantec 2016
- Location Inaccessible, Stantec 2016
- Groundwater Sample from Monitoring W
- Well not located, 10/21/16
- Surface Water Drainage Flow Direction

Shaded: Constituent exceeds one or more Model (MTCA) screening levels
BOLD: Constituent detected
* = Carcinogenic Polycyclic Aromatic Hydrocarbo
All constituents reported as micrograms/Liter (ug/L
J: The reported value is an estimate
U: Constituent not detected

Notes:
1. Coordinate System: NAD 1983 HARN StatePlane
4601 Feet
2. Data Sources Include: Stantec, King County, URS
3. Orthophotography: NAIP 2013
4. Differences in the spatial alignment between t
GIS/spatial data may cause locations and pr
appear offset.
5. Waste characterization sample locations of the
shown on this Figure. See MKE's Phase I Remedic
1991 & EMR's Remedial Investigation / Feasibility
Maralco Site, 2003.
6. The locations of subsurface soil samples associa
16 are not known and are not present on this map

Survey area near Southwest corner of warehouse building and presumed location of MW3

Rusted rails in the vicinity of presumed location of MW3

Metal detected near presumed MW3 location, a rail joint

Rail joint near presumed MW3 location

Metal detected near presumed MW3 location, a smashed can

Smashed metal can near presumed MW3 location

Rusty piece of rail joint near presumed MW3 location

View to west from presumed area of MW4

Area surveyed with metal detector to locate MW4

Area surveyed with metal detector to locate MW4, looking southwest toward railroad tracks

GROUNDWATER MONITORING WELL INSTALLATION REPORT

Performed for:
Former Maralco Aluminum Site
7730 South 202nd Street
Kent, Washington 98032

August 15, 2017

Performed by:

AEROTECH Environmental Consulting Inc.
13925 Interurban Avenue South, Suite No. 210
Seattle, Washington 98168
Fax (206) 402-3872
(866) 800-4030
www.AeroTechEnvironmental.com

GROUNDWATER MONITORING WELL INSTALLATION REPORT

performed for:

FORMER MARALCO ALUMINUM SITE
7730 South 202nd Street
Kent, Washington 98032

Clients:	**JOHN P. LYON & GLORIA LYON IRREVOCABLE TRUST**
Point of Contact:	John P. Lyon 601 South Figueroa Street Suite No. 1370 Los Angeles, California 90017 (818)422-2018
Property:	**FORMER MARALCO ALUMINUM SITE** 7730 South 202nd Street Kent, Washington 98032
County:	King County, Washington Parcel Number: 6315000300
Commercial Activity:	Vacant Property
Licensed Geologist:	Justin Foslien (Washington State License No. 2540)
Report Date:	August 15, 2017

EXECUTIVE SUMMARY

The Former Maralco Aluminium Site Property (King County Parcel Identification Number 6315000300) includes approximately 12.05 acres of land and is located at 7730 South 202nd Street in Kent, Washington (Figures 1 and 2). Currently zoned for industrial development, the property contains a 45,000 square foot warehouse building constructed in 1981 and a former farmhouse with several out-buildings constructed between 1960 and 1968. An asphalt-paved parking lot is located in the northwest corner of the parcel. Puget Sound Pipe and Supply, a business located on a north adjacent property, currently utilizes the parking lot for storage of steel pipe. The eastern portion of the Property is covered in blackberry bushes and other shrubbery. The surrounding area is predominantly occupied by heavy industrial properties.

According to Stantec's 2017 Phase II Investigation and 2015 Phase I ESA, the Property operated from 1980 to 1986 as a smelting facility processing aluminum scrap into ingots for recycling. After the smelting process, the salt flux became a waste product consisting of aluminum oxide and impurities from the molten salt smelting process called "black dross" or "salt cake." During the first year of operation the black dross was hauled offsite for disposal at a solid waste landfill. It was stored on-site in a consolidated stockpile located on the south and east sides of the warehouse building for all successive operations. The black dross has remained on-site since the plant closed in 1986.

Mr. John P. Lyon, the Facilities Manager, contracted Aerotech Environmental Consulting, Inc. ("Aerotech") to determine if impacts related to the dross stockpile are migrating off-property.

Groundwater Monitoring Well Installation: Conclusions & Recommendations:

Soil Analytical Results: No concentrations of Aluminum, Lead, Total Chromium, Cadmium, Arsenic, Mercury, Barium, Silver or Selenium in soil samples collected from MW3A, MW4A and MW6 exceeded the respective MTCA A or B Cleanup Level.

Groundwater Monitoring Well Installation: Aerotech Environmental Consulting, Inc. constructed four soil borings as groundwater monitoring wells (MW3A, MW4A, MW5A and MW6) to evaluate potential off-property migration of groundwater. Monitoring well MW3A, MW4A and MW5A are replacement locations of previously destroyed or missing locations MW3 through MW5.

Groundwater Sampling Results: Groundwater samples collected from monitoring wells MW3A and MW6 contained concentrations of Fluorides above the Method B Cleanup Level. Concentrations of Chlorides above the Washington Administrative Code Maximum Contaminant Level were present in groundwater samples collected from monitoring wells MW4A and MW6. Groundwater samples collected from monitoring well MW5A contained concentrations of Arsenic and Aluminum above the respective MTCA Method A or B Cleanup Level. All remaining analyses completed on groundwater samples were either not detected at or above laboratory detection limits, or detected below the applicable Cleanup Level.

Conclusions. The newly installed perimeter wells MW3A, MW4A and MW6 along the northwest and western property boundary contain concentrations above applicable regulatory standards of one or more contaminants associated with the dross stockpile. Additionally samples collected from MW5A contained concentrations of Aluminium above MTCA Method B Cleanup Levels. Based on the investigation results, it appears that groundwater with concentrations above regulatory standards is migrating off-property toward the north and northwest.

TABLE OF CONTENTS

INTRODUCTION

Mr. John P. Lyon, retained Aerotech Environmental Consulting, Inc. ("Aerotech") of Seattle, Washington to determine if groundwater impacted from the current stockpiles of dross waste at the subject property is migrating off-property . Aerotech collected three soil samples from soil borings constructed as monitoring wells and four groundwater samples from the newly installed wells.

SECTION I.

SITE DESCRIPTION

Property Exterior Description:

The Property (King County Parcel Identification Number 6315000300) includes approximately 12.05 acres of land and is located at 7730 South 202nd Street in Kent, Washington (Figures 1 and 2). Currently zoned for industrial development, the property contains a 45,000 square foot warehouse building constructed in 1981 and a former farmhouse with several out-buildings constructed between 1960 and 1968. An asphalt-paved parking lot is located in the northwest corner of the parcel. Puget Sound Pipe and Supply, a business located on a north adjacent property, currently utilized for storage of steel pipe. The eastern portion of the Property is covered in blackberry bushes and other shrubbery. The surrounding area is predominantly occupied by heavy industrial properties.

Recognized Environmental Conditions

Site Discovery and Regulatory Status:

According to Stantec's 2017 Phase II Investigation and 2015 Phase I ESA, the Property operated from 1980 to 1986 as a smelting facility processing aluminum scrap into ingots for recycling. After the smelting process, the salt flux became a waste product consisting of aluminum oxide and impurities from the molten salt smelting process called "black dross" or "salt cake." During the first year of operation the black dross was hauled offsite for disposal at a solid waste landfill. It was stored on-site in a consolidated stockpile located on the south and east sides of the warehouse building for all successive operations. The black dross has remained on-site since the plant closed in 1986. A summary of pertinent previous environmental reports may be found in Stantec's 2017 Phase II Investigation.

In 2013, a previous agreement with the State of Washington Department of Ecology ("WDOE") under the Voluntary Cleanup Program ("VCP") and was terminated on March 6, 2013. The site was previously associated with the name MARALCO and VCP Site No. NW2356.

Previously Identified Contaminants of Concern:

Previous investigations at the Site have identified, diesel and lubricant range petroleum constituents;. Polynuclear Aromatic Hydrocarbons ("PAHs"); RCRA 8 metals; aluminum; and chloride and fluoride as Contaminants of Concern at the Site

Site Observations and Reported Conditions:

With the exception of the above referenced environmental concern. There were no additional Recognized Environmental Conditions or concerns identified as potential impacts to the Site.

SECTION II.

FIELD WORK

Notifications – "Public Utilities:

Due to the age and nature of the Site, a "public" utilities notification was performed prior to the start of work. Aerotech requested the notification on July 14, 2017, and was issued ticket number 17266862 by the Utilities Underground Location Center ("UULC").

According to the UULC the utilities in the vicinity of the Site that required notification included:

District	Company	Marking Concerns	Customer Service	Repair
ATT08	AT&T CORP	(800)252-1133	(800)222-0300	(800)222-0300
CC7760	COMCAST CABLE	(800)762-0592	(800)266-2278	(855)537-6296
KCMTRO01	KING CNTY METRO SEWER	(206)263-5722	(206)263-3700	(206)263-3840
KENT01	CITY OF KENT	(253)856-5600	(253)856-5600	(253)856-5600
MCI01	MCI	(800)289-3427	(800)289-3427	(800)289-3427
OLYPE01	BP/OLYMPIC PIPE LINE COMPANY	(425)981-2517	(425)981-2517	(888)271-8880

Private Utilities Location:

Additionally, Aerotech engaged personnel of Mountain View Locating Services LLC. ("Mountain View") of Bonney Lake, Washington to locate building and site utilities on July 26, 2017, prior to the start of the on Site drilling activities. No anticipated or unexpected situations were discovered or encountered during the "private" locating activities.

Based in part upon the pavement markings made by utility location technicians; the locations of utility fixtures such as water, electrical, or manholes, and the presence of anomalies detected by induction or ground penetrating radar methodologies, final monitoring well locations were chosen. Refer to Figure 4 for details regarding the soil boring locations and site features.

Ground Penetrating Radar Survey:

Mountain View staff conducted a Ground Penetrating Radar ("GPR") Survey on July 26, 2017 to augment the induced current methodology, and to verify the presence of utility trenches such as sewer and water main trenches. Mr. Tim Schaff of Mountain View employed radar equipment utilizing Dual Frequency Antennae (300 MHz/800 MHz) manufactured by Geophysical Survey Systems. The locations of the water main and storm sewers were confirmed by means of GPR activities.

Site Activities:

Four soil borings constructed as monitoring wells (MW3A, MW4A, MW5A and MW6) were completed on July 21, 2017 under contract with Aerotech. All the work was performed during business hours. No unusual or unforeseen circumstances occurred during the Site activities.

Drilling Activities:

Drilling operations utilized a Truck-mounted Direct Push Drilling Rig. The subsurface soil borings were performed by equipment owned and operated by Licensed Driller from Standard Environmental Probe of Olympia. All subsurface work was overseen by State of Washington Licensed Geologist, Mr. Justin Foslien (State of Washington License No. 2540). The laboratory analytical services were performed by a State of Washington licensed labs, Advance Analytical Labs located in Renton, Washington and TestAmerica Seattle located in Tacoma, Washington.

Soil Borings:

Boring logs indicate approximately a 2-3 foot thick layer of gravel fill followed by a 1-4 foot layer of silt, 2.5-5 foot layer of fine to medium grained sand and 0.5-4 feet silty clay. Each soil boring with the exception of MW5A terminated in very fine to fine grained sand at approximately 16 feet bgs.

Soil Sample Collection:

A total of six discrete soil samples were collected on July 21, 2017 from three soil boring locations. Of these samples three were submitted for analyses based on the shallowest depth. Additional samples collected were held pending analyses results in case of detection above MTCA cleanup levels.

Soils from each location were visually inspected for color quality and evidence of discoloration, and physically observed for the purpose of recording composition and noting color, where distinctive. Each sample was handled with a fresh pair of clean latex gloves. Samples were then placed into sterile four-ounce glass jars.

Each sample was given a unique identifier number and placed into an iced cooler for preservation. Samples were held in the custody of Nicholas Gerkin until delivery to Advance Analytical Labs in Renton, Washington and TestAmerica Seattle of Tacoma, Washington.

Equipment Decontamination:

All sample acquisition equipment was decontaminated before and after the completion of each borehole to eliminate the potential for cross-contamination between borings, as required. All reusable sampling equipment for soil sampling, drive rods, and probes were decontaminated after each sampling point by washing with an Alconox-distilled water solution and rinsing with distilled water.

Site Restoration:

The four monitoring wells MW3A, MW4A, MW5A, and MW6 included the installation of a traffic rated well vault mounted flush with the surrounding grade.

Well Purging:

Aerotech pumped each of the newly constructed monitoring wells at 500 ml/min for 45 minutes resulting in approximately 5-gallons of purge water. This was to ensure the groundwater sample to be collected was representative of the subsurface conditions and to remove any construction material suspended in the wells.

Well Sampling:

Aerotech collected groundwater samples from each of the newly constructed monitoring wells (MW3A, MW4A, MW5A and MW6) in accordance with the Low Flow Groundwater Standard Operating Procedure included in the Appendix.

SECTION III.

GEOLOGY AND HYDROGEOLOGY

Geology – Regional and on-Site Conditions:

The Puget Sound Region is a lowland basin created by tectonic wrenching between the Olympic Mountains to the west and the Cascade Mountains to the east. The principle aquifers in the Puget Sound Lowlands occur in the glacial drift associated with the last few glacial and interglacial periods. A series of coarse grained glacial and interglacial sands or gravels, which tend to a serve as aquifers lie between fine grained glacial tills or fine grained interglacial sediments which generally serve to confine or restrict the flow of groundwater. These unconsolidated sediments commonly underlie the basin lowland to depths of a few tens of feet to more than 1,000 feet.

Geology and Subsurface Soils Characteristics – Site and Vicinity

The Site lies within the Green River Valley, a part of the Duwamish-Green River Watershed, a northwest-southeast trending valley and associated tributaries extending from the Cascade foothills to the Puget Sound. Major surface water bodies in the Duwamish Valley include the Green River, the Duwamish River and Springbrook Creek. The closest surface bodies of water to the Site are drainage ditches that flow across the Site eventually toward the Green River, which is approximately 1 mile northwest.

The Duwamish-Green River Watershed has been gradually filled since the last glacial retreat. The valley is filled with over 300 feet of Quaternary alluvium interbedded at depth with marine sand. According to the USGS, most of the upper 100 feet of deposits in the Duwamish Valley consist of sand, gravel, silt, clay and peat. In areas in and around Kent finer grained surficial deposits extend to depths of greater than 50 feet. The shallowest layers of sandy silt or silt are generally found in the upper 30 feet and are generally continuous across a given site.

Beneath the Site is a 2-3 foot thick layer of fill followed by a 1-4 foot layer of silt, 2.5-5 foot layer of fine to medium grained sand and 0.5-4 feet silty clay. Each soil boring with the exception of MW5A terminated in very fine to fine grained sand at approximately 16 feet bgs.

Subsurface Hydrogeological Characteristics – Groundwater Occurrence:

Saturated conditions were observed in all soil borings within the fine to medium grained sand layer, silty clay as well as the very fine to fine grained sand. Aerotech observed groundwater at approximately 5-6.5 feet bgs at MW3A, MW4A, MW5A and MW6.

SECTION IV.

ANALYTICAL RESULTS

Total Aluminum, Fluoride, Chloride, RCRA 8 Metals, Total Petroleum Hydrocarbons – Gasoline, Diesel and Polynuclear Aromatic Hydrocarbons ("PAHs")

No concentrations of Aluminum, Lead, Total Chromium, Cadmium, Arsenic, Mercury, Barium, Silver or Selenium in soil samples collected from MW3A, MW4A and MW6 exceeded the respective MTCA A or B Cleanup Level. A summary of these results may be found in Table 1, including results from the previous investigations.

Groundwater samples collected from monitoring wells MW3A and MW6 contained concentrations of Fluorides above the Method B Cleanup Level. Concentrations of Chlorides above the Washington Administrative Code Maximum Contaminant Level were present in groundwater samples collected from monitoring wells MW4A and MW6. Groundwater samples collected from monitoring well MW5A contained concentrations of Arsenic and Aluminum above the respective MTCA Method A or B Cleanup Level. All remaining analyses completed on groundwater samples were either not detected at or above laboratory detection limits, or detected below the applicable Cleanup Level. A summary of these results may be found in Table 2, including results from the previous investigations.

APPLICABLE ANALYTICAL METHODOLOGIES AND PARAMETERS

The analytical parameters were chosen based upon the results of previous investigations to provide a comprehensive characterization of the subsurface soils and groundwater present at the Site Areas of Concern and to comply with State of Washington recommendations.

Analytical Methodology:

Soil: **Total Aluminum**
USEPA 6010C

Water **Total Aluminum**
USEPA 6010C

Water **Fluorides and Chlorides**
USEPA 300.0

Water **RCRA 8 Metals**
USEPA 7010/7470A

Water **Diesel and Lubricant Range Organics**
State of Washington NWTPH-Dx/Dx Extended

Water **Polynuclear Aromatic Hydrocarbons ("PAHs")**
USEPA 8270 SIM

Laboratory Analysis:

Laboratory analysis was provided by:

TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
253.922.2310
cathy.gamble@testamericainc.com; and

Advanced Analytical Laboratory, LLC
4078 148 Avenue NE
Redmond, WA 98052
425.702.8571
aachemlab@yahoo.com

STATEMENT OF QUALITY ASSURANCE

I have performed this Remedial Investigation in accordance with generally accepted environmental practices, procedures, and regulatory requirements, as of the date of this Report. I have employed the degree of care and skill ordinarily exercised under similar circumstances by reputable environmental professionals practicing in this area.

I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in § 312.10 of this part. I have the specific qualifications based upon education, training, and experience necessary to conduct Remedial Investigations.

Signature of Washington Certified UST Site Assessor:

Signature – Nicholas Gerkin (Certificate No. 8452487)

STATEMENT OF THE LICENSED GEOLOGIST

As stipulated in the Regulatory Code of the State of Washington Title 18, Chapter 18.220, the undersigned is a licensed Geologist in the State of Washington, and has met the statutory requirements of RCW § 18.220.060 for such licensing including, but not limited to, educational requirements, work and field experience, examination proficiency, and acceptance by the State Licensing Board.

The undersigned Licensed Geologist has supervised the geological work performed as described in attached Report – a majority of said work being performed by employees of the firm which employs undersigned Licensed Geologist – as delineated in RCW Title 18, Chapter 18.220, Paragraph 190.

Signature of Licensed Washington Geologist:

Signature – Justin Francis Foslien (License No. 2540)

APPENDIX

- Analytical Results Tables & Figures
- Photographs
- Project Contract Documents
- Laboratory Analytical Reports & Chains of Custody
- Boring Logs
- Low-Flow Groundwater Sampling Standard Operating Procedure
- Low-Flow Sampling Field Documentation

ANALYTICAL RESULTS TABLES
&
FIGURES

TABLE 1
SOIL ANALYTICAL RESULTS
Former Maralco Aluminum Property
7730 South 202nd Street
Kent, Washington

Aerotech Environmental Consulting, Inc. - Groundwater Monitoring Well Installation and Sampling Report, dated August 15, 2017

Sample ID	Soil Boring Samp Point ID	Sampling Date	Sample Depth	Aluminum	Lead	Total Chromium	Cadmium	Arsenic	Mercury	Barium	Silver	Selenium
			Feet BGS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
MW3A(5)	MW3A	07/21/17	5.0	7,800	<1.0	1.2	<1.0	1.1	<0.5	<5.0	<1.0	<2.0
MW4A(6.5)	MW4A	07/21/17	6.5	5,600	<1.0	<1.0	<1.0	<1.0	<0.5	<5.0	<1.0	<2.0
MW6(6.5)	MW6	07/21/17	6.5	9,700	1.6	4.0	<1.0	1.6	<0.5	<5.0	<1.0	<2.0
MTCA Method A Cleanup Levels				80,000*	250	105	2	20	2	16,000*	400*	400*

MTCA = Model Toxic Control Act Cleanup Level (WAC173-340-900)
BGS = Below Ground Surface mg/kg = milligram of analyte per kilogram of soil
< = not detected at indicated Laboratory Detection Limits -- = not analyzed
Aluminum by EPA Method 6010C
Lead, Total Chromium, Cadmium, Arsenic, Barium, Silver and Selenium by EPA Method 7010
Mercury by EPA Method 7471
Bolded numbers and red-shaded cells denote concentrations above the MTCA Method A Cleanup Levels for soil
* Denotes Method B Cleanup Level, Ecology does not have a Method A Cleanup Level for this constituent

TABLE 2
GROUNDWATER ANALYTICAL RESULTS
Former Maralco Aluminum Property
7730 South 202nd Street
Kent, Washington

MW2 (Sampled by Stantec - 11/02/16)

Well Depth	Sampling Date	Ground Water Level	TPHd	TPHo	PAHs	Aluminum	Lead	Total Chromium	Cadmium	Arsenic	Mercury	Barium	Silver	Selenium	Fluorides	Chlorides
Feet		Feet Below TOC	µg/L	µg/L		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
	11/02/16	5.21	<82.5	<165	--	174	2.59	<10.0	<2.0	<10	<0.2	5.65	<5.0	<10	80.7	3,890
	MTCA Cleanup Levels		500	500	Variable	16,000*	15	50	5	5	2	2,000	80	80	640*	250,000#

MW3A

Well Depth	Sampling Date	Ground Water Level	TPHd	TPHo	PAHs	Aluminum	Lead	Total Chromium	Cadmium	Arsenic	Mercury	Barium	Silver	Selenium	Fluorides	Chlorides
Feet		Feet Below TOC	µg/L	µg/L		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
13.5	07/26/17	5.90	--	--	--	5,800	<2	<10	<5	<5	<0.5	<50	<10	<50	**27,000**	78,000
	MTCA Cleanup Levels		500	500	Variable	16,000*	15	50	5	5	2	2,000	80	80	640*	250,000#

MW4A

Well Depth	Sampling Date	Ground Water Level	TPHd	TPHo	PAHs	Aluminum	Lead	Total Chromium	Cadmium	Arsenic	Mercury	Barium	Silver	Selenium	Fluorides	Chlorides
Feet		Feet Below TOC	µg/L	µg/L		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
15.2	07/26/17	7.65	<20	<50	Lab Report[1]	61	<2	<10	<5	<5	<0.5	<50	<10	<50	<200	**290,000**
	MTCA Cleanup Levels		500	500	Variable	16,000*	15	50	5	5	2	2,000	80	80	640*	250,000#

MW5A

Well Depth	Sampling Date	Ground Water Level	TPHd	TPHo	PAHs	Aluminum	Lead	Total Chromium	Cadmium	Arsenic	Mercury	Barium	Silver	Selenium	Fluorides	Chlorides
Feet		Feet Below TOC	µg/L	µg/L		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
14.5	07/26/17	6.73	--	--	--	**93,000**	2	10	<5	**6**	<0.5	<50	<10	<50	230	150,000
	MTCA Cleanup Levels		500	500	Variable	16,000*	15	50	5	5	2	2,000	80	80	640*	250,000#

MW6

Well Depth	Sampling Date	Ground Water Level	TPHd	TPHo	PAHs	Aluminum	Lead	Total Chromium	Cadmium	Arsenic	Mercury	Barium	Silver	Selenium	Fluorides	Chlorides
Feet		Feet Below TOC	µg/L	µg/L		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
14.0	07/26/17	4.92	--	--	--	130	<2	<10	<5	<5	<0.5	<50	<10	<50	**4,100**	**270,000**
	MTCA Cleanup Levels		500	500	Variable	16,000*	15	50	5	5	2	2,000	80*	80*	640*	250,000#

MTCA = Model Toxic Control Act Cleanup Level (WAC173-340-900)

TOC = Top of Casing MSL = Mean Sea Level

< = not detected at indicated Laboratory Detection Limits -- not analyzed NM = Not Measured

TPHd - Total Petroleum Hydrocarbons - Diesel by Method NWTPH-Dx TPHo - Total Petroleum Hydrocarbons - Motor Oil by Method NWTPH-Dx extended

PAHs (including Naphthalene) by EPA Method 8270

Aluminum by EPA Method 6010C Mercury by EPA Method 7471

Lead, Total Chromium, Cadmium, Arsenic, Barium, Silver and Selenium by EPA Method 7010

* = Method B Cleanup Level (Method A Cleanup Level does not apply to this particular constituent)

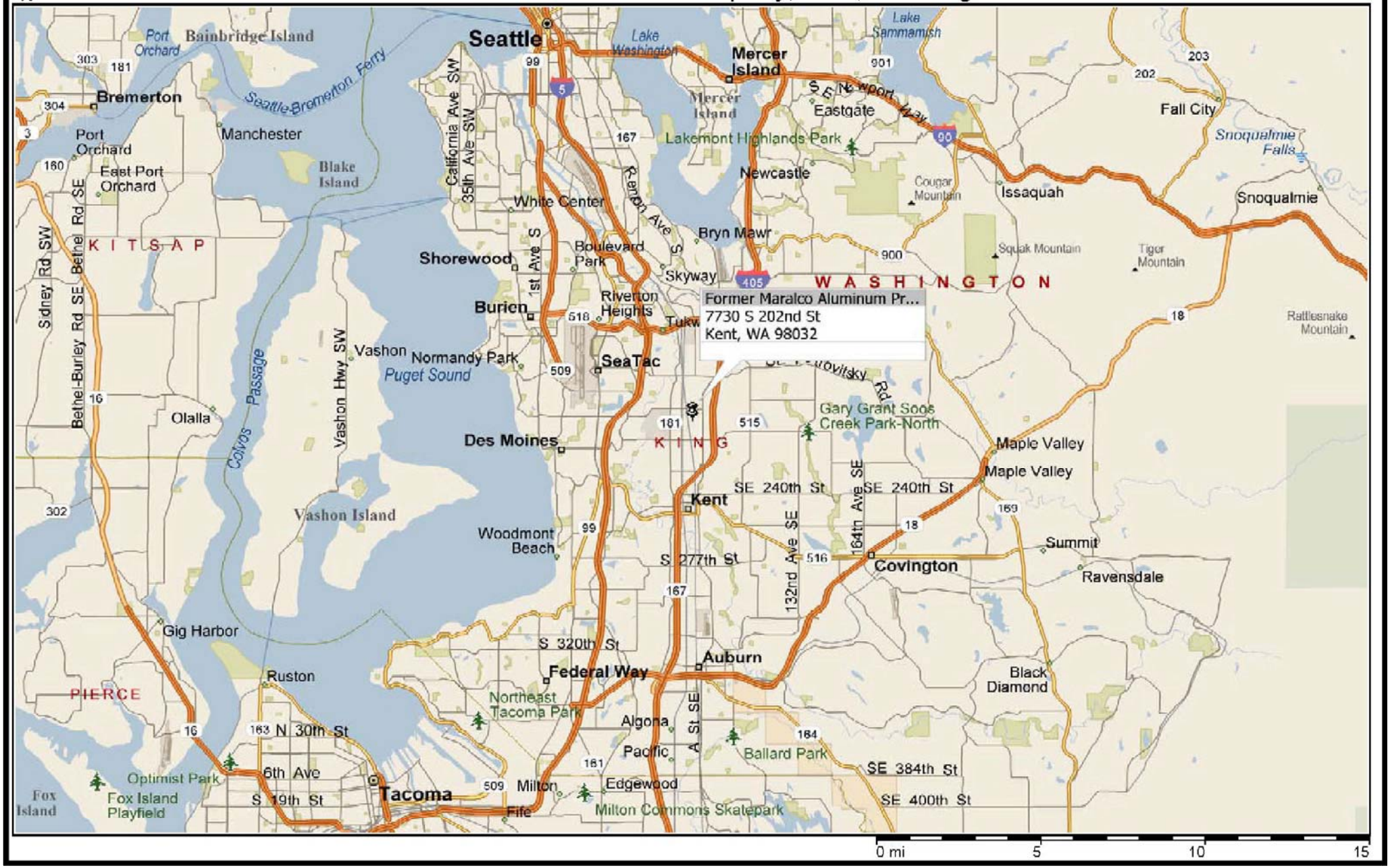
= Washington Administrative Code Maximum Contaminant Level

1 = Concentrations can be found in the attached laboratory report. By utilizing Toxic Equivalency Calculations, All PAHs were determined to be present at concentrations below the MTCA Cleanup Levels

ND = Not Detected (multiple detection limits see laboratory report for further detail)

Bolded numbers and red-shaded cells denote concentrations above the MTCA Cleanup Levels for groundwater

Former Maralco Aluminum Property, Kent, Washington

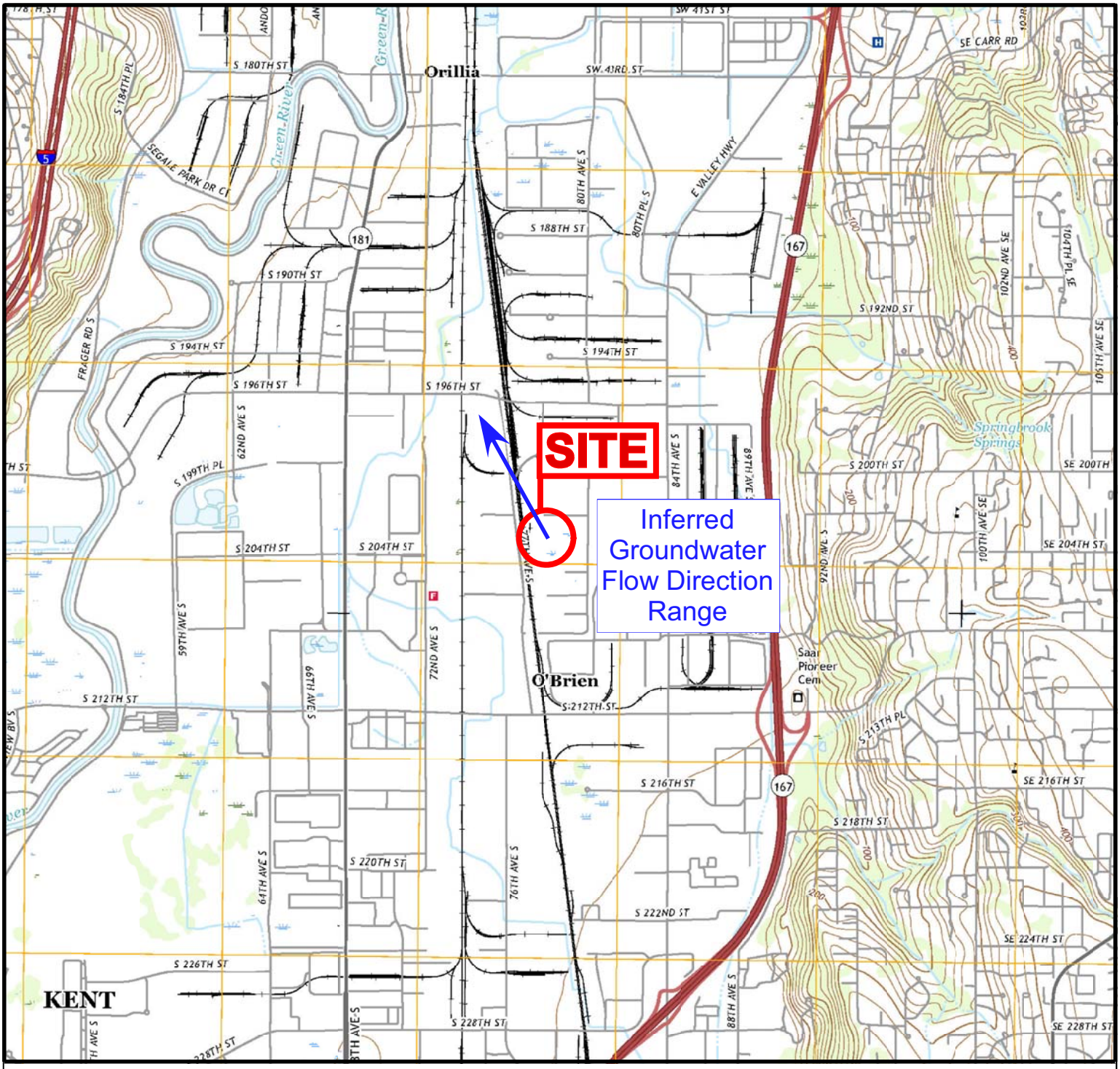


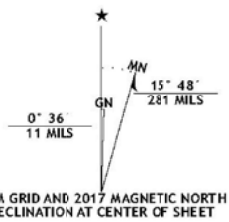
AEROTECH ENVIRONMENTAL CONSULTING	**SITE VICINITY MAP**	**Former Maralco Aluminum Property** **7730 South 202nd Street** **Kent, Washington**

Date: 05/27/17

By: Nick Gerkin

Figure: 1





UTM GRID AND 2017 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

0 0.5 1

SCALE (mile)

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

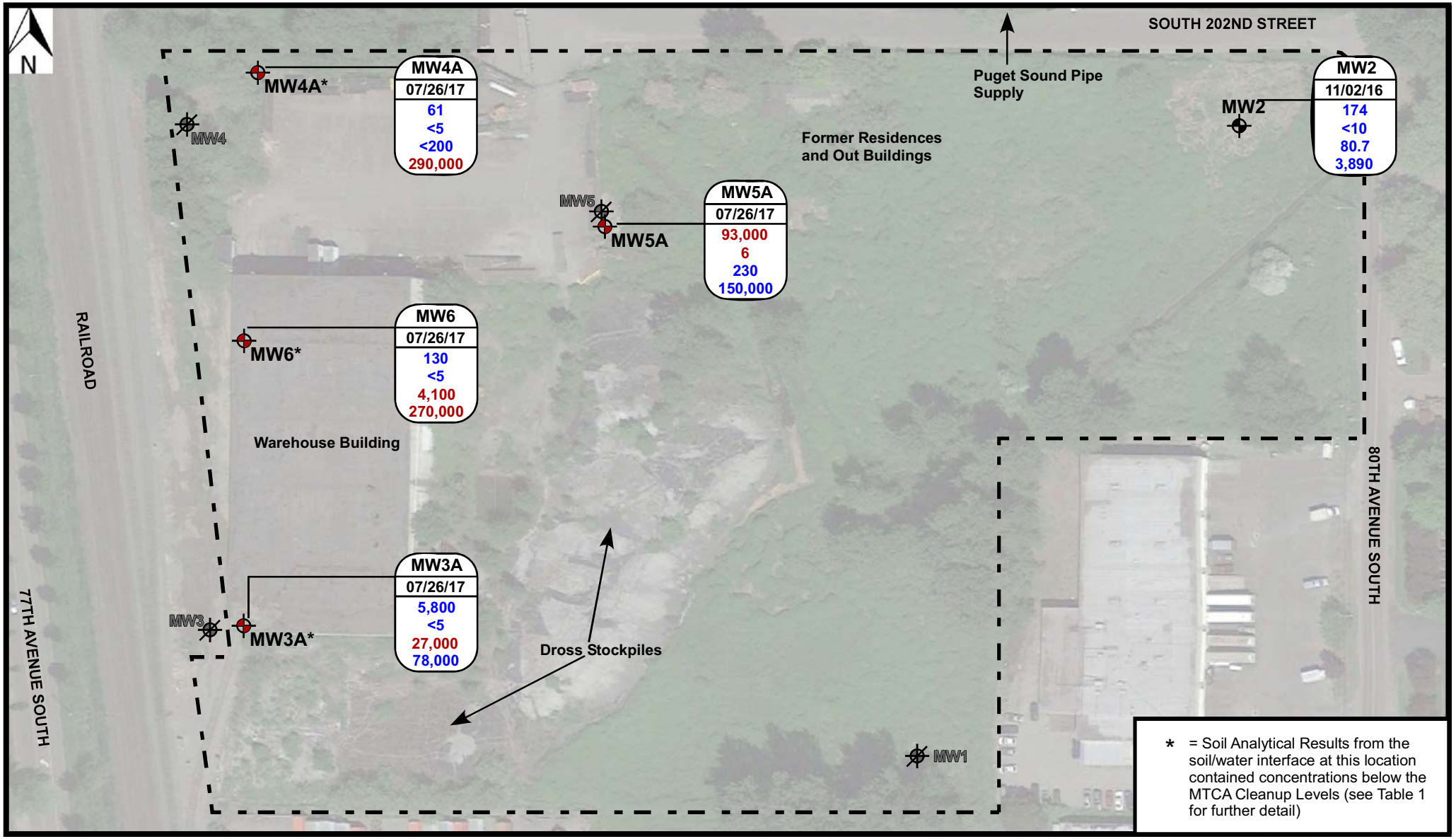
QUADRANGLE LOCATION

AEROTECH ENVIRONMENTAL CONSULTING

USGS TOPOGRAPHIC MAP

Former Maralco Aluminum Property
7730 South 202nd Street
Kent, Washington

Date: 08/15/17
By: Nick Gerkin
Figure: 2



EXPLANATION

- Blue numbers and symbols indicate concentrations below the MTCA Method A Cleanup Levels in Groundwater
- Red numbers and symbols indicate concentrations above the MTCA Method A Cleanup Levels

MW6 — Groundwater Monitoring Well

MW5 — Former Groundwater Monitoring Well

Property Boundary

MW6	Well ID
07/26/17	Date
130	Aluminum
<5	Arsenic
4,100	Fluorides
270,000	Chlorides

AEROTECH ENVIRONMENTAL CONSULTING

ANALYTICAL RESULTS MAP

Former Maralco Aluminum Property
7730 South 202nd Street
Kent, Washington

0 100 200
SCALE (feet)

Date: 07/31/17
By: Nick Gerkin
Figure: 3

PHOTOGRAPHS

Advancement of MW4A

Advancement of MW4A

Purging of MW5A

Monument and top section of MW5

View of newly installed MW5A

Log of MW4A

PROJECT CONTRACT DOCUMENTS

ENVIRONMENTAL CONTRACTOR'S CERTIFICATION

Former Maralco Aluminum Property
7730 South 202nd Street
Kent, Washington 98032

1. Contractor's Name: Aerotech Environmental Consulting, Inc.

2. Contractor's Address: 13925 Interurban Avenue South, Ste. 210, Seattle, Washington 98168

3. Name and title of person completing this certification: Alan T. Blotch / President

4. Answer the following questions about each employee that contractor will have perform the assessment or prepare the report showing the results of the inspection:

   a. Name and Title of Employee: Alan T. Blotch – Environmental Professional

   b. Length of experience doing environmental assessments: 31 years

   c. Education degrees received: Masters of Business Administration
   Juris Doctor – Environmental Law

   d. Relevant training received: ASTM E50 Environmental Assessment Committee Meetings

5. Identify any certifications and approvals issued to contractor pursuant to an official Federal, State of local program or policy to conduct environmental assessments: Registered Environmental Assessor
   Issued by State of California

6. Describe the generally recognized standards which the contractor will use to perform the assessment.
   Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process (ASTM E 1903)

7. Disclose the nature of any previous environmental inspections contractor has ever performed for the Owner of the property: Phase I Environmental Site Assessment

8. Disclose the nature of any affiliation or association contractor now has, or ever had, with the above referenced seller of the property, of the above referenced buyer of the property: N/A

9. Describe the liability insurance carried by contractor to cover claims in the event that ir fails to discover adverse environmental conditions during an environmental inspection.
   Professional Errors & Omissions Coverage $1,000,000 / claim and $1,000,000 aggregate liability

THE UNDERSIGNED HEREBY CERTIFIES, UNDER PENALTY OF THE CRIMINAL AND/OR CIVIL PENALTIES IN 18 U.S.C. § 1001 FOR FALSE STATEMENTS TO THE UNITED STATES GOVERNMENT, THAT THE ABOVE INFORMATION IS TRUE AND CORRECT.

Signature

8-15-17
Date

LABORATORY ANALYTICAL REPORTS
& CHAINS OF CUSTODY

ADVANCED ANALYTICAL

Environmental Testing Laboratory

August 02, 2017

Nick Gerkin
Aerotech Environmental, Inc.
13925 Interurban Avenue South, Suite 210
Seattle, WA 98168

Dear Mr. Gerkin:

Please find enclosed the analytical data report for the *MARALCO* ***(C70724-3)*** Project.

Samples were received on *July 24, 2017.* The results of the analyses are presented in the attached tables. Applicable reporting limits, QA/QC data and data qualifiers are included. A copy of the chain-of-custody and an invoice for the work is also enclosed.

ADVANCED ANALYTICAL LABORATORY appreciates the opportunity to provide analytical services for this project. Should there be any questions regarding this report, please contact me at (425) 702-8571.

It was a pleasure working with you, and we are looking forward to the next opportunity to work together.

Sincerely,

V. Ivanov

Val G. Ivanov, Ph.D.
Laboratory Manager

4078 148 Ave NE■ Redmond, WA 98052
425.702-8571
E-mail: aachemlab@yahoo.com

This report is issued solely for the use of the person or company to whom it is addressed.
Any use, copying or disclosure other than by the intended recipient is unauthorized.

Advanced Analytical Laboratory
(425) 702-8571

AAL Job Number:	C70724-3
Client:	Aerotech Environmental
Project Manager:	Nick Gerkin
Client Project Name:	MARALCO
Client Project Number:	na
Date received:	07/24/17

Advanced Analytical Laboratory
(425) 702-8571

AAL Job Number: C70724-3
Client: Aerotech Environmental
Project Manager: Nick Gerkin
Client Project Name: MARALCO
Client Project Number: na
Date received: 07/24/17

Analytical Results

Metals (7010/7471), mg/kg		MTH BLK	LCS	MW3A(5)	MW4A(6.5)	MW6(6.5)	MS	MSD	RPD
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	07/25/17	07/25/17	07/25/17	07/25/17	07/25/17	07/25/17	07/25/17	07/25/17
Date analyzed	Limits	07/25/17	07/25/17	07/25/17	07/25/17	07/25/17	07/25/17	07/25/17	07/25/17
Lead (Pb)	1.0	nd	95%	nd	nd	1.6	72%	65%	10%
Chromium (Cr)	1.0	nd	92%	1.2	nd	4.0	83%	112%	30%
Cadmium (Cd)	1.0	nd	89%	nd	nd	nd	95%	104%	9%
Arsenic (As)	1.0	nd	87%	1.1	nd	1.6	74%	67%	9%
Mercury (Hg) (7471)	0.5	nd	109%	nd	nd	nd	102%	103%	2%
Barium (Ba)	5.0	nd	81%	nd	nd	nd			
Silver (Ag)	1.0	nd	94%	nd	nd	nd			
Selenium (Se)	2.0	nd	105%	nd	nd	nd			

nd - not detected at listed reporting limits
na - not analyzed
M- matrix interference
Results reported on dry-weight basis
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 30%

ADVANCED ANALYTICAL

Chain of Custody Record

Page of

Laboratory Job #: C70724-3

4078 148 Avenue NE
Redmond, WA 98052
(425) 702-8571
aachemlab@yahoo.com

Client: Terotech

Project Manager: Nick Gerkin, Justin Foslien

Address: 13925 Interurban Ave S

Phone: 206 482 2287 Fax:

Project Name: MARALCO

Project Number: —

Collector: Nick Gerkin

Date of collection: 7/21/17

	Sample ID	Time	Matrix	Container type	8260 Volatiles	HVOC 8260	BTEX	BTEX/NWTPH-Gx	NWTPH-Gx	NWTPH-Dx	NWTPH-HCID	8270 Semivolatiles	8270 PAH	8082 PCBs	8081 Pesticides	RCRA 8 Metals	Lead	MTCA 5 Metals	PLP46	Notes, comments	# of containers
1	MW3A (5)	1230	S	4 VOA 1 J4R														X			2
2	MW3A (10)	1250																			
3	MW4A (6.5)	1000																X			
4	MW4A (9.5)	1020																			
5	MW6 (6.5)	1440																X			
6	MW6 (11)	1450	↓	↓																	↓
7																					
8																					
9																					
10																					
11																					
12																					

Relinquished by:	Date/Time	Received by:	Date/Time
	7/24/17 0900		7/24/17 0960
Relinquished by:	Date/Time	Received by:	Date/Time
S. Gerkin	7/24/17 11:30	V. Watt	07/24/17 1131

Sample receipt info:

Total # of containers:

Condition (temp, °C)

Seals (intact?, Y/N)

Comments:

Turnaround time:

Same day O

24 hr O

48 hr O

Standard X

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: 580-70285-1
Client Project/Site: Maralco, Kent, WA

For:
Aerotech Environmental Consulting, Inc.
13925 Interurban Ave South
Suite 210
Seattle, Washington 98168

Attn: Nick Gerkin

Kayse Zalmai

Authorized for release by:
8/7/2017 12:56:40 PM
Kayse Zalmai, Project Manager I
(253)922-2310
kayse.zalmai@testamericainc.com

Designee for

Cathy Gamble, Project Manager I
(253)922-2310
cathy.gamble@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.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: 580-70285-1

Laboratory: TestAmerica Seattle

Narrative

Job Narrative
580-70285-1

Receipt
The samples were received on 8/2/2017 8:40 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 4.8º C.

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.

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70285-1

Qualifiers

Metals

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

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	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
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 (Radiochemistry)
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: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70285-1

Client Sample ID: MW3A (5)
Date Collected: 07/21/17 12:30
Date Received: 08/02/17 08:40

Lab Sample ID: 580-70285-1
Matrix: Solid

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	77.4		0.1	0.1	%			08/03/17 09:14	1
Percent Moisture	22.6		0.1	0.1	%			08/03/17 09:14	1

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70285-1

Client Sample ID: MW3A (5)
Date Collected: 07/21/17 12:30
Date Received: 08/02/17 08:40

Lab Sample ID: 580-70285-1
Matrix: Solid
Percent Solids: 77.4

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	7800	B	91	12	mg/Kg	☼	08/02/17 15:09	08/03/17 14:43	1

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70285-1

Client Sample ID: MW4A (6.5)

Date Collected: 07/21/17 10:00
Date Received: 08/02/17 08:40

Lab Sample ID: 580-70285-3

Matrix: Solid

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	93.1		0.1	0.1	%			08/03/17 09:14	1
Percent Moisture	6.9		0.1	0.1	%			08/03/17 09:14	1

Client Sample Results

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70285-1

Client Sample ID: MW4A (6.5)
Date Collected: 07/21/17 10:00
Date Received: 08/02/17 08:40

Lab Sample ID: 580-70285-3
Matrix: Solid
Percent Solids: 93.1

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	5600	B	71	9.4	mg/Kg	☼	08/02/17 15:09	08/03/17 14:46	1

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70285-1

Client Sample ID: MW6 (6.5)
Date Collected: 07/21/17 14:40
Date Received: 08/02/17 08:40

Lab Sample ID: 580-70285-5
Matrix: Solid

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	72.5		0.1	0.1	%			08/03/17 09:14	1
Percent Moisture	27.5		0.1	0.1	%			08/03/17 09:14	1

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70285-1

Client Sample ID: MW6 (6.5)
Date Collected: 07/21/17 14:40
Date Received: 08/02/17 08:40

Lab Sample ID: 580-70285-5
Matrix: Solid
Percent Solids: 72.5

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	9700	B	86	11	mg/Kg	☼	08/02/17 15:09	08/03/17 14:49	1

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70285-1

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 580-252808/12-A
Matrix: Solid
Analysis Batch: 252931

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 252808

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	16.9	J	75	10	mg/Kg		08/02/17 15:09	08/03/17 13:54	1

Lab Sample ID: LCS 580-252808/13-A
Matrix: Solid
Analysis Batch: 252931

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 252808

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	500	510		mg/Kg		102	80 - 120

Lab Sample ID: LCSD 580-252808/14-A
Matrix: Solid
Analysis Batch: 252931

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 252808

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	500	497		mg/Kg		99	80 - 120	3	20

Lab Chronicle

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70285-1

Client Sample ID: MW3A (5)
Date Collected: 07/21/17 12:30
Date Received: 08/02/17 08:40

Lab Sample ID: 580-70285-1
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	252849	08/03/17 09:14	TTN	TAL SEA

Client Sample ID: MW3A (5)
Date Collected: 07/21/17 12:30
Date Received: 08/02/17 08:40

Lab Sample ID: 580-70285-1
Matrix: Solid
Percent Solids: 77.4

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			252808	08/02/17 15:09	ADB	TAL SEA
Total/NA	Analysis	6010C		1	252931	08/03/17 14:43	HJM	TAL SEA

Client Sample ID: MW4A (6.5)
Date Collected: 07/21/17 10:00
Date Received: 08/02/17 08:40

Lab Sample ID: 580-70285-3
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	252849	08/03/17 09:14	TTN	TAL SEA

Client Sample ID: MW4A (6.5)
Date Collected: 07/21/17 10:00
Date Received: 08/02/17 08:40

Lab Sample ID: 580-70285-3
Matrix: Solid
Percent Solids: 93.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			252808	08/02/17 15:09	ADB	TAL SEA
Total/NA	Analysis	6010C		1	252931	08/03/17 14:46	HJM	TAL SEA

Client Sample ID: MW6 (6.5)
Date Collected: 07/21/17 14:40
Date Received: 08/02/17 08:40

Lab Sample ID: 580-70285-5
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	252849	08/03/17 09:14	TTN	TAL SEA

Client Sample ID: MW6 (6.5)
Date Collected: 07/21/17 14:40
Date Received: 08/02/17 08:40

Lab Sample ID: 580-70285-5
Matrix: Solid
Percent Solids: 72.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			252808	08/02/17 15:09	ADB	TAL SEA
Total/NA	Analysis	6010C		1	252931	08/03/17 14:49	HJM	TAL SEA

Laboratory References:

TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: Aerotech Environmental Consulting, Inc. TestAmerica Job ID: 580-70285-1
Project/Site: Maralco, Kent, WA

Laboratory: TestAmerica Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska (UST)	State Program	10	UST-022	03-02-18
California	State Program	9	2901	01-31-18
L-A-B	DoD ELAP		L2236	01-19-19
L-A-B	ISO/IEC 17025		L2236	01-19-19
Montana (UST)	State Program	8	N/A	04-30-20
Oregon	NELAP	10	WA100007	11-05-17
US Fish & Wildlife	Federal		LE058448-0	10-31-17
USDA	Federal		P330-14-00126	02-10-20
Washington	State Program	10	C553	02-17-18

Sample Summary

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70285-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-70285-1	MW3A (5)	Solid	07/21/17 12:30	08/02/17 08:40
580-70285-3	MW4A (6.5)	Solid	07/21/17 10:00	08/02/17 08:40
580-70285-5	MW6 (6.5)	Solid	07/21/17 14:40	08/02/17 08:40

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Seattle
5755 8th Street E.
Tacoma, WA 98424
Tel. 253-922-2310
Fax 253-922-5047
www.testamericainc.com

Loc: 580
70285

☐ Rush
☐ Short Hold

Chain of Custody Record

Client	Client Contact	Date	Chain of Custody Number
Aerotech Env Consulting	Nick Gerkin	8/2/17	31503
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 1**
13925 Interurban Ave S, Ste k	206 482 2287		
City / **State** / **Zip Code**	**Sampler**	**Lab Contact**	
Tukwila / WA / 98168	Nick Gerkin	Cathy Gamble	
Project Name and Location (State)	**Billing Contact**		
MARALCO, Kent, WA	laura@dirtydirt.us		
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: Total Alum. w/m	Special Instructions/ Conditions of Receipt
MW3A (5)	7/21/17	1230				X	X						X	
MW3A (10)	7/21/17	1250				X	X							HOLD
MW4A (6.5)	7/21/17	1000				X	X						X	
MW4A (9.5)	7/21/17	1020				X	X							HOLD
MW6 (6.5)	7/21/17	1440				X	X						X	
MW6 (11)	7/21/17	1450				X	X							HOLD

580-70285 Chain of Custody

TB ___ Cooler: IR5 Cor 4.8 Unc 4.7
Cooler Dsc: Med red unit @ Lab
Wet/Packs Packing: None
Cli drop w/o cs

Cooler	Possible Hazard Identification	Sample Disposal	
☐ Yes ☐ No Cooler Temp: ____	☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown	☐ 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)

	Relinquished By Sign/Print	Date	Time	Received By Sign/Print	Date	Time
1.	Nicholas Gerkin	8/2/17	0840	[signature]	8/2/17	0840
2.						
3.						

Comments

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

Login Sample Receipt Checklist

Client: Aerotech Environmental Consulting, Inc.

Job Number: 580-70285-1

Login Number: 70285
List Number: 1
Creator: Ponce-McDermott, Monica

List Source: TestAmerica Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
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.	True	
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.	N/A	
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	

ADVANCED ANALYTICAL

Environmental Testing Laboratory

August 02, 2017

Nick Gerkin
Aerotech Environmental, Inc.
13925 Interurban Avenue South, Suite 210
Seattle, WA 98168

Dear Mr. Gerkin:

Please find enclosed the analytical data report for the *MARALCO* ***(C70727-3)*** Project.

Samples were received on *July 27, 2017.* The results of the analyses are presented in the attached tables. Applicable reporting limits, QA/QC data and data qualifiers are included. A copy of the chain-of-custody and an invoice for the work is also enclosed.

ADVANCED ANALYTICAL LABORATORY appreciates the opportunity to provide analytical services for this project. Should there be any questions regarding this report, please contact me at (425) 702-8571.

It was a pleasure working with you, and we are looking forward to the next opportunity to work together.

Sincerely,

V. Ivanov

Val G. Ivanov, Ph.D.
Laboratory Manager

4078 148 Ave NE■ Redmond, WA 98052
425.702-8571
E-mail: aachemlab@yahoo.com

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Any use, copying or disclosure other than by the intended recipient is unauthorized.

Advanced Analytical Laboratory
(425) 702-8571

AAL Job Number:	C70727-3
Client:	Aerotech Environmental
Project Manager:	Nick Gerkin
Client Project Name:	MARALCO
Client Project Number:	na
Date received:	07/27/17

AAL Job Number:	C70727-3
Client:	Aerotech Environmental
Project Manager:	Nick Gerkin
Client Project Name:	MARALCO
Client Project Number:	na
Date received:	07/27/17

Analytical Results

NWTPH-Dx, mg/L		MTH BLK	W-MW4A
Matrix	Water	Water	Water
Date extracted	Reporting	07/27/17	07/27/17
Date analyzed	Limits	07/27/17	07/27/17
Kerosene/Jet fuel	0.20	nd	nd
Diesel/Fuel oil	0.20	nd	nd
Heavy oil	0.50	nd	nd
Surrogate recoveries:			
Fluorobiphenyl		111%	109%
o-Terphenyl		123%	129%

na - not analyzed
nd - not detected at listed reporting limits
C - coelution with sample peaks
Acceptable Recovery limits: 70% TO 130%
Acceptable RPD limit: 30%

AAL Job Number: C70727-3
Client: Aerotech Environmental
Project Manager: Nick Gerkin
Client Project Name: MARALCO
Client Project Number: na
Date received: 07/27/17

Analytical Results

PAH(8270), ug/L		MTH BLK	LCS	W-MW4A	MS	MSD	RPD
Matrix	Water	Water	Water	Water	Water	Water	Water
Date extracted	Reporting	08/02/17	08/02/17	08/02/17	08/02/17	08/02/17	08/02/17
Date analyzed	Limits	08/02/17	08/02/17	08/02/17	08/02/17	08/02/17	08/02/17
Naphthalene	0.1	nd		nd			
1-MethylNaphthalene	0.1	nd		nd			
2-MethylNaphthalene	0.1	nd		nd			
Acenaphthylene	0.1	nd		nd			
Acenaphthene	0.1	nd	109%	nd	109%	110%	1%
Fluorene	0.1	nd		nd			
Phenanthrene	0.1	nd		2.0			
Anthracene	0.1	nd		nd			
Fluoranthene	0.1	nd		2.0			
Pyrene	0.1	nd	106%	2.2	103%	102%	2%
Benzo(a)anthracene	0.1	nd		nd			
Chrysene	0.1	nd		0.44			
Benzo(b)fluoranthene	0.1	nd		0.18			
Benzo(k)fluoranthene	0.1	nd		nd			
Benzo(a)pyrene	0.1	nd		nd			
Indeno(1,2,3-cd)pyrene	0.1	nd		nd			
Dibenzo(ah)anthracene	0.1	nd		nd			
Benzo(ghi)perylene	0.1	nd		nd			

Surrogate recoveries:

Fluorobiphenyl	112%	129%	99%	127%	130%
o-Terphenyl	101%	99%	101%	97%	98%

Data Qualifiers and Analytical Comments
nd - not detected at listed reporting limits
na - not analyzed
Acceptable Recovery limits: 50% TO 150%
Acceptable RPD limit: 50%

AAL Job Number: C70727-3
Client: Aerotech Environmental
Project Manager: Nick Gerkin
Client Project Name: MARALCO
Client Project Number: na
Date received: 07/27/17

Analytical Results

Total Metals (7010/7470A), mg/L		MTH BLK	LCS	W-MW3A	W-MW4A
Matrix	Water	Water	Water	Water	Water
Date extracted	Reporting	07/31/17	07/31/17	07/31/17	08/01/17
Date analyzed	Limits	07/31/17,08/02/17	07/31/17,08/02/17	07/31/17,08/02/17	07/31/17,08/02/18
Lead (Pb)	0.002	nd	116%	nd	nd
Chromium (Cr)	0.01	nd	91%	nd	nd
Cadmium (Cd)	0.005	nd	101%	nd	nd
Arsenic (As)	0.005	nd	101%	nd	nd
Mercury (Hg) (7470A)	0.0005	nd	106%	nd	nd
Barium (Ba)	0.05	nd	98%	nd	nd
Selenium (Se)	0.05	nd	108%	nd	nd
Silver (Ag)	0.01	nd	128%	nd	nd

Data Qualifiers and Analytical Comments
nd - not detected at listed reporting limits
na - not analyzed
M - matrix interference
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 30%

AAL Job Number: C70727-3
Client: Aerotech Environmental
Project Manager: Nick Gerkin
Client Project Name: MARALCO
Client Project Number: na
Date received: 07/27/17

Analytical Results

Total Metals (7010/7470A), mg/L		W-MW5A	W-MW6	MS	MSD
Matrix	Water	Water	Water	Water	Water
Date extracted	Reporting	08/02/17	08/03/17	07/31/17	07/31/17
Date analyzed	Limits	07/31/17,08/02/19	07/31/17,08/02/20	07/31/17,08/02/17	07/31/17,08/02/17
Lead (Pb)	0.002	0.002	nd	96%	97%
Chromium (Cr)	0.01	0.01	nd	88%	90%
Cadmium (Cd)	0.005	nd	nd	112%	116%
Arsenic (As)	0.005	0.006	nd	118%	116%
Mercury (Hg) (7470A)	0.0005	nd	nd	102%	99%
Barium (Ba)	0.05	nd	nd		
Selenium (Se)	0.05	nd	nd		
Silver (Ag)	0.01	nd	nd		

Data Qualifiers and Analytical Comments
nd - not detected at listed reporting limits
na - not analyzed
M - matrix interference
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 30%

Advanced Analytical Laboratory
(425) 702-8571

AAL Job Number: C70727-3
Client: Aerotech Environmental
Project Manager: Nick Gerkin
Client Project Name: MARALCO
Client Project Number: na
Date received: 07/27/17

Analytical Results

Total Metals (7010/7470A), mg/L		RPD
Matrix	Water	Water
Date extracted	Reporting	07/31/17
Date analyzed	Limits	07/31/17,08/02/17
Lead (Pb)	0.002	1%
Chromium (Cr)	0.01	2%
Cadmium (Cd)	0.005	4%
Arsenic (As)	0.005	2%
Mercury (Hg) (7470A)	0.0005	3%
Barium (Ba)	0.05	
Selenium (Se)	0.05	
Silver (Ag)	0.01	

Data Qualifiers and Analytical Comments
nd - not detected at listed reporting limits
na - not analyzed
M - matrix interference
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 30%

ADVANCED ANALYTICAL

Chain of Custody Record

Page 1 of 1

Laboratory Job #: C70727-3

4078 148 Avenue NE
Redmond, WA 98052
(425) 702-8571
aachemlab@yahoo.com

Client: Aerotech

Project Manager: Nick Gerkin

Address: 13925 Interurban Ave S, Tukwila

Phone: 206 482 2287 Fax:

Project Name: MARALCO

Project Number: —

Collector: Nick Gerkin

Date of collection: 7/26/17

	Sample ID	Time	Matrix	Container type	8260 Volatiles	HVOC 8260	BTEX	BTEX/NWTPH-Gx	NWTPH-Gx	NWTPH-Dx ext	NWTPH-HCID	8270 Semivolatiles	8270 PAH	8082 PCBs	8081 Pesticides	RCRA 8 Metals - Total	Lead	MTCA5 Metals			Notes, comments	# of containers
1	W-MW3A	1155	W	1 Poly											X							1
2	W-MW4A	1045		1 Poly 1 HCl Total 1 VOA 1 HNO3 1 Poly					X			X			X							3
3	W-MW5A	1000		1 Poly											X							1
4	W-MW6	1230	↓	↓											X							1
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						

Relinquished by:	Date/Time	Received by:	Date/Time
	7/27/17 0800		7/27/17 0800
Relinquished by:	Date/Time	Received by:	Date/Time
S. Dyer	7/27/17 1230	V Tanner	07/27/17 12:30

Sample receipt info:

Total # of containers:

Condition (temp, °C)

Seals (intact?, Y/N)

Comments:

Turnaround time:

Same day O

24 hr O

48 hr O

Standard X

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: 580-70199-1
Client Project/Site: Maralco, Kent, WA

For:
Aerotech Environmental Consulting, Inc.
13925 Interurban Ave South
Suite 210
Seattle, Washington 98168

Attn: Nick Gerkin

Authorized for release by:
7/31/2017 11:05:06 AM

Cathy Gamble, Project Manager I
(253)922-2310
cathy.gamble@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.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

Case Narrative

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-1

Job ID: 580-70199-1

Laboratory: TestAmerica Seattle

Narrative

Receipt

The samples were received on 7/27/2017 3:55 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 5.4º C.

General Chemistry

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

Definitions/Glossary

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-1

Qualifiers

General Chemistry

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.

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	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
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 (Radiochemistry)
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: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-1

Client Sample ID: W-MW3A
Date Collected: 07/26/17 11:55
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-1
Matrix: Water

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	27		2.0	0.30	mg/L			07/28/17 19:19	10
Chloride	78	F1	0.90	0.14	mg/L			07/28/17 10:28	1

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-1

Client Sample ID: W-MW4A
Date Collected: 07/26/17 10:45
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-2
Matrix: Water

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	ND		0.20	0.030	mg/L			07/28/17 11:13	1
Chloride	**290**		90	14	mg/L			07/28/17 11:27	100

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-1

Client Sample ID: W-MW5A
Date Collected: 07/26/17 10:00
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-3
Matrix: Water

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	0.23		0.20	0.030	mg/L			07/28/17 11:42	1
Chloride	150		90	14	mg/L			07/28/17 11:57	100

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-1

Client Sample ID: W-MW6
Date Collected: 07/26/17 12:30
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-4
Matrix: Water

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	4.1		0.20	0.030	mg/L			07/28/17 12:11	1
Chloride	270		90	14	mg/L			07/28/17 13:26	100

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 580-252517/3
Matrix: Water
Analysis Batch: 252517

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoride	ND		0.20	0.030	mg/L			07/28/17 09:59	1
Chloride	ND		0.90	0.14	mg/L			07/28/17 09:59	1

Lab Sample ID: LCS 580-252517/4
Matrix: Water
Analysis Batch: 252517

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Fluoride	5.00	4.77		mg/L		95	90 - 110
Chloride	50.0	47.7		mg/L		95	90 - 110

Lab Sample ID: 580-70199-1 MS
Matrix: Water
Analysis Batch: 252517

Client Sample ID: W-MW3A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Fluoride	26		5.00	29.2	4	mg/L		68	90 - 110
Chloride	78	F1	50.0	122	F1	mg/L		89	90 - 110

Lab Sample ID: 580-70199-1 MSD
Matrix: Water
Analysis Batch: 252517

Client Sample ID: W-MW3A
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Fluoride	26		5.00	29.1	4	mg/L		66	90 - 110	0	15
Chloride	78	F1	50.0	122	F1	mg/L		89	90 - 110	0	15

Lab Chronicle

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-1

Client Sample ID: W-MW3A
Date Collected: 07/26/17 11:55
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	252517	07/28/17 10:28	MMM	TAL SEA
Total/NA	Analysis	300.0		10	252517	07/28/17 19:19	MMM	TAL SEA

Client Sample ID: W-MW4A
Date Collected: 07/26/17 10:45
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	252517	07/28/17 11:13	MMM	TAL SEA
Total/NA	Analysis	300.0		100	252517	07/28/17 11:27	MMM	TAL SEA

Client Sample ID: W-MW5A
Date Collected: 07/26/17 10:00
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	252517	07/28/17 11:42	MMM	TAL SEA
Total/NA	Analysis	300.0		100	252517	07/28/17 11:57	MMM	TAL SEA

Client Sample ID: W-MW6
Date Collected: 07/26/17 12:30
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	252517	07/28/17 12:11	MMM	TAL SEA
Total/NA	Analysis	300.0		100	252517	07/28/17 13:26	MMM	TAL SEA

Laboratory References:

TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: Aerotech Environmental Consulting, Inc. TestAmerica Job ID: 580-70199-1
Project/Site: Maralco, Kent, WA

Laboratory: TestAmerica Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska (UST)	State Program	10	UST-022	03-02-18
California	State Program	9	2901	01-31-18
L-A-B	DoD ELAP		L2236	01-19-19
L-A-B	ISO/IEC 17025		L2236	01-19-19
Montana (UST)	State Program	8	N/A	04-30-20
Oregon	NELAP	10	WA100007	11-05-17
US Fish & Wildlife	Federal		LE058448-0	10-31-17
USDA	Federal		P330-14-00126	02-10-20
Washington	State Program	10	C553	02-17-18

Sample Summary

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-70199-1	W-MW3A	Water	07/26/17 11:55	07/27/17 15:55
580-70199-2	W-MW4A	Water	07/26/17 10:45	07/27/17 15:55
580-70199-3	W-MW5A	Water	07/26/17 10:00	07/27/17 15:55
580-70199-4	W-MW6	Water	07/26/17 12:30	07/27/17 15:55

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Seattle
5755 8th Street E.
Tacoma, WA 98424
Tel. 253-922-2310
Fax 253-922-5047
www.testamericainc.com

Loc: 580
70199

☐ Rush
☐ Short Hold

Chain of Custody Record

Client: Aerotech Env. Consulting	Client Contact: Nick Gerkin	Date: 7/26/17	Chain of Custody Number: 31272
Address: 13925 Interurban Ave S	Telephone Number (Area Code)/Fax Number: 206 482 2287	Lab Number	Page 1 of 1
City: Tukwila / State: WA / Zip Code: 98168	Sampler: Nick Gerkin / Lab Contact:	Analysis (Attach list if more space is needed)	
Project Name and Location (State): MARALCO, Kent, WA	Billing Contact: laura@dirtydirt.us		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	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Fluorides	Chlorides	Special Instructions/Conditions of Receipt
W-MW3A	7/26/17	1155		X			X						X	X	
W-MW4A	7/26/17	1045		X			X						X	X	
W-MW5A	7/26/17	1000		X			X						X	X	
W-MW6	7/26/17	1230		X			X						X	X	

580-70199 Chain of Custody

TB____ Cooler IR4 Cor 5.4 Unc 5.5
Cooler Dsc Small blue wht @ Lab
Wet/Packs Packing none
cli drop w/o CS

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~~ NAG Std

QC Requirements (Specify)

1. Relinquished By (Sign/Print): [signature] Nicholas Gerkin	Date: 7/27/16	Time: 1555	1. Received By (Sign/Print): [signature] McDermott	Date: 7/27/17	Time: 1555
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: Please Send Results to: Nick@dirtydirt.us

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

TAL-8274-580 (0210)

Login Sample Receipt Checklist

Client: Aerotech Environmental Consulting, Inc. Job Number: 580-70199-1

Login Number: 70199 **List Source: TestAmerica Seattle**
List Number: 1
Creator: Ponce-McDermott, Monica

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
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.	True	
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.	N/A	
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	

TestAmerica

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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: 580-70199-2
Client Project/Site: Maralco, Kent, WA

For:
Aerotech Environmental Consulting, Inc.
13925 Interurban Ave South
Suite 210
Seattle, Washington 98168

Attn: Nick Gerkin

Kayse Zalmai

Authorized for release by:
8/9/2017 10:34:30 AM
Kayse Zalmai, Project Manager I
(253)922-2310
kayse.zalmai@testamericainc.com

Designee for

Cathy Gamble, Project Manager I
(253)922-2310
cathy.gamble@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.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: 580-70199-2

Laboratory: TestAmerica Seattle

Narrative

Job Narrative
580-70199-2

Receipt
The samples were received on 7/27/2017 3:55 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 5.4º C.

Metals
The following samples were received with insufficient preservation: W-MW3A (580-70199-1), W-MW4A (580-70199-2), W-MW5A (580-70199-3) and W-MW6 (580-70199-4). 2.5mL of nitric acid preservative was added by the laboratory, and the samples' pH was adjusted to <2 SU. As per SOP requirements the samples were set aside for 24 hours before proceeding with analyses.

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

Definitions/Glossary

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-2

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

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	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
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 (Radiochemistry)
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: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-2

Client Sample ID: W-MW3A
Date Collected: 07/26/17 11:55
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-1
Matrix: Water

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	5.8		0.50	0.046	mg/L		08/07/17 08:56	08/08/17 13:05	5

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-2

Client Sample ID: W-MW4A
Date Collected: 07/26/17 10:45
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-2
Matrix: Water

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	0.061	J	0.50	0.046	mg/L		08/07/17 08:56	08/08/17 13:10	5

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-2

Client Sample ID: W-MW5A
Date Collected: 07/26/17 10:00
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-3
Matrix: Water

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	93		0.50	0.046	mg/L		08/07/17 08:56	08/08/17 13:14	5

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-2

Client Sample ID: W-MW6
Date Collected: 07/26/17 12:30
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-4
Matrix: Water

Method: 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	0.13	J	0.50	0.046	mg/L		08/07/17 08:56	08/08/17 13:19	5

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 580-253039/16-A
Matrix: Water
Analysis Batch: 253201

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 253039

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		0.50	0.046	mg/L		08/07/17 08:56	08/08/17 11:49	5

Lab Sample ID: LCS 580-253039/17-A
Matrix: Water
Analysis Batch: 253201

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 253039

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	10.0	11.6		mg/L		116	80 - 120

Lab Sample ID: LCSD 580-253039/18-A
Matrix: Water
Analysis Batch: 253201

Client Sample ID: Lab Control Sample Dup
Prep Type: Total Recoverable
Prep Batch: 253039

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	10.0	10.2		mg/L		102	80 - 120	13	20

Lab Chronicle

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-2

Client Sample ID: W-MW3A
Date Collected: 07/26/17 11:55
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			253039	08/07/17 08:56	ADB	TAL SEA
Total Recoverable	Analysis	6020B		5	253201	08/08/17 13:05	HJM	TAL SEA

Client Sample ID: W-MW4A
Date Collected: 07/26/17 10:45
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			253039	08/07/17 08:56	ADB	TAL SEA
Total Recoverable	Analysis	6020B		5	253201	08/08/17 13:10	HJM	TAL SEA

Client Sample ID: W-MW5A
Date Collected: 07/26/17 10:00
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			253039	08/07/17 08:56	ADB	TAL SEA
Total Recoverable	Analysis	6020B		5	253201	08/08/17 13:14	HJM	TAL SEA

Client Sample ID: W-MW6
Date Collected: 07/26/17 12:30
Date Received: 07/27/17 15:55

Lab Sample ID: 580-70199-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			253039	08/07/17 08:56	ADB	TAL SEA
Total Recoverable	Analysis	6020B		5	253201	08/08/17 13:19	HJM	TAL SEA

Laboratory References:

TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: Aerotech Environmental Consulting, Inc. TestAmerica Job ID: 580-70199-2
Project/Site: Maralco, Kent, WA

Laboratory: TestAmerica Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska (UST)	State Program	10	UST-022	03-02-18
California	State Program	9	2901	01-31-18
L-A-B	DoD ELAP		L2236	01-19-19
L-A-B	ISO/IEC 17025		L2236	01-19-19
Montana (UST)	State Program	8	N/A	04-30-20
Oregon	NELAP	10	WA100007	11-05-17
US Fish & Wildlife	Federal		LE058448-0	10-31-17
USDA	Federal		P330-14-00126	02-10-20
Washington	State Program	10	C553	02-17-18

Sample Summary

Client: Aerotech Environmental Consulting, Inc.
Project/Site: Maralco, Kent, WA

TestAmerica Job ID: 580-70199-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-70199-1	W-MW3A	Water	07/26/17 11:55	07/27/17 15:55
580-70199-2	W-MW4A	Water	07/26/17 10:45	07/27/17 15:55
580-70199-3	W-MW5A	Water	07/26/17 10:00	07/27/17 15:55
580-70199-4	W-MW6	Water	07/26/17 12:30	07/27/17 15:55

TestAmerica
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Fax 253-922-5047
www.testamericainc.com

Loc: 580
70199

☐ Rush
☐ Short Hold

Chain of Custody Record

Client: Aerotech Env. Consulting	Client Contact: Nick Gerkin	Date: 7/26/17	Chain of Custody Number: 31272
Address: 13925 Interurban Ave S	Telephone Number (Area Code)/Fax Number: 206 482 2287	Lab Number:	Page 1 of 1
City: Tukwila State: WA Zip Code: 98168	Sampler: Nick Gerkin	Lab Contact:	
Project Name and Location (State): MARALCO, Kent, WA	Billing Contact: laura@dirtydirt.us		
Contract/Purchase Order/Quote No.			

Analysis (Attach list if more space is needed)

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	Fluorides	Chlorides	Special Instructions/ Conditions of Receipt
W-MW3A	7/26/17	1155		X			X						X	X	
W-MW4A	7/26/17	1045		X			X						X	X	
W-MW5A	7/26/17	1000		X			X						X	X	
W-MW6	7/26/17	1230		X			X						X	X	

580-70199 Chain of Custody

TB___ Cooler IR4 Cor 5.4 Unc 5.5
Cooler Dsc Small blue wht @ Lab___
Wet/Packs Packing none
cli drop w/o CS

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~~ NAG Std

QC Requirements (Specify)

1. Relinquished By Sign/Print: [signature] Nicholas Gerkin	Date: 7/27/16	Time: 1555	1. Received By Sign/Print: [signature] McDermott	Date: 7/27/17	Time: 1555
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
Please Send Results to: Nick@dirtydirt.us

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

TAL-8274-580 (0210)

Login Sample Receipt Checklist

Client: Aerotech Environmental Consulting, Inc.

Job Number: 580-70199-2

Login Number: 70199
List Number: 1
Creator: Ponce-McDermott, Monica

List Source: TestAmerica Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
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.	True	
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.	N/A	
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	

BORING LOGS

CALIFORNIA DEPARTMENT OF TRANSPORTATION (CALTRANS)

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)		
		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)		
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)		
		SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)		
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or 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
SILTS AND CLAYS Liquid limit 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

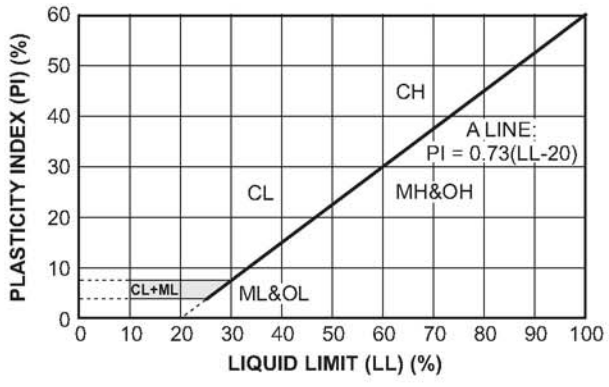
LABORATORY CLASSIFICATION CRITERIA

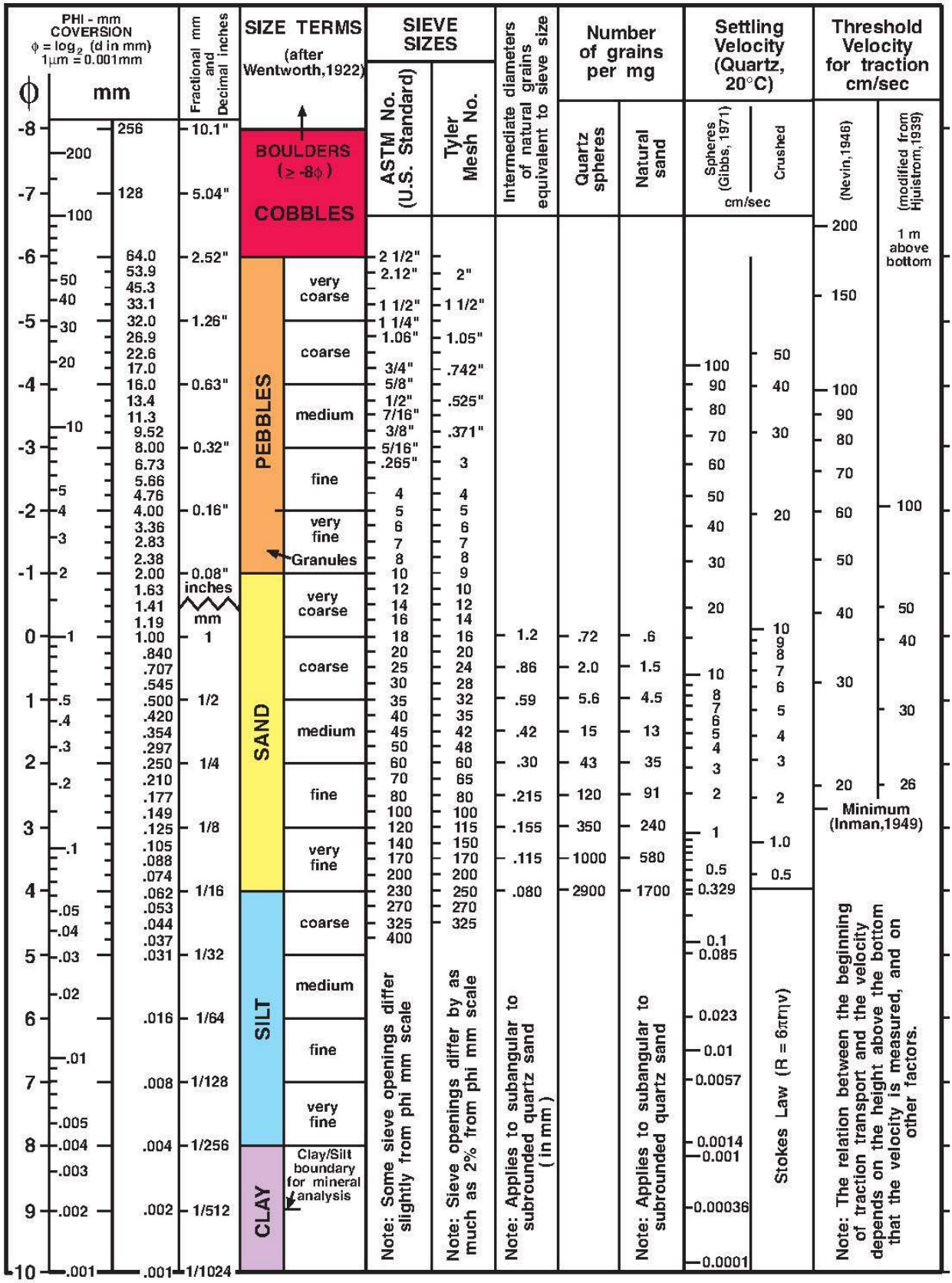
GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent ..... GW, GP, SW, SP
More than 12 percent ..... GM, GC, SM, SC
5 to 12 percent ..... Borderline cases requiring dual symbols

PLASTICITY CHART





US Geological Survey

AEROTECH
ENVIRONMENTAL CONSULTING
www.AerotechEnvironmental.com

Depth (ft)	Groundwater		Visual or Olfactory Evidence	Blow Counts	Recovery		USCS Classification	Soil Classification/ Description **UNIFIED SOIL CLASSIFICATION SYSTEM EXPLANATION**	Well Construction		
							GW	**GRAVELS**, well-graded* OR Gravel+Sand mix, little-no fines			
							GP	**GRAVELS**, poorly-graded* OR Gravel+Sand mix, little-no fines			
							GM	**GRAVELS**, silty OR Gravel-sand-silt mix			
							GC	**GRAVELS**, clayey OR Gravel-sand-clay mix			
							SW	**SAND**, well-graded OR **Gravelly Sands**, little-no fines			
							SP	**SAND**, poorly-graded OR **Gravelly Sands**, little-no fines			
							SM	**SAND**, silty OR Sand-silt mix			
							SC	**SAND**, clayey OR Sand-clay mix			
							ML	**SILT**, inorganic (very fine sands, rock flour, silty or clayey fine			
								sands) OR Clayey silts with slight plasticity			
							CL	**CLAY**, inorganic, low-med plasticity (gravelly, sandy, silty, lean)			
							OL	**SILT**, organic, AND **SILT-CLAY**, organic, low plasticity			
							MH	**SILT**, inorganic (micaceous or diatomaceous fn sndy/silty soils)			
								OR SILTY SOILS, elastic SILTS			
							CH	**CLAY**, inorganic, high plasticity, fat clays			
							OH	**CLAY**, organic, med-high plasticity OR Organic SILTS			
							PT	**PEAT** and other highly organic SOILS			
								**** Terminology clarification:*** *The term "**Well graded**" is a synonym for "**Poorly sorted**," both meaning that a wide range of particle sizes are present. The former term is employed in geotechnical descriptions, while the latter is preferred by the USDA in characterizing topsoils and subsoils.*			

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BORING LOG #: MW3A

Site Name: Former Maralco Aluminum Property
Project Number: 217-4026

Site Location: 7730 South 202nd Street, Kent, Washington
AOC: Downgradient and adjacent to the southern portion of the dross pile
Borehole Location: 6' West, 4' North of SWX Building

Logged by: N. Gerkin **Boring Depth:** 16 feet **GW Encountered:** YES

Drilling Information

Drilling Contractor:	SEP, Tumwater, WA
Drilling Method:	2-inch Direct Push
Sampler Type:	Core sampler + virgin poly-sleeve
ECY Well Tag:	BJP695

Approx. Surface Elev.: 27' above MSL
Work Date: 07/21/17

Depth (ft)	Groundwater	PID (ppm)	Sample	Blow Counts	Recovery	USCS Classification	Soil Classification/ Description	Well Construction
							Compacted Gravel Surface	
1–2						GW	FILL - GRAVEL and SAND, light brown to gray, damp, fine to coarse sand and gravel, subangular to subrounded gravel, Well graded, trace silt. No distinct odor.	
3						ML	SILT with some very fine Sand, dark brown, damp. No distinct odor.	
4–5		0.1	Lab			SP/ SW	SAND, fine to medium, gray to brown, saturated and oxidized at 5', moderately graded. No distinct odor.	
6–9						SP/ SW	SAND, fine to medium, gray to brown, saturated and oxidized at 5', moderately graded. No distinct odor.	
10		0.0				CH	Silty CLAY, dark gray, saturated, highly plastic. No distinct odor.	
11–16						SP	SAND, very fine to fine, dark gray to black, saturated, poorly graded, trace silt. No distinct odor.	
17–25								

1" Diameter Schedule 80 PVC, 0.010" Screen from 4 to 14 ft bgs
Well completed with Colorado Silica Sand from 3 to 14 ft bgs
Bentonite from 1 to 3 ft bgs and Concrete from 0.5 to 1 ft bgs

AEROTECH ENVIRONMENTAL CONSULTING
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BORING LOG #: MW4A

Site Name: Former Maralco Aluminum Property
Project Number: 217-4026

Site Location: 7730 South 202nd Street, Kent, Washington
AOC: Downgradient of former Diesel UST Basin
Borehole Location: 178' North of NWX Building

Logged by: N. Gerkin **Boring Depth:** 16 feet **GW Encountered:** YES

Drilling Information

Drilling Contractor:	SEP, Tumwater, WA
Drilling Method:	2-inch Direct Push
Sampler Type:	Core sampler + virgin poly-sleeve
ECY Well Tag:	BJP694

Approx. Surface Elev.: 27' above MSL
Work Date: 07/21/17

Depth (ft)	Groundwater	PID (ppm)	Sample	Blow Counts	Recovery	USCS Classification	Soil Classification/ Description	Well Construction
							Asphalt Surface	
1–2						GW	FILL - GRAVEL and SAND, light brown to gray, damp, fine to coarse sand and gravel, subangular to subrounded gravel, Well graded, trace silt. No distinct odor.	
3–6						ML	SILT with some very fine Sand, dark brown, moist. No distinct odor.	
7–8		0.5	Lab			SP	SAND, medium, gray to brown, saturated and dark gray at 8', poorly graded. No distinct odor.	
9–10		0.9				ML	Silty CLAY, dark gray, saturated, highly plastic. No distinct odor.	
11–16		0.0				SP	SAND, very fine to fine, dark gray to black, saturated, poorly graded, trace silt. No distinct odor.	

1" Diameter Schedule 80 PVC, 0.010" Screen from 6 to 16 ft bgs
Well completed with Colorado Silica Sand from 4.5 to 16 ft bgs
Bentonite from 1 to 4.5 ft bgs and Concrete from 0.5 to 1 ft bgs

AEROTECH ENVIRONMENTAL CONSULTING
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BORING LOG #: MW5A

Site Name: Former Maralco Aluminum Property
Project Number: 217-4026

Site Location: 7730 South 202nd Street, Kent, Washington
AOC: Replacement well for MW5
Borehole Location: East Side of Parking Lot. 12' South, 3' East of MW5

Logged by: N. Gerkin **Boring Depth:** 16 feet **GW Encountered:** YES

Drilling Information

Drilling Contractor:	SEP, Tumwater, WA
Drilling Method:	2-inch Direct Push
Sampler Type:	Core sampler + virgin poly-sleeve
ECY Well Tag:	BJP693

Approx. Surface Elev.: 27' above MSL
Work Date: 07/21/17

Depth (ft)	Groundwater	PID (ppm)	Sample	Blow Counts	Recovery	USCS Classification	Soil Classification/ Description	Well Construction
							Bark chips, other organics, and Gravel	
1						GW	FILL - GRAVEL and SAND, light brown to gray, damp, fine to coarse sand and gravel, subangular to subrounded gravel, Well graded, trace silt. No distinct odor.	
2								
3						ML	SILT with some very fine Sand, dark brown, moist. No distinct odor.	
4								
5								
6								
7								
8							NO RECOVERY from 4 to 16 ft bgs	
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22							1" Diameter Schedule 80 PVC, 0.010" Screen from 5 to 15 ft bgs Well completed with Colorado Silica Sand from 4 to 16 ft bgs Bentonite from 1 to 4 ft bgs and Concrete from 0.5 to 1 ft bgs	
23								
24								
25								

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BORING LOG #: MW6

Site Name: Former Maralco Aluminum Property
Project Number: 217-4026

Site Location: 7730 South 202nd Street, Kent, Washington
AOC: Generally downgradient of dross piles
Borehole Location: 50' South, 3' West of NWX Building

Logged by: N. Gerkin **Boring Depth:** 16 feet **GW Encountered:** YES

Drilling Information

Drilling Contractor:	SEP, Tumwater, WA
Drilling Method:	2-inch Direct Push
Sampler Type:	Core sampler + virgin poly-sleeve
ECY Well Tag:	BJP696

Approx. Surface Elev.: 27' above MSL
Work Date: 07/21/17

Depth (ft)	Groundwater	PID (ppm)	Sample	Blow Counts	Recovery		USCS Classification	Soil Classification/ Description	Well Construction
								Asphalt Surface	
1–2							GW	FILL - GRAVEL and SAND, light brown to gray, damp, fine to coarse sand and gravel, subangular to subrounded gravel, Well graded, trace silt. No distinct odor.	
3–7		0.5	Lab				SP	SAND, medium, gray to brown, saturated and dark gray at 8', poorly graded. No distinct odor.	
8–10							ML	Silty CLAY, dark gray, saturated, highly plastic. No distinct odor.	
11		0.0							
12–16							SP	SAND, very fine to fine, dark gray to black, saturated, poorly graded, trace silt. No distinct odor.	
17–25									

1" Diameter Schedule 80 PVC, 0.010" Screen from 5 to 15 ft bgs
Well completed with Colorado Silica Sand from 4 to 16 ft bgs
Bentonite from 1 to 4 ft bgs and Concrete from 0.5 to 1 ft bgs

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Depth (ft)	Groundwater		Visual or Olfactory Evidence	Blow Counts	Recovery		USCS Classification	Soil Classification/ Description **UNIFIED SOIL CLASSIFICATION SYSTEM EXPLANATION**	Well Construction		
							GW	**GRAVELS**, well-graded* OR Gravel+Sand mix, little-no fines			
							GP	**GRAVELS**, poorly-graded* OR Gravel+Sand mix, little-no fines			
							GM	**GRAVELS**, silty OR Gravel-sand-silt mix			
							GC	**GRAVELS**, clayey OR Gravel-sand-clay mix			
							SW	**SAND**, well-graded OR **Gravelly Sands**, little-no fines			
							SP	**SAND**, poorly-graded OR **Gravelly Sands**, little-no fines			
							SM	**SAND**, silty OR Sand-silt mix			
							SC	**SAND**, clayey OR Sand-clay mix			
							ML	**SILT**, inorganic (very fine sands, rock flour, silty or clayey fine			
								sands) OR Clayey silts with slight plasticity			
							CL	**CLAY**, inorganic, low-med plasticity (gravelly, sandy, silty, lean)			
							OL	**SILT**, organic, AND **SILT-CLAY**, organic, low plasticity			
							MH	**SILT**, inorganic (micaceous or diatomaceous fn sndy/silty soils)			
								OR SILTY SOILS, elastic SILTS			
							CH	**CLAY**, inorganic, high plasticity, fat clays			
							OH	**CLAY**, organic, med-high plasticity OR Organic SILTS			
							PT	**PEAT** and other highly organic SOILS			
								**** Terminology clarification:*** *The term "**Well graded**" is a synonym for "**Poorly sorted**," both meaning that a wide range of particle sizes are present. The former term is employed in geotechnical descriptions, while the latter is preferred by the USDA in characterizing topsoils and subsoils.*			

LOW-FLOW GROUNDWATER SAMPLING STANDARD OPERATING PROCEDURE

AEROTECH
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13925 Interurban Avenue South, Suite No.210
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(360)710-5899

2916 NW Bucklin Hill Road, Suite No.126
Silverdale, Washington 98383
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512 W. International Airport Road, Suite 201
Anchorage, Alaska 99518
(907) 575-6661

5319 SW Westgate Dr., Suite No.24
Portland, Oregon 97221
(503) 360-4701

LOW-FLOW GROUNDWATER SAMPLING STANDARD OPERATING PROCEDURE

The following protocol and sampling procedures were designed to meet or exceed standards for groundwater monitoring well sampling, as specified by the State of Washington Department of Ecology *"Standard Operating Procedures for Purging and Sampling Monitoring Wells, Version 1.0,"* dated and approved on October 4, 2011. These procedures are strictly adhered to by Aerotech field staff:

Cross-Contamination Mitigation Protocol

A sampling table is set up adjacent to the well head in order to protect field equipment from contact with the ground, to prevent or minimize the possible introduction of foreign materials into the wells, and in general in order to mitigate the possibility of cross-contamination. Where previous laboratory data is available, or where visual of olfactory indicators provide initial evidence, well sampling order is arranged to proceed with the least contaminated well, often the upgradient groundwater monitoring wells, and sampling order proceeds by sampling wells associated with successively higher contamination levels. Thus, the wells exhibiting the highest contamination levels are sampled last, in order to minimize the possibility of cross contamination.

A fresh pair of disposable Nitrile gloves is worn at each well. Equipment neither disposable nor dedicated to wells, is washed in a dedicated container prepared with non-phosphate Alconox detergent and triple rinsed in a second container prepared with distilled and/or deionized water. Surfaces that cannot be readily submerged for the purpose of decontamination, are sprayed with wash water followed by rinse water, and wiped with a fresh disposable paper towel. For shallow wells that require a peristaltic pump, dedicated tubing is left in each well after sampling, however, for deeper wells that require a submersible pump, dedicated tubing is recovered from wells after each use, and deployed to a designated dedicated clean plastic bag, bearing a label indicating well identification information.

Water Level Measurement

Prior to the well purge process and the collection of groundwater samples, groundwater levels are measured at the north side of the ("TOC") with a piezometer/water level indicator, by slowly lowering the sensor into wells prior to purging, in order to minimize disturbances. The water levels are measured twice, with tape a marked in 0.01 foot increments, in order to reduce possible reading error. Where appropriate, free product thickness is measured with gas level indicator paste or an interface indicator. Upon arrival, each well is visual inspected and the condition of the well and well head are noted.

Groundwater Monitoring Well Purge and Sampling Methodologies

Prior to groundwater sample collection, A dedicated length of high density polyethylene tubing is lowered into each well to a level near the middle of the screened interval. A dedicated length of clean silicone tubing is utilized within the pump mechanism. The wells are purged by means of low flow techniques, during which time groundwater is monitored for physical parameters, including temperature, pH, specific conductivity, dissolved oxygen (DO), and oxidation-reduction potential (ORP), by means of a multi-parameter device mounted upon a flow cell, until such time as values recorded have stabilized and equilibrium conditions are verified according to State guidelines. This protocol ensures that collected groundwater samples are representative of in-situ groundwater conditions. Readings are recorded once every 2 to 5 minutes, including water level measurement. The pumping rate shall remain below 1 L/min during monitoring and sampling procedures. This is verified by periodically filling a one-Liter graduated cylinder and recording the rate, adjusting the pump as necessary. The water column within the well should remain within 5% of the static height during the purge and sample process, if this cannot be achieved, the pump rate will be reduced until the water level stabilizes. The following conditions must be met in three consecutive readings prior to sampling:

•	pH	+/- 0.1 standard units
•	Specific Conductivity	+/- 10.0 mS/cm for values < 1,000 mS/cm
		+/- 20.0 mS/cm for values > 1,000 mS/cm
•	DO	+/- 0.05 mg/L for values < 1 mg/L
		+/- 0.2 mg/L for values > 1 mg/L
•	Temperature	+/- 0.1 degrees Celcius
•	ORP	+/- 10 mV

Groundwater samples are collected in containers specified by the laboratory for the analyses established at the Site, and in accordance with State of Washington regulations or guidelines. Sample containers are labeled with site name, well identification, and date of collection information. Each sample is documented on a *Chain of Custody* (“”COC”) form, and immediately placed in an iced cooler (maintained at 4 degrees Celcius or less) for transport to a certified laboratory for analysis. Please note that any purge water suspected or confirmed to contain concentrations above the MTCA Cleanup Levels is drummed and left on Site

Please feel free to contact the Aerotech Geologist/Hydrogeologist, Mr. James McDermott, at (425) 686-0032, or the Aerotech Environmental Scientist/Field Sampling Coordinator, Mr. Nicholas Gerkin, at (206) 482-2287, if you have questions regarding work completed at this Site.

LOW-FLOW SAMPLING FIELD DOCUMENTATION

AEROTECH ENVIRONMENTAL CONSULTING

www. AerotechEnvironmental.com

GROUNDWATER MONITORING WELL
LOW FLOW SAMPLING FIELD LOG

FIELD CREW: NAG	**PROJECT NAME:** Former Maralco Aluminum Prop.
DATE: 07/26/17	**PROJECT ADDRESS:** 7730 South 202nd Street, Kent, Washington

MW3A

Time	DTW	Purge Rate	Temperature	Specific Conductivity	DO	pH	ORP
hr:min	feet	mL/min	°C	mS/cm	mg/L	unit	mV
11:28	5.90	--	--	--	--	--	--
11:40	6.11	200	16.3	670	4.08	7.08	0.9
11:42	6.08	200	16.1	673	3.13	7.04	4.3
11:44	6.09	200	16.0	672	2.81	7.03	5.5
11:46	6.10	200	15.9	673	2.47	7.02	5.9
11:48	6.10	200	15.9	673	2.15	7.02	5.8
11:50	6.10	200	15.8	673	1.99	7.02	5.8
11:52	6.10	200	15.8	673	1.97	7.02	5.8
Ecology Parameter Limits (3 Consecutive Readings)			**+/- 0.1**	**+/- 10**	**+/- 0.05**	**+/- 0.1**	**+/- 10**
11:55	**SAMPLE**	--	--	--	--	--	--

Comments:

MW4A

Time	DTW	Purge Rate	Temperature	Specific Conductivity	DO	pH	ORP
hr:min	feet	mL/min	°C	mS/cm	mg/L	unit	mV
10:17	7.65	--	--	--	--	--	--
10:30	7.70	175	14.4	1594	1.00	6.65	-89.3
10:32	7.70	175	14.3	1592	0.86	6.68	-92.9
10:34	7.70	175	14.3	1592	0.79	6.69	-95.7
10:36	7.70	175	14.2	1619	0.69	6.69	-98.7
10:38	7.70	175	14.2	1633	0.68	6.72	-100.7
10:40	7.70	175	14.2	1647	0.65	6.7	-102.4
10:42	7.70	175	14.1	1646	0.63	6.72	-101.9
Ecology Parameter Limits (3 Consecutive Readings)			**+/- 0.1**	**+/- 10**	**+/- 0.2**	**+/- 0.1**	**+/- 10**
10:45	**SAMPLE**	--	--	--	--	--	--

Comments:

AEROTECH ENVIRONMENTAL CONSULTING

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GROUNDWATER MONITORING WELL
LOW FLOW SAMPLING FIELD LOG

FIELD CREW: NAG	**PROJECT NAME:** Former Maralco Aluminum Prop.
DATE: 07/26/17	**PROJECT ADDRESS:** 7730 South 202nd Street, Kent, Washington

MW5A

Time	DTW	Purge Rate	Temperature	Specific Conductivity	DO	pH	ORP
hr:min	feet	mL/min	°C	mS/cm	mg/L	unit	mV
09:34	6.73	--	--	--	--	--	--
09:44	8.64	125	14.9	1762	0.87	6.91	-147.7
09:46	8.72	125	14.6	1757	0.60	6.93	-150.0
09:48	8.76	125	14.5	17512	0.57	6.92	-152.0
09:50	8.83	125	14.4	1743	0.43	6.93	-153.7
09:52	8.89	125	14.4	1728	0.30	6.95	-156.0
09:54	8.84	125	14.5	1717	0.32	6.98	-157.9
09:56	8.90	125	14.5	1718	0.31	6.93	-158.5
Ecology Parameter Limits (3 Consecutive Readings)			**+/- 0.1**	**+/- 10**	**+/- 0.2**	**+/- 0.1**	**+/- 10**
10:00	**SAMPLE**	--	--	--	--	--	--

Comments:
Water is slightly silty

MW6

Time	DTW	Purge Rate	Temperature	Specific Conductivity	DO	pH	ORP
hr:min	feet	mL/min	°C	mS/cm	mg/L	unit	mV
12:09	4.92	--	--	--	--	--	--
12:17	5.10	200	17.7	1585	1.15	6.71	-87.9
12:19	5.10	200	17.5	1601	0.87	6.70	-88.6
12:21	5.10	200	17.6	1599	0.67	6.71	-89.7
12:23	5.90	200	17.7	1595	0.64	6.70	-89.8
12:25	5.08	200	17.6	1594	0.65	6.69	-90.0
Ecology Parameter Limits (3 Consecutive Readings)			**+/- 0.1**	**+/- 10**	**+/- 0.2**	**+/- 0.1**	**+/- 10**
12:30	**SAMPLE**	--	--	--	--	--	--

Comments:

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Anchorage, Alaska 99518
(907) 575-6661

October 31, 2017

Laura Fox
GVA Kidder Mathews
1201 Pacific Avenue
Suite No. 1400
Tacoma, Washington 98402

SUBJECT **Site Summary Report**
Former Maralco Aluminum Site
7730 South 202nd Street
Kent, Washington 98032

Ms. Fox,

At your request Aerotech Environmental Consulting, Inc. ("Aerotech") has compiled a summary of existing information from investigations previously conducted at the above referenced Site. The purpose of this summary report is to inform prospective property buyers the information known by Aerotech to date regarding the environmental assessment completed at the Site as of October 31, 2017.

Sincerely,

Justin Foslien
Licesed Geologist
Email: justin@dirtydirt.us

Enclosed: Site Summary Report dated October 31, 2017

SITE SUMMARY REPORT

Performed for:
Former Maralco Aluminum Site
7730 South 202nd Street
Kent, Washington 98032

AEROTECH
Environmental Consulting Inc.

October 31, 2017

Anchorage Seattle Portland

Cost-effective environmental solutions
for the western United States and Alaska

www.AerotechEnvironmental.com

SITE SUMMARY REPORT

Performed for:
Former Maralco Aluminum Site
7730 South 202nd Street
Kent, Washington 98032

October 31, 2017

Performed by:

AEROTECH Environmental Consulting Inc.
13925 Interurban Avenue South, Suite No. 210
Seattle, Washington 98168
Fax (206) 402-3872
(866) 800-4030
www.AeroTechEnvironmental.com

SITE SUMMARY REPORT

performed for:

FORMER MARALCO ALUMINUM SITE
7730 South 202nd Street
Kent, Washington 98032

Clients:	**GVA Kidder Mathews**
Point of Contact:	Laura Fox GVA Kidder Mathews 1201 Pacific Avenue Suite No. 1400 Tacoma, Washington 98402 (253)722-1441 lfox@kiddermathews.com
Property:	**FORMER MARALCO ALUMINUM SITE** 7730 South 202nd Street Kent, Washington 98032
County:	King County, Washington Parcel Number: 6315000300
Commercial Activity:	Vacant Property
Licensed Geologist:	Justin Foslien (Washington State License No. 2540)
Report Date:	October 31, 2017

EXECUTIVE SUMMARY

The Former Maralco Aluminium Site Property (King County Parcel Identification Number 6315000300) includes approximately 12.05 acres of land and is located at 7730 South 202nd Street in Kent, Washington (Figures 1 and 2). Currently zoned for industrial development, the property contains a 45,000 square foot warehouse building constructed in 1981 and a former farmhouse with several out-buildings constructed between 1960 and 1968. An asphalt-paved parking lot is located in the northwest corner of the parcel. Puget Sound Pipe and Supply, a business located on a north adjacent property, currently utilized for storage of steel pipe. The eastern portion of the Property is covered in blackberry bushes and other shrubbery. The surrounding area is predominantly occupied by heavy industrial properties.

According to the Limited Phase II Environmental Site Assessment Report date February 27, 2017, the Property operated from 1980 to 1986 as a smelting facility processing aluminum scrap into ingots for recycling. After the smelting process, the salt flux became a waste product consisting of aluminum oxide and impurities from the molten salt smelting process called "black dross" or "salt cake." During the first year of operation the black dross was hauled offsite for disposal at a solid waste landfill. It was stored on-site in a consolidated stockpile located on the south and east sides of the warehouse building for all successive operations. The black dross has remained on-site since the plant closed in 1986.

Generation of the black dross during the operation of the former smelting facility has resulted in two large stockpiles present at the Site. The stockpiles have been mapped and estimated to contain 21,577 cubic yards of material.

Black dross is known to contain high concentrations of metals and oxides that pose a risk to human health and the environment. The existing monitoring wells at the site have been sampled and detectable concentrations of fluorides and chlorides were reported in samples collected from perimeter wells along the western property boundary. This appears to indicate the potential for migration of contaminated groundwater off Property to the northwest based on the groundwater flow at the Site toward the north northwest.

There has been discussion of alternative cleanup options for the property. However, the Washington Department of Ecology will require the dross stockpiles, the primary source for onsite contamination, to be removed and disposed to sufficiently address the requirements of the Model Toxics Control Act ("MTCA").

Various opinions of the cost to remove and dispose of the dross in the past 30 years since operations at the Site have ceased. At this time the costs to clean up the Site will need to cover:

- Removal and disposal of the 21,577 cubic yards of material in stockpiles;
- Delineation of the contaminated media;
- Performance monitoring of groundwater and surface water; and
- Conformational sampling of soil and sediment remaining.

TABLE OF CONTENTS

INTRODUCTION

Ms. Laura Fox of GVA Kidder Mathews, retained Aerotech Environmental Consulting, Inc. ("Aerotech") of Seattle, Washington to provide a summary of the Former Maralco Aluminum Site for prospective buyers. Aerotech reviewed previous investigations completed at the Site to provide a summary of environmental assessment known by Aerotech as of the date of this report.

SECTION I.

SITE DESCRIPTION

Property Exterior Description:

The Property (King County Parcel Identification Number 6315000300) includes approximately 12.05 acres of land and is located at 7730 South 202nd Street in Kent, Washington (Figures 1 and 2). Currently zoned for industrial development, the property contains a 45,000 square foot warehouse building constructed in 1981 and a former farmhouse with several out-buildings constructed between 1960 and 1968. An asphalt-paved parking lot is located in the northwest corner of the parcel. Puget Sound Pipe and Supply, a business located on a north adjacent property, currently utilized for storage of steel pipe. The eastern portion of the Property is covered in blackberry bushes and other shrubbery. The surrounding area is predominantly occupied by heavy industrial properties.

Site History and Background:

According to the Limited Phase II Environmental Site Assessment Report date February 27, 2017, the Property operated from 1980 to 1986 as a smelting facility processing aluminum scrap into ingots for recycling. After the smelting process, the salt flux became a waste product consisting of aluminum oxide and impurities from the molten salt smelting process called "black dross" or "salt cake." During the first year of operation the black dross was hauled offsite for disposal at a solid waste landfill. It was stored on-site in a consolidated stockpile located on the south and east sides of the warehouse building for all successive operations. The black dross has remained on-site since the plant closed in 1986.

SECTION II.

PREVIOUS INVESTIGATIONS

Previous environmental studies summarized in Stantech's 2017 Phase II Investigation are included below in chronological order as well as the investigations completed by Aerotech.

Ecology and Environment ("E&E"), Inc.; *Site Assessment Report Maralco Aluminum*, Kent,Washington; June 25, 1987.

E&E completed a site assessment at the Property in the summer of 1987. According to E&E, Maralco had analyzed samples of black dross, baghouse dust, and aluminum oxide using the Extraction Procedure Toxicity (EP-Tox) method and acute fish toxicity testing in February and July of 1986. Although the report does not state explicitly the purpose of collecting these samples, it is assumed that these samples were for waste characterization purposes to assess disposal options for the black dross. The sample results indicated the materials did not exceed the then current EP-Tox hazardous waste criteria, however, that surface water sample mortality for acute fish toxicity testing was 100%. A sediment sample was collected from within the drainage ditch that transects the Property adjacent to the black dross pile (sample location B2). The analytical results indicated that metals contained in the black dross (antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel and zinc) impacted drainage ditch sediments. Four of the detected metals [cadmium (4.5 milligrams/kilogram) (mg/kg), chromium (232 mg/kg), copper (1,500 mg/kg), and nickel (74.0 mg/kg)] exceeded their respective Sediment Management Standard (SMS) Sediment Cleanup Objective (SCO) criteria. To evaluate whether the sediment sample would constitute a hazardous waste, the sample was also submitted for EP-Tox analysis. The results indicated that the sample did not meet the criteria of a hazardous waste. A surface water sample co-located with the sediment sample was also collected for laboratory analysis of priority pollutant metals. Only copper (0.19 micrograms/liter [µg/L]) and zinc (0.16 µg/L) were detected, however at concentrations significantly less than the applicable Surface Water Aquatic Life Acute and Chronic Exposure cleanup levels.

Morrison-Knudsen Environmental Services, Inc.; *Draft Phase I Remedial Investigation Report*, Maralco Site, Kent, Washington; February, 1991.

Groundwater, sediment, surface water, and black dross samples were collected as part of this investigation. Assessment activities completed by Morrison-Knudsen Environmental Services, Inc. ("MKE") included the characterization of the exterior dross piles, and the installation, development, and sampling of four monitoring wells. Testing of the dross samples for leachable metals indicated that the material was not a characteristic hazardous waste. Groundwater concentrations for arsenic and lead were detected at concentrations greater than the Model Toxics Control Act ("MTCA") Method A Groundwater screening levels, and for barium exceeding the federal primary drinking water standard of 1.0 milligram per liter (mg/L). The surface water and sediment sample results revealed that dross was entering on-site drainage ditches and that surface water was transporting the material off-site. The report indicates that in 1987 Ecology placed plastic barricades around the dross stockpile to prevent run-off from entering the drainage ditches; however, by 1989 the barricades were no longer in place.

Enviros, Inc.; *Underground Storage Tank Decommissioning at the Maralco Aluminum Site*, 7730 South 202nd Street, Kent, Washington; July 31, 1995

On behalf of Ecology, Enviros, Inc. (Enviros) decommissioned a 35,000-gallon diesel underground storage tank (UST) located in the parking lot at the northwest portion of the Property in July of 1995. Approximately 150 cubic yards of contaminated soil was removed from the excavation and stockpiled on visqueen. The report indicates that upon inspection the UST was observed to be in generally good condition with the exception of three pin-point sized holes located near the west end of the UST. Confirmation soil

samples were collected from the base and sidewalls of the excavation. The analytical results indicated the presence of diesel-range organics (DRO) in soil from only the south and west sidewalls (6,300 mg/kg and 96 mg/kg respectively), with only the sample collected from the south sidewall exceeding the MTCA Method A screening level of 2,000 mg/kg. DRO was also detected in stockpiled soils from the excavation at concentrations ranging from 1,200 mg/kg to 2,100 mg/kg. The MTCA Method A screening level for DRO is 2,000 mg/kg. According to the report, Ecology approved returning stockpiled soil to the excavation following completion of UST removal activities.

Environmental Management Resources, Inc. ("EMR"); *Draft Remedial Investigation/Feasibility Study for the Former Maralco Site*, Kent, Washington; May, 2003

EMR conducted a Remedial Investigation/Feasibility Study (RI/FS) in 2003 at the Site. The RI/FS included the installation, development, and sampling of one new monitoring well (MW-5); sampling of three of the four existing monitoring wells (MW-2 through MW-4); and the collection of 22 dross samples from four soil borings (DP-1 through DP-4). Depth to groundwater measurements collected by EMR and others indicates that groundwater occurs at a depth of approximately 5 feet below the ground surface, and that groundwater flow is generally to the north-northwest. Aluminum, arsenic, barium, chloride and fluoride were found to exceed the Project Remediation Goals (PRGs) in groundwater (generally equivalent to the MTCA Method B formula values corresponding to the lesser concentration for a Hazard Quotient of 1 or a potential carcinogenic risk of one in one million). Constituents of concern in soil were reportedly less than the PRGs for the Property. The dross and site sediments contain arsenic, barium, copper and mercury at concentrations greater than the Site PRGs. However, leachability testing indicated that the black dross was not a characteristic hazardous waste. The report identified three cleanup action alternatives:

- Alternative 1 – Limited Action/Institutional Controls
- Alternative 2 – Removal and Off-Site Disposal
- Alternative 3 – On-Site Containment

The Draft RI/FS report recommended Alternative 2 – Removal and Off-Site Disposal as the recommended alternative. This alternative included the removal and off-site disposal of the dross and other wastes inside the warehouse building and impacted soil and sediment.

URS Corporation; *Draft Cleanup Action Plan*, Maralco Redevelopment Project; November 12, 2004

URS Corporation ("URS") completed an inventory of stockpiled particulate matter collected in baghouses located in the southwest corner of the warehouse building. Seven cribbed stockpiles were noted. The total estimated volume of material in these stockpiles was 1,100 cubic yards. Also noted by URS were five 55-gallon drums of waste located in the southeast corner of the building. Further characterization of these wastes was recommended by URS. The URS report summarized findings from additional investigations that include a URS "Black Dross Characterization Report" dated 2000 as well as a "Former UST Investigation" conducted by EMR dated 2003. URS's summaries of these reports are provided below.

- URS completed further characterization of dross at the Property in August of 2000 by collecting and analyzing one discrete black dross sample and four composite black dross samples from the exterior dross stockpiles. The samples were collected east of the warehouse with a hand auger from a depth of five feet or less except for one sample that was collected at a depth of 9.5 feet. Testing included evaluation of toxicity using the Toxicity Characteristic Leaching Procedure (TCLP) and fish bioassay test methods. The TCLP testing results indicated that the black dross was not a characteristic hazardous waste. Also, the fish bioassay testing indicated that the black dross was not a State of Washington dangerous waste.

- In 2003, EMR conducted additional site characterization activities in the former UST area of the Property. The investigation indicated that two 1.5-inch copper pipes extended from the UST area to

the southeast toward the warehouse suggesting that diesel may have been used to fuel one or more of the furnaces within the building. These pipes were only removed to the edge of the UST excavation, and the pipes left in place were capped. Soil samples collected during this investigation indicated no evidence of petroleum hydrocarbon impacts exceeding MTCA Method A screening levels. However, petroleum hydrocarbon concentrations in the groundwater grab sample collected from boring SB-1 exceeded the MTCA Method A screening levels at a concentration of 450 mg/L. The preferred remedial action identified by URS was the removal and disposal of black dross, baghouse dust and other wastes inside the warehouse at an off-site disposal facility. URS further recommended sampling of the black dross and interior waste piles for hazardous waste characterization purposes, sampling of groundwater in the former UST area, and resampling of the five existing monitoring wells on the Site as part of a supplemental RI.

URS Corporation; *Proposal, Environmental Services, Maralco Restoration Project*; 202nd Street, Kent Washington. November 14, 2011

The purpose of the URS proposal was to document the scope of work required by Ecology for entry into a Prospective Purchaser Consent Decree ("PPCD"). The PPCD is a particular type of Consent Decree entered into with a person who is not currently liable for remedial action at the Property and who wishes to purchase the Property. Ecology identified the following three requirements which are needed prior to developing a PPCD:

1. Completing a supplemental Remedial Investigation (RI) to address data gaps in site characterization;
2. Update the existing RI/FS report prepared by EMR (the proposal erroneously refers to another consulting company "ERM"); and
3. Revise the URS November 12, 2004 Draft Cleanup Action Plan (DCAP) to address comments provided by Ecology.

Additionally, a fourth task was identified, updating the Wetland Delineation report for the Site. The last wetland report for the Site was prepared in April of 2003; wetland assessments valid for a period of 5 years according to Kent City Code 11.06.590.D.

The Task 1 – Supplemental RI tasks were recommended to include:

- Additional sampling and analysis of the black dross stockpiles located outside of the warehouse building for disposal characterization;
- Sampling the waste stockpiles inside the warehouse for disposal characterization;
- Drilling and sampling seven borings around the former USTs at the Site;
- Sampling existing Site monitoring wells; and
- Inspecting the farmhouse to confirm former uses of the structure. Ecology suspected the building may have been used as a drug or chemical laboratory which included the use and onsite disposal of hazardous substances.

Stantech; *Limited Phase II Environmental Site Assessment Report*, Former Maralco Aluminum Site, Kent, Washington; February 27, 2017

The results of the Limited Phase II ESA at the former Maralco Aluminum Property indicate that metals, chloride, fluoride, and benzo(a)pyrene exceed screening levels in groundwater, surface water and sediment at the Property. A summary of Stantec's conclusions and recommendations are provided below.

Mercury was detected at concentrations greater than the natural background levels for the Puget Sound Basin in soil at the Property. The likely source of these contaminants is the black dross stockpiled onsite. The stockpile material was covered as part of interim action in 1991; however, the cover has not been maintained over time. The majority of the stockpile is now exposed to surface water runoff and wind

dispersion. Interim actions to mitigate erosion of this material could include placing and securing a visqueen cover over the stockpiled material and erecting new barricades (e.g., silt fences or similar) to prevent the black dross from entering the onsite drainage ditches. Based on the data from borings B-1 through B-3, petroleum hydrocarbon impacted soil was not identified in the former UST excavation area. No further evaluation of soil in this area of the Property is recommended.

Only one of the five existing monitoring wells was sampled during this investigation. To delineate the horizontal extent of impacted groundwater at the Property, monitoring wells MW-3, 4 and 5 should be replaced. In addition, working with Ecology and the Army Corps of Engineers for any wetland impacts, permits should be obtained to clear vegetation and/or provide access to well MW-1 located in the southeast corner of the Property. After the installation of the monitoring wells, a full round of water levels and groundwater samples should be collected and analyzed for metals, geochemical parameters and PAHs. The results may indicate that additional monitoring wells are needed to adequately delineate the horizontal and vertical extent of contaminants in groundwater.

Surface water at the Property has been impacted with aluminum, cadmium, lead and chloride. Similarly, surface sediment has been impacted with cadmium, chromium and silver and elevated levels of chloride. These contaminants may be migrating off-site via surface water or sediment transport in the drainage ditches. To evaluate the transport of these contaminants, surface water and surface sediment samples should be collected from the upgradient portion of the ditch along the southern property boundary and at a downgradient location near the northern Property boundary prior to discharge off-site. Subsurface sediment samples may also be necessary to fully delineate contamination associated with the drainage ditches.

Internal testing by two disposal companies reported that the black dross is suitable for disposal at a Subtitle D landfill. The wastes inside the warehouse will still need to be characterized to evaluate disposal options. Additionally, the federal wetland delineation manual, state wetland rating system and City of Kent code have been revised since the original wetland delineation. The wetland boundaries should be verified and the wetland report updated.

Aerotech Environmental, Inc.; *Stockpile Survey and Assessment*, Former Maralco Site, Kent, Washington; May 31, 2017

Aerotech collected 32 discrete samples from the stockpiles and surveyed the site with an aerial drone to estimate the quantity of material stockpiled and it's density for the purpose of determining disposal costs for the property. Aerotech also observed, Brian Green of Azure Green Consultants ("AG") conduct an Aerial Drone Survey of the Site on May 8, 2017.

The collection of samples resulted in a wide range of density values from 0.76 to 1.14 tons per cubic yard. Several factors have likely caused the variability of density throughout the Site. They include but are not limited to: 1) varying moisture and water content; 2) the approximate measure of 5-gallons of the material; 3) variability in the content of the sample (i.e. concrete and or cobbles); 4) and varying measurement output from the scale. To accurately estimate the cost of disposing the stockpile present at the Site, Aerotech recommends utilizing the entire range of the data when predicting the cost of removing the dross stockpile from the Site.

AG provided a calculated estimate of 25,177 cubic yards comparing the elevation of the base surface estimated from the toe of the stockpile and the elevation and current area the stockpile occupies at the Site.

Aerotech Environmental, Inc.; *Groundwater Monitoring Well Installation Report*, Former Maralco Site, Kent, Washington; August 15, 2017

Aerotech Environmental Consulting, Inc. constructed four soil borings as groundwater monitoring wells (MW3A, MW4A, MW5A and MW6) to evaluate potential off-property migration of groundwater. Monitoring well MW3A, MW4A and MW5A are replacement locations of previously destroyed or missing locations MW3 through MW5.

No concentrations of Aluminum, Lead, Total Chromium, Cadmium, Arsenic, Mercury, Barium, Silver or Selenium in soil samples collected from MW3A, MW4A and MW6 exceeded the respective MTCA A or B Cleanup Level.

Groundwater samples collected from monitoring wells MW3A and MW6 contained concentrations of Fluorides above the Method B Cleanup Level. Concentrations of Chlorides above the Washington Administrative Code Maximum Contaminant Level were present in groundwater samples collected from monitoring wells MW4A and MW6. Groundwater samples collected from monitoring well MW5A contained concentrations of Arsenic and Aluminum above the respective MTCA Method A or B Cleanup Level. All remaining analyses completed on groundwater samples were either not detected at or above laboratory detection limits, or detected below the applicable Cleanup Level.

The newly installed perimeter wells MW3A, MW4A and MW6 along the northwest and western property boundary contain concentrations above applicable regulatory standards of one or more contaminants associated with the dross stockpile. Additionally samples collected from MW5A contained concentrations of Aluminium above MTCA Method B Cleanup Levels. Based on the investigation results, it appears that groundwater with concentrations above regulatory standards is migrating off-property toward the north and northwest.

SECTION III.

SUMMARY

Generation of the black dross during the operation of the former smelting facility has resulted in two large stockpiles present at the Site. The stockpiles have been mapped and estimated to contain 21,577 cubic yards of material.

Black dross is known to contain high concentrations of metals and oxides that pose a risk to human health and the environment. The existing monitoring wells at the site have been sampled and detectable concentrations of fluorides and chlorides were reported in samples collected from perimeter wells along the western property boundary. This appears to indicate the potential for migration of contaminated groundwater off Property to the northwest based on the groundwater flow at the Site toward the north northwest.

There has been discussion of alternative cleanup options for the property. However, the Washington Department of Ecology will require the dross stockpiles, the primary source for onsite contamination, to be removed and disposed to sufficiently address the requirements of the Model Toxics Control Act ("MTCA").

Various opinions of the cost to remove and dispose of the dross in the past 30 years since operations at the Site have ceased. At this time the costs to clean up the Site will need to cover expenses to include:

- Removal and disposal of the 21,577 cubic yards of material in stockpiles;
- Delineation of the contaminated media;
- Performance monitoring of groundwater and surface water; and
- Conformational sampling of soil and sediment remaining.

STATEMENT OF QUALITY ASSURANCE

I have performed this Remedial Investigation in accordance with generally accepted environmental practices, procedures, and regulatory requirements, as of the date of this Report. I have employed the degree of care and skill ordinarily exercised under similar circumstances by reputable environmental professionals practicing in this area.

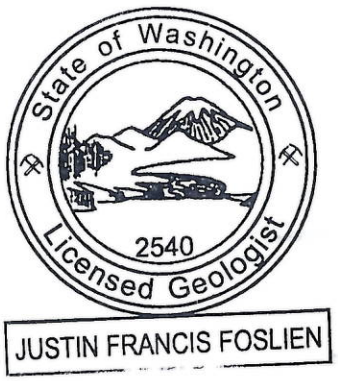
STATEMENT OF THE LICENSED GEOLOGIST

As stipulated in the Regulatory Code of the State of Washington Title 18, Chapter 18.220, the undersigned is a licensed Geologist in the State of Washington, and has met the statutory requirements of RCW § 18.220.060 for such licensing including, but not limited to, educational requirements, work and field experience, examination proficiency, and acceptance by the State Licensing Board.

The undersigned Licensed Geologist has supervised the geological work performed as described in attached Report – a majority of said work being performed by employees of the firm which employs undersigned Licensed Geologist – as delineated in RCW Title 18, Chapter 18.220, Paragraph 190.

Signature of Licensed Washington Geologist:

Signature – Justin Francis Foslien (License No. 2540)



REPORT ENDNOTES

APPENDIX

- Stockpile Survey and Assessment Report

Project: MARALCO	Project Number:	Boring No. DPT-1	CRETE CONSULTING, INC.
Location: 7730 S. 202nd St, Kent WA		Client: Bridge	Sheet 1 of 1
Logged By: E. Jones	Date Started: 5.24.21 0835	Tooling: MacroCore Tooling	Drilling Contractor: Holt Services
Drill Crew: Louie Fehner	Completed: 5.24.21 0940	Core liners	Borehole Diameter:
USA Ticket Number:	Backfilled: Holeplug chips		Drill Rig Type: Geoprobe 7822DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): 15

Depth (feet)	Recovery	Sample Depth	PID (ppm) MiniRAE 3000	Sample ID, Depth, Time	Lithology/Notes
					Adjacent/immediately down-gradient of former UST hold.
0					ASPHALT @ surface.
	3' rec.	1.8-3.5'	0.4		0-1' GRAVELLY SAND, FILL, reddish brown, sl. moist, cg-fg
	3'	4-5'	0.5		1-1.8' SAND, fg, reddish brown, sl. moist, no gravel
5		5-6'	1.3	DPT-1 5-6' @0905	1.8-5' SAND, fg-med., slight moist - moist, brown w/ dark grains
	41"				@~4.5 Mist - wet
		6-7'	0.4	DPT-1 6-7' @0910	@~5' SLOUGH
					~5-6' SAA, moist
					6-6.5' SAA, wet fg-med
		9-10'	0.4	DPT-1 9-10' @0920	6.5-10' SANDY CLAY fg, minor SILTS, soft, high plastic, wet, tan-gray
10					@9-9.5' SANDY, med fg, gray, dec' CLAY, saturated, loose
	~48"	10-12'	0.3		10-15' SAA, gray SAND, saturated, fg, SOME CLAY fines, non-cohesive
					No HC odors or sheen observed 0-15' bgs.
15				DPT-1-0521 @0935	1" 3/4" PVC temporary well screened ~5-15 ft bgs
					LDPE + silicone tubing + peristaltic pump
					Purged ~5-minutes (<1-gallon) prior to sampling
					Sample water very turbid (fine-grained formation material)

Project: MARALCO	Project Number:	Boring No. DPT-2	CRETE CONSULTING, INC.
Location: 7730 S. 202nd St., Kent, WA		Client: Bridge	Sheet 1 of 1
Logged By: R. Jones	Date Started: 5.24.21 0945	Tooling: Macrocore	Drilling Contractor: Holt Services
Drill Crew: Louie Fehner	Completed: 5.24.21 1045	core liners	Borehole Diameter:
USA Ticket Number:	Backfilled: Holeplug chips		Drill Rig Type: Geoprobe 7822DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): 15

Depth (feet)		Sample Depth	PID (ppm) Minirae 3000	Sample ID, Depth, Time	Lithology/Notes
0	~36"	3.5-5	0.8		ASPHALT @ surface 0-1+ FILL GRAVELLY SAND, well-graded, sl. moist, browns, subrd-subang. @~1.5'-2.5' SILTY SAND, vfg-fg, trace roots and organic fines, sl. moist dk brown 2.5-5' SAND fg-med, mixed grains, sl. moist-moist, loose @ 4.5 Moist, gray
5'	~48"	5-6'	2.6	DPT-2-5-6' @1015	
		6-7.5'	1.7	DPT-2 6.75' @1020	5-10' Mostly SAA, SAND w/ SILT, vfg-fg, minor-some CLAY fines, dark gray med-firm ~5-6' wet ~6-10' Saturated ~6-8' trace SHEEN on surface of core, no appreciable odor ~8-9- Inc. CLAY content CLAYEY SAND 9-10' SAA
10'	32"	8.5-10'	3.2	DPT-2 8.5-10' @1025	
		10-12.5'	1.9		10-15' POOR RECOVERY SAA, SILTY SAND, vfg-fg, dk gray, saturated, little to no CLAY no sheen/odors
15'				DPT-2-0521 @1040	

Project: MARALCO	Project Number:	Boring No. DPT-3	CRETE CONSULTING, INC.
Location: 7730 S 202nd St., Kent WA		Client: Bridge	Sheet 1 of 1
Logged By: R. Jones	Date Started: 5.24.21 ~1100	Tooling: MacroCore	Drilling Contractor: Holt Services
Drill Crew: Louie Fenner	Date Completed: 5.24.21 ~1125		Borehole Diameter:
USA Ticket Number:	Date Backfilled: Holeplug / Cutting		Drill Rig Type: Geoprobe 7822DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): 10

Depth (feet)	Recovery	Sample Depth	PID (ppm) MiniRAE 3000	Sample ID, Depth, Time	Lithology/Notes
					Plastic cover @ surface
0	~40"	24"		DPT-3 2.5/3' @1115	0-2.5' Mixed sand-sized grains and weakly-cemented c.g. cake gravel fg-c.g., dk grais, sl. moist-moist
					@ 2.5-3' SAND, fg, dk gray, consistent litho., sl. moist, med. cons.
		38"	5-4.5' 0.3	DPT-3 4.5' @1120	@~4.5' SAND, fg-med., mixed grain colors (gray-brown), sl. moist
5					2" slough
	~42"		5-6.5' 0.3	DPT-3 6.5' @1125	Stringers - SAA, SAND, med, moist-wet, dk gray-dk brown (~11")
					@~6.5-10' - SILTY CLAY, wet, dark gray, Fe-oxide staining, soft, mod. plastic (~11+ to 42")
10'					

Project: MARALCO	Project Number:	Boring No. DPT-4	CRETE CONSULTING, INC.
Location: 7730 S. 202nd St. Kent WA		Client: Bridge	Sheet 1 of 1
Logged By: R Jones	Date Started: 5.24.21 ~1130	Tooling: MacroCore	Drilling Contractor: Holt Services
Drill Crew: Louie Fehner	Date Completed: 5.24.21 ~1150		Borehole Diameter:
USA Ticket Number:	Backfilled: Bentonite/Cuttings		Drill Rig Type: Geoprobe 7822DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): 10

Depth (feet)	Recovery	Sample Depth	PID (ppm) Minirae 3000	Sample ID, Depth, Time	Lithology/Notes
					Plastic cover @ surface
0	36"	11-15"	0-1.5' 1.5-2.0	DPT-4 ~1.5' @ 1140	0-0.8' (0-6") Brown, med.-c.g SAND, trace roots 0.8-1.5 (6-11") Gray med-c.g. SAND w/ DROSS, wet salts, some roots,
			1.5-5' 45-49.3	DPT-4 ~5' @ 1145	1.5-5' (11-36") SAND, fine-med., moist-wet, brown, FILL or native SAND (mix grain colors) below DROSS, no ROOTS
5	43"	10-14"	5.0-7.6	DPT-4 ~6.5' @ 1150	5-6/6.5' (0-10") SAA 6.5-10' (10-43") Native SILTY CLAY, wet saturated, med. gray-dk gray @ 24" Inc. fg-med SAND @ 27" More SAND than CLAY, saturated, dk gray-black, native
			6.5-8' 0.2		
10					

Project: MARALCO	Project Number:	Boring No. DPT-5	CRETE CONSULTING, INC.
Location: 7730 S. 202nd St., Kent WA		Client: Bridge	Sheet 1 of 1
Logged By: R Jones	Date Started: 5.24.21 ~1150	Tooling: MacroCore	Drilling Contractor: Holt Services
Drill Crew: Louie Fehner	Date Completed: 5.24.21 ~1200		Borehole Diameter:
USA Ticket Number:	Date Backfilled: Holeplug / Cuttings		Drill Rig Type: Geoprobe 7822DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): 5

Depth (feet)	Recovery	Sample Depth	PID (ppm) MiniRAE 3000	Sample ID, Depth, Time	Lithology/Notes
					No plastic cover ~~at surface~~ in core PT but plastic cover observed @ surface
0	34"		0-4' 0.3-0.9 2-6" 0.4	DPT-5 ~0.5' 1205	0-2" Peat/wood debris, mulch/organics, soft, wet
					2-26" SAND, fg-med, med. brown - dk brown, mixed grain colors (fill), likely FILL moist
			3.8-4.2' 26-29" 0.4	DPT-5 ~4' 1210	26-29" SANDY CLAY, fg, w/ SILT, wet, Fe-staining, layering feature/seams, NATIVE
5'			4.2-5' 29-34" 0.4	DPT-5 ~4.5' @1215	29-34" SILTY SAND w/ some CLAY, fg, gray - dk gray, wet - sat. Native

Project: MARALCO	Project Number:	Boring No. DPT-6	CRETE CONSULTING, INC.
Location: 9730 S. 202nd St. Kent, WA		Client: Bridge	Sheet 1 of 1
Logged By: R. Jones	Date Started: 5.24.21 ~1225	Tooling: MacroCore	Drilling Contractor: Holt Services
Drill Crew: Louie Fehner	Completed: 5.24.21		Borehole Diameter:
USA Ticket Number:	Backfilled: Holeplug/Cutting		Drill Rig Type: Geoprobe 7822DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): ~~10~~ 5

Depth (feet)	Recovery	Sample Depth	PID (ppm) Minirae 3000	Sample ID, Depth, Time	Lithology/Notes
					No plastic in core
0	30"	9-12"	1.5-2'	DPT-6 9" 1235	thin moss layer @ surface 0-9" DROSS, dk gray, fg, soft, wet SALT in pockets
		16-19"	2.6-3.1 ~~7.6-8.1~~ KS	DPT-6 16" @1240	9-16" SILTY SAND, fg, dk brown, minor Rd gravel (≤1.5 cm), trace-minor ROOTS, sl. moist
5'		26-30"	4.3-5'	DPT-6 26" @1245	16-30" SAND, fg-med, med. brown - dk brown, moist @23" wet

Project: MARALCO	Project Number:	Boring No. DPT-7	CRETE CONSULTING, INC.
Location: 7730 S. 202nd St., Kent, WA		Client: Bridge	Sheet 1 of 1
Logged By: R. Jones	Date Started: 5.24.21 ~1250	Tooling: MacroCore	Drilling Contractor: Holt Services
Drill Crew: Louie Fehner	Completed: 5.24.21 ~1305		Borehole Diameter:
USA Ticket Number:	Backfilled: Holeplug / Cuttings	with Sand catcher	Drill Rig Type: Geoprobe 7822DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): 15

Depth (feet)	Recovery	Sample Depth	PID (ppm)	Sample ID, Depth, Time
0	31.5"	11-14"		DPT-7 11.7-12.2' @1305
10		27-31"		DPT-7 14.3-15' @1310

Lithology/Notes

On top of South dross stock-pile

No plastic cover in core. Moss at surface

0-5' push easy (voids, unconsolidated)
0-10' Not core (solid dip → displacement)
0-10' ALL DROSS

10-11.7' DROSS, white minerals in pockets/seams, dark gray SAND
(0-8") fg-cg, moist to wet

11.2-11.7' Mixed DROSS and SAND from litho. below
(8-11") disturbed interface, SILTY SAND

11.7-15' SAND, vfg-fg, moist, dk brown
(11-31.5") coarsening downward (SILT/vfg to fg)
@29" moist to wet

~~DRY~~

Project: MARALCO	Project Number:	Boring No. DPT-8	CRETE CONSULTING, INC.
Location: 7730 S. 202nd St, Kent, WA		Client: MacroCore	Sheet 1 of 1
Logged By: R. Jones	Date Started: 5.24.21 ~1305	Tooling: MacroCore	Drilling Contractor: Holt Services
Drill Crew: Louie Fehrer	Date Completed: 5.24.21 1320		Borehole Diameter:
USA Ticket Number:	Date Backfilled: Holeplug / Cuttings		Drill Rig Type: Geoprobe 7822DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): 15

Far SW corner, South dross pile

Depth (feet)	Recovery	Sample Depth	PID (ppm)	Sample ID, Depth, Time
0				
5'	36"	23-35"	8.2-8.4'	DPT-8 23-25" @1325
		32-36"	9.4-10'	DPT-8 32-36" @1330
10'		45"	11.7-12.2'	DPT-8 16-20" @1335
15'				

0-5' Not cored (center rod)
All DROSS

5'-10' → 36" Recovery

0-23" DROSS, gray SANDy minerals, fg-cg, and some blue, soft salt XLs
@ 23' thin subrd-rd gravel interface
23-27" SANDY SILT, vfg, minor small ROOT, dk brown, sl. moist-moist
UNDISTURBED, likely native
27-31" coarsening downward sequence SILT/vfg SAND to fg-med. SAND
abundant organic fines, SAND, vfg-fg, minor seams of organics
NATIVE
31-36" fg SAND, dk brown-black, moist, NATIVE

minor slough
6-29" SAND, fg-med. moist-wet, dk gray-black

29-45" SANDY CLAY, wet, soft, mod.-high plastic, gray
@ 30" small seam of wood

Project: MARALCO	Project Number:	Boring No. DPT-9	CRETE CONSULTING, INC.
Location: 7730 S. 202nd St. Kent WA		Client: Bridge	Sheet 1 of 1
Logged By: R. Jones	Date Started: 5.24.21 1335	Tooling: MacroCore	Drilling Contractor: Holt Services
Drill Crew: Louie Fenner	Date Completed: 5.24.21 1353	core liners	Borehole Diameter:
USA Ticket Number:	Backfilled: Holeplug chips		Drill Rig Type: Geoprobe 7822DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): 15

Depth (feet)	Recovery	Sample Depth	PID (ppm) MiniRAE 3000	Sample ID, Depth, Time	Lithology/Notes
0					
5'	N/A				0-5' push/core not collected for observation Assume all DROSS
	35"		5-10' 0.7		5-10' → 35" recovery → All DROSS Mixed minerals and colors, salts, pockets of Zn & green salts, oxides, smelt minerals
10'					
	42"	27-32"	13.2-13.8' 182.8	DPT-9 27-32" @1400	10-15' push → 42" recovery 0-27" DROSS, mostly gray c.g. sandy minerals w/ minor yellowish white seams, generally soft & friable, moist to wet (22") @12" plastic (from surface? from below? plastic under/mid layer?)
		39-42"	14.5-15' 9.5-10	DPT-9 39-42" @1405	27-38" SAND, fg-med., black, wet, likely native (former wetland) 38-42" SILTY clay, tan to brown w/ Fe-oxide staining, native some vfg SAND
15'					Ceased coring @ 15' below stockpile surface @ location

Project: MARALCO	Project Number:	Boring No. DPT-10	CRETE CONSULTING, INC.
Location: 7730 S. 202nd St., Kent WA		Client: Bridge	Sheet 1 of 1
Logged By: R. Jones	Date Started: 5.24.21 1355	Tooling: Macro Core	Drilling Contractor: Holt Services
Drill Crew: Louie Fehner	Date Completed: 5.24-21 1445	Core liners	Borehole Diameter:
USA Ticket Number:	Date Backfilled: Holeplug chips		Drill Rig Type: Geoprobe 7822 DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): 15

Depth (feet)		Sample Depth	PID (ppm)	Sample ID, Depth, Time	Lithology/Notes
					Location is on very top of dross stock, or within ~2 ft of large stock pile summit No remaining plastic on very top of dross stockpile
0				NO SAMPLES COLLECTED	0-10' No core recovery (center rod or solid tip) 10-15' Begin core collection w/ core barrel @ 12' Per driller, something hard Pushed 12-15' hard DPT push Rods came up bent (ruined), unable to remove line In core barrel tip → white salt, large chunks Refusal @ 15', damaged equipment, cease efforts @ location
10'					
12'					
15'					

Project: MARALCO	Project Number:	Boring No. DPT-11	CRETE CONSULTING, INC.
Location: 7730 S. 202nd St, Kent WA		Client: Bridge	Sheet 1 of 1
Logged By: R. Jones	Date Started: 5.24.21 1450	Tooling: MacroCore	Drilling Contractor: Holt Services
Drill Crew: Louie Fehner	Completed: 5.24.21 1500		Borehole Diameter:
USA Ticket Number:	Backfilled: Holeplug chips/cuttings		Drill Rig Type: Geoprobe 7822DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): 5

Depth (feet)	Recovery	Sample Depth	PID (ppm)	Sample ID, Depth, Time	Lithology/Notes
					Plastic cover @ surface
0	40"	17-25"		DPT-11 2.1-3' @1500	0-2.1' (0-17") DROSS, gray, med-c.g. sand w/ white SALTS, moist
					2.1-5' (17") GRAVELLY SAND, disturbed FILL/grading ops, fg-cg sl. moist fan, subrd gravel (up to 2.5cm observed)
		36-40"		DPT-11 4.5-5' @1505	
5					

Project: MARALCO	Project Number:	Boring No. DPT-12	CRETE CONSULTING, INC.
Location: 7730 S. 202nd St. Kent WA		Client: Bridge	Sheet 1 of 1
Logged By: R. Jones	Date Started: 5.24.21 1508	Tooling: MacroCore	Drilling Contractor: Holt Services
Drill Crew: Louie Fehner	Completed: 5.24.21 1520		Borehole Diameter:
USA Ticket Number:	Backfilled: Holeplug / Cuttings		Drill Rig Type: Geoprobe 7822DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): 10

Depth (feet)	Recovery	Sample Depth	PID (ppm)	Sample ID, Depth, Time	Lithology/Notes
0	13"	25-29"		DPT-12 14.2 ft DPT-12 8.6-9.2' @ 1525	0-5' → 13" Recovery All DROSS, moist @ bottom
5	34"				5-10' → 34" Recovery 5-8.6 (0-29") DROSS, gray, tan w/ pink & white salts, soft minerals (wet) 8.6-10 (29-34") GRAVELLY SAND, subrd Gravel, reddish tan
10					

Project: MARALCO	Project Number:	Boring No. DPT-13	CRETE CONSULTING, INC.
Location: 7730 S. 202nd St, Kent WA		Client: Bridge	Sheet 1 of 1
Logged By: R. Jones	Date Started: 5.24.21 1535	Tooling: MacroCore	Drilling Contractor: Holt Services
Drill Crew: Louie Fehner	Date Completed: 5.24.21 1548		Borehole Diameter:
USA Ticket Number:	Date Backfilled: Holeplug/Cuttings		Drill Rig Type: Geoprobe 7822DT
	Groundwater Depth (ft bgs):		Total Depth of Boring (ft bgs): 10'

Depth (feet)	Recovery	Sample Depth	PID (ppm)	Sample ID, Depth, Time	Lithology/Notes
0	36"	15-21"		DPT-13 7.2-8.2' @1550	0-5 → 36" recovery All DROSS, dark gray, moist, some pocket white-green minerals more fines, almost clay-like
5'	33"	29-33"		DPT-13 9.2-10' @1555	5-10' → 33" recovery ~~10~~ 5-6.5 DROSS SAA 6.5-7.4 (10-15") Mixed DROSS and below GRAVELLY SAND, disturbed interface 7.4-9.2' (~~15-21"~~) (15"-28") GRAVELLY SAND, fg-med, tan, rd-subrd gravel (≤2cm) moist 9.2-10' (28-33") SAND, no GRAVEL, wet, dk gray/black sand w/ tan (organics) fg-med (old wetland surface)
10'					

Licensed Surveyor Measurements

Maralco Property - Kent, WA

Surveyor Data Point	Location ID	Y/Northing	X/Easting	Ground Surface Elevation
	(DPT)	(DPT)	(DPT)	(top of dross pile at DPT location)
1000	DPT-1	156684.981	1292913.406	29.368
1001	DPT-2	156583.693	1293041.710	29.397
1012	DPT-3	156253.859	1293090.420	29.396
1007	DPT-4	156210.285	1293090.203	28.360
1008	DPT-5	156157.920	1293105.016	26.850
1011	DPT-6	156206.730	1293014.839	29.056
1009	DPT-7	156166.568	1293054.060	39.070
1010	DPT-8	156168.900	1292982.423	35.308
1006	DPT-9	156213.888	1293133.993	37.521
1005	DPT-10	156338.387	1293191.919	50.236
1013	DPT-11	156385.318	1293136.747	33.218
1003	DPT-12	156446.386	1293192.903	42.013
1002	DPT-13	156482.970	1293233.893	34.806
1004	MISC/AHBL 105	156354.246	1293197.943	52.727
1014	PK/AHBL 104	156777.282	1293139.129	29.636

Notes:

Vertical Datum NAVD 1988, orthometrically corrected GPS using WSRN and GEOID 2012A

NAD 1983/11, Washington State Plane North Projection, Based on GPS observations using WSRN and GEOID 2012A. Units are US Survey Feet.

SITE ID: MARALCO **WELL ID:** MW3A

Groundwater Sampling Field Data Sheet

Project Number: Kent, WA Date: 6.3.2021

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
1	Reportedly 4 to 14 ft ~~BTOC~~ BGS	250 mL/min
Total Depth of Well (ft BTOC)	**Purge Equipment**	**Sample Equipment**
NM	GeoPump	LDPE & Silicone tubing
Initial Static Water from (ft BTOC)	**Depth of Sample Intake (ft BTOC)**	**Analytical Equipment**
4.69	~1-ft from bottom	Horiba U-52, LaMotte 2020we
Product Level from (ft BTOC)	**Total Time Purged**	**Additional Details**
NM	1147-1214 (~27 min)	*Unable to gauge DTW during purge/sample process (tubing & probe do not fit in well together)
Length of Water Column (ft)	**Pump Setting**	
1 Well Volume (gal)		

Time	Depth to Water (ft BTOC)	Flow Rate (mL/min)	Temp (°C)	SpC (ms/cm)	ORP (mV)	DO (mg/L)	pH (S.U.)	Turbidity (NTU)
~~1147~~ 25 (1150)	4.69	~300	15.16	0.384	-40	1.40	7.34	—
1154	NM*	↓	13.75	0.375	-10	0.27	6.80	12.0
1158	↓	↓	13.53	0.376	-3	0.19	6.61	11.06
1202	↓	↓	13.57	0.375	1	0.12	6.53	7.55
1206	↓	↓	13.27	0.378	5	0.20	6.41	5.88
1210	NM*	↓	13.15	0.378	8	0.18	6.35	3.95

Sample ID: MW3A-0621	Sample Date: 6.3.2021	Sample Time: 1214
Observations:		
Analytical Parameters: Select Metals, F^-, Cl^-		
Disposition of Purged Water:	Sampler Name & Date: R. Jones 6.3.21	

SITE ID: MARALCO **WELL ID:** MW4A

Groundwater Sampling Field Data Sheet

Project Number: Kent, WA Date: 6.3.2021

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
1	Reportedly 6 to 16 ft bgs	≤ 250 mL/min
Total Depth of Well (ft BTOC)	**Purge Equipment**	**Sample Equipment**
Can't advance probe >9	GeoPump	LDPE, Silicone tubing
Initial Static Water from (ft BTOC)	**Depth of Sample Intake (ft BTOC)**	**Analytical Equipment** LaMotte 2020we
6.83	~1 ft from well bottom	Horiba U-52 WQM
Product Level from (ft BTOC)	**Total Time Purged**	**Additional Details**
NM	0918-0945 (27 min)	Unable to gauge DTW w/ tubing in place
Length of Water Column (ft)	**Pump Setting**	
1 Well Volume (gal)		

Time	Depth to Water (ft BTOC)	Flow Rate (mL/min)	Temp (°C)	SpC (ms/cm)	ORP (mV)	DO (mg/L)	pH (S.U.)	Turbidity (NTU)
0918	6.83	Begin micropurge. Filling flow cell.						
0922	NM	200-225	15.05	1.87	-99	1.36	6.72	97.3H
0926	↓	↓	14.56	1.76	-106	0.45	6.41	15.6L
0930	↓	↓	14.18	1.73	-113	0.19	6.30	15.4L
0934	NM	200-225	14.42	1.71	-116	0.09	6.27	8.31L
0938	NM	↓	14.54	1.71	-118	0.01	6.25	3.25L

Sample ID: MW4A-0621	Sample Date: 6.3.2021	Sample Time: 0945
Observations: H = Horiba U52 value L = LaMotte value	Collected DUP-0621 @ "0800" (same sample suite)	
Analytical Parameters: Select metals, Cl⁻, Fl⁻, TPH-Gx, -Dx w/ & w/out SGC		
Disposition of Purged Water: Suspended solids present, mostly clear	Sampler Name & Date: R. Jones 6.3.21	

SITE ID: MARALCO **WELL ID:** MW5A

Groundwater Sampling Field Data Sheet

Project Number: Kent, WA Date: 6/3/2021

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
1	Reportedly 5-15	
Total Depth of Well (ft BTOC)	**Purge Equipment**	**Sample Equipment**
13.33	GeoPump	~~Hor~~ LDPE, silicone tubing
Initial Static Water from (ft BTOC)	**Depth of Sample Intake (ft BTOC)**	**Analytical Equipment** LaMotte 2020wp
6.18 North side of exposed PVC	Variable, near bottom mostly	Horiba U-52 WQM
Product Level from (ft BTOC)	**Total Time Purged**	**Additional Details**
NM	30+, troubleshooting	TOC broken, wellhead damaged
Length of Water Column (ft)	**Pump Setting**	TOC measurements not likely to match survey data
	Variable	
1 Well Volume (gal)		Unable to purge with tubing @ 8-11 ft BTOC.

Time	Depth to Water (ft BTOC)	Flow Rate (mL/min)	Temp (°C)	SpC (ms/cm)	ORP (mV)	DO (mg/L)	pH (S.U.)	Turbidity (NTU)
0807	6.18	Begin micro-purge.						→
0816	6.69	Troubleshooting pump and tubing setup.						
0822	*Unable to gauge well with tubing in well.* Water finally surfacing to flow cell.							
0826	NM		16.76	2.10	-163	1.18	6.96	Extremely turbid
0830	NM	Not stabilized. Unable to get consistent flow, very thick muddy water, Peri pump struggling to purge muddy water						
0845	7.90	Post. Sampling. Tubing removed						Off the Scale.

Sample ID: MW5A-0621	Sample Date: 6.3.2021	Sample Time: 0840
Observations:		
Analytical Parameters: Select metals, Cl^-, Fl^-		
Disposition of Purged Water: Very turbid	Sampler Name & Date: R. Jones 6.3.21	

SITE ID: MARALCO **WELL ID:** MW6

Groundwater Sampling Field Data Sheet

Project Number: Kent, WA Date: 6.3.2021

Casing Diameter (in): 1	Screened Interval (ft BGS): Reportedly 5 to 15	Recommended Flow Rate for Well: ~200-250 mL/min
Total Depth of Well (ft BTOC): 76 (unable to advance probe past 6ft (tight))	Purge Equipment: GeoPump	Sample Equipment: LDPE + Silicone tubing
Initial Static Water from (ft BTOC): 4.45	Depth of Sample Intake (ft BTOC): ~14 ft from bottom	Analytical Equipment: Lamotte 2020we, Horiba U-52 WQM
Product Level from (ft BTOC): NM	Total Time Purged: 1054-1116 (~20 min.)	Additional Details: Unable to measure DTW with this probe with sample/purge tubing in MW
Length of Water Column (ft):	Pump Setting:	
1 Well Volume (gal):		

Time	Depth to Water (ft BTOC)	Flow Rate (mL/min)	Temp (°C)	SpC (ms/cm)	ORP (mV)	DO (mg/L)	pH (S.U.)	Turbidity (NTU)
1054	4.45	Begin micropurge. Filling flow cell.						
1056	NM	300-325	16.95	1.62	-106	1.21	6.65	30
1100	↓	↓	14.96	1.73	-123	0.52	6.62	25.7
1104	↓	~200	14.60	1.77	-135	0.27	6.59	11.11
1108	↓	↓	14.82	1.77	-140	0.29	6.59	11.8
1112	NM	↓	14.75	1.78	-143	0.13	6.58	9.74
1120	4.48	Post Sampling						

Sample ID: MW6-0621	Sample Date: 6.3.2021	Sample Time: 1116
Observations:		
Analytical Parameters: Select metals, Cl^-, F^-, TPH-G/Dx w/ & w/out SGC		
Disposition of Purged Water: Mostly clear, slight red tint	Sampler Name & Date: R. Jones 6.3.21	

MARALCO Site, Kent, WA
Supplemental Phase II ESA
5/24/2021
Crete Consulting, Inc.

~0605 Depart Seattle, WA for Kent, WA
0630 Retrieve ice for sampler coolers.
0642 Continue to Site in Kent, WA
0648 R. Jones (CRETE) arrive at Site. APS Locator already on-site (adjacent facility workers opened gate for APS). FT
0650-0700 Walk areas with APS Locator, discuss needs for 2-3 locations

Equipment List:
- Sample Containers from Friedman & Bruya (F&B)
- Honeywell MiniRAE 3000+ Field # U938220
  SN 592-928090016
  (See separate calibration sheet from FET)
- Ziplocks, nitrile gloves, LDPE/silicone tubing (disposable)

~0726 APS Locates finish, departing site.
Unable to locate any live utilities in 3 marked drill locations. RJ
0727 Dale Smith (Holt) called me, said Louie & crew are in-route, but delayed by traffic.
0757 Holt Services arriving on-site. Late.
Louie Fehner (driller) and James (help)
Rig: Geoprobe 7822DT rubber tracked rig, new
0800-0816 Walked site with drill crew (Holt) and discussed saw and sequence of events
0817 Driller unloading rig and mobilizing equipment.
See separate boring logs for all DPT & core locations.
Installed DPT soil boring by former UST tank hold and by former underground vault (presumed to be a former transformer vault). Installed 3/4" temp wells at these 2 locations.
~1100 Begin DPT work around/on dross stock pile to evaluate bottom of stockpiles (ground surface below dross and soil impacts below dross). RT
@1405 Holt temporarily lost a rod in a void @ DPT-10 (~5-12' bgs top of dross stock pile)

MARALCO Site, Kent, WA
Supplemental Phase II ESA
5/24/2021
CRETE

~1450 Moved onto next DPT location (DPT-10 abandoned in w/out core samples).
~1550 Holt finished up @ DPT locations, demobilizing, cleaning, packing up. R. Jones still processing samples, correcting sample labels, etc.
DROSS IDW installed at each borehole location.
~1645 Holt Services departing Site
1653-1707 Phone call de-brief w/ G. Hainsworth (Crete PM).
1708 R. Jones departing site
~1740 Back in Seattle, top off more coolers with fresh, additional ice.
Will hold samples overnight and deliver samples to lab on 5/25/21.

SAMPLE DELIVERY
5/25/21

1005 Take samples to Friedman + Bruya (F+B)
1026 Sign over (deliver) samples to F+B (lab)

R. Jones 5/25/2021

5/24/2021
Bridge Maralco

FIELD ENVIRONMENTAL INSTRUMENTS, INC.
www.fieldenvironmental.com

301 Brushton Ave
Suite A
Pittsburgh, PA 15221
Toll Free (800) 393-4009
Local (412) 436-2600
Fax (412) 436-2616

Photo-Ionization Detector Calibration Certificate

	Lot #	Expiration
Isobutylene Gas	21-7767	2/5/2025

Cal Standard	Reading	Acceptable Range
100 ppm	100.5	(98 - 102)

	Pump Flow mL/min	Acceptable Range
☑ T.H.P. Sensor Check	582	(450+)

Response Factor
1.0

Model	MiniRae 3000
Lamp	10.6 eV
S/N	
Barcode	U93822X
Order #	456650

Calibrated By: Caitlyn Davis

Date of Calibration: 05/21/2021 PA

All calibrations performed by FEI conform to manufacturer's specifications. Please report any issues within 24 hours of receiving equipment.
All calibration gas used is traceable to NIST. Additional documentation is available upon request.

MARALCO Site, Kent, WA
Groundwater Sampling
6/3/2021
CRETE

~0700 RJ. Jones (CRETE) at Crete office, Tukwila, WA
Gather supplies & equipment, load vehicle. — RJ
~0722 At convenience station, obtain ice for sample coolers.
~0738 Arrive at MARALCO site in Kent, WA
Park near MW5A, prepare GWS equipment.
Equipment List:

- Heron Instruments Inc dipper-T water level meter 200ft SN 4560-T, FEI # 493144X
- LaMotte 2020we turbidimeter FEI # 484525X SN 8140-2616
  - Check calibration w/ 0NTU Std → 0.02 NTU
    w/ 10 NTU Std → 10.50 NTU
- GeoPump peristaltic pump #62133
- Horiba U-52 WQM w/ sonde & flow cell
  # YU3ENH6Y FEI # 490352X
  See separate calibration sheet for cal. details.
- LDPE tubing, silicone tubing

0757 Set up on MW5A to low flow purge and sample
See separate Groundwater Sampling Field Sheet for additional details for each GW MW sampled. — RJ
* MW5A is 4inch Sch. 80 PVC, but wellhead is broken/sheared off (manhole missing). Open and exposed well riser PVC.* — RJ
~1000 Trying to locate MW6
Used forklift operator at warehouse next door to lift piles of pipe to check under them
~1038 Found MW6 outside of the building adjacent to RR Spur (between each).
1040 Setup at MW6. — RJ
1140 MW-3A is also outside of the building, intact. — RJ
1222-1305 Trying to access the MW-2 area.
Area is largely fenced with some razor wire, but also with dense, abundant thick thorny brushy. Unable to access the MW2 greater area at present with given equipment
Vegetation needs cleared or thinned out.

MARALCO Site, Kent, WA
Groundwater Sampling
6/3/2021
CRETE

1308 At greater former UST area, gathering supplies to access former holding pond area.* This area is also pretty dense with thorny vegetation.* — RJ
1335 Located the original MW-4 well, stickup well with 3 protective bollards, and locked. Unable to access well due to lock. — RJ
1345 SED-01-0621 sample time
Sediment sample in former holding pond NW of the large building, behind the fire hydrant, and west of the former UST area.
Sediments: Abundant organic leaf debris at surface, organic fines and roots below, moist, black, void space, loose/unconsolidated ~4-6" from leafy surface → Sandy SILT, vfg
Sample is 0-6" depths, moist, abundant decomposed organic matter.
1355 Consolidate IDW purge water in mini-drum labelled, closed, and stowed by Ecology blocks near MW4A.
~1412 Equipment pack up, decon.
~1420 RJ Jones departing site. Other (warehouse) personnel on-site in parking lot, leave gate open for them to close. — RJ
~1435 At Crete office, Tukwila, unload/demobilize supplies and equipment. — RJ
~1500 Depart CRETE office for Friedman and Bruya (lab).
1526 At F&B, completing custody chain, check samples. — RJ
1543 Sign over samples to lab. — RJ
1550 Depart lab. — RJ

RJ Jones 6/3/21

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Pittsburgh, PA 15221
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Fax (412) 436-2616

	Lot #	Expiration
Horiba Auto-Cal Solution	7005360	6/2/2022

		Reading	Acceptable Range
Cal Standard PH 4 @ 25°c		4.00	(3.96 - 4.04)
Cal Standard Conductivity		Reading ms/cm: 4.45	(4.31 - 4.58)
Cal Standard Turbidity	0 NTU	Reading NTU: 0.0	(-2 - +2)
	100 NTU	100.0	(95 - 105)
Dissolved Oxygen		Reading mg/L	
100% Saturation		9.90	
0% Saturation		0.00	

Cal Standard	Lot #	Expiration	Reading	Acceptable Range
PH 7 @ 25°c	8012081.00	12/17/2022	7.00	(6.93 - 7.07)
Cal Standard	**Lot #**	**Expiration**	**Reading**	**Acceptable Range**
PH 10 @ 25°c	8012077.00	12/16/2022	10.00	(9.9 - 10.1)

	Temp °c	Relative Reading	Acceptable Range
Check Standard ORP	21.6	220.0	(+/- 15mV)

☑ ORP pin in place

*Solutions provided by LabChem (412-826-5230)

Model	U-52-2
S/N	
Sonde	90352
Barcode	U78335X
Order #	457641

Calibrated By: Don Redeen

Date of Calibration: 6/2/2021

All calibrations performed by FEI conform to manufacturer's specifications. Please report any issues within 24 hours of receiving equipment.
All calibration solutions used are traceable to NIST. Additional documentation is available upon request.

FIELD ENVIRONMENTAL INSTRUMENTS, INC.
www.fieldenvironmental.com

301 Brushton Ave
Suite A
Pittsburgh, PA 15221
Toll Free (800) 393-4009
Local (412) 436-2600
Fax (412) 436-2616

Lamotte Turbidity Meter Calibration Certificate

	Lot #	Exp Date	Reading
0.0 NTU	20370117	10/1/21	0.0
10.0 NTU	20320111	12/1/21	10.0

Order #	**457641**
Model	**2020we**
S/N	
Barcode	U84525X

Calibrated By: Caitlyn Davis

Date of Calibration: 06/02/21

All calibrations performed by Field Environmental Instruments conform to manufacturer's specifications.
Any problems must be reported to Field Environmental within 24 hours of receiveing equipment.

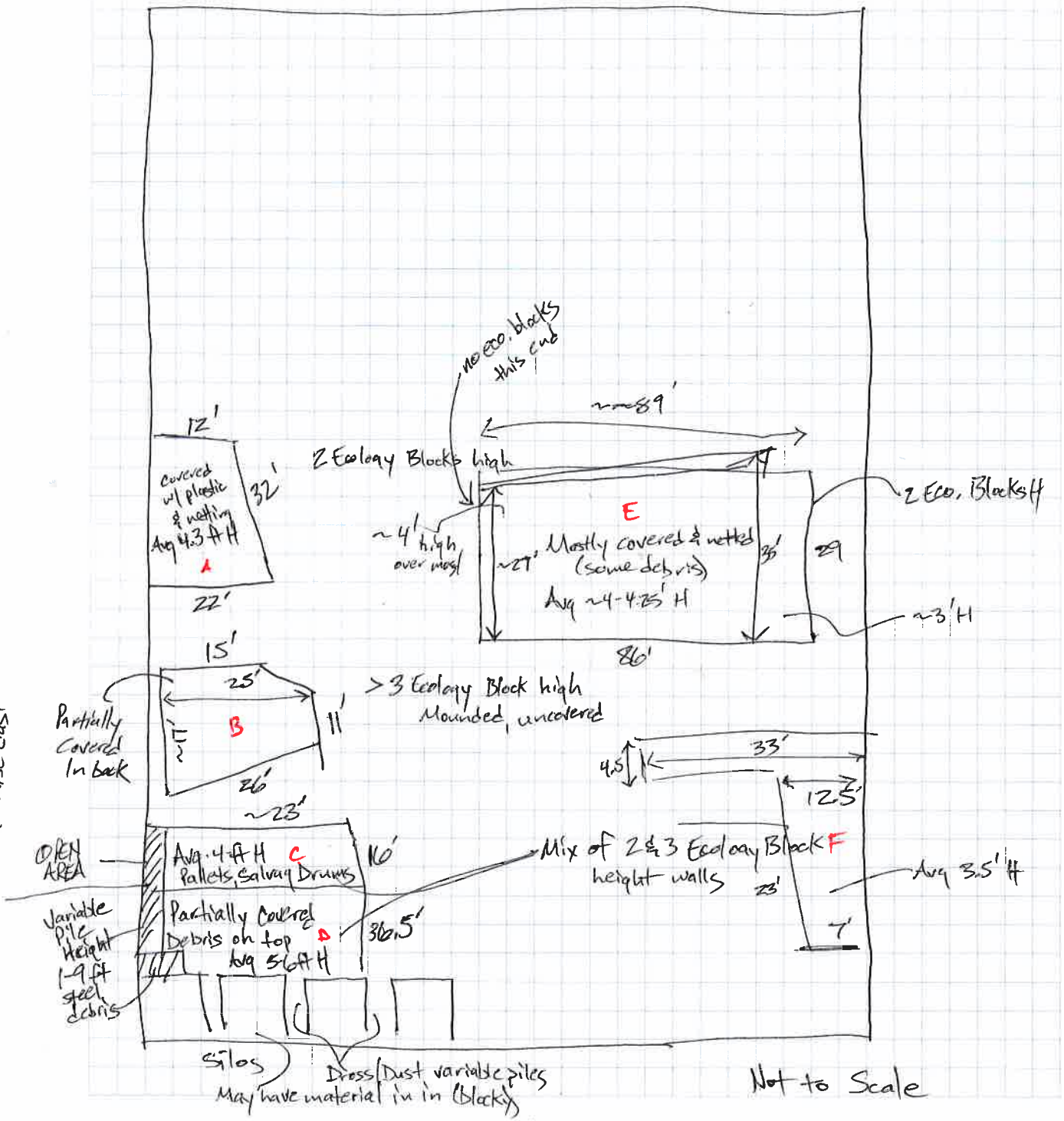
MARALCO Site, Kent WA
Sediment Sampling, Measure Stockpiles

6/9/2021
CRETE

~1130 Gather equipment + supplies, load vehicle, mobilize to site. — RJ
1207 R. Jones (Crete) arrive at site. — RJ
1210-1305 Investigate access, and sample "Christopher Ditch" along the north/northwest corner of the Maralco site
1225 Sample time for SED-02-0621 0-0.5',
1230 ↓ ↓ SED-02-0621 0.5-1',
SED-02-0621 sediment sample location at mouth of 3-4' diameter culvert. (within 4-5 ft of mouth/opening)

1255 Sample time for SED-03-0621 0-0.5',
1305 Sample time for SED-03-0621 0.5-1'
SED-03-0621 sediment sample location along Christopher Ditch further west than SED-02-0621.
~1325 Depart site for CRETE. — RJ
~1345 At CRETE office, pack and prepare sample cooler for courier pickup. — RJ
1355 Sign off on custody chain. — RJ
~1405 Depart CRETE office. — RJ
1415 R. Jones returned to site, measure & size up indoor (building) stock piles as best can.
Measure/estimate indoor stockpiles.
1535 R. Jones departing site.
See separate sketches/notes on indoor stock piles.

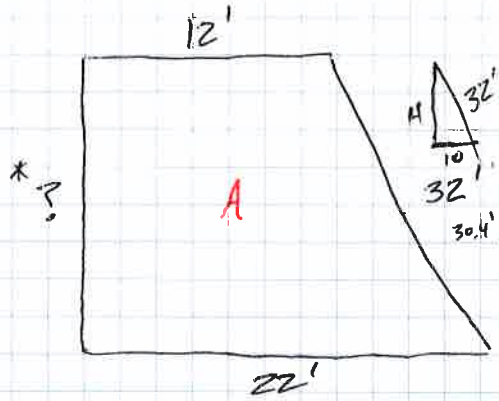
R. Jones 6/09/21



BY R. Jones DATE 6/9/2021 Sheet No 1 of 3

PROJECT Maraleo, Kent, WA PROJECT NUMBER BRIDGE

CRETE CONSULTING, INC.



*This dimension not recorded.

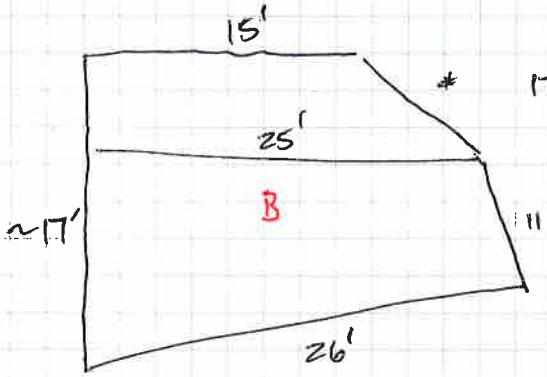
$A = \frac{1}{2}bh = \frac{1}{2}(10)H = \frac{1}{2}(10)(30.4) = 152\ ft^2$

$H = \sqrt{32^2 - 10^2} = \sim 30.4$

$A = 12' \times 30.4' = 364.8\ ft^2$

$A = 152\ ft^2 + 364.8\ ft^2 = 516.8\ ft^2$

$V = 516.8\ ft^2 \times 4.3\ ft = 2222.2\ ft^3$

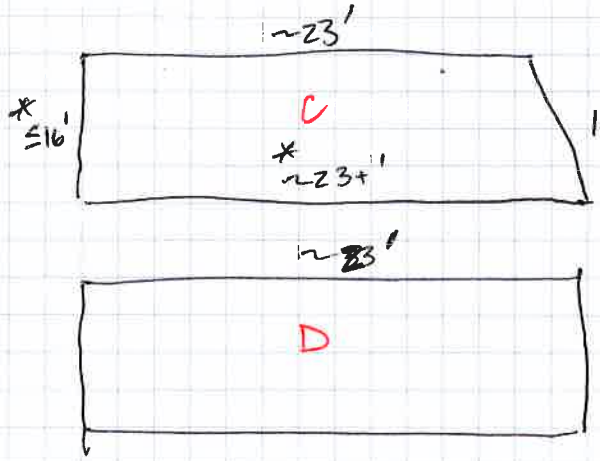


*This dimension not recorded.

Rounding up, assume rectangle

17' × 26' $A = 17\ ft \times 26\ ft = 442\ ft^2$ ~~1222 ft²~~

$V = 442\ ft^2 \times \sim 6\ ft = 2652\ ft^3$ ~~1222 ft²~~



*This dimension not recorded.

$A = 16 \times 24' = 384\ ft^2$

$V = 384\ ft^2 \times 4\ ft = 1536\ ft^3$

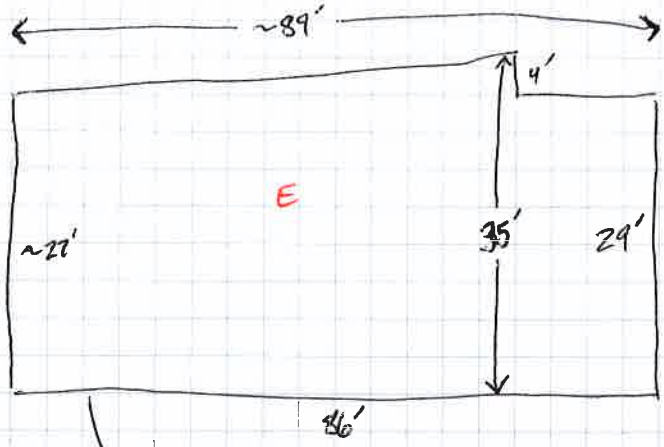
$A = 24\ ft \times 36.5\ ft = 876\ ft^2$ ~~23 ft~~

$V = 876\ ft^2 \times \sim 5.5\ ft = 4818\ ft^3$

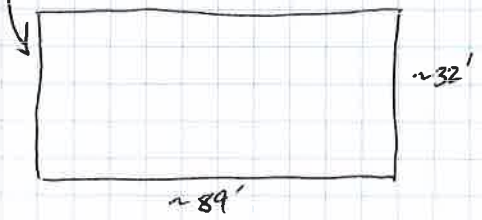
BY R. Jones DATE 6/9/2021 Sheet No 2 of 3

PROJECT Maraleo, Kent, WA PROJECT NUMBER BRIDGE

CRETE CONSULTING, INC.

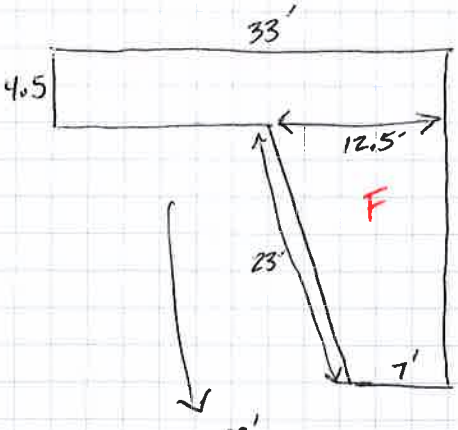


Averaged shape into rectangle

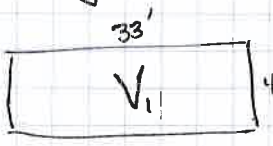


$A = 89\,ft \times 32\,ft = 2848\,ft^2$

$V = 2848\,ft^2 \times 4.25\,ft = 12104\,ft^3$

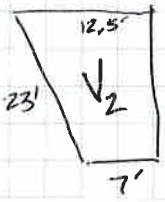


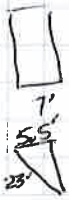
$V = V_1 + V_2 = 519.8\,ft^3 + 217.4\,ft^3$
$= 737.2\,ft^3$



$A = 33\,ft \times 4.5\,ft = 148.5\,ft^2$

$V_1 = 148.5\,ft^2 \times 3.5\,ft = 519.8\,ft^3$





$A = 7' \times 22.3' = 156.1\,ft^2$

$V_2 = (156.1\,ft^2 + 61.3\,ft^2)(3.5\,ft) = 217.4\,ft^3$

$A = \frac{1}{2}bh = \frac{1}{2}(5.5')(h) = \frac{1}{2}(5.5')(22.3') = 61.3\,ft^2$

$h = \sqrt{23^2 - 5.5^2} = 22.3$

BY R. Jones DATE 6/9/2021 Sheet No 3 of 3

PROJECT Maralco, Kent, WA PROJECT NUMBER BRIDGE

CRETE CONSULTING, INC.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

June 3, 2021

Jamie Stevens, Project Manager
Crete Consulting
108 S. Washington St., Suite 300
Seattle, WA 98104

Dear Ms Stevens:

Included are the results from the testing of material submitted on May 25, 2021 from the Maralco, F&BI 105456 project. There are 32 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Rusty Jones
CTC0603R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on May 25, 2020 by Friedman & Bruya, Inc. from the Crete Consulting Maralco, F&BI 105456 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
105456 -01	DTP-1 5-6'
105456 -02	DTP-1 6-7'
105456 -03	DTP-1 9-10'
105456 -04	DTP-1-0521
105456 -05	DTP-2 5-6'
105456 -06	DTP-2 6-7.5'
105456 -07	DTP-2 8.5-10'
105456 -08	DTP-2-0521
105456 -09	DTP-3 2.5-3'
105456 -10	DTP-3 4.5'
105456 -11	DTP-3 6.5'
105456 -12	DTP-4 1.5-2.0'
105456 -13	DTP-4 4.5-5'
105456 -14	DTP-4 6.1-7.6'
105456 -15	DTP-5 0.3-0.9'
105456 -16	DTP-5 3.8-4.2'
105456 -17	DTP-5 4.2-5'
105456 -18	DTP-6 1.5-2'
105456 -19	DTP-6 2.6-3.1'
105456 -20	DTP-6 4.3-5'
105456 -21	DTP-7 11.7-12.2'
105456 -22	DTP-7 14.3-15'
105456 -23	DTP-8 8.2-8.4'
105456 -24	DTP-8 9.4-10'
105456 -25	DTP-8 11.7-12.2'
105456 -26	DTP-9 13.2-13.8'
105456 -27	DTP-9 14.5-15'
105456 -28	DTP-11 2.1-3.1'
105456 -29	DTP-11 4.5-5'
105456 -30	DTP-11 8.6-9.2'
105456 -31	DTP-13 7.2-8.2'
105456 -32	DTP-13 9.3-10'
105456 -33	DC-052421

CASE NARRATIVE (continued)

Samples DTP-1-0521 and DTP-2-0521 were sent to Fremont Analytical for chloride and fluoride analysis. In addition, samples DTP-5 0.3-0.9', DTP-6 1.5-2', DTP-8 8.2-8.4', DTP-9 13.2-13.8', DTP-11 2.1-3.1', DTP-11 8.6-9.2' and DTP-13 7.2-8.2' were sent to Fremont for aluminum and iron analysis. The report is enclosed.

All quality control requirements were acceptable.

Date of Report: 06/03/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456
Date Extracted: 05/27/21
Date Analyzed: 05/28/21

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

Results Reported on a Dry Weight Basis
Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
DTP-1 5-6' 105456-01	<0.02	<0.02	<0.02	<0.06	<5	74
DTP-2 6-7.5' 105456-06	<0.02	<0.02	<0.02	<0.06	<5	88
Method Blank 01-1286 MB2	<0.02	<0.02	<0.02	<0.06	<5	86

Date of Report: 06/03/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456
Date Extracted: 05/27/21
Date Analyzed: 05/28/21

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 52-124)
DTP-1-0521 105456-04	<1	<1	<1	<3	<100	99
DTP-2-0521 105456-08	<1	<1	<1	<3	<100	99
Method Blank 01-1287 MB	<1	<1	<1	<3	<100	96

Date of Report: 06/03/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456
Date Extracted: 05/26/21
Date Analyzed: 05/26/21

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
DTP-1-0521 105456-04	850 x	370 x	94
DTP-2-0521 105456-08	12,000 x	1,700 x	127
Method Blank 01-1318 MB	<50	<250	103

Date of Report: 06/03/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456
Date Extracted: 05/26/21
Date Analyzed: 05/26/21

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx
Sample Extracts Passed Through a Silica Gel Column Prior to Analysis
Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 47-140)
DTP-1-0521 105456-04	140 x	<250	117
DTP-2-0521 105456-08	4,500	430 x	ip
Method Blank 01-1318 MB	<50	<250	120

Date of Report: 06/03/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456
Date Extracted: 05/25/21
Date Analyzed: 05/25/21

RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported on a Dry Weight Basis
Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 53-144)
DTP-1 5-6' 105456-01	<50	<250	101
DTP-2 6-7.5' 105456-06	1,100	<250	102
Method Blank 01-1316 MB	<50	<250	101

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-5 0.3-0.9'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-15
Date Analyzed:	05/26/21	Data File:	105456-15.146
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Cadmium	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-5 0.3-0.9'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-15 x5
Date Analyzed:	05/27/21	Data File:	105456-15 x5.090
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<5
Chromium	12.0
Cobalt	<5
Copper	<25
Manganese	80.9
Nickel	6.38
Zinc	<25

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-6 1.5-2'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-18
Date Analyzed:	05/26/21	Data File:	105456-18.147
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Cadmium	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-6 1.5-2'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-18 x5
Date Analyzed:	05/27/21	Data File:	105456-18 x5.094
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	10.9
Chromium	10.6
Cobalt	<5
Copper	43.6
Manganese	140
Nickel	8.46
Zinc	353

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-8 8.2-8.4'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-23
Date Analyzed:	05/26/21	Data File:	105456-23.154
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Cadmium	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-8 8.2-8.4'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-23 x5
Date Analyzed:	05/27/21	Data File:	105456-23 x5.095
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	11.3
Chromium	17.0
Cobalt	6.65
Copper	56.5
Manganese	194
Nickel	14.0
Zinc	56.0

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-9 13.2-13.8'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-26
Date Analyzed:	05/26/21	Data File:	105456-26.155
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	4.83
Cadmium	2.37

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-9 13.2-13.8'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-26 x10
Date Analyzed:	05/27/21	Data File:	105456-26 x10.096
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<10
Chromium	4,530
Cobalt	<10
Copper	1,530
Manganese	1,860
Nickel	32.6
Zinc	364

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-11 2.1-3.1'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-28
Date Analyzed:	05/26/21	Data File:	105456-28.156
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Cadmium	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-11 2.1-3.1'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-28 x5
Date Analyzed:	05/27/21	Data File:	105456-28 x5.097
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<5
Chromium	25.7
Cobalt	6.30
Copper	58.1
Manganese	242
Nickel	27.4
Zinc	60.7

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-11 8.6-9.2'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-30
Date Analyzed:	05/26/21	Data File:	105456-30.157
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Cadmium	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-11 8.6-9.2'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-30 x5
Date Analyzed:	05/27/21	Data File:	105456-30 x5.098
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<5
Chromium	18.4
Cobalt	6.21
Copper	26.7
Manganese	229
Nickel	21.8
Zinc	50.8

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-13 7.2-8.2'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-31
Date Analyzed:	05/26/21	Data File:	105456-31.158
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Cadmium	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	DTP-13 7.2-8.2'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-31 x5
Date Analyzed:	05/27/21	Data File:	105456-31 x5.099
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<5
Chromium	19.8
Cobalt	6.10
Copper	29.3
Manganese	253
Nickel	20.6
Zinc	35.0

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	NA	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	I1-335 mb
Date Analyzed:	05/26/21	Data File:	I1-335 mb.103
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Arsenic	<1
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	<5
Manganese	<1
Nickel	<1
Zinc	<5

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	DTP-2 6-7.5'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/25/21	Lab ID:	105456-06 1/6
Date Analyzed:	05/25/21	Data File:	052505.D
Matrix:	Soil	Instrument:	GC7
Units:	mg/kg (ppm) Dry Weight	Operator:	IJL

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	57	23	127

Compounds:	Concentration mg/kg (ppm)
Aroclor 1221	<0.02
Aroclor 1232	<0.02
Aroclor 1016	<0.02
Aroclor 1242	<0.02
Aroclor 1248	<0.02
Aroclor 1254	<0.02
Aroclor 1260	<0.02
Aroclor 1262	<0.02
Aroclor 1268	<0.02

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Maralco, F&BI 105456
Date Extracted:	05/25/21	Lab ID:	01-1279 mb2 1/6
Date Analyzed:	05/25/21	Data File:	052504.D
Matrix:	Soil	Instrument:	GC7
Units:	mg/kg (ppm) Dry Weight	Operator:	IJL

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	74	23	127

Compounds:	Concentration mg/kg (ppm)
Aroclor 1221	<0.02
Aroclor 1232	<0.02
Aroclor 1016	<0.02
Aroclor 1242	<0.02
Aroclor 1248	<0.02
Aroclor 1254	<0.02
Aroclor 1260	<0.02
Aroclor 1262	<0.02
Aroclor 1268	<0.02

Date of Report: 06/03/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456

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

Laboratory Code: 105390-02 (Duplicate)

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Benzene	mg/kg (ppm)	<0.02	<0.02	nm
Toluene	mg/kg (ppm)	<0.02	<0.02	nm
Ethylbenzene	mg/kg (ppm)	<0.02	<0.02	nm
Xylenes	mg/kg (ppm)	<0.06	<0.06	nm
Gasoline	mg/kg (ppm)	<5	<5	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/kg (ppm)	0.5	96	69-120
Toluene	mg/kg (ppm)	0.5	100	70-117
Ethylbenzene	mg/kg (ppm)	0.5	100	65-123
Xylenes	mg/kg (ppm)	1.5	100	66-120
Gasoline	mg/kg (ppm)	20	85	71-131

Date of Report: 06/03/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456

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

Laboratory Code: 105510-04 (Duplicate)

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	103	65-118
Toluene	ug/L (ppb)	50	105	72-122
Ethylbenzene	ug/L (ppb)	50	107	73-126
Xylenes	ug/L (ppb)	150	103	74-118
Gasoline	ug/L (ppb)	1,000	102	69-134

Date of Report: 06/03/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	100	96	63-142	4

Date of Report: 06/03/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample Silica Gel

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	124	116	61-133	7

Date of Report: 06/03/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 105455-05 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	<50	88	88	64-133	0

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	84	58-147

Date of Report: 06/03/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 105471-01 x5 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/kg (ppm)	20	<5	84	83	75-125	1
Arsenic	mg/kg (ppm)	10	19.7	90 b	65 b	75-125	32 b
Cadmium	mg/kg (ppm)	10	<5	91	92	75-125	1
Chromium	mg/kg (ppm)	50	19.7	90	89	75-125	1
Cobalt	mg/kg (ppm)	20	<5	86	88	75-125	2
Copper	mg/kg (ppm)	50	246	70 b	34 b	75-125	69 b
Manganese	mg/kg (ppm	20	338	145 b	0 b	75-125	200 b
Nickel	mg/kg (ppm)	25	16.9	82	76	75-125	8
Zinc	mg/kg (ppm)	50	115	119 b	65 b	75-125	59 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	mg/kg (ppm)	20	98	80-120
Arsenic	mg/kg (ppm)	10	96	80-120
Cadmium	mg/kg (ppm)	10	95	80-120
Chromium	mg/kg (ppm)	50	103	80-120
Cobalt	mg/kg (ppm)	20	96	80-120
Copper	mg/kg (ppm)	50	98	80-120
Manganese	mg/kg (ppm)	20	98	80-120
Nickel	mg/kg (ppm)	25	98	80-120
Zinc	mg/kg (ppm)	50	90	80-120

Date of Report: 06/03/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: 105390-02 1/6 (Matrix Spike) 1/6

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Control Limits	RPD (Limit 20)
Aroclor 1016	mg/kg (ppm)	0.25	<0.02	73	86	29-125	16
Aroclor 1260	mg/kg (ppm)	0.25	<0.02	75	89	25-137	17

Laboratory Code: Laboratory Control Sample 1/6

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Aroclor 1016	mg/kg (ppm)	0.25	98	55-137
Aroclor 1260	mg/kg (ppm)	0.25	103	51-150

Data Qualifiers & Definitions

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

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

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

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

105456

SAMPLE CHAIN OF CUSTODY

ME 05/25/21

Report To: R. Jones | G. Hainsworth
Company: Crete Consulting, Inc.
Address: 108 S. Washington, Ste 300
City, State, ZIP: Seattle, WA 98104
Phone: ______ Email: ______

SAMPLERS (signature): Rusty Jones R. Jones

PROJECT NAME: MARALCO

PO #:

REMARKS: Metals List: Antimony, Aluminum, Ag, Cd, Chrom., Cobalt, Cu, Pb, Fe, Ni, Manganese, Zn
Project specific RLs? - Yes / No

INVOICE TO:

VS3 / VW1

TURNAROUND TIME
☒ Standard turnaround
☐ RUSH ______
Rush charges authorized by:

E03 / B14

SAMPLE DISPOSAL
☐ Archive samples
☐ Other ______
Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Chlorides/Fluorides	Metals (see List)			Notes
DPT-1 5-6'	01 A-F	5/24/21	0905	SOIL	6	X	X	X									
DPT-1 6-7'	02		0910		6												
DPT-1 9-10'	03		0920	↓	6												
DPT-1-0521	04		0935	WATER	6	X	X	X					X				w/ + w/ SGC
DPT-2 5-6'	05		1015	SOIL	6												
DPT-2 6-7.5'	06		1020		6	X	X	X				X					
DPT-2 8.5-10'	07		1025	↓	6												
DPT-2-0521	08		1040	WATER	6	X	X	X					X				w/ + w/ SGC
DPT-3 2.5-3'	09		1115	SOIL	1												
DPT-3 4.5'	10	↓	1120	↓	1												

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

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	CRETE	5.25.21	1026
Received by: [signature]	Liz Webber-Bruya	F?B	5/25/21	1026
Relinquished by:				
Received by:		Samples received at 3°C		

105456 [redacted]

SAMPLE CHAIN OF CUSTODY

ME 05/25/21 [redacted]

VW1

Report To: See Page 1

Company:

Address:

City, State, ZIP:

Phone: Email:

SAMPLERS (*signature*): Rusty Jones R-Jones

PROJECT NAME: MARALCO

PO #:

REMARKS: Metals List: Sb, Al, As, Cd, Cr, Co, Cu, Fe, Mn, Pb Ni, Zn

Project specific RLs? - Yes / No

INVOICE TO:

Page # 2 of 4 VS3

TURNAROUND TIME
- [x] Standard turnaround EDB
- ☐ RUSH
- Rush charges authorized by: BJU

SAMPLE DISPOSAL
- ☐ Archive samples
- ☐ Other
- Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Metals (see list)				Notes
DPT-3 6.5'	11	5.24.21	1125	Soil	1												
DPT-4 1.5-2.0'	12	↓	1140	↓	1												
DPT-4 4.5-5'	13		1145		1												
DPT-4 6.1-7.6'	14		1150		1												
DPT-5 0.3-0.9'	15		1205		1								X				
DPT-5 3.8-4.2'	16		1210		1												
DPT-5 4.2-5'	17		1215		1												
DPT-6 1.5-2'	18		1235		1								X				
DPT-6 2.6-3.1'	19		1240		1												
DPT-6 4.3-5'	20	↓	1245	↓	1												

Friedman & Bruya, Inc.

3012 16th Avenue West

Seattle, WA 98119-2029

Ph. (206) 285-8282

SIGNATURE		PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	R-Jones	Rusty Jones	CRETE	5.25.21	1026
Received by:	[signature]	Liz Webber-Bruya	F?B	5/25/21	1026
Relinquished by:					
Received by:			Samples received at 3 °C		

105456

SAMPLE CHAIN OF CUSTODY ME 05/25/21

Page # 3 of 4 VWJ

Report To See Page 1

Company

Address

City, State, ZIP

Phone Email

SAMPLERS (signature) Rusty Jones R. Jones

PROJECT NAME: MARALCO

PO #

REMARKS Metals List: Sb, Al, As, Cd, Cr, Co, Cu, Fe, Mn, Pb, Ni, Zn

INVOICE TO

TURNAROUND TIME 4 WK

☒ Standard Turnaround EDF

☐ RUSH

Rush charges authorized by: BJH

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Archive Samples
☐ Other

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	Metals (see List)				Notes
DPT-7 11.7-12.2'	21	5.24.21	1305	Soil	1												
DPT-7 14.3-15'	22		1310		1												
DPT-8 8.2-8.4'	23		1325		1								X				
DPT-8 9.4-10'	24		1330		1												
DPT-8 11.7-12.2'	25		1335		1												
DPT-9 ~~8.2-8.8~~ 13.2-13.6	26		1400		1								X				
DPT-9 ~~9.5-10~~ 14.5-15'	27		1405		1												
DPT-11 2.1-3.1'	28		1500		1								X				
DPT-11 4.5-5'	24		1505		1												
DPT-12 8.6-9.2'	30	↓	1525	↓	1								X				

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	CRETE	5.25.21	1026
Received by:	Liz Wuber-Bruya	F?B	5/25/21	1026
Relinquished by:				
Received by:		Samples received at 3 °C		

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

105456 [redacted]

SAMPLE CHAIN OF CUSTODY

ME 05/25/21 [redacted]

Report To: See Page 1

Company

Address

City, State, ZIP

Phone Email

SAMPLERS (signature): Rusty Jones R-Jones [redacted]

PROJECT NAME: MARALCO

PO #

REMARKS: Metals List: Sb, Al, As, Cd, Cr, Co, Cu, Fe, Mn, Pb, Ni, Zn

INVOICE TO

Page # 4 of 4 VW1 VS3

TURNAROUND TIME
- ☒ Standard Turnaround
- ☐ RUSH
- Rush charges authorized by:

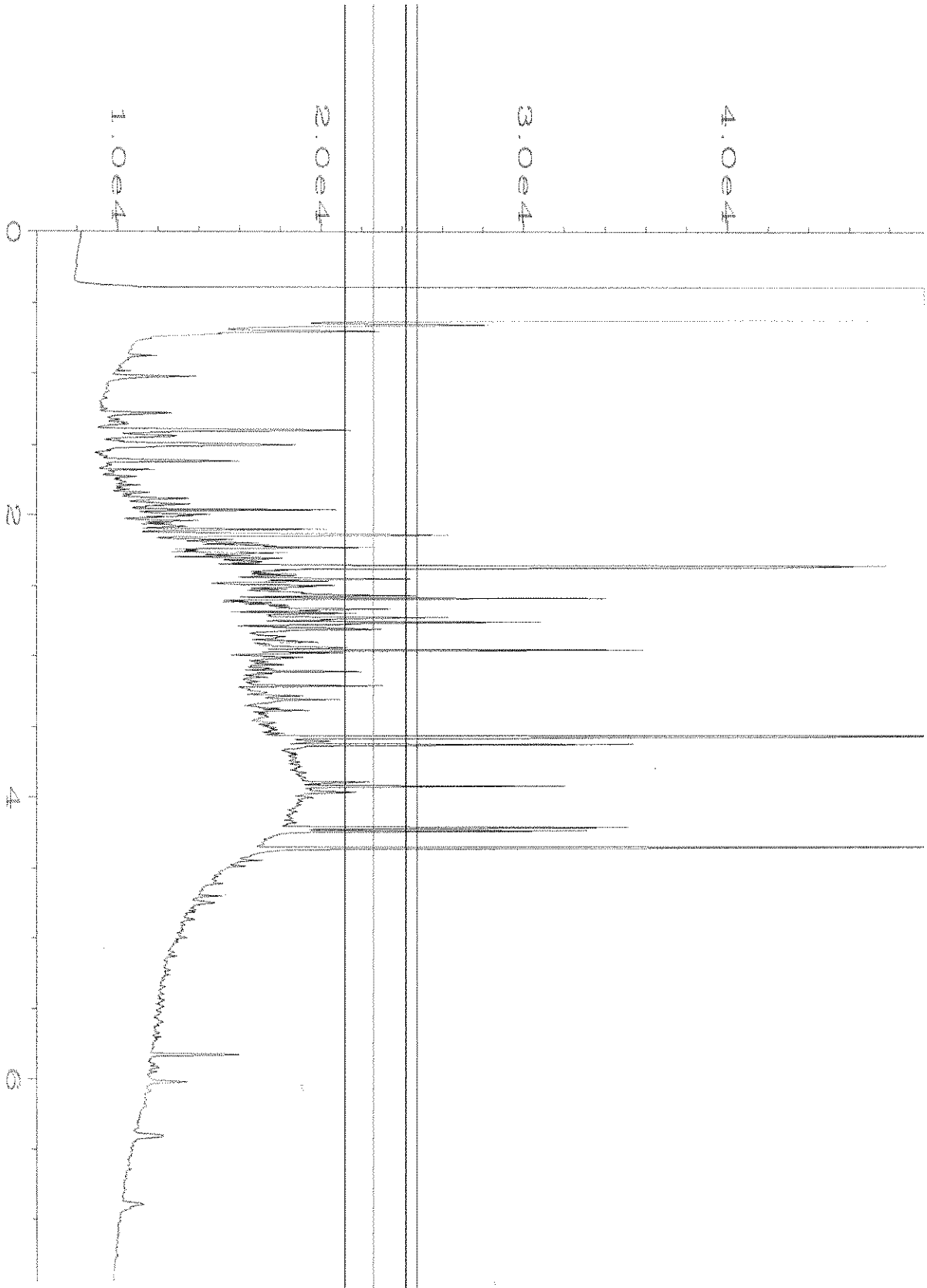
FJB BDY

SAMPLE DISPOSAL
- ☐ Dispose after 30 days
- ☐ Archive Samples
- ☐ Other

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	Metals (see List)	DOT 4.3	Dangerous when wet		Notes
DPT-13 7.2-8.2'	31	5/24/21	1550	SOIL	1								X				
DPT-13 9.3-10'	32	↓	1555	↓	1												
DC-052421	33 A-D	5/24/21	1600	SOIL	4										(X)	※	※ added at lab (NP) 5/25/21
																	(Y) per RJ 6/3/21 MG

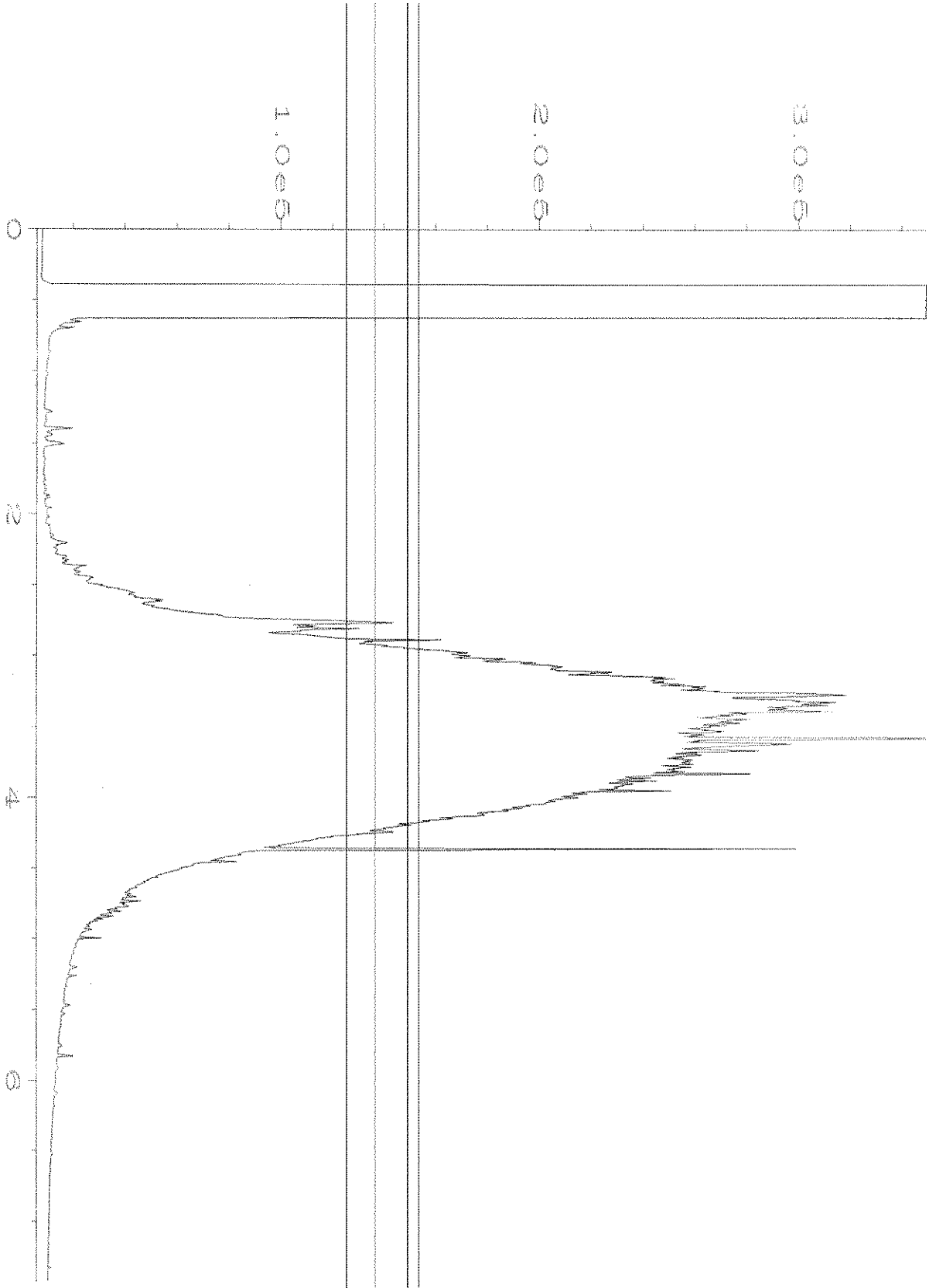
Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R-Jones	Rusty Jones	CRETE	5.25.21	1026
Received by: [signature]	Liz Webber-Bruya	F&B	5/25/21	1026
Relinquished by:				
Received by:		Samples received at 3 °C		



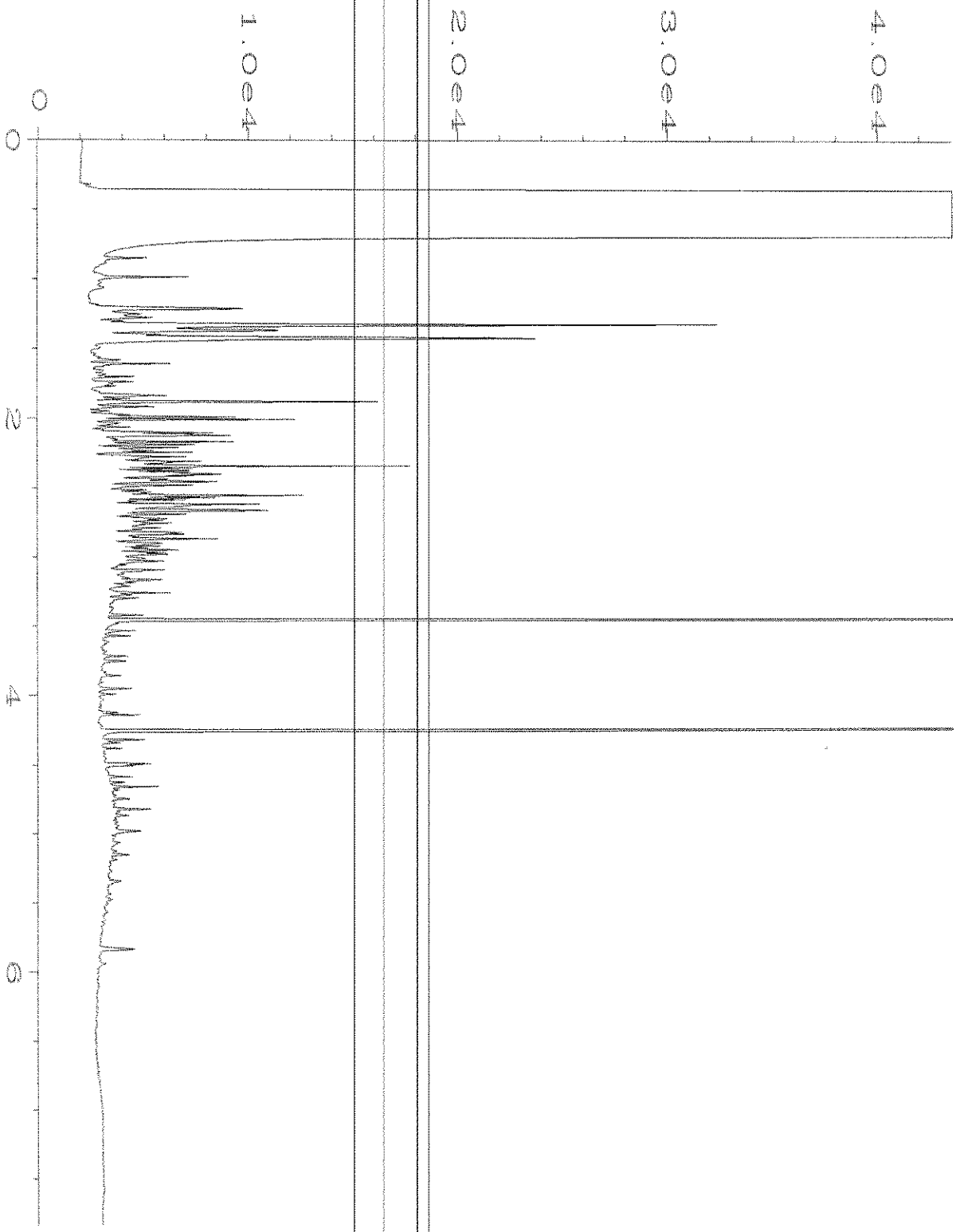
Data File Name : C:\HPCHEM\1\DATA\05-26-21\022F0601.D
Operator : TL
Instrument : GC1
Sample Name : 105456-04
Run Time Bar Code:
Acquired on : 26 May 21 03:04 PM
Report Created on: 27 May 21 09:38 AM

Page Number : 1
Vial Number : 22
Injection Number : 1
Sequence Line : 6
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



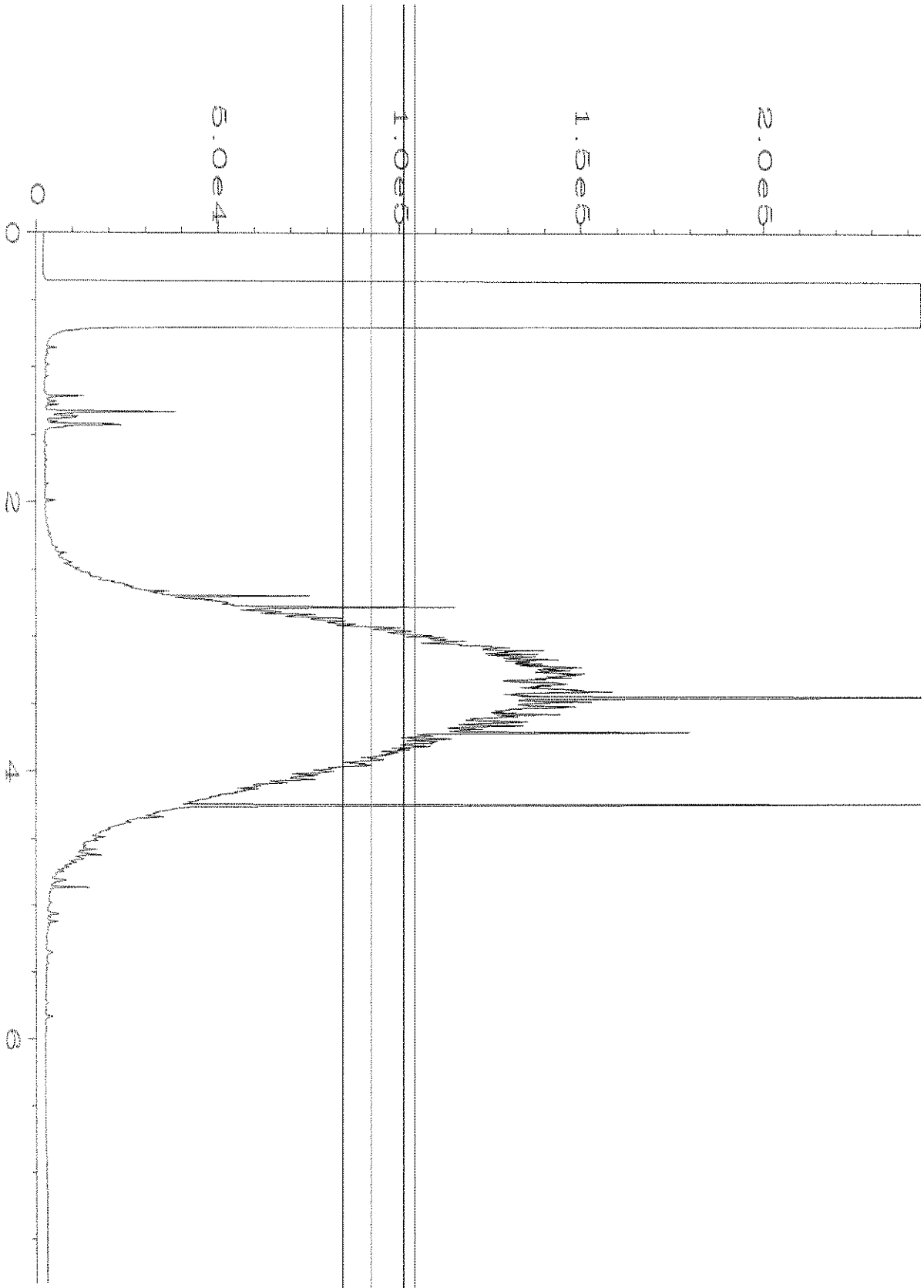
Data File Name : C:\HPCHEM\1\DATA\05-26-21\023F0601.D
Operator : TL
Instrument : GC1
Sample Name : 105456-08
Run Time Bar Code:
Acquired on : 26 May 21 03:16 PM
Report Created on: 27 May 21 09:38 AM

Page Number : 1
Vial Number : 23
Injection Number : 1
Sequence Line : 6
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\4\DATA\05-26-21\036F0701.D
Operator : TL
Instrument : GC#4
Sample Name : 105456-04 sg
Run Time Bar Code:
Acquired on : 26 May 21 05:58 PM
Report Created on: 27 May 21 08:26 AM

Page Number : 1
Vial Number : 36
Injection Number : 1
Sequence Line : 7
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\4\DATA\05-26-21\037F0701.D
Operator : TL
Instrument : GC#4
Sample Name : 105456-08 sg
Run Time Bar Code:
Acquired on : 26 May 21 06:10 PM
Report Created on: 27 May 21 08:26 AM

Page Number : 1
Vial Number : 37
Injection Number : 1
Sequence Line : 7
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

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

RE: 105456
Work Order Number: 2105396

June 11, 2021

Attention Michael Erdahl:

Fremont Analytical, Inc. received 9 sample(s) on 5/25/2021 for the analyses presented in the following report.

Ion Chromatography by EPA Method 300.0
Sample Moisture (Percent Moisture)
Total Metals by EPA Method 200.8
Total Metals by EPA Method 6020B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

CC:
Grant Hainsworth
Rusty Jones

Date: *06/11/2021*

CLIENT: Friedman & Bruya
Project: 105456
Work Order: 2105396

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2105396-001	DPT-1-0521	05/24/2021 9:35 AM	05/25/2021 2:29 PM
2105396-002	DPT-2-0521	05/24/2021 10:40 AM	05/25/2021 2:29 PM
2105396-003	DPT-5 0.3-0.9'	05/24/2021 12:05 PM	05/25/2021 2:29 PM
2105396-004	DPT-6 1.5-2'	05/24/2021 12:35 PM	05/25/2021 2:29 PM
2105396-005	DPT-8 8.2-8.4'	05/24/2021 1:25 PM	05/25/2021 2:29 PM
2105396-006	DPT-9 13.2-13.8'	05/24/2021 2:00 PM	05/25/2021 2:29 PM
2105396-007	DPT-11 2.1-3.1'	05/24/2021 3:00 PM	05/25/2021 2:29 PM
2105396-008	DPT-12 8.6-9.2'	05/24/2021 3:25 PM	05/25/2021 2:29 PM
2105396-009	DPT-13 7.2-8.2'	05/24/2021 3:50 PM	05/25/2021 2:29 PM

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

Revision v1

Case Narrative

WO#: **2105396**
Date: **6/11/2021**

CLIENT: Friedman & Bruya
Project: 105456

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

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

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

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

Revision 1 includes additional analyses requested by the client.

Qualifiers:

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

Acronyms:

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

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Collection Date: 5/24/2021 9:35:00 AM
Project: 105456
Lab ID: 2105396-001
Matrix: Water
Client Sample ID: DPT-1-0521

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32507		Analyst: SS
Fluoride	ND	0.800	D	mg/L	10	6/1/2021 11:41:00 PM
Chloride	224	10.0	D	mg/L	100	6/2/2021 10:41:00 AM
NOTES: Diluted due to matrix.						
Total Metals by EPA Method 200.8				Batch ID: 32582		Analyst: EH
Aluminum	405	100		µg/L	1	6/11/2021 3:25:54 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Project: 105456
Lab ID: 2105396-002
Client Sample ID: **DPT-2-0521**

Collection Date: 5/24/2021 10:40:00 AM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32507		Analyst: SS
Fluoride	1.38	0.800	D	mg/L	10	6/2/2021 12:04:00 AM
Chloride	51.6	2.00	D	mg/L	20	6/2/2021 11:04:00 AM
Total Metals by EPA Method 200.8				Batch ID: 32582		Analyst: EH
Aluminum	1,160	100		µg/L	1	6/11/2021 3:31:28 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Project: 105456
Lab ID: 2105396-003
Client Sample ID: **DPT-5 0.3-0.9'**

Collection Date: 5/24/2021 12:05:00 PM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	7,460	950	D	mg/Kg-dry	100	5/27/2021 5:08:00 PM
Iron	9,000	950	D	mg/Kg-dry	100	5/27/2021 5:08:00 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	19.6	0.500		wt%	1	6/1/2021 2:59:23 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Project: 105456
Lab ID: 2105396-004
Client Sample ID: **DPT-6 1.5-2'**

Collection Date: 5/24/2021 12:35:00 PM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	14,500	954	D	mg/Kg-dry	100	5/27/2021 5:13:34 PM
Iron	12,400	954	D	mg/Kg-dry	100	5/27/2021 5:13:34 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	21.2	0.500		wt%	1	6/1/2021 2:59:23 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Project: 105456
Lab ID: 2105396-005
Client Sample ID: **DPT-8 8.2-8.4'**

Collection Date: 5/24/2021 1:25:00 PM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	17,400	905	D	mg/Kg-dry	100	5/27/2021 5:19:08 PM
Iron	15,300	905	D	mg/Kg-dry	100	5/27/2021 5:19:08 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	16.9	0.500		wt%	1	6/1/2021 2:59:23 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Collection Date: 5/24/2021 2:00:00 PM
Project: 105456
Lab ID: 2105396-006
Matrix: Soil
Client Sample ID: **DPT-9 13.2-13.8'**

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	48,100	982	D	mg/Kg-dry	100	5/27/2021 5:24:42 PM
Iron	19,600	982	D	mg/Kg-dry	100	5/27/2021 5:24:42 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	23.4	0.500		wt%	1	6/1/2021 2:59:23 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Collection Date: 5/24/2021 3:00:00 PM
Project: 105456
Lab ID: 2105396-007
Matrix: Soil
Client Sample ID: DPT-11 2.1-3.1'

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	17,100	889	D	mg/Kg-dry	100	5/27/2021 5:30:17 PM
Iron	18,600	889	D	mg/Kg-dry	100	5/27/2021 5:30:17 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	9.28	0.500		wt%	1	6/1/2021 2:59:23 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Collection Date: 5/24/2021 3:25:00 PM
Project: 105456
Lab ID: 2105396-008
Matrix: Soil
Client Sample ID: DPT-12 8.6-9.2'

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	16,500	891	D	mg/Kg-dry	100	5/27/2021 5:35:52 PM
Iron	18,200	891	D	mg/Kg-dry	100	5/27/2021 5:35:52 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	9.52	0.500		wt%	1	6/1/2021 2:59:23 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Collection Date: 5/24/2021 3:50:00 PM
Project: 105456
Lab ID: 2105396-009
Matrix: Soil
Client Sample ID: DPT-13 7.2-8.2'

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	14,700	886	D	mg/Kg-dry	100	5/27/2021 5:41:26 PM
Iron	16,400	886	D	mg/Kg-dry	100	5/27/2021 5:41:26 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	9.70	0.500		wt%	1	6/1/2021 2:59:23 PM

Work Order: 2105396
CLIENT: Friedman & Bruya
Project: 105456

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **MB-32507**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **6/1/2021**	RunNo: **67663**
Client ID: **MBLKW**	Batch ID: **32507**		Analysis Date: **6/1/2021**	SeqNo: **1364754**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	0.0800									
Chloride	ND	0.100									

Sample ID: **LCS-32507**	SampType: **LCS**	Units: **mg/L**	Prep Date: **6/1/2021**	RunNo: **67663**
Client ID: **LCSW**	Batch ID: **32507**		Analysis Date: **6/1/2021**	SeqNo: **1364755**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	0.531	0.0800	0.5000	0	106	90	110				
Chloride	0.707	0.100	0.7500	0	94.3	90	110				

Sample ID: **2105395-001AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **6/1/2021**	RunNo: **67663**
Client ID: **BATCH**	Batch ID: **32507**		Analysis Date: **6/1/2021**	SeqNo: **1364758**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	4.96	0.800	5.000	0	99.2	80	120				D
Chloride	18.2	1.00	7.500	10.42	103	80	120				D

Sample ID: **2105395-001AMSD**	SampType: **MSD**	Units: **mg/L**	Prep Date: **6/1/2021**	RunNo: **67663**
Client ID: **BATCH**	Batch ID: **32507**		Analysis Date: **6/1/2021**	SeqNo: **1364759**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	4.89	0.800	5.000	0	97.8	80	120	4.960	1.42	20	D
Chloride	18.0	1.00	7.500	10.42	101	80	120	18.18	0.829	20	D

Work Order: 2105396
CLIENT: Friedman & Bruya
Project: 105456

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **2105420-001ADUP** SampType: **DUP** Units: **mg/L** Prep Date: **6/1/2021** RunNo: **67663**
Client ID: **BATCH** Batch ID: **32507** Analysis Date: **6/2/2021** SeqNo: **1364773**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	8.00						0		20	D
Chloride	90.1	10.0						84.60	6.30	20	D

Sample ID: **2105420-001AMS** SampType: **MS** Units: **mg/L** Prep Date: **6/1/2021** RunNo: **67663**
Client ID: **BATCH** Batch ID: **32507** Analysis Date: **6/2/2021** SeqNo: **1364774**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	47.9	8.00	50.00	0	95.8	80	120				D
Chloride	203	10.0	75.00	84.60	158	80	120				DS

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Work Order: 2105396
CLIENT: Friedman & Bruya
Project: 105456

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID: **MB-32582** SampType: **MBLK** Units: **µg/L** Prep Date: **6/8/2021** RunNo: **67806**
Client ID: **MBLKW** Batch ID: **32582** Analysis Date: **6/9/2021** SeqNo: **1367906**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	100									

Sample ID: **2106098-001EDUP** SampType: **DUP** Units: **µg/L** Prep Date: **6/8/2021** RunNo: **67806**
Client ID: **BATCH** Batch ID: **32582** Analysis Date: **6/9/2021** SeqNo: **1367909**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	100						220.5	86.6	30	R

NOTES:
R - High RPD observed due to low analyte concentration. High RPDs may be expected in this range.

Sample ID: **2106098-001EMS** SampType: **MS** Units: **µg/L** Prep Date: **6/8/2021** RunNo: **67806**
Client ID: **BATCH** Batch ID: **32582** Analysis Date: **6/9/2021** SeqNo: **1367910**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	5,090	100	5,000	220.5	97.4	70	130				

Sample ID: **2106098-001EMSD** SampType: **MSD** Units: **µg/L** Prep Date: **6/8/2021** RunNo: **67806**
Client ID: **BATCH** Batch ID: **32582** Analysis Date: **6/9/2021** SeqNo: **1367911**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	5,430	100	5,000	220.5	104	70	130	5,089	6.56	30	

Sample ID: **LCS-32582** SampType: **LCS** Units: **µg/L** Prep Date: **6/8/2021** RunNo: **67806**
Client ID: **LCSW** Batch ID: **32582** Analysis Date: **6/11/2021** SeqNo: **1369682**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	1,050	100	1,000	0	105	85	115				

Work Order: 2105396
CLIENT: Friedman & Bruya
Project: 105456

QC SUMMARY REPORT

Total Metals by EPA Method 6020B

Sample ID: **MB-32448** SampType: **MBLK** Units: **mg/Kg** Prep Date: **5/26/2021** RunNo: **67547**
Client ID: **MBLKS** Batch ID: **32448** Analysis Date: **5/26/2021** SeqNo: **1362250**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	7.87									
Iron	ND	7.87									

Sample ID: **LCS-32448** SampType: **LCS** Units: **mg/Kg** Prep Date: **5/26/2021** RunNo: **67547**
Client ID: **LCSS** Batch ID: **32448** Analysis Date: **5/26/2021** SeqNo: **1362251**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	415	7.87	393.7	0	105	80	120				
Iron	403	7.87	393.7	0	102	80	120				

Sample ID: **2105343-003AMS** SampType: **MS** Units: **mg/Kg-dry** Prep Date: **5/26/2021** RunNo: **67547**
Client ID: **BATCH** Batch ID: **32448** Analysis Date: **5/26/2021** SeqNo: **1362254**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	15,400	8.20	410.1	16,210	-192	75	125				ES
Iron	24,500	8.20	410.1	24,830	-73.1	75	125				ES

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Sample ID: **2105343-003AMSD** SampType: **MSD** Units: **mg/Kg-dry** Prep Date: **5/26/2021** RunNo: **67547**
Client ID: **BATCH** Batch ID: **32448** Analysis Date: **5/26/2021** SeqNo: **1362255**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	16,800	8.20	410.1	16,210	142	75	125	15,420	8.49	20	ES
Iron	27,100	8.20	410.1	24,830	565	75	125	24,530	10.1	20	ES

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2105396**
Logged by:	**Clare Griggs**	Date Received:	**5/25/2021 2:29:00 PM**

Chain of Custody

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

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
6.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
7.	Were all items received at a temperature of >2°C to 6°C *	Yes ☑	No ☐	NA ☐
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
10.	Are samples properly preserved?	Yes ☑	No ☐	
11.	Was preservative added to bottles?	Yes ☑	No ☐	NA ☐ HNO3 to 001B & 002B
12.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
14.	Does paperwork match bottle labels?	Yes ☑	No ☐	
15.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
16.	Is it clear what analyses were requested?	Yes ☑	No ☐	
17.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Sample	3.8

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

2105316

Page # _____ of _____

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Fremont

PROJECT NAME/NO.	PO #
105456	B-255

REMARKS

Please Email Results

TURNAROUND TIME

☐ Standard TAT

☐ RUSH _____

Rush charges authorized by: _____

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Return samples

☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Chloride / Fluoride	Iron, Aluminum						Notes
DPT-1-0521		5/24/21	935	Water	1				X							
DPT-2-0521			1040	Water	1				X							
DPT-5 0.3-0.9'			1205	Soil	1					X						
DPT-6 1.5-2'			1235	Soil	1					X						
DPT-8 8.2-8.4'			1325	Soil	1					X						
DPT-9 13.2-13.8'			1400	Soil	1					X						
DPT-11 2.1-3.1'			1500	Soil	1					X						
DPT-12 8.6-9.2'			1525	Soil	1					X						
DPT-13 7.2-8.2'			1550	Soil	1					X						

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	D. Wood	Michael Erdahl	Friedman & Bruya	5/25/21	
Received by:	Carter Johnson	Carter Johnson	FAI	5/25/21	1429
Relinquished by:					
Received by:					

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

2105396

Page # _____ of _____

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Fremont

PROJECT NAME/NO. 105456

PO # B-255

REMARKS

Please Email Results

TURNAROUND TIME

☐ Standard TAT

☐ RUSH _____

Rush charges authorized by: _____

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Return samples

☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Chloride / Fluoride	Iron, Aluminum	Aluminum					Notes
DPT-1-0521		5/24/21	935	Water	1				X		X					X = run per ME, Std TAT, 6/7/21 -CG
DPT-2-0521			1040	Water	1				X		X					
DPT-5 0.3-0.9'			1205	Soil	1					X						
DPT-6 1.5-2'			1235	Soil	1					X						
DPT-8 8.2-8.4'			1325	Soil	1					X						
DPT-9 13.2-13.8'			1400	Soil	1					X						
DPT-11 2.1-3.1'			1500	Soil	1					X						
DPT-12 8.6-9.2'			1525	Soil	1					X						
DPT-13 7.2-8.2'			1550	Soil	1					X						

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	D. Wert	Michael Erdahl	Friedman & Bruya	5/25/21	
Received by:	Carter Johnson	Carter Johnson	FAI	5/25/21	1429
Relinquished by:					
Received by:					

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

June 22, 2021

Jamie Stevens, Project Manager
Crete Consulting
108 S. Washington St., Suite 300
Seattle, WA 98104

Dear Ms Stevens:

Included are the additional results from the testing of material submitted on May 25, 2021 from the Maralco, F&BI 105456 project. There are 19 pages included in this report.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Rusty Jones, Grant Hainsworth
CTC0622R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on May 25, 2020 by Friedman & Bruya, Inc. from the Crete Consulting Maralco, F&BI 105456 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
105456 -01	DPT-1 5-6'
105456 -02	DPT-1 6-7'
105456 -03	DPT-1 9-10'
105456 -04	DPT-1-0521
105456 -05	DPT-2 5-6'
105456 -06	DPT-2 6-7.5'
105456 -07	DPT-2 8.5-10'
105456 -08	DPT-2-0521
105456 -09	DPT-3 2.5-3'
105456 -10	DPT-3 4.5'
105456 -11	DPT-3 6.5'
105456 -12	DPT-4 1.5-2.0'
105456 -13	DPT-4 4.5-5'
105456 -14	DPT-4 6.1-7.6'
105456 -15	DPT-5 0.3-0.9'
105456 -16	DPT-5 3.8-4.2'
105456 -17	DPT-5 4.2-5'
105456 -18	DPT-6 1.5-2'
105456 -19	DPT-6 2.6-3.1'
105456 -20	DPT-6 4.3-5'
105456 -21	DPT-7 11.7-12.2'
105456 -22	DPT-7 14.3-15'
105456 -23	DPT-8 8.2-8.4'
105456 -24	DPT-8 9.4-10'
105456 -25	DPT-8 11.7-12.2'
105456 -26	DPT-9 13.2-13.8'
105456 -27	DPT-9 14.5-15'
105456 -28	DPT-11 2.1-3.1'
105456 -29	DPT-11 4.5-5'
105456 -30	DPT-12 8.6-9.2'
105456 -31	DPT-13 7.2-8.2'
105456 -32	DPT-13 9.3-10'
105456 -33	DC-052421

Sample DC-052421 was sent to Fauske for UN DOT 4.3 dangerous when wet analysis. The report will be forwarded upon receipt.

Samples DPT-1-0521 and DPT-2-0521 were sent to Fremont Analytical for aluminum analysis. In addition, samples DPT-6 2.6-3.1', DPT-8 9.4-10', DPT-9 14.5-15', DPT-11 4.5-5', and DPT-13 9.3-10' were sent to Fremont for aluminum and iron analysis. The report is enclosed.

All quality control requirements were acceptable.

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-1-0521	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	06/08/21	Lab ID:	105456-04
Date Analyzed:	06/08/21	Data File:	105456-04.066
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Antimony	<2
Arsenic	13.3
Cadmium	<1
Chromium	2.41
Cobalt	4.29
Copper	11.1
Lead	<1
Nickel	8.14
Zinc	<5

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-1-0521	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	06/08/21	Lab ID:	105456-04 x100
Date Analyzed:	06/10/21	Data File:	105456-04 x100.035
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	32,200
Manganese	2,720

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-2-0521	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	06/08/21	Lab ID:	105456-08
Date Analyzed:	06/08/21	Data File:	105456-08.067
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Antimony	<2
Arsenic	13.6
Cadmium	<1
Chromium	1.74
Cobalt	<1
Copper	9.63
Lead	<1
Manganese	379
Nickel	1.02
Zinc	<5

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-2-0521	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	06/08/21	Lab ID:	105456-08 x10
Date Analyzed:	06/10/21	Data File:	105456-08 x10.036
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	10,300

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Maralco, F&BI 105456
Date Extracted:	06/08/21	Lab ID:	I1-355 mb2
Date Analyzed:	06/08/21	Data File:	I1-355 mb2.063
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Antimony	<2
Arsenic	<1
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	<5
Iron	<50
Lead	<1
Manganese	<1
Nickel	<1
Zinc	<5

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-6 2.6-3.1'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	06/18/21	Lab ID:	105456-19
Date Analyzed:	06/18/21	Data File:	105456-19.104
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	AP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Arsenic	2.91
Cadmium	<1
Chromium	8.31
Cobalt	3.35
Copper	33.3
Lead	3.69
Manganese	92.7
Nickel	6.25
Zinc	47.0

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-8 9.4-10'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	06/18/21	Lab ID:	105456-24
Date Analyzed:	06/18/21	Data File:	105456-24.105
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	AP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Arsenic	1.74
Cadmium	<1
Chromium	7.32
Cobalt	2.66
Copper	7.75
Lead	2.95
Manganese	81.0
Nickel	5.31
Zinc	13.6

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-9 14.5-15'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	06/08/21	Lab ID:	105456-27
Date Analyzed:	06/08/21	Data File:	105456-27.124
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Arsenic	7.51
Cadmium	<1
Lead	3.43

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-9 14.5-15'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	06/08/21	Lab ID:	105456-27 x2
Date Analyzed:	06/09/21	Data File:	105456-27 x2.037
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Chromium	13.8
Cobalt	4.97
Copper	19.4
Manganese	135
Nickel	9.51
Zinc	26.6

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-11 4.5-5'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	06/18/21	Lab ID:	105456-29
Date Analyzed:	06/18/21	Data File:	105456-29.106
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	AP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Arsenic	2.10
Cadmium	<1
Lead	2.78

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-11 4.5-5'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	06/18/21	Lab ID:	105456-29 x5
Date Analyzed:	06/21/21	Data File:	105456-29 x5.031
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	AP

Analyte:	Concentration mg/kg (ppm)
Chromium	19.4
Cobalt	6.59
Copper	<25
Manganese	230
Nickel	22.5
Zinc	32.0

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-13 9.3-10'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	06/18/21	Lab ID:	105456-32
Date Analyzed:	06/18/21	Data File:	105456-32.107
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	AP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Arsenic	3.15
Cadmium	<1
Chromium	9.81
Cobalt	4.59
Copper	12.2
Lead	10.1
Manganese	85.0
Nickel	7.71
Zinc	29.9

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Maralco, F&BI 105456
Date Extracted:	06/18/21	Lab ID:	I1-381 mb2
Date Analyzed:	06/18/21	Data File:	I1-381 mb2.103
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	AP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Arsenic	<1
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	<5
Lead	<1
Manganese	<1
Nickel	<1
Zinc	<5

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Maralco, F&BI 105456
Date Extracted:	06/08/21	Lab ID:	I1-357 mb
Date Analyzed:	06/08/21	Data File:	I1-357 mb.115
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Arsenic	<1
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	<5
Lead	<1
Manganese	<1
Nickel	<1
Zinc	<5

Date of Report: 06/22/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 106278-01 x5 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/kg (ppm)	20	<10	90	94	75-125	4
Arsenic	mg/kg (ppm)	10	9.57	85	94	75-125	10
Cadmium	mg/kg (ppm)	10	<5	92	96	75-125	4
Chromium	mg/kg (ppm)	50	15.5	88	91	75-125	3
Cobalt	mg/kg (ppm)	20	5.05	86	91	75-125	6
Copper	mg/kg (ppm)	50	33.9	58 b	62 b	75-125	7 b
Lead	mg/kg (ppm)	50	12.5	80	82	75-125	2
Manganese	mg/kg (ppm	20	223	98 b	69 b	75-125	35 b
Nickel	mg/kg (ppm)	25	20.1	89	89	75-125	0
Zinc	mg/kg (ppm)	50	49.8	66 b	71 b	75-125	7 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	mg/kg (ppm)	20	97	80-120
Arsenic	mg/kg (ppm)	10	82	80-120
Cadmium	mg/kg (ppm)	10	95	80-120
Chromium	mg/kg (ppm)	50	101	80-120
Cobalt	mg/kg (ppm)	20	99	80-120
Copper	mg/kg (ppm)	50	99	80-120
Lead	mg/kg (ppm)	50	88	80-120
Manganese	mg/kg (ppm)	20	94	80-120
Nickel	mg/kg (ppm)	25	99	80-120
Zinc	mg/kg (ppm)	50	89	80-120

Date of Report: 06/22/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Antimony	ug/L (ppb)	20	107	103	80-120	4
Arsenic	ug/L (ppb)	10	102	101	80-120	1
Cadmium	ug/L (ppb)	5	99	95	80-120	4
Chromium	ug/L (ppb)	20	109	100	80-120	9
Cobalt	ug/L (ppb)	20	101	96	80-120	5
Copper	ug/L (ppb)	20	104	95	80-120	9
Iron	ug/L (ppb)	100	104	98	80-120	6
Lead	ug/L (ppb)	10	99	93	80-120	6
Manganese	ug/L (ppb)	20	104	98	80-120	6
Nickel	ug/L (ppb)	20	103	96	80-120	7
Zinc	ug/L (ppb)	50	99	92	80-120	7

Date of Report: 06/22/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 106114-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/kg (ppm)	20	<1	92	90	75-125	2
Arsenic	mg/kg (ppm)	10	5.76	73 b	79 b	75-125	8 b
Cadmium	mg/kg (ppm)	10	<1	93	92	75-125	1
Chromium	mg/kg (ppm)	50	16.9	100	98	75-125	2
Cobalt	mg/kg (ppm)	20	4.73	83	77	75-125	7
Copper	mg/kg (ppm)	50	12.5	78	76	75-125	3
Lead	mg/kg (ppm)	50	9.27	83	83	75-125	0
Manganese	mg/kg (ppm	20	200	365 b	10 b	75-125	189 b
Nickel	mg/kg (ppm)	25	16.7	84	78	75-125	7
Zinc	mg/kg (ppm)	50	20.5	71 b	69 b	75-125	3 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	mg/kg (ppm)	20	100	80-120
Arsenic	mg/kg (ppm)	10	82	80-120
Cadmium	mg/kg (ppm)	10	98	80-120
Chromium	mg/kg (ppm)	50	115	80-120
Cobalt	mg/kg (ppm)	20	105	80-120
Copper	mg/kg (ppm)	50	100	80-120
Lead	mg/kg (ppm)	50	95	80-120
Manganese	mg/kg (ppm)	20	108	80-120
Nickel	mg/kg (ppm)	25	104	80-120
Zinc	mg/kg (ppm)	50	94	80-120

Data Qualifiers & Definitions

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

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

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

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

105456
[redacted]

SAMPLE CHAIN OF CUSTODY

ME 05/25/21 [redacted]

Page # 1 of 4 VS3 VW1

Report To: R. Jones | G. Hainsworth

Company: Crete Consulting, Inc.

Address: 108 S. Washington, Ste 300

City, State, ZIP: Seattle, WA 98104

Phone: ______ Email: ______

SAMPLERS (signature): Rusty Jones R. Jones

PROJECT NAME: MARALCO

PO #:

REMARKS: Metals List: Antimony, Aluminum, Ag, Cd, Chrom., Cobalt, Cu, Pb, Fe, Ni, Manganese, Zn

Project specific RLs? - Yes / No

INVOICE TO:

TURNAROUND TIME
- ☒ Standard turnaround EU3
- ☐ RUSH ______ BZY
- Rush charges authorized by:

SAMPLE DISPOSAL
- ☐ Archive samples
- ☐ Other ______
- Default: Dispose after 30 days

						ANALYSES REQUESTED											
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Chlorides / Fluorides	Metals (see List)			Notes ● - per RJ
DPT-1 5-6'	01 A-F	5/24/21	0905	SOIL	6	X	X	X									6/7/21 ME
DPT-1 6-7'	02	↓	0910	↓	6												
DPT-1 9-10'	03	↓	0920	↓	6												
DPT-1-0521	04	↓	0935	WATER	6	X	X	X					X	●			w/ + w/ SGC
DPT-2 5-6'	05	↓	1015	SOIL	6												
DPT-2 6-7.5'	06	↓	1020	↓	6	X	X	X				X					
DPT-2 9.5-10'	07	↓	1025	↓	6												
DPT-2-0521	08	↓	1040	WATER	6	X	X	X					X	●			w/ + w/ SGC
DPT-3 2.5-3'	09	↓	1115	SOIL	1												
DPT-3 4.5'	10	↓	1120	↓	1												

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

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	CRETE	5.25.21	1026
Received by: [signature]	Liz Webber-Bruya	F&B	5/25/21	1026
Relinquished by:				
Received by:		Samples received at 3 °C		

105456

SAMPLE CHAIN OF CUSTODY ME 05/25/21 VW1

Report To See Page 1

Company

Address

City, State, ZIP

Phone Email

SAMPLERS (signature) Rusty Jones R Jones

PROJECT NAME MARALCO

PO #

REMARKS Metals List: Sb, Al, As, Cd, Cr, Co, Cu, Fe, Mn, Pb, Ni, Zn

Project specific RLs? - Yes / No

INVOICE TO

Page # 2 of 4 VS3

TURNAROUND TIME

☒ Standard turnaround EOB

☐ RUSH

Rush charges authorized by: BDU

SAMPLE DISPOSAL

☐ Archive samples

☐ Other

Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Metals (see list)				Notes
DPT-3 6.5′	11	5.24.21	1125	SOIL	1												
DPT-4 1.5-2.0′	12	↓	1140	↓	1												
DPT-4 4.5-5′	13	↓	1145	↓	1												
DPT-4 6.1-7.6′	14	↓	1150	↓	1												
DPT-5 0.3-0.9′	15	↓	1205	↓	1								X				
DPT-5 3.8-4.2′	16	↓	1210	↓	1												
DPT-5 4.2-5′	17	↓	1215	↓	1												
DPT-6 1.5-2′	18	↓	1235	↓	1								X				
DPT-6 2.6-3.1′	19	↓	1240	↓	1								●				
DPT-6 4.3-5′	20	↓	1245	↓	1												

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

SIGNATURE		PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	R. Jones	Rusty Jones	CRETE	5.25.21	1026
Received by:	[signature]	Liz Webber-Bruya	F&B	5/25/21	1026
Relinquished by:					
Received by:			Samples received at 3 °C		

105456

SAMPLE CHAIN OF CUSTODY ME 05/25/21

Page # 3 of 4 VW1

Report To: See Page 1

Company

Address

City, State, ZIP

Phone Email

SAMPLERS (signature) Rusty Jones R. Jones

PROJECT NAME: MARALCO

PO #

REMARKS Metals List: Sb, Al, As, Cd, Cr, Co, Cu, Fe, Mn, Pb, Ni, Zn

INVOICE TO

TURNAROUND TIME
- [x] Standard Turnaround
- [ ] RUSH
- Rush charges authorized by:

SAMPLE DISPOSAL
- [ ] Dispose after 30 days
- [ ] Archive Samples
- [ ] Other

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	Metals (see List)				Notes
DPT-7 11.7-12.2'	21	5.24.21	1305	Soil	1												
DPT-7 14.3-15'	22	↓	1310	↓	1												
DPT-8 8.2-8.4'	23		1325		1								X				
DPT-8 9.4-10'	24		1330		1								●				
DPT-8 11.7-12.2'	25		1335		1												
DPT-9 ~~8.2-8.8~~ 13.2-13.8	26		1400		1								X				
DPT-9 ~~9.5-10~~ 14.5-15'	27		1405		1								●				
DPT-11 2.1-3.1'	28		1500		1								X				
DPT-11 4.5-5'	29		1505		1								●				
DPT-12 8.6-9.2'	30	↓	1525	↓	1								X				

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	CRETE	5.25.21	1026
Received by: [signature]	Liz Webber-Bruya	F?B	5/25/21	1026
Relinquished by:				
Received by:		Samples received at 3 °C		

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

105456 [redacted]

SAMPLE CHAIN OF CUSTODY

ME 05/25/21 [redacted]

Report To: See Page 1

Company

Address

City, State, ZIP

Phone Email

SAMPLERS (signature): Rusty Jones R-Jones

PROJECT NAME: MARALCO

PO #

REMARKS: Metals List: Sb, Al, As, Cd, Cr, Co, Cu, Fe, Mn, Pb, Ni, Zn

INVOICE TO

Page # 4 of 4 VW1 VS3

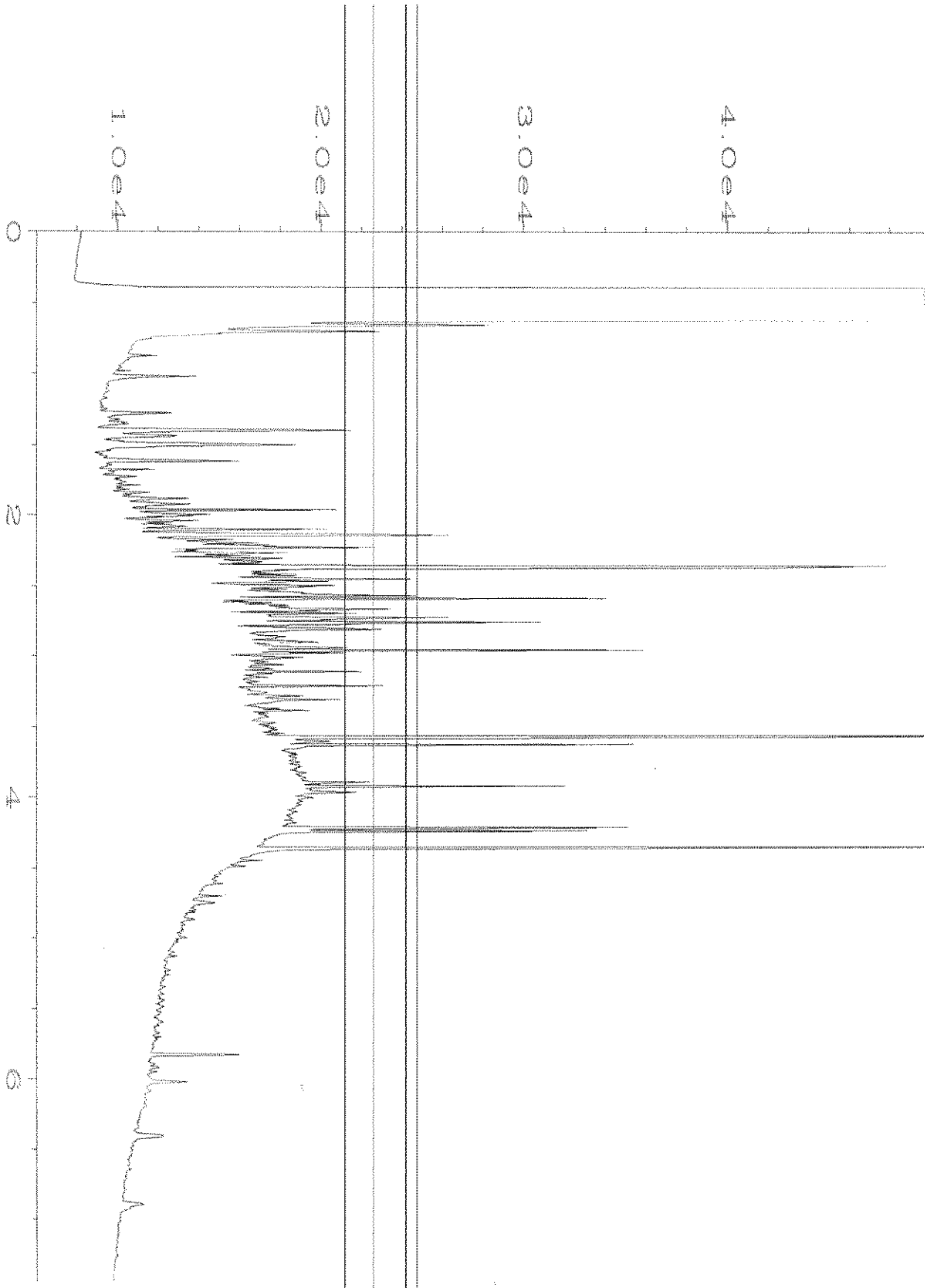
TURNAROUND TIME
- ☒ Standard Turnaround FJB
- ☐ RUSH BDY
- Rush charges authorized by:

SAMPLE DISPOSAL
- ☐ Dispose after 30 days
- ☐ Archive Samples
- ☐ Other

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	Metals (see List)	DOT 4.3	Dangerous when wet		Notes
DPT-13 7.2-8.2'	31	5/24/21	1550	soil	1								X				
DPT-13 9.3-10'	32	↓	1555	↓	1								●				
DC-052421	33 A-D	5/24/21	1600	soil	4										(X)		※ Added at lab (NP) 5/25/21
																	(Y) per RS 6/3/21 MG

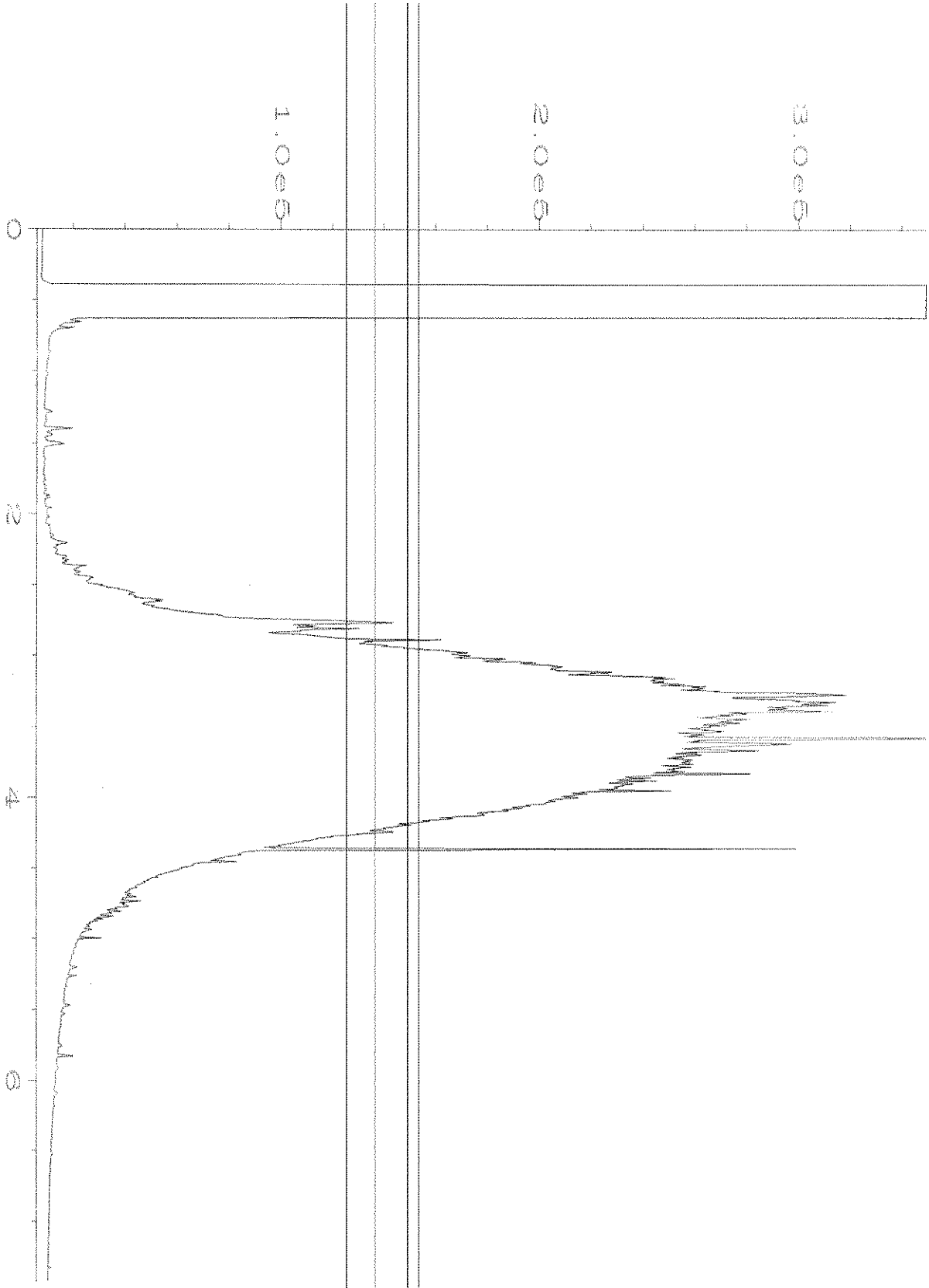
Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R-Jones	Rusty Jones	CRETE	5.25.21	1016
Received by: [signature]	Liz Webber-Bruya	F&B	5/25/21	1026
Relinquished by:				
Received by:		Samples received at 3 °C		



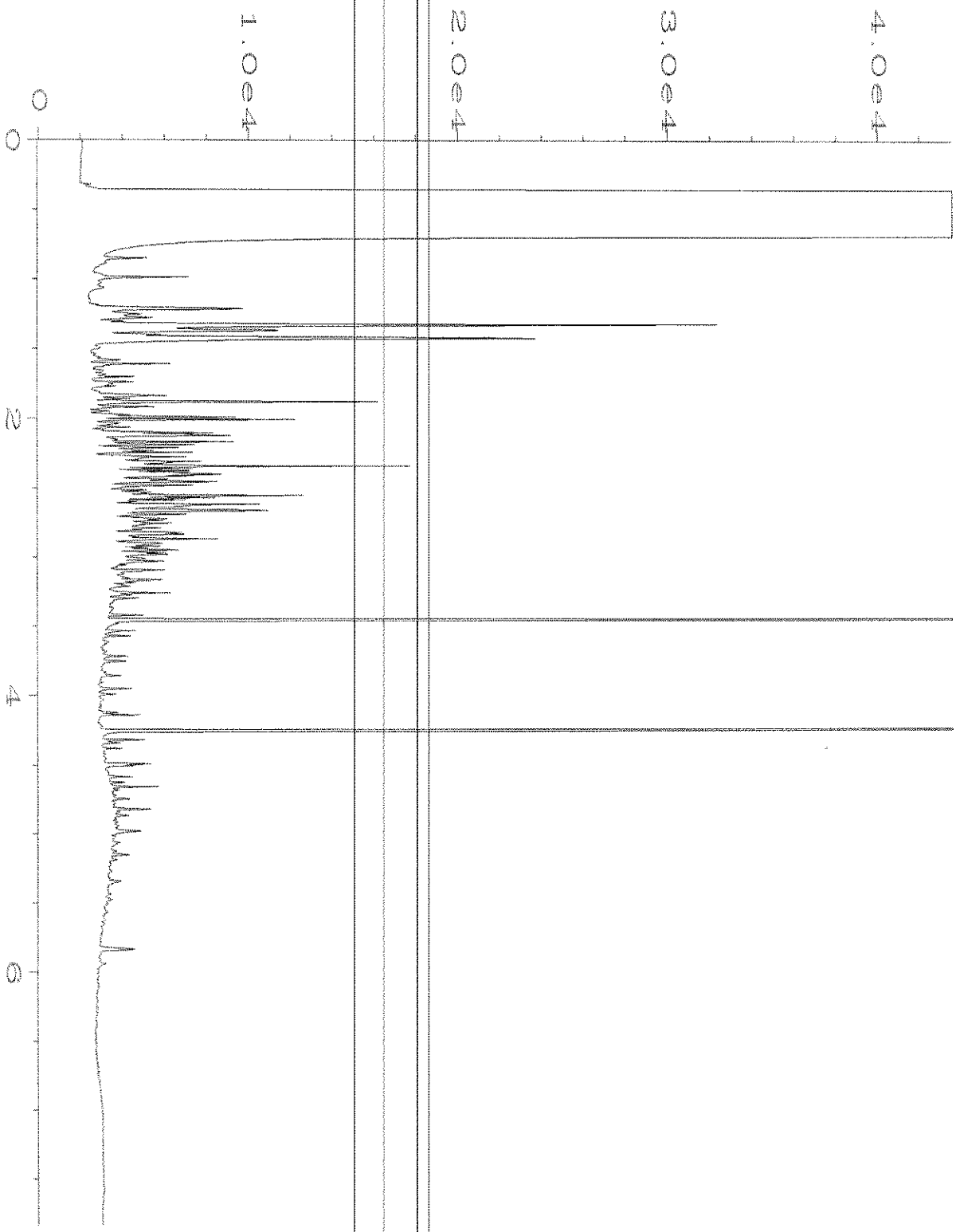
Data File Name : C:\HPCHEM\1\DATA\05-26-21\022F0601.D
Operator : TL
Instrument : GC1
Sample Name : 105456-04
Run Time Bar Code:
Acquired on : 26 May 21 03:04 PM
Report Created on: 27 May 21 09:38 AM

Page Number : 1
Vial Number : 22
Injection Number : 1
Sequence Line : 6
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



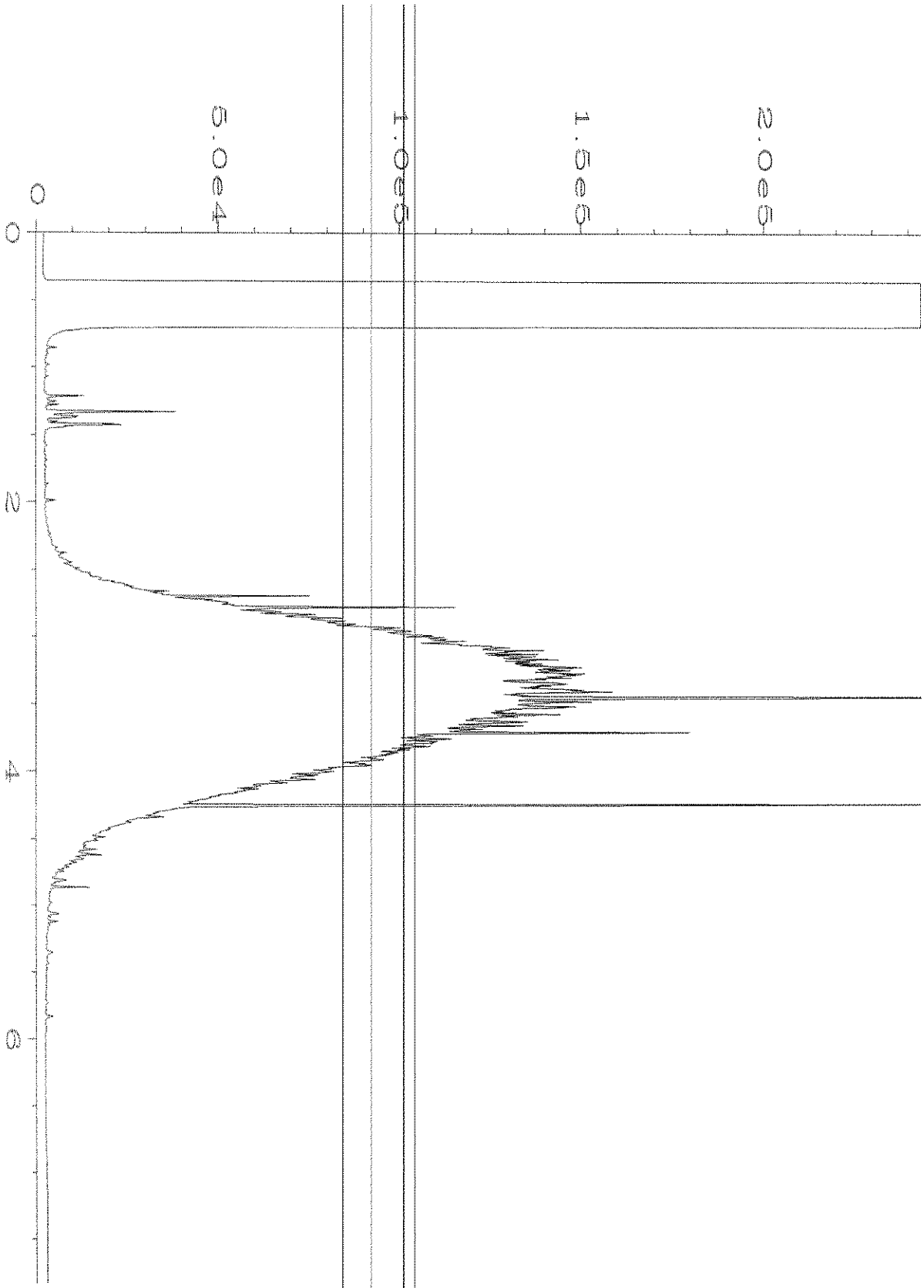
Data File Name : C:\HPCHEM\1\DATA\05-26-21\023F0601.D
Operator : TL
Instrument : GC1
Sample Name : 105456-08
Run Time Bar Code:
Acquired on : 26 May 21 03:16 PM
Report Created on: 27 May 21 09:38 AM

Page Number : 1
Vial Number : 23
Injection Number : 1
Sequence Line : 6
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\4\DATA\05-26-21\036F0701.D
Operator : TL
Instrument : GC#4
Sample Name : 105456-04 sg
Run Time Bar Code:
Acquired on : 26 May 21 05:58 PM
Report Created on: 27 May 21 08:26 AM

Page Number : 1
Vial Number : 36
Injection Number : 1
Sequence Line : 7
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\4\DATA\05-26-21\037F0701.D
Operator : TL
Instrument : GC#4
Sample Name : 105456-08 sg
Run Time Bar Code:
Acquired on : 26 May 21 06:10 PM
Report Created on: 27 May 21 08:26 AM

Page Number : 1
Vial Number : 37
Injection Number : 1
Sequence Line : 7
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

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

RE: 105456
Work Order Number: 2106117

June 11, 2021

Attention Michael Erdahl:

Fremont Analytical, Inc. received 5 sample(s) on 6/8/2021 for the analyses presented in the following report.

Sample Moisture (Percent Moisture)
Total Metals by EPA Method 6020B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *06/11/2021*

CLIENT: Friedman & Bruya
Project: 105456
Work Order: 2106117

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2106117-001	DPT-6 2.6-3.1'	05/24/2021 12:40 PM	06/08/2021 9:51 AM
2106117-002	DPT-8 9.4-10'	05/24/2021 1:30 PM	06/08/2021 9:51 AM
2106117-003	DPT-9 14.5-15'	05/24/2021 2:05 PM	06/08/2021 9:51 AM
2106117-004	DPT-11 4.5-5'	05/24/2021 1:05 PM	06/08/2021 9:51 AM
2106117-005	DPT-13 9.3-10'	05/24/2021 3:58 PM	06/08/2021 9:51 AM

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

Original

Case Narrative

WO#: **2106117**
Date: **6/11/2021**

CLIENT: Friedman & Bruya
Project: 105456

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

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

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

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

Qualifiers:

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

Acronyms:

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

Analytical Report

Work Order: **2106117**
Date Reported: **6/11/2021**

CLIENT: Friedman & Bruya
Project: 105456

Lab ID: 2106117-001 **Collection Date:** 5/24/2021 12:40:00 PM
Client Sample ID: **DPT-6 2.6-3.1'** **Matrix:** Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32600		Analyst: EH
Aluminum	10,800	970	D	mg/Kg-dry	100	6/11/2021 12:39:34 PM
Iron	11,200	970	D	mg/Kg-dry	100	6/11/2021 12:39:34 PM
Sample Moisture (Percent Moisture)				Batch ID: R67782		Analyst: OK
Percent Moisture	18.8	0.500		wt%	1	6/8/2021 3:02:40 PM

Lab ID: 2106117-002 **Collection Date:** 5/24/2021 1:30:00 PM
Client Sample ID: **DPT-8 9.4-10'** **Matrix:** Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32600		Analyst: EH
Aluminum	37,500	972	D	mg/Kg-dry	100	6/11/2021 12:45:08 PM
Iron	37,300	972	D	mg/Kg-dry	100	6/11/2021 12:45:08 PM
Sample Moisture (Percent Moisture)				Batch ID: R67782		Analyst: OK
Percent Moisture	19.6	0.500		wt%	1	6/8/2021 3:02:40 PM

Lab ID: 2106117-003 **Collection Date:** 5/24/2021 2:05:00 PM
Client Sample ID: **DPT-9 14.5-15'** **Matrix:** Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32600		Analyst: EH
Aluminum	15,400	1,110	D	mg/Kg-dry	100	6/11/2021 12:50:43 PM
Iron	21,700	1,110	D	mg/Kg-dry	100	6/11/2021 12:50:43 PM
Sample Moisture (Percent Moisture)				Batch ID: R67782		Analyst: OK
Percent Moisture	27.2	0.500		wt%	1	6/8/2021 3:02:40 PM

CLIENT: Friedman & Bruya
Project: 105456

Lab ID: 2106117-004 **Collection Date:** 5/24/2021 1:05:00 PM
Client Sample ID: **DPT-11 4.5-5'** **Matrix:** Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32600		Analyst: EH
Aluminum	15,400	884	D	mg/Kg-dry	100	6/11/2021 12:33:59 PM
Iron	16,500	884	D	mg/Kg-dry	100	6/11/2021 12:33:59 PM
Sample Moisture (Percent Moisture)				Batch ID: R67782		Analyst: OK
Percent Moisture	10.9	0.500		wt%	1	6/8/2021 3:02:40 PM

Lab ID: 2106117-005 **Collection Date:** 5/24/2021 3:58:00 PM
Client Sample ID: **DPT-13 9.3-10'** **Matrix:** Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32600		Analyst: EH
Aluminum	11,800	1,040	D	mg/Kg-dry	100	6/11/2021 12:56:17 PM
Iron	9,420	1,040	D	mg/Kg-dry	100	6/11/2021 12:56:17 PM
Sample Moisture (Percent Moisture)				Batch ID: R67782		Analyst: OK
Percent Moisture	23.4	0.500		wt%	1	6/8/2021 3:02:40 PM

Work Order: 2106117
CLIENT: Friedman & Bruya
Project: 105456

QC SUMMARY REPORT

Total Metals by EPA Method 6020B

Sample ID: **MB-32600** SampType: **MBLK** Units: **mg/Kg** Prep Date: **6/9/2021** RunNo: **67848**
Client ID: **MBLKS** Batch ID: **32600** Analysis Date: **6/10/2021** SeqNo: **1368947**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	7.87									
Iron	ND	7.87									

Sample ID: **LCS-32600** SampType: **LCS** Units: **mg/Kg** Prep Date: **6/9/2021** RunNo: **67848**
Client ID: **LCSS** Batch ID: **32600** Analysis Date: **6/10/2021** SeqNo: **1368948**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	390	7.81	390.6	0	99.9	80	120				
Iron	380	7.81	390.6	0	97.2	80	120				

Sample ID: **2106117-004AMS** SampType: **MS** Units: **mg/Kg-dry** Prep Date: **6/9/2021** RunNo: **67848**
Client ID: **DPT-11 4.5-5'** Batch ID: **32600** Analysis Date: **6/10/2021** SeqNo: **1368953**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	18,800	8.70	435.2	16,820	460	75	125				ES
Iron	20,400	8.70	435.2	18,710	390	75	125				ES

NOTES:
S - Outlying spike recovery(ies) observed. A duplicate analysis was performed with similar results indicating a possible matrix effect (Al, Fe).

Sample ID: **2106117-004AMSD** SampType: **MSD** Units: **mg/Kg-dry** Prep Date: **6/9/2021** RunNo: **67848**
Client ID: **DPT-11 4.5-5'** Batch ID: **32600** Analysis Date: **6/10/2021** SeqNo: **1368954**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	16,800	8.98	449.2	16,820	4.10	75	125	18,820	11.1	20	ES
Iron	19,400	8.98	449.2	18,710	156	75	125	20,410	5.01	20	ES

NOTES:
S - Outlying spike recovery(ies) observed. A duplicate analysis was performed with similar results indicating a possible matrix effect (Al, Fe).

Date: *6/11/2021*

Work Order: 2106117
CLIENT: Friedman & Bruya
Project: 105456

QC SUMMARY REPORT

Total Metals by EPA Method 6020B

Sample ID: **2106117-004APDS** SampType: **PDS** Units: **mg/Kg-dry** Prep Date: **6/9/2021** RunNo: **67848**
Client ID: **DPT-11 4.5-5'** Batch ID: **32600** Analysis Date: **6/10/2021** SeqNo: **1368955**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	18,600	8.84	442	16,800	403	75	125				ES
Iron	20,200	8.84	442	18,700	347	75	125				ES

NOTES:
S - Spike recovery indicates a possible matrix effect. The method is in control as indicated by the Laboratory Control Sample (LCS).

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2106117**
Logged by:	**Clare Griggs**	Date Received:	**6/8/2021 9:51:00 AM**

Chain of Custody

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

Log In

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

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Sample	5.3

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

106117

Page # 1 of 1

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Fremont

PROJECT NAME/NO.	PO #
105456	B-286

REMARKS

Please Email Results

TURNAROUND TIME

☐ Standard TAT

☑ RUSH 3-Day

Rush charges authorized by:

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Return samples

☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Al+Fe							Notes
DPT-6 2.6-3.1'		5/24/21	1240	Soil	1				x							
DPT-8 9.4-10'		"	1330	"	1				x							
DPT-9 14.5-15'		"	1405	"	1				x							
DPT-11 4.5-5'		"	1505	"	1				x							
DPT-13 @ 9.3-10'		"	1555	"	1				x							

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	6/8/21	0817
Received by:		Claire Anderson	FBI	6/9/21	0957
Relinquished by:					
Received by:					

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

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

RE: 105456
Work Order Number: 2105396

June 11, 2021

Attention Michael Erdahl:

Fremont Analytical, Inc. received 9 sample(s) on 5/25/2021 for the analyses presented in the following report.

Ion Chromatography by EPA Method 300.0
Sample Moisture (Percent Moisture)
Total Metals by EPA Method 200.8
Total Metals by EPA Method 6020B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

CC:
Grant Hainsworth
Rusty Jones

Date: *06/11/2021*

CLIENT: Friedman & Bruya
Project: 105456
Work Order: 2105396

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2105396-001	DPT-1-0521	05/24/2021 9:35 AM	05/25/2021 2:29 PM
2105396-002	DPT-2-0521	05/24/2021 10:40 AM	05/25/2021 2:29 PM
2105396-003	DPT-5 0.3-0.9'	05/24/2021 12:05 PM	05/25/2021 2:29 PM
2105396-004	DPT-6 1.5-2'	05/24/2021 12:35 PM	05/25/2021 2:29 PM
2105396-005	DPT-8 8.2-8.4'	05/24/2021 1:25 PM	05/25/2021 2:29 PM
2105396-006	DPT-9 13.2-13.8'	05/24/2021 2:00 PM	05/25/2021 2:29 PM
2105396-007	DPT-11 2.1-3.1'	05/24/2021 3:00 PM	05/25/2021 2:29 PM
2105396-008	DPT-12 8.6-9.2'	05/24/2021 3:25 PM	05/25/2021 2:29 PM
2105396-009	DPT-13 7.2-8.2'	05/24/2021 3:50 PM	05/25/2021 2:29 PM

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

Revision v1

Case Narrative

WO#: **2105396**
Date: **6/11/2021**

CLIENT: Friedman & Bruya
Project: 105456

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

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

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

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

Revision 1 includes additional analyses requested by the client.

Qualifiers:

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

Acronyms:

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

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Collection Date: 5/24/2021 9:35:00 AM
Project: 105456
Lab ID: 2105396-001
Matrix: Water
Client Sample ID: DPT-1-0521

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32507		Analyst: SS
Fluoride	ND	0.800	D	mg/L	10	6/1/2021 11:41:00 PM
Chloride	224	10.0	D	mg/L	100	6/2/2021 10:41:00 AM
NOTES: Diluted due to matrix.						
Total Metals by EPA Method 200.8				Batch ID: 32582		Analyst: EH
Aluminum	405	100		µg/L	1	6/11/2021 3:25:54 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Project: 105456
Lab ID: 2105396-002
Client Sample ID: **DPT-2-0521**

Collection Date: 5/24/2021 10:40:00 AM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32507		Analyst: SS
Fluoride	1.38	0.800	D	mg/L	10	6/2/2021 12:04:00 AM
Chloride	51.6	2.00	D	mg/L	20	6/2/2021 11:04:00 AM
Total Metals by EPA Method 200.8				Batch ID: 32582		Analyst: EH
Aluminum	1,160	100		µg/L	1	6/11/2021 3:31:28 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Project: 105456
Lab ID: 2105396-003
Client Sample ID: **DPT-5 0.3-0.9'**

Collection Date: 5/24/2021 12:05:00 PM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	7,460	950	D	mg/Kg-dry	100	5/27/2021 5:08:00 PM
Iron	9,000	950	D	mg/Kg-dry	100	5/27/2021 5:08:00 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	19.6	0.500		wt%	1	6/1/2021 2:59:23 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Project: 105456
Lab ID: 2105396-004
Client Sample ID: **DPT-6 1.5-2'**

Collection Date: 5/24/2021 12:35:00 PM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	14,500	954	D	mg/Kg-dry	100	5/27/2021 5:13:34 PM
Iron	12,400	954	D	mg/Kg-dry	100	5/27/2021 5:13:34 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	21.2	0.500		wt%	1	6/1/2021 2:59:23 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Project: 105456
Lab ID: 2105396-005
Client Sample ID: **DPT-8 8.2-8.4'**

Collection Date: 5/24/2021 1:25:00 PM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	17,400	905	D	mg/Kg-dry	100	5/27/2021 5:19:08 PM
Iron	15,300	905	D	mg/Kg-dry	100	5/27/2021 5:19:08 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	16.9	0.500		wt%	1	6/1/2021 2:59:23 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Collection Date: 5/24/2021 2:00:00 PM
Project: 105456
Lab ID: 2105396-006
Matrix: Soil
Client Sample ID: **DPT-9 13.2-13.8'**

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	48,100	982	D	mg/Kg-dry	100	5/27/2021 5:24:42 PM
Iron	19,600	982	D	mg/Kg-dry	100	5/27/2021 5:24:42 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	23.4	0.500		wt%	1	6/1/2021 2:59:23 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Collection Date: 5/24/2021 3:00:00 PM
Project: 105456
Lab ID: 2105396-007
Matrix: Soil
Client Sample ID: DPT-11 2.1-3.1'

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	17,100	889	D	mg/Kg-dry	100	5/27/2021 5:30:17 PM
Iron	18,600	889	D	mg/Kg-dry	100	5/27/2021 5:30:17 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	9.28	0.500		wt%	1	6/1/2021 2:59:23 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Collection Date: 5/24/2021 3:25:00 PM
Project: 105456
Lab ID: 2105396-008
Matrix: Soil
Client Sample ID: DPT-12 8.6-9.2'

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	16,500	891	D	mg/Kg-dry	100	5/27/2021 5:35:52 PM
Iron	18,200	891	D	mg/Kg-dry	100	5/27/2021 5:35:52 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	9.52	0.500		wt%	1	6/1/2021 2:59:23 PM

Analytical Report

Work Order: **2105396**
Date Reported: **6/11/2021**

Client: Friedman & Bruya
Collection Date: 5/24/2021 3:50:00 PM
Project: 105456
Lab ID: 2105396-009
Matrix: Soil
Client Sample ID: DPT-13 7.2-8.2'

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Metals by EPA Method 6020B				Batch ID: 32448		Analyst: EH
Aluminum	14,700	886	D	mg/Kg-dry	100	5/27/2021 5:41:26 PM
Iron	16,400	886	D	mg/Kg-dry	100	5/27/2021 5:41:26 PM
Sample Moisture (Percent Moisture)				Batch ID: R67631		Analyst: OK
Percent Moisture	9.70	0.500		wt%	1	6/1/2021 2:59:23 PM

Work Order: 2105396
CLIENT: Friedman & Bruya
Project: 105456

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **MB-32507**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **6/1/2021**	RunNo: **67663**
Client ID: **MBLKW**	Batch ID: **32507**		Analysis Date: **6/1/2021**	SeqNo: **1364754**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	0.0800									
Chloride	ND	0.100									

Sample ID: **LCS-32507**	SampType: **LCS**	Units: **mg/L**	Prep Date: **6/1/2021**	RunNo: **67663**
Client ID: **LCSW**	Batch ID: **32507**		Analysis Date: **6/1/2021**	SeqNo: **1364755**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	0.531	0.0800	0.5000	0	106	90	110				
Chloride	0.707	0.100	0.7500	0	94.3	90	110				

Sample ID: **2105395-001AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **6/1/2021**	RunNo: **67663**
Client ID: **BATCH**	Batch ID: **32507**		Analysis Date: **6/1/2021**	SeqNo: **1364758**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	4.96	0.800	5.000	0	99.2	80	120				D
Chloride	18.2	1.00	7.500	10.42	103	80	120				D

Sample ID: **2105395-001AMSD**	SampType: **MSD**	Units: **mg/L**	Prep Date: **6/1/2021**	RunNo: **67663**
Client ID: **BATCH**	Batch ID: **32507**		Analysis Date: **6/1/2021**	SeqNo: **1364759**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	4.89	0.800	5.000	0	97.8	80	120	4.960	1.42	20	D
Chloride	18.0	1.00	7.500	10.42	101	80	120	18.18	0.829	20	D

Work Order: 2105396
CLIENT: Friedman & Bruya
Project: 105456

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **2105420-001ADUP** SampType: **DUP** Units: **mg/L** Prep Date: **6/1/2021** RunNo: **67663**
Client ID: **BATCH** Batch ID: **32507** Analysis Date: **6/2/2021** SeqNo: **1364773**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	8.00						0		20	D
Chloride	90.1	10.0						84.60	6.30	20	D

Sample ID: **2105420-001AMS** SampType: **MS** Units: **mg/L** Prep Date: **6/1/2021** RunNo: **67663**
Client ID: **BATCH** Batch ID: **32507** Analysis Date: **6/2/2021** SeqNo: **1364774**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	47.9	8.00	50.00	0	95.8	80	120				D
Chloride	203	10.0	75.00	84.60	158	80	120				DS

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Work Order: 2105396
CLIENT: Friedman & Bruya
Project: 105456

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID: **MB-32582** SampType: **MBLK** Units: **µg/L** Prep Date: **6/8/2021** RunNo: **67806**
Client ID: **MBLKW** Batch ID: **32582** Analysis Date: **6/9/2021** SeqNo: **1367906**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	100									

Sample ID: **2106098-001EDUP** SampType: **DUP** Units: **µg/L** Prep Date: **6/8/2021** RunNo: **67806**
Client ID: **BATCH** Batch ID: **32582** Analysis Date: **6/9/2021** SeqNo: **1367909**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	100						220.5	86.6	30	R

NOTES:
R - High RPD observed due to low analyte concentration. High RPDs may be expected in this range.

Sample ID: **2106098-001EMS** SampType: **MS** Units: **µg/L** Prep Date: **6/8/2021** RunNo: **67806**
Client ID: **BATCH** Batch ID: **32582** Analysis Date: **6/9/2021** SeqNo: **1367910**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	5,090	100	5,000	220.5	97.4	70	130				

Sample ID: **2106098-001EMSD** SampType: **MSD** Units: **µg/L** Prep Date: **6/8/2021** RunNo: **67806**
Client ID: **BATCH** Batch ID: **32582** Analysis Date: **6/9/2021** SeqNo: **1367911**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	5,430	100	5,000	220.5	104	70	130	5,089	6.56	30	

Sample ID: **LCS-32582** SampType: **LCS** Units: **µg/L** Prep Date: **6/8/2021** RunNo: **67806**
Client ID: **LCSW** Batch ID: **32582** Analysis Date: **6/11/2021** SeqNo: **1369682**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	1,050	100	1,000	0	105	85	115				

Work Order: 2105396
CLIENT: Friedman & Bruya
Project: 105456

QC SUMMARY REPORT

Total Metals by EPA Method 6020B

Sample ID: **MB-32448** SampType: **MBLK** Units: **mg/Kg** Prep Date: **5/26/2021** RunNo: **67547**
Client ID: **MBLKS** Batch ID: **32448** Analysis Date: **5/26/2021** SeqNo: **1362250**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	7.87									
Iron	ND	7.87									

Sample ID: **LCS-32448** SampType: **LCS** Units: **mg/Kg** Prep Date: **5/26/2021** RunNo: **67547**
Client ID: **LCSS** Batch ID: **32448** Analysis Date: **5/26/2021** SeqNo: **1362251**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	415	7.87	393.7	0	105	80	120				
Iron	403	7.87	393.7	0	102	80	120				

Sample ID: **2105343-003AMS** SampType: **MS** Units: **mg/Kg-dry** Prep Date: **5/26/2021** RunNo: **67547**
Client ID: **BATCH** Batch ID: **32448** Analysis Date: **5/26/2021** SeqNo: **1362254**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	15,400	8.20	410.1	16,210	-192	75	125				ES
Iron	24,500	8.20	410.1	24,830	-73.1	75	125				ES

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Sample ID: **2105343-003AMSD** SampType: **MSD** Units: **mg/Kg-dry** Prep Date: **5/26/2021** RunNo: **67547**
Client ID: **BATCH** Batch ID: **32448** Analysis Date: **5/26/2021** SeqNo: **1362255**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	16,800	8.20	410.1	16,210	142	75	125	15,420	8.49	20	ES
Iron	27,100	8.20	410.1	24,830	565	75	125	24,530	10.1	20	ES

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2105396**
Logged by:	**Clare Griggs**	Date Received:	**5/25/2021 2:29:00 PM**

Chain of Custody

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

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
6.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
7.	Were all items received at a temperature of >2°C to 6°C *	Yes ☑	No ☐	NA ☐
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
10.	Are samples properly preserved?	Yes ☑	No ☐	
11.	Was preservative added to bottles?	Yes ☑	No ☐	NA ☐ HNO3 to 001B & 002B
12.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
14.	Does paperwork match bottle labels?	Yes ☑	No ☐	
15.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
16.	Is it clear what analyses were requested?	Yes ☑	No ☐	
17.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Sample	3.8

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

2105316

Page # _____ of _____

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Fremont

PROJECT NAME/NO.	PO #
105456	B-255

REMARKS

Please Email Results

TURNAROUND TIME

☐ Standard TAT

☐ RUSH _____

Rush charges authorized by: _____

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Return samples

☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Chloride / Fluoride	Iron, Aluminum						Notes
DPT-1-0521		5/24/21	935	Water	1				X							
DPT-2-0521			1040	Water	1				X							
DPT-5 0.3-0.9'			1205	Soil	1					X						
DPT-6 1.5-2'			1235	Soil	1					X						
DPT-8 8.2-8.4'			1325	Soil	1					X						
DPT-9 13.2-13.8'			1400	Soil	1					X						
DPT-11 2.1-3.1'			1500	Soil	1					X						
DPT-12 8.6-9.2'			1525	Soil	1					X						
DPT-13 7.2-8.2'			1550	Soil	1					X						

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	D. Wood	Michael Erdahl	Friedman & Bruya	5/25/21	
Received by:	Carter Johnson	Carter Johnson	FAI	5/25/21	1429
Relinquished by:					
Received by:					

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

2105396

Page # _____ of _____

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Fremont

PROJECT NAME/NO. 105456

PO # B-255

REMARKS

Please Email Results

TURNAROUND TIME

☐ Standard TAT

☐ RUSH _____

Rush charges authorized by: _____

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Return samples

☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Chloride / Fluoride	Iron, Aluminum	Aluminum					Notes
DPT-1-0521		5/24/21	935	Water	1				X		X					X = run per ME, Std TAT, 6/7/21 -CG
DPT-2-0521			1040	Water	1				X		X					
DPT-5 0.3-0.9'			1205	Soil	1					X						
DPT-6 1.5-2'			1235	Soil	1					X						
DPT-8 8.2-8.4'			1325	Soil	1					X						
DPT-9 13.2-13.8'			1400	Soil	1					X						
DPT-11 2.1-3.1'			1500	Soil	1					X						
DPT-12 8.6-9.2'			1525	Soil	1					X						
DPT-13 7.2-8.2'			1550	Soil	1					X						

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	D. Wert	Michael Erdahl	Friedman & Bruya	5/25/21	
Received by:	Carter Johnson	Carter Johnson	FAI	5/25/21	1429
Relinquished by:					
Received by:					

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

September 29, 2021

Jamie Stevens, Project Manager
Crete Consulting
108 S. Washington St., Suite 300
Seattle, WA 98104

Dear Ms Stevens:

Included are the additional results from the testing of material submitted on May 25, 2021 from the Maralco, F&BI 105456 project. There are 13 pages included in this report.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Rusty Jones, Grant Hainsworth
CTC0929R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on May 25, 2020 by Friedman & Bruya, Inc. from the Crete Consulting Maralco, F&BI 105456 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
105456 -01	DPT-1 5-6'
105456 -02	DPT-1 6-7'
105456 -03	DPT-1 9-10'
105456 -04	DPT-1-0521
105456 -05	DPT-2 5-6'
105456 -06	DPT-2 6-7.5'
105456 -07	DPT-2 8.5-10'
105456 -08	DPT-2-0521
105456 -09	DPT-3 2.5-3'
105456 -10	DPT-3 4.5'
105456 -11	DPT-3 6.5'
105456 -12	DPT-4 1.5-2.0'
105456 -13	DPT-4 4.5-5'
105456 -14	DPT-4 6.1-7.6'
105456 -15	DPT-5 0.3-0.9'
105456 -16	DPT-5 3.8-4.2'
105456 -17	DPT-5 4.2-5'
105456 -18	DPT-6 1.5-2'
105456 -19	DPT-6 2.6-3.1'
105456 -20	DPT-6 4.3-5'
105456 -21	DPT-7 11.7-12.2'
105456 -22	DPT-7 14.3-15'
105456 -23	DPT-8 8.2-8.4'
105456 -24	DPT-8 9.4-10'
105456 -25	DPT-8 11.7-12.2'
105456 -26	DPT-9 13.2-13.8'
105456 -27	DPT-9 14.5-15'
105456 -28	DPT-11 2.1-3.1'
105456 -29	DPT-11 4.5-5'
105456 -30	DPT-12 8.6-9.2'
105456 -31	DPT-13 7.2-8.2'
105456 -32	DPT-13 9.3-10'
105456 -33	DC-052421

The 1311/6020 analysis was requested outside of the holding time for mercury. The data were flagged accordingly.

All other quality control requirements were acceptable.

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-8 8.2-8.4'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-23
Date Analyzed:	05/26/21	Data File:	105456-23.154
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Barium	54.8
Silver	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-9 13.2-13.8'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-26
Date Analyzed:	05/26/21	Data File:	105456-26.155
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Barium	67.3
Silver	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-12 8.6-9.2'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-30
Date Analyzed:	05/26/21	Data File:	105456-30.157
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Barium	38.2
Cadmium	<1
Lead	5.72
Mercury	<1
Selenium	<1
Silver	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	DPT-12 8.6-9.2'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	105456-30 x5
Date Analyzed:	05/27/21	Data File:	105456-30 x5.098
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<5
Chromium	18.4

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Maralco, F&BI 105456
Date Extracted:	05/26/21	Lab ID:	I1-335 mb
Date Analyzed:	05/26/21	Data File:	I1-335 mb.103
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<1
Barium	<1
Cadmium	<1
Chromium	<1
Lead	<1
Mercury	<1
Selenium	<1
Silver	<1

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	DPT-8 8.2-8.4'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	09/23/21	Lab ID:	105456-23
Date Analyzed:	09/24/21	Data File:	105456-23.086
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1 ht	0.2
Selenium	<1	1.0
Silver	<1	5.0

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	DPT-9 13.2-13.8'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	09/23/21	Lab ID:	105456-26
Date Analyzed:	09/24/21	Data File:	105456-26.089
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1 ht	0.2
Selenium	<1	1.0
Silver	<1	5.0

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	DPT-12 8.6-9.2'	Client:	Crete Consulting
Date Received:	05/25/21	Project:	Maralco, F&BI 105456
Date Extracted:	09/23/21	Lab ID:	105456-30
Date Analyzed:	09/24/21	Data File:	105456-30.090
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1 ht	0.2
Selenium	<1	1.0
Silver	<1	5.0

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Maralco, F&BI 105456
Date Extracted:	09/23/21	Lab ID:	I1-597 mb
Date Analyzed:	09/24/21	Data File:	I1-597 mb.084
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1	0.2
Selenium	<1	1.0
Silver	<1	5.0

Date of Report: 09/29/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 105471-01 x5 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	mg/kg (ppm)	10	19.7	90 b	65 b	75-125	32 b
Barium	mg/kg (ppm)	50	79.0	96 b	73 b	75-125	27 b
Cadmium	mg/kg (ppm)	10	<5	91	92	75-125	1
Chromium	mg/kg (ppm)	50	19.7	90	89	75-125	1
Lead	mg/kg (ppm)	50	588	203 b	0 b	75-125	200 b
Mercury	mg/kg (ppm	5	<5	83	94	75-125	12
Selenium	mg/kg (ppm)	5	<5	85	90	75-125	6
Silver	mg/kg (ppm)	10	<5	92	94	75-125	2

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/kg (ppm)	10	96	80-120
Barium	mg/kg (ppm)	50	94	80-120
Cadmium	mg/kg (ppm)	10	95	80-120
Chromium	mg/kg (ppm)	50	103	80-120
Lead	mg/kg (ppm)	50	96	80-120
Mercury	mg/kg (ppm)	5	100	80-120
Selenium	mg/kg (ppm)	5	94	80-120
Silver	mg/kg (ppm)	10	100	80-120

Date of Report: 09/29/21
Date Received: 05/25/21
Project: Maralco, F&BI 105456

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL/SOLID SAMPLES FOR TCLP METALS USING EPA METHODS 6020B AND 1311

Laboratory Code: 105456-23 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	mg/L (ppm)	1.0	<1	92	89	75-125	3
Barium	mg/L (ppm)	5.0	<1	96	93	75-125	3
Cadmium	mg/L (ppm)	0.5	<1	97	95	75-125	2
Chromium	mg/L (ppm)	2.0	<1	95	95	75-125	0
Lead	mg/L (ppm)	1.0	<1	91	89	75-125	2
Mercury	mg/L (ppm)	1.0	<0.1	103	100	75-125	3
Selenium	mg/L (ppm)	0.5	<1	98	94	75-125	4
Silver	mg/L (ppm)	0.5	<1	88	92	75-125	4

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/L (ppm)	1.0	94	80-120
Barium	mg/L (ppm)	5.0	97	80-120
Cadmium	mg/L (ppm)	0.5	98	80-120
Chromium	mg/L (ppm)	2.0	98	80-120
Lead	mg/L (ppm)	1.0	94	80-120
Mercury	mg/L (ppm)	1.0	103	80-120
Selenium	mg/L (ppm)	0.5	103	80-120
Silver	mg/L (ppm)	0.5	99	80-120

Data Qualifiers & Definitions

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

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

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

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

105456

SAMPLE CHAIN OF CUSTODY

ME 05/25/21

Report To R Jones / G. Hainsworth
Company Crete Consulting, Inc.
Address 108 S. Washington, Ste 300
City, State, ZIP Seattle, WA 98104
Phone _____ Email _____

SAMPLERS (signature) Rusty Jones R Jones
PROJECT NAME: MARALCO
PO #:
REMARKS Metals List: Antimony, Aluminum, Ag, Cd, Chrom, Cobalt, Cu, Pb, Fe, Ni, Manganese, Zn
Project specific RLs? - Yes / No
INVOICE TO:

Page # 1 of 4
TURNAROUND TIME
☒ Standard turnaround
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Archive samples
☐ Other
Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Chlorides / fluoride	Metals (see list)			Notes
DPT-1 5-6'	01 A-F	5/24/21	0905	SOIL	6	X	X	X						●			● - per RS
DPT-1 6-7'	02		0910		6												6/7/21 MC
DPT-1 9-10'	03		0920	↓	6												
DPT-1-0521	04		0935	WATER	6	X	X	X					X	●			w/ + w/ SGC
DPT-2 5-6'	05		1015	SOIL	6												
DPT-2 6-7.5'	06		1020		6	X	X	X				X					
DPT-2 8.5-10'	07		1025	↓	6												
DPT-2-0521	08		1040	WATER	6	X	X	X					X	●			w/ + w/ SGC
DPT-3 2.5-3'	09		1115	SOIL	1												
DPT-3 4.5'	10	↓	1120	↓	1												

ANALYSES REQUESTED

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R Jones	Rusty Jones	CRETE	5.25.21	1026
Received by: [signature]	Liz Webber-Bruya	F:B	5/25/21	1026
Relinquished by:				
Received by:		Samples received at 3°C		

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

105456

SAMPLE CHAIN OF CUSTODY

ME 05/25/21

Page # 2 of 4

Report To See Page 1

Company

Address

City, State, ZIP

Phone Email

SAMPLERS (signature): Rusty Jones R Jones

PROJECT NAME: MARALCO

PO #

REMARKS: Metals List: Sb, Al, As, Cd, Cr, Co, Cu, Fe, Mn, Pb, Ni, Zn
Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME
- [x] Standard turnaround 5d
- [ ] RUSH
- Rush charges authorized by: BJ

SAMPLE DISPOSAL
- [ ] Archive samples
- [ ] Other
- Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Metals (see list)				Notes
DPT-3 6.5'	11	5.24.21	1125	Soil	1												
DPT-4 1.5-2.0'	12		1140		1												
DPT-4 4.5-5'	13		1145		1												
DPT-4 6.1-7.6'	14		1150		1												
DPT-5 0.3-0.9'	15		1205		1												
DPT-5 3.8-4.2'	16		1210		1								X				
DPT-5 4.2-5'	17		1215		1												
DPT-6 1.5-2'	18		1235		1												
DPT-6 2.6-3.1'	19		1240		1								X				
DPT-6 4.3-5'	20	↓	1245	↓	1								●				

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	CRETE	5.25.21	1026
Received by:	Liz Wilcox-Bryce	F?B	5/25/21	1026
Relinquished by:				
Received by:		Samples received at 3 °C		

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Seattle, WA 98119-2029
Ph. (206) 285-8282

105456

SAMPLE CHAIN OF CUSTODY ME 05/25/21

Report To: See Page 1

Company

Address

City, State, ZIP

Phone Email

SAMPLERS (signature) Rusty Jones R. Jones [redacted]

PROJECT NAME: MARALCO

PO #

REMARKS Metals List: Sb, Al, As, Cd, Cr, Co, Cu, Fe, Mn, Pb, Ni, Zn

INVOICE TO

Page # 3 of 4 VIOI

TURNAROUND TIME
X Standard Turnaround
☐ RUSH
Rush charges authorized by: BTY

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Archive Samples
☐ Other

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	Metals (see list)	TCLP RCRA	Barium+Silver	RCRA	Notes
DPT-7 11.7-12.2'	21	5.24.21	1305	Soil	1												(X) per JS 9/22/21 ME
DPT-7 14.3-15'	22		1310		1												
DPT-8 8.2-8.4'	23		1325		1								X	(X)	(X)		
DPT-8 9.4-10'	24		1330		1								●				
DPT-8 11.7-12.2'	25		1335		1												
DPT-9 ~~8.2-8.8~~ 13.2-13.6	26		1400		1								X	(X)	(X)		
DPT-9 ~~9.5-10~~ 14.5-15'	27		1405		1								●				
DPT-11 2.1-3.1'	28		1500		1								X				
DPT-11 4.5-5'	29		1505		1								●				
DPT-12 8.6-9.2'	30	↓	1525	↓	1								X	(X)		(X)	

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Seattle, WA 98119-2029
Ph. (206) 285-8282

SIGNATURE		PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	R. Jones	Rusty Jones	CRETE	5.25.21	1026
Received by:	[signature]	Liz Webber-Bruya	F&B	5/25/21	1026
Relinquished by:					
Received by:			Samples received at 3 °C		

105456

SAMPLE CHAIN OF CUSTODY

ME 05/25/21

Page # 4 of 4

Report To See Page 1

Company

Address

City, State, ZIP

Phone Email

SAMPLERS (signature): Rusty Jones R Jones

PROJECT NAME: MARALCO

PO #

REMARKS: Metals List: Sb, Al, As, Cd, Cr, Co, Cu, Fe, Mn, Pb, Ni, Zn

INVOICE TO

TURNAROUND TIME
- [x] Standard Turnaround
- [ ] RUSH
- Rush charges authorized by:

SAMPLE DISPOSAL
- [ ] Dispose after 30 days
- [ ] Archive Samples
- [ ] Other

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	Metals (see list)	DOT 4.3	Dangerous when wet	TCLP RCRA	Notes
DPT-13 7.2-8.2'	31	5/24/21	1550	Soil	1								X				
DPT-13 9.3-10'	32	↓	1555	↓	1								●				
DC-052421	33 A-D	5/24/21	1600	Soil	4										(X)	R	Added at lab (NP) 5/25/21
																	(Y) per RS 6/3/21 MR

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R Jones	Rusty Jones	CRETE	5.25.21	1026
Received by: D.M.B	Liz Webber-Bruya	FBB	5/25/21	1026
Relinquished by:				
Received by:		Samples received at 3 °C		

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FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

3012 16th Avenue West
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fbi@isomedia.com
www.friedmanandbruya.com

June 11, 2021

Grant Hainsworth, Project Manager
Crete Consulting
16300 Christensen Road, Suite 214
Tukwila, WA 98188

Dear Mr Hainsworth:

Included are the results from the testing of material submitted on June 3, 2021 from the Maralco Kent WA, F&BI 106055 project. There are 25 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Rusty Jones, James Stevens
CTC0611R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on June 3, 2021 by Friedman & Bruya, Inc. from the Crete Consulting Maralco Kent WA, F&BI 106055 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
106055 -01	MW5A-0621
106055 -02	MW4A-0621
106055 -03	MW6-0621
106055 -04	MW3A-0621
106055 -05	Dup-0621
106055 -06	Sed-01-0621

The samples were sent to Fremont for fluoride, chloride, and aluminum testing. In addition, sample Sed-01-0621 was sent to Fremont for iron testing. The report will be forwarded upon receipt.

All quality control requirements were acceptable.

Date of Report: 06/11/21
Date Received: 06/03/21
Project: Maralco Kent WA, F&BI 106055
Date Extracted: 06/09/21
Date Analyzed: 06/09/21

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE USING METHOD NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Gasoline Range	Surrogate (% Recovery) (Limit 51-134)
MW4A-0621 106055-02	<100	107
MW6-0621 106055-03	<100	109
Dup-0621 106055-05	<100	107
Method Blank 01-1298 MB	<100	109

Date of Report: 06/11/21
Date Received: 06/03/21
Project: Maralco Kent WA, F&BI 106055
Date Extracted: 06/04/21
Date Analyzed: 06/07/21

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx
Sample Extracts Passed Through a Silica Gel Column Prior to Analysis
Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 47-140)
MW4A-0621 106055-02	<50	<250	122
MW6-0621 106055-03	<50	<250	110
Dup-0621 106055-05	<50	<250	119
Method Blank 01-1351 MB2	<50	<250	114

Date of Report: 06/11/21
Date Received: 06/03/21
Project: Maralco Kent WA, F&BI 106055
Date Extracted: 06/04/21
Date Analyzed: 06/04/21

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
MW4A-0621 106055-02	200 x	<250	95
MW6-0621 106055-03	<50	<250	83
Dup-0621 106055-05	210 x	<250	87
Method Blank 01-1351 MB2	<50	<250	94

Analysis For Total Metals By EPA Method 6020B

Client ID:	Sed-01-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-06
Date Analyzed:	06/04/21	Data File:	106055-06.115
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	8.79
Arsenic	4.32
Cadmium	5.37
Chromium	68.4
Cobalt	6.10
Copper	627
Lead	158
Manganese	193
Nickel	35.1

Analysis For Total Metals By EPA Method 6020B

Client ID:	Sed-01-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-06 x10
Date Analyzed:	06/07/21	Data File:	106055-06 x10.108
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Zinc	957

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	NA	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	I1-352 mb
Date Analyzed:	06/04/21	Data File:	I1-352 mb.082
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Arsenic	<1
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	<5
Lead	<1
Manganese	<1
Nickel	<1
Zinc	<5

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW5A-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-01
Date Analyzed:	06/04/21	Data File:	106055-01.113
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Lead	53.7

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW5A-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-01 x2
Date Analyzed:	06/07/21	Data File:	106055-01 x2.109
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Antimony	<4
Arsenic	60.5
Cadmium	4.60

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW5A-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-01 x10
Date Analyzed:	06/04/21	Data File:	106055-01 x10.112
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Antimony	<20
Arsenic	73.2
Cadmium	<10
Chromium	98.6
Cobalt	34.6
Copper	589
Manganese	2,510
Nickel	76.7
Zinc	431

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW5A-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-01 x100
Date Analyzed:	06/07/21	Data File:	106055-01 x100.110
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	157,000

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW4A-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-02
Date Analyzed:	06/04/21	Data File:	106055-02.122
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Antimony	<2
Arsenic	9.45
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	8.56
Lead	<1
Nickel	1.06
Zinc	<5

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW4A-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-02 x100
Date Analyzed:	06/07/21	Data File:	106055-02 x100.111
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	62,900
Manganese	2,660

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW6-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-03
Date Analyzed:	06/04/21	Data File:	106055-03.123
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Antimony	<2
Arsenic	18.3
Cadmium	<1
Chromium	2.13
Cobalt	2.77
Copper	19.0
Lead	<1
Nickel	2.71
Zinc	<5

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW6-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-03 x100
Date Analyzed:	06/07/21	Data File:	106055-03 x100.113
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	47,700
Manganese	1,590

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW3A-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-04
Date Analyzed:	06/04/21	Data File:	106055-04.124
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Antimony	<2
Arsenic	<1
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	6.73
Iron	304
Lead	<1
Manganese	37.5
Nickel	<1
Zinc	<5

Analysis For Total Metals By EPA Method 6020B

Client ID:	Dup-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-05
Date Analyzed:	06/04/21	Data File:	106055-05.125
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Antimony	<2
Arsenic	9.37
Cadmium	<1
Chromium	1.01
Cobalt	<1
Copper	9.51
Lead	<1
Nickel	1.06
Zinc	<5

Analysis For Total Metals By EPA Method 6020B

Client ID:	Dup-0621	Client:	Crete Consulting
Date Received:	06/03/21	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	106055-05 x100
Date Analyzed:	06/07/21	Data File:	106055-05 x100.114
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	64,500
Manganese	2,750

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	NA	Project:	Maralco Kent WA, F&BI 106055
Date Extracted:	06/04/21	Lab ID:	I1-351 mb2
Date Analyzed:	06/04/21	Data File:	I1-351 mb2.111
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Antimony	<2
Arsenic	<1
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	<5
Iron	<50
Lead	<1
Manganese	<1
Nickel	<1
Zinc	<5

Date of Report: 06/11/21
Date Received: 06/03/21
Project: Maralco Kent WA, F&BI 106055

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TPH AS GASOLINE USING METHOD NWTPH-Gx

Laboratory Code: 106093-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Gasoline	ug/L (ppb)	1,000	97	69-134

Date of Report: 06/11/21
Date Received: 06/03/21
Project: Maralco Kent WA, F&BI 106055

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample Silica Gel

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	116	124	61-133	7

Date of Report: 06/11/21
Date Received: 06/03/21
Project: Maralco Kent WA, F&BI 106055

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	100	112	63-142	11

Date of Report: 06/11/21
Date Received: 06/03/21
Project: Maralco Kent WA, F&BI 106055

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 106058-01 x5 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/kg (ppm)	20	<5	100	95	75-125	5
Arsenic	mg/kg (ppm)	10	<5	97	93	75-125	4
Cadmium	mg/kg (ppm)	10	<5	102	99	75-125	3
Chromium	mg/kg (ppm)	50	16.9	96	98	75-125	2
Cobalt	mg/kg (ppm)	20	6.52	92	89	75-125	3
Copper	mg/kg (ppm)	50	<25	97	93	75-125	4
Lead	mg/kg (ppm)	50	<5	91	88	75-125	3
Manganese	mg/kg (ppm	20	264	28 b	154 b	75-125	138 b
Nickel	mg/kg (ppm)	25	19.2	94	99	75-125	5
Zinc	mg/kg (ppm)	50	<25	89	90	75-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	mg/kg (ppm)	20	99	80-120
Arsenic	mg/kg (ppm)	10	93	80-120
Cadmium	mg/kg (ppm)	10	99	80-120
Chromium	mg/kg (ppm)	50	110	80-120
Cobalt	mg/kg (ppm)	20	94	80-120
Copper	mg/kg (ppm)	50	99	80-120
Lead	mg/kg (ppm)	50	93	80-120
Manganese	mg/kg (ppm)	20	97	80-120
Nickel	mg/kg (ppm)	25	99	80-120
Zinc	mg/kg (ppm)	50	90	80-120

Date of Report: 06/11/21
Date Received: 06/03/21
Project: Maralco Kent WA, F&BI 106055

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 106052-01 x10 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	ug/L (ppb)	20	<20	85	80	75-125	6
Arsenic	ug/L (ppb)	10	<10	93	89	75-125	4
Cadmium	ug/L (ppb)	5	<10	96	94	75-125	2
Chromium	ug/L (ppb)	20	<10	95	92	75-125	3
Cobalt	ug/L (ppb)	20	<10	92	90	75-125	2
Copper	ug/L (ppb)	20	<50	98	96	75-125	2
Iron	ug/L (ppb)	100	5,110	180 b	218 b	75-125	19
Lead	ug/L (ppb)	10	<10	98	95	75-125	3
Manganese	ug/L (ppb)	20	480	66 b	31 b	75-125	72 b
Nickel	ug/L (ppb)	20	<10	96	93	75-125	3
Zinc	ug/L (ppb)	50	<50	89	87	75-125	2

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	ug/L (ppb)	20	102	80-120
Arsenic	ug/L (ppb)	10	95	80-120
Cadmium	ug/L (ppb)	5	97	80-120
Chromium	ug/L (ppb)	20	94	80-120
Cobalt	ug/L (ppb)	20	95	80-120
Copper	ug/L (ppb)	20	98	80-120
Iron	ug/L (ppb)	100	95	80-120
Lead	ug/L (ppb)	10	96	80-120
Manganese	ug/L (ppb)	20	91	80-120
Nickel	ug/L (ppb)	20	96	80-120
Zinc	ug/L (ppb)	50	90	80-120

Data Qualifiers & Definitions

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

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

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

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

106055

SAMPLE CHAIN OF CUSTODY

06-03-21 AI2/EO3/VW1

Page # 1 of 1

Report To R. Jones, G. Hainsworth

Company Crete Consulting, Inc.

Address

City, State, ZIP

Phone Email

SAMPLERS (signature) Rusty Jones R. Jones

PROJECT NAME: MARALCO, Kent, WA

PO #

REMARKS Metals List: Sb, Al, As, Cd, Cr, Co, Cu, Fe, Mn, Pb, Ni, Zn

Project specific RLs? - Yes / No

INVOICE TO

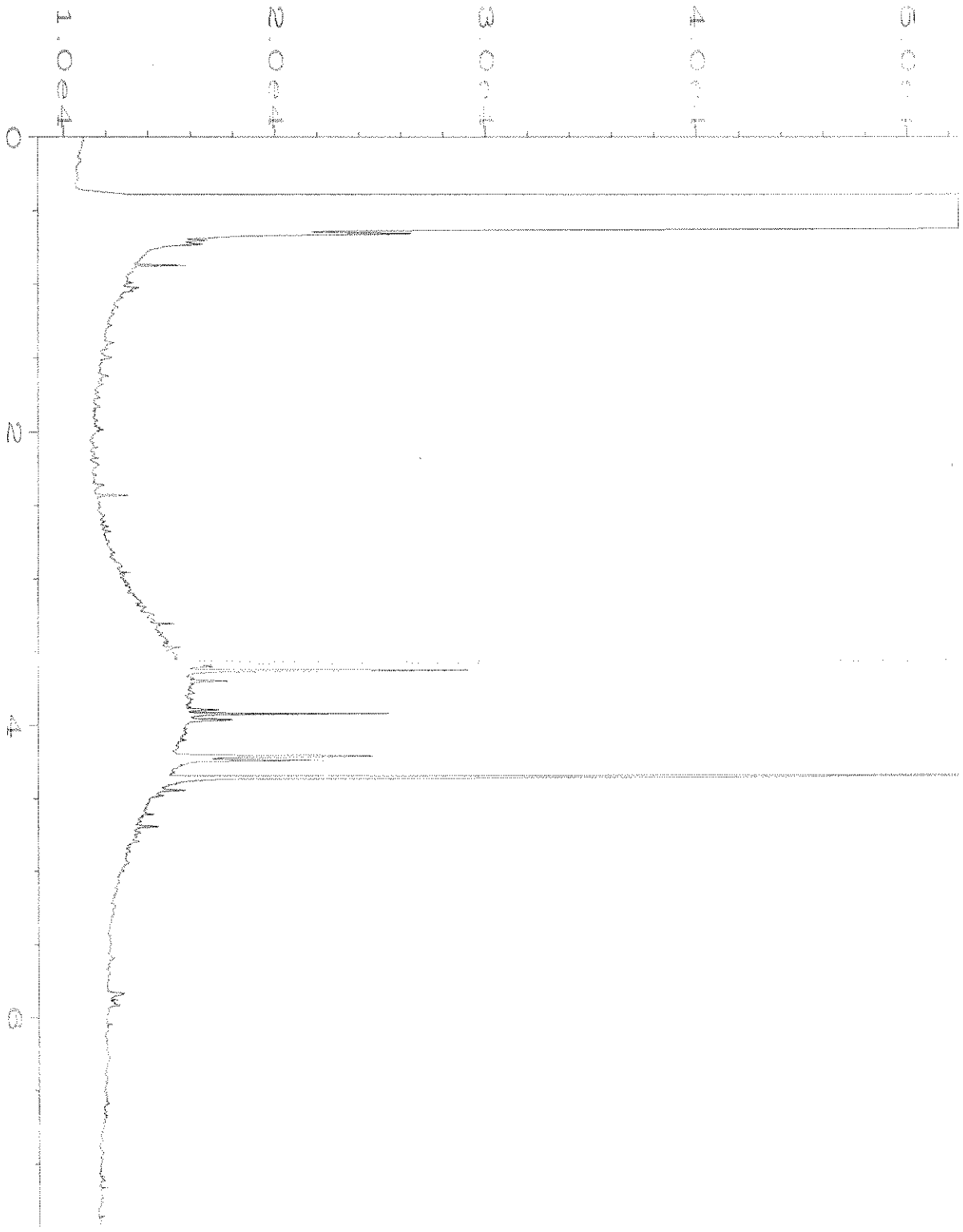
TURNAROUND TIME
- [x] Standard turnaround
- [ ] RUSH
- Rush charges authorized by:

SAMPLE DISPOSAL
- [ ] Archive samples
- [ ] Other
- Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	METALS (see List)	Cl- FI-			Notes
MW5A-0621	01 A-C	6.3.2021	0840	WATER	3								X	X			
MW4A-0621	02 A-G		0945		7	X	X						X	X			with & without SGC
MW6-0621	03 A-G		1116		7	X	X						X	X			↓ ↓
MW3A-0621	04 A-C		1214		3								X	X			
DUP-0621	05 A-G		0800	↓	7	X	X						X	X			with & without SGC
SED-01-0621	06 A-C	↓	1345	SOIL	3								X	X			
																	Samples received at 3 °C

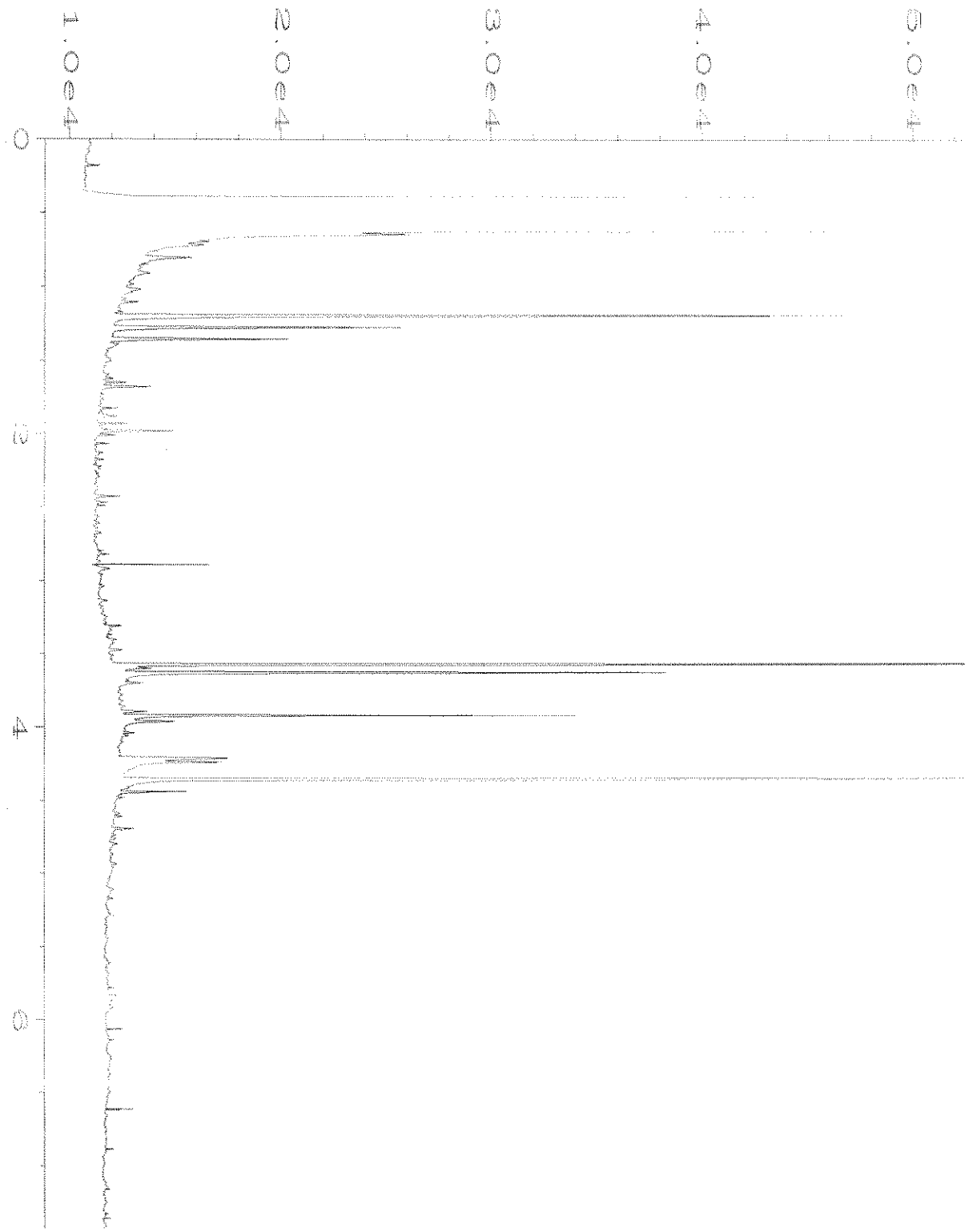
SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	Crete Consulting	6.3.21	1543
~~Received by:~~ Michael Erdahl	Michael Erdahl	F1, Bruya	6-3-21	1543
Relinquished by:				
Received by:				

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



Data File Name : C:\HPCHEM\1\DATA\06-04-21\009F0301.D
Operator : TL
Instrument : GC1
Sample Name : 106055-02
Run Time Bar Code:
Acquired on : 04 Jun 21 10:59 AM
Report Created on: 07 Jun 21 09:29 AM

Page Number : 1
Vial Number : 9
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



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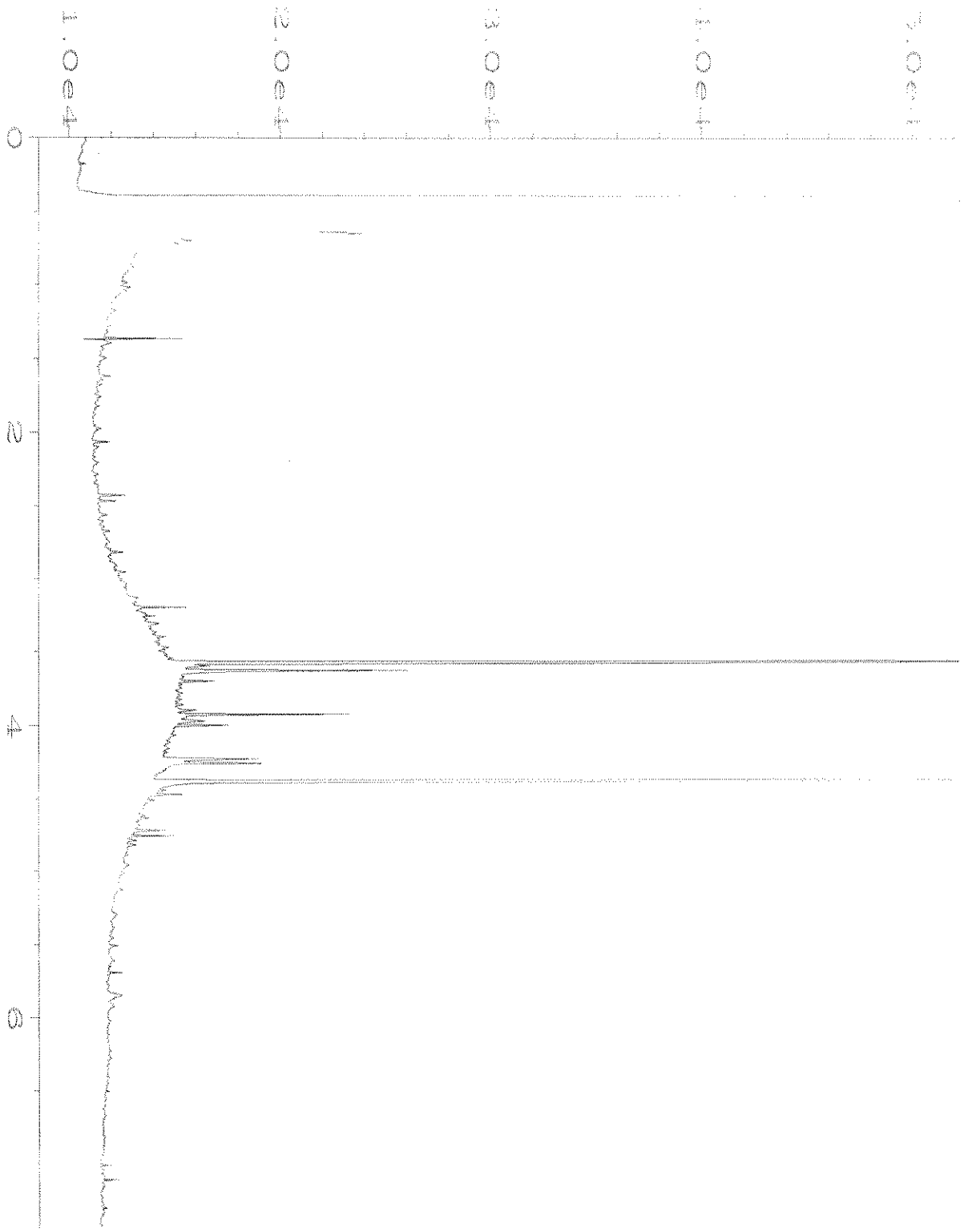
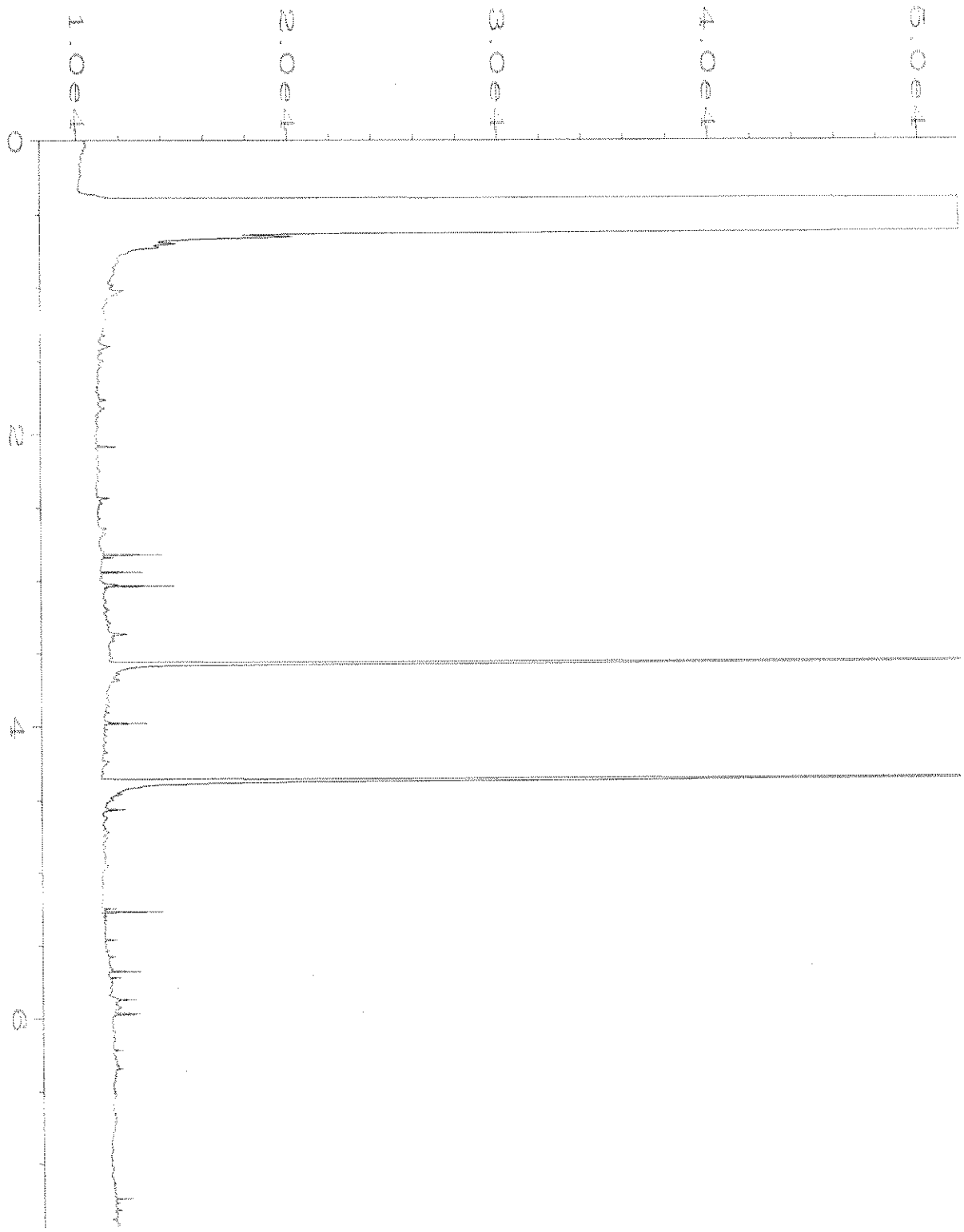
Operator : TL
Instrument : GC1
Sample Name : 106055-03
Run Time Bar Code:
Acquired on : 04 Jun 21 11:10 AM
Report Created on: 07 Jun 21 09:29 AM

Page Number : 1
Vial Number : 10
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\1\DATA\06-04-21\011F0301.D
Operator : TL
Instrument : GC1
Sample Name : 106055-05
Run Time Bar Code:
Acquired on : 04 Jun 21 11:22 AM
Report Created on: 07 Jun 21 09:29 AM

Page Number : 1
Vial Number : 11
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



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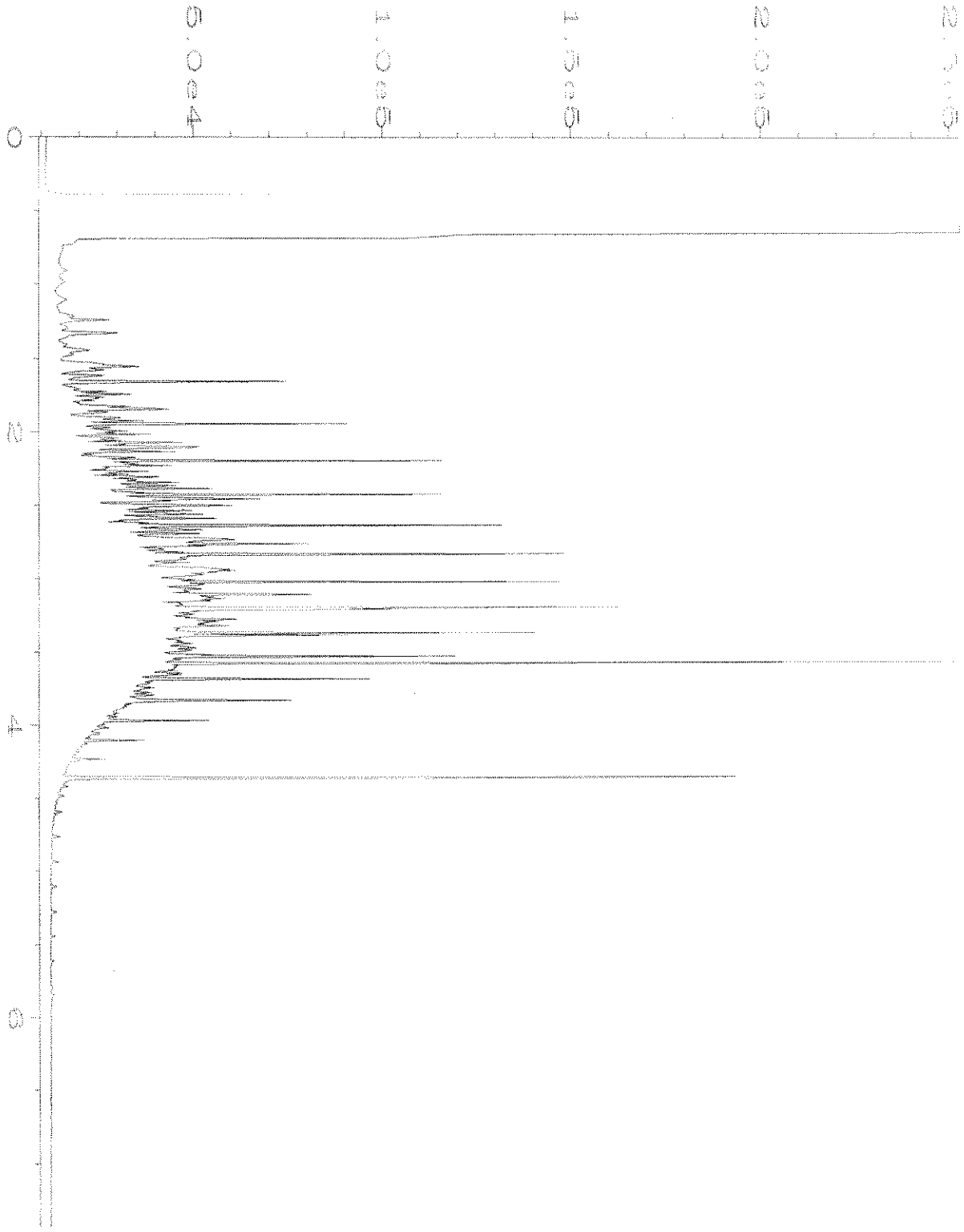
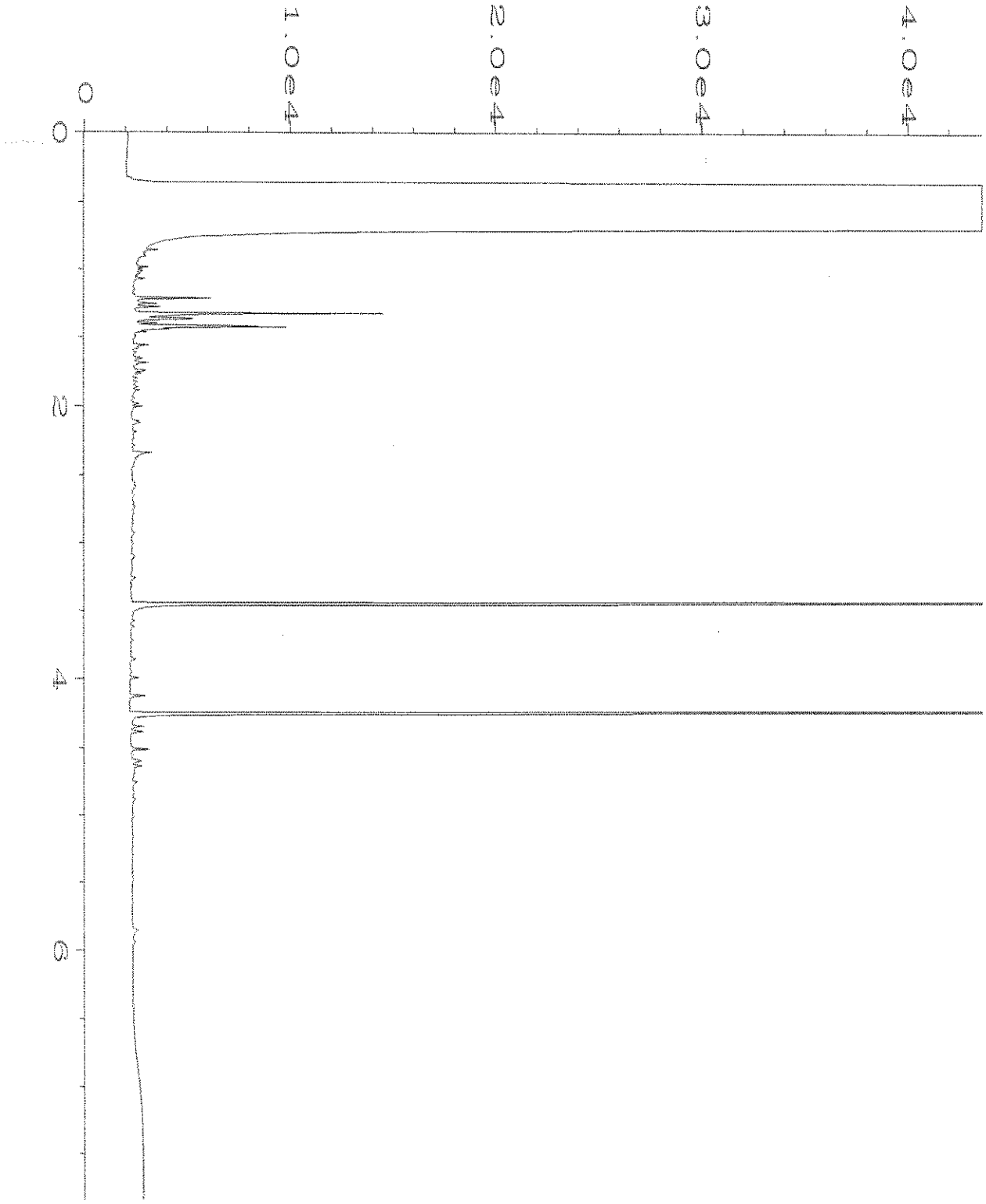
Operator : TL
Instrument : GC1
Sample Name : 01-1351 mb2
Run Time Bar Code:
Acquired on : 04 Jun 21 10:26 AM
Report Created on: 07 Jun 21 09:29 AM

Page Number : 1
Vial Number : 6
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\1\DATA\06-04-21\003F0201.D
Operator : TL
Instrument : GC1
Sample Name : 500 Dx 62-142D
Run Time Bar Code:
Acquired on : 04 Jun 21 05:47 AM
Report Created on: 07 Jun 21 09:29 AM

Page Number : 1
Vial Number : 3
Injection Number : 1
Sequence Line : 2
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



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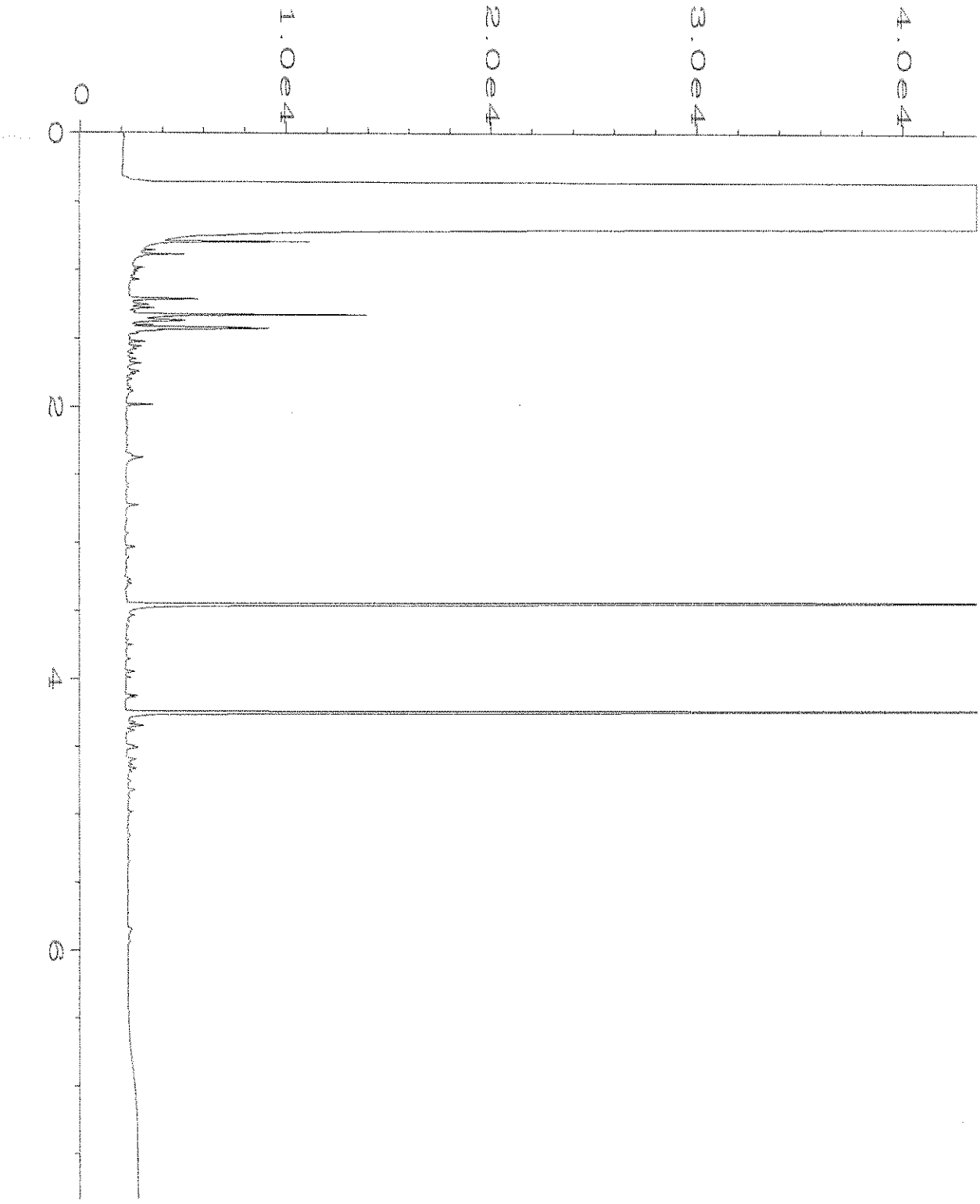
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 25
Sample Name	: 106055-02 sg	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 4
Acquired on	: 07 Jun 21 12:49 PM	Instrument Method	: DX.MTH
Report Created on	: 08 Jun 21 09:12 AM	Analysis Method	: DEFAULT.MTH



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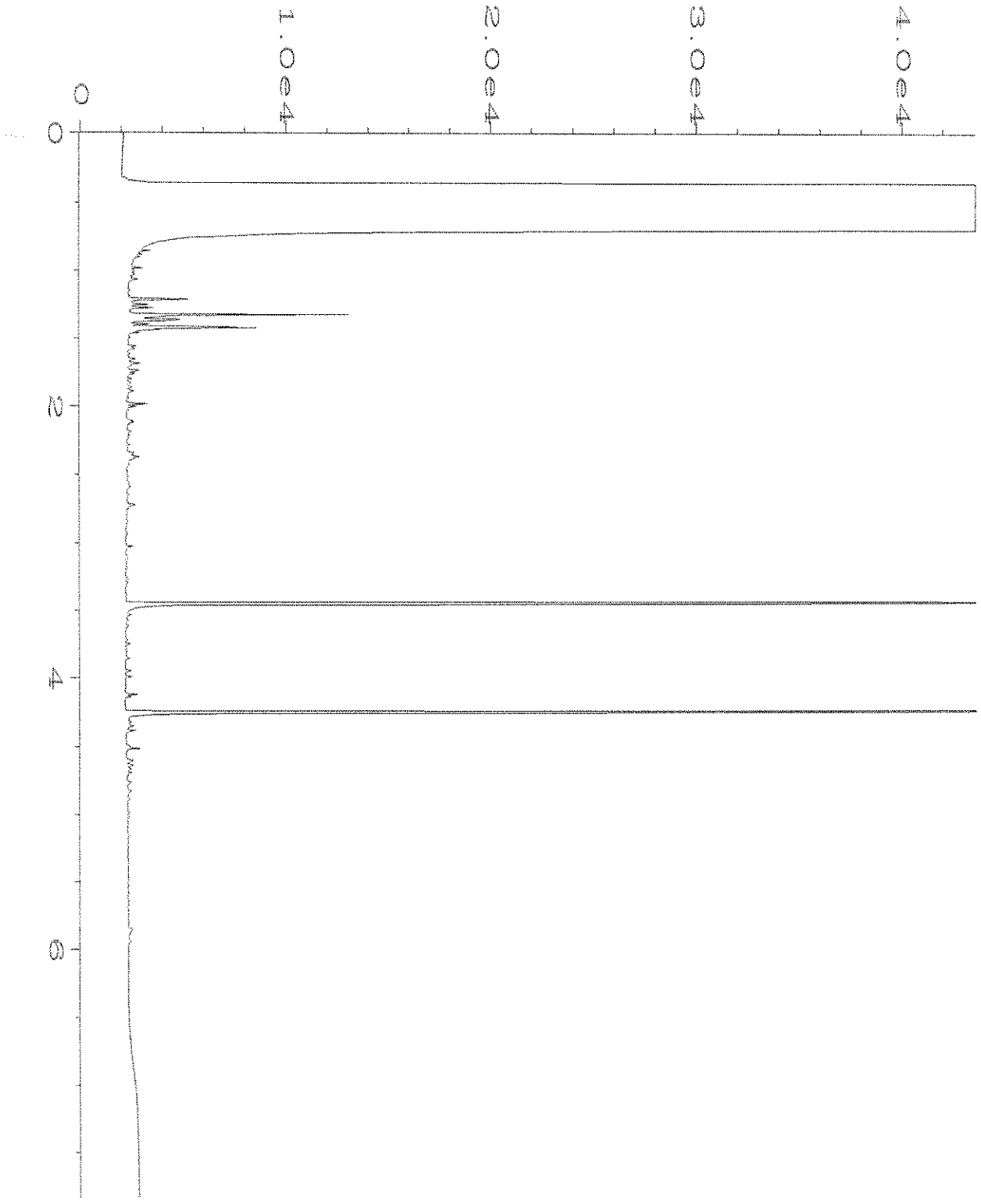
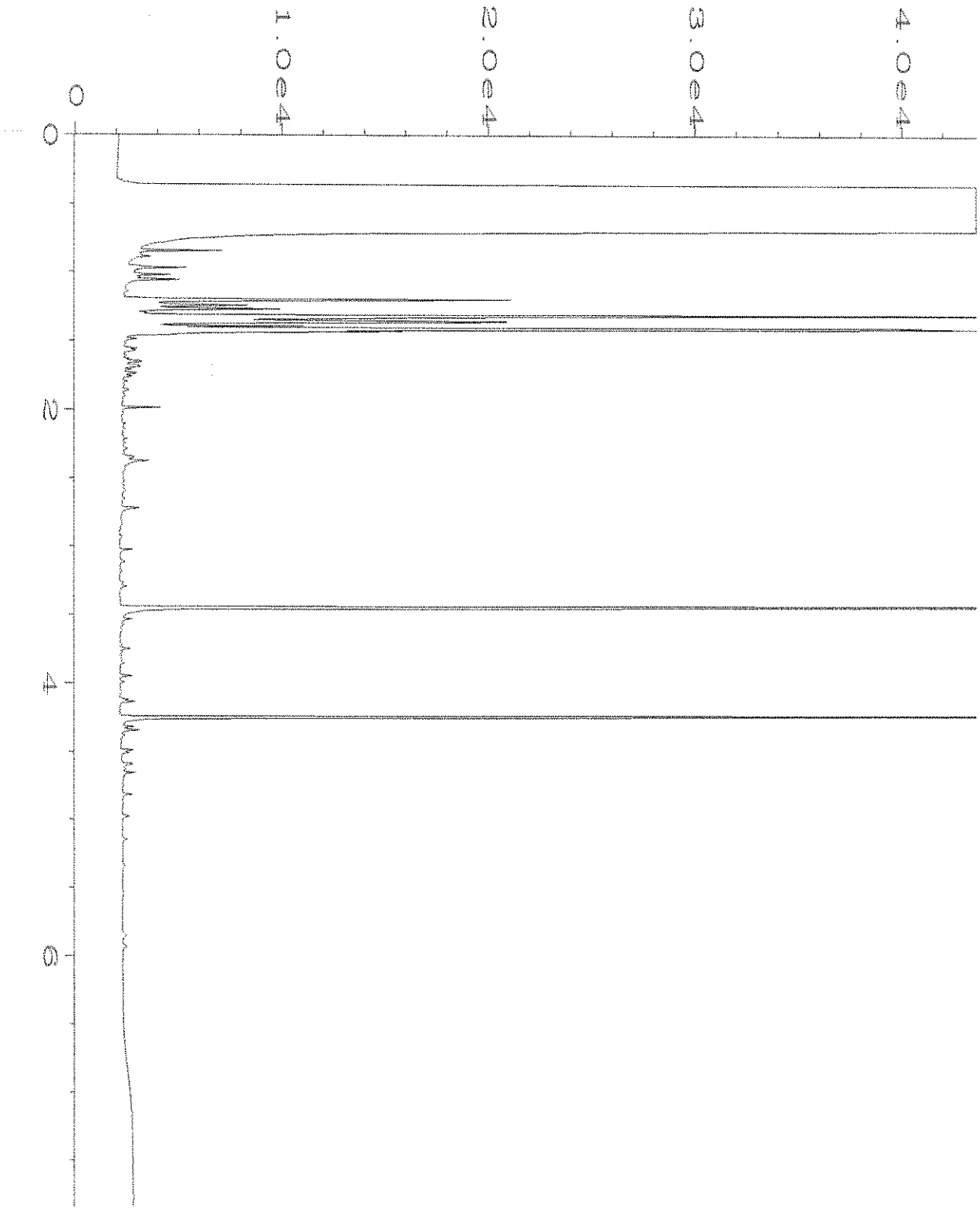
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 26
Sample Name	: 106055-03 sg	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 4
Acquired on	: 07 Jun 21 01:01 PM	Instrument Method	: DX.MTH
Report Created on:	08 Jun 21 09:12 AM	Analysis Method	: DEFAULT.MTH



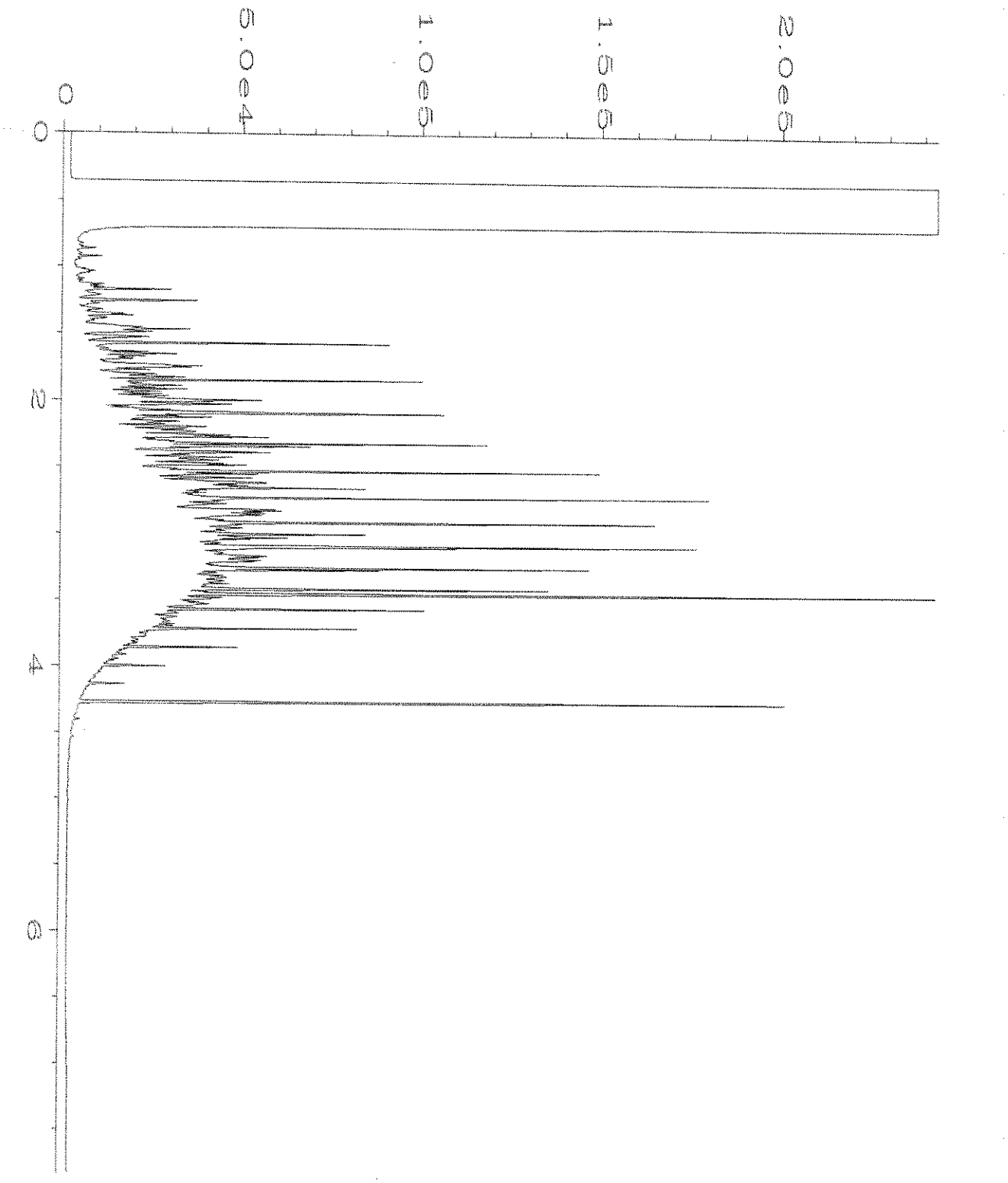
Data File Name : C:\HPCHEM\4\DATA\06-07-21\027F0401.D
Operator : TL
Instrument : GC#4
Sample Name : 106055-05 sg
Run Time Bar Code:
Acquired on : 07 Jun 21 01:14 PM
Report Created on: 08 Jun 21 09:12 AM

Page Number : 1
Vial Number : 27
Injection Number : 1
Sequence Line : 4
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\4\DATA\06-07-21\022F0401.D
Operator : TL
Instrument : GC#4
Sample Name : 01-1355 mb2 sg
Run Time Bar Code:
Acquired on : 07 Jun 21 12:11 PM
Report Created on: 08 Jun 21 09:12 AM

Page Number : 1
Vial Number : 22
Injection Number : 1
Sequence Line : 4
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



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Operator : TL
Instrument : GC#4
Sample Name : 500 Dx 62-142D
Run Time Bar Code:
Acquired on : 07 Jun 21 03:39 PM
Report Created on: 08 Jun 21 09:13 AM

Page Number : 1
Vial Number : 3
Injection Number : 1
Sequence Line : 7
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

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

RE: 106055
Work Order Number: 2106075

June 11, 2021

Attention Michael Erdahl:

Fremont Analytical, Inc. received 6 sample(s) on 6/4/2021 for the analyses presented in the following report.

Ion Chromatography by EPA Method 300.0
Sample Moisture (Percent Moisture)
Total Metals by EPA Method 200.8
Total Metals by EPA Method 6020B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

CC:
Grant Hainsworth
Rusty Jones

Date: *06/11/2021*

CLIENT: Friedman & Bruya
Project: 106055
Work Order: 2106075

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2106075-001	MW5A-0621	06/03/2021 8:40 AM	06/04/2021 2:45 PM
2106075-002	MW4A-0621	06/03/2021 9:45 AM	06/04/2021 2:45 PM
2106075-003	MW6-0621	06/03/2021 11:16 AM	06/04/2021 2:45 PM
2106075-004	MW3A-0621	06/03/2021 12:14 PM	06/04/2021 2:45 PM
2106075-005	DUP-0621	06/03/2021 8:00 AM	06/04/2021 2:45 PM
2106075-006	SED-1-0621	06/03/2021 1:45 PM	06/04/2021 2:45 PM

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

Original

Case Narrative

WO#: **2106075**
Date: **6/11/2021**

CLIENT: Friedman & Bruya
Project: 106055

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

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

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

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

Qualifiers:

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

Acronyms:

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

CLIENT: Friedman & Bruya
Project: 106055

Lab ID: 2106075-001 **Collection Date:** 6/3/2021 8:40:00 AM
Client Sample ID: **MW5A-0621** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32597		Analyst: SS
Fluoride	1.92	0.800	D	mg/L	10	6/8/2021 7:28:00 PM
Chloride	81.3	5.00	D	mg/L	50	6/9/2021 10:31:00 AM
Total Metals by EPA Method 200.8				Batch ID: 32572		Analyst: EH
Aluminum	32,200	1,000	D	µg/L	10	6/10/2021 4:15:30 PM

Lab ID: 2106075-002 **Collection Date:** 6/3/2021 9:45:00 AM
Client Sample ID: **MW4A-0621** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32597		Analyst: SS
Fluoride	ND	0.800	D	mg/L	10	6/8/2021 7:51:00 PM
Chloride	275	20.0	D	mg/L	200	6/9/2021 10:54:00 AM
Total Metals by EPA Method 200.8				Batch ID: 32572		Analyst: EH
Aluminum	ND	100		µg/L	1	6/9/2021 10:34:34 PM

Lab ID: 2106075-003 **Collection Date:** 6/3/2021 11:16:00 AM
Client Sample ID: **MW6-0621** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32597		Analyst: SS
Fluoride	16.0	0.800	D	mg/L	10	6/8/2021 9:01:00 PM
Chloride	207	10.0	D	mg/L	100	6/9/2021 11:17:00 AM
Total Metals by EPA Method 200.8				Batch ID: 32598		Analyst: EH
Aluminum	273	100		µg/L	1	6/10/2021 8:21:21 PM

CLIENT: Friedman & Bruya
Project: 106055

Lab ID: 2106075-004 **Collection Date:** 6/3/2021 12:14:00 PM
Client Sample ID: **MW3A-0621** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32597		Analyst: SS
Fluoride	19.8	1.60	D	mg/L	20	6/9/2021 11:40:00 AM
Chloride	14.2	1.00	D	mg/L	10	6/8/2021 9:24:00 PM
Total Metals by EPA Method 200.8				Batch ID: 32572		Analyst: EH
Aluminum	2,160	100		µg/L	1	6/11/2021 12:11:41 PM

Lab ID: 2106075-005 **Collection Date:** 6/3/2021 8:00:00 AM
Client Sample ID: **DUP-0621** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32597		Analyst: SS
Fluoride	ND	0.800	D	mg/L	10	6/8/2021 9:47:00 PM
Chloride	280	20.0	D	mg/L	200	6/9/2021 12:04:00 PM

NOTES:
Diluted due to matrix.

Total Metals by EPA Method 200.8				Batch ID: 32572		Analyst: EH
Aluminum	ND	100		µg/L	1	6/10/2021 2:07:54 AM

Analytical Report

Work Order: **2106075**
Date Reported: **6/11/2021**

CLIENT: Friedman & Bruya
Project: 106055

Lab ID: 2106075-006 **Collection Date:** 6/3/2021 1:45:00 PM
Client Sample ID: **SED-1-0621** **Matrix:** Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32615		Analyst: SS
Fluoride	45.1	2.10		mg/Kg-dry	1	6/11/2021 10:56:00 AM
Chloride	49.4	4.59		mg/Kg-dry	1	6/10/2021 6:20:00 PM
Total Metals by EPA Method 6020B				Batch ID: 32565		Analyst: EH
Aluminum	46,900	411	D	mg/Kg-dry	20	6/10/2021 4:55:13 PM
Iron	12,200	411	D	mg/Kg-dry	20	6/8/2021 7:28:22 PM
Sample Moisture (Percent Moisture)				Batch ID: R67761		Analyst: OK
Percent Moisture	61.9	0.500		wt%	1	6/7/2021 3:56:29 PM

Work Order: 2106075
CLIENT: Friedman & Bruya
Project: 106055

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **MB-32597**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **6/8/2021**	RunNo: **67812**
Client ID: **MBLKW**	Batch ID: **32597**		Analysis Date: **6/8/2021**	SeqNo: **1368031**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	0.0800									
Chloride	ND	0.100									

Sample ID: **LCS-32597**	SampType: **LCS**	Units: **mg/L**	Prep Date: **6/8/2021**	RunNo: **67812**
Client ID: **LCSW**	Batch ID: **32597**		Analysis Date: **6/8/2021**	SeqNo: **1368032**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	0.524	0.0800	0.5000	0	105	90	110				
Chloride	0.712	0.100	0.7500	0	94.9	90	110				

Sample ID: **2106016-002ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **6/8/2021**	RunNo: **67812**
Client ID: **BATCH**	Batch ID: **32597**		Analysis Date: **6/8/2021**	SeqNo: **1368035**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	1.62	0.160						1.644	1.22	20	D
Chloride	9.20	0.200						9.098	1.14	20	DE

Sample ID: **2106016-002AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **6/8/2021**	RunNo: **67812**
Client ID: **BATCH**	Batch ID: **32597**		Analysis Date: **6/8/2021**	SeqNo: **1368036**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	2.70	0.160	1.000	1.644	106	80	120				D
Chloride	10.9	0.200	1.500	9.098	120	80	120				DE

Work Order: 2106075
CLIENT: Friedman & Bruya
Project: 106055

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **2106016-002AMSD** SampType: **MSD** Units: **mg/L** Prep Date: **6/8/2021** RunNo: **67812**
Client ID: **BATCH** Batch ID: **32597** Analysis Date: **6/8/2021** SeqNo: **1368037**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	2.71	0.160	1.000	1.644	106	80	120	2.702	0.148	20	D
Chloride	10.9	0.200	1.500	9.098	121	80	120	10.90	0.165	20	DES

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Sample ID: **2106088-001BDUP** SampType: **DUP** Units: **mg/L** Prep Date: **6/8/2021** RunNo: **67812**
Client ID: **BATCH** Batch ID: **32597** Analysis Date: **6/8/2021** SeqNo: **1368046**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	0.0800						0		20	
Chloride	1.36	0.100						1.360	0.147	20	

Sample ID: **2106088-001BMS** SampType: **MS** Units: **mg/L** Prep Date: **6/8/2021** RunNo: **67812**
Client ID: **BATCH** Batch ID: **32597** Analysis Date: **6/8/2021** SeqNo: **1368047**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	0.497	0.0800	0.5000	0.06200	87.0	80	120				
Chloride	2.14	0.100	0.7500	1.360	103	80	120				

Work Order: 2106075
CLIENT: Friedman & Bruya
Project: 106055

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **MB-32615**	SampType: **MBLK**	Units: **mg/Kg**	Prep Date: **6/10/2021**	RunNo: **67872**
Client ID: **MBLKS**	Batch ID: **32615**		Analysis Date: **6/10/2021**	SeqNo: **1369479**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	0.800									
Chloride	ND	1.75									

Sample ID: **LCS-32615**	SampType: **LCS**	Units: **mg/Kg**	Prep Date: **6/10/2021**	RunNo: **67872**
Client ID: **LCSS**	Batch ID: **32615**		Analysis Date: **6/10/2021**	SeqNo: **1369480**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	5.12	0.800	5.000	0	102	90	110				
Chloride	7.28	1.75	7.500	0	97.1	90	110				

Sample ID: **2106075-006ADUP**	SampType: **DUP**	Units: **mg/Kg-dry**	Prep Date: **6/10/2021**	RunNo: **67872**
Client ID: **SED-1-0621**	Batch ID: **32615**		Analysis Date: **6/10/2021**	SeqNo: **1369482**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	92.1	2.10						90.64	1.65	30	E
Chloride	49.2	4.60						49.36	0.347	30	

Sample ID: **2106075-006AMS**	SampType: **MS**	Units: **mg/Kg-dry**	Prep Date: **6/10/2021**	RunNo: **67872**
Client ID: **SED-1-0621**	Batch ID: **32615**		Analysis Date: **6/10/2021**	SeqNo: **1369483**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	93.0	2.10	13.16	90.64	18.0	80	120				SE
Chloride	72.6	4.60	19.73	49.36	118	80	120				

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Work Order: 2106075
CLIENT: Friedman & Bruya
Project: 106055

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **2106075-006AMSD** SampType: **MSD** Units: **mg/Kg-dry** Prep Date: **6/10/2021** RunNo: **67872**
Client ID: **SED-1-0621** Batch ID: **32615** Analysis Date: **6/10/2021** SeqNo: **1369484**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	97.5	2.10	13.11	90.64	52.0	80	120	93.01	4.68	30	SE
Chloride	69.1	4.59	19.67	49.36	101	80	120	72.59	4.87	30	

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Work Order: 2106075
CLIENT: Friedman & Bruya
Project: 106055

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID: **MB-32572** SampType: **MBLK** Units: **µg/L** Prep Date: **6/7/2021** RunNo: **67824**
Client ID: **MBLKW** Batch ID: **32572** Analysis Date: **6/9/2021** SeqNo: **1368411**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	100									

Sample ID: **2106075-002BDUP** SampType: **DUP** Units: **µg/L** Prep Date: **6/7/2021** RunNo: **67824**
Client ID: **MW4A-0621** Batch ID: **32572** Analysis Date: **6/9/2021** SeqNo: **1368416**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	100						0		30	

Sample ID: **2106075-002BMS** SampType: **MS** Units: **µg/L** Prep Date: **6/7/2021** RunNo: **67824**
Client ID: **MW4A-0621** Batch ID: **32572** Analysis Date: **6/10/2021** SeqNo: **1368419**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	6,540	100	5,000	33.75	130	70	130				

Sample ID: **2106075-002BMSD** SampType: **MSD** Units: **µg/L** Prep Date: **6/7/2021** RunNo: **67824**
Client ID: **MW4A-0621** Batch ID: **32572** Analysis Date: **6/10/2021** SeqNo: **1368420**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	7,130	100	5,000	33.75	142	70	130	6,544	8.57	30	S

NOTES:
S - Outlying spike recovery(ies) observed.

Sample ID: **MB-32598** SampType: **MBLK** Units: **µg/L** Prep Date: **6/9/2021** RunNo: **67832**
Client ID: **MBLKW** Batch ID: **32598** Analysis Date: **6/10/2021** SeqNo: **1368649**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	100									

Work Order: 2106075
CLIENT: Friedman & Bruya
Project: 106055

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID: **LCS-32598** SampType: **LCS** Units: **µg/L** Prep Date: **6/9/2021** RunNo: **67832**
Client ID: **LCSW** Batch ID: **32598** Analysis Date: **6/10/2021** SeqNo: **1368650**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	954	100	1,000	0	95.4	85	115				

Sample ID: **2106101-001CDUP** SampType: **DUP** Units: **µg/L** Prep Date: **6/9/2021** RunNo: **67832**
Client ID: **BATCH** Batch ID: **32598** Analysis Date: **6/10/2021** SeqNo: **1368652**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	100						0		30	

Sample ID: **2106101-001CMS** SampType: **MS** Units: **µg/L** Prep Date: **6/9/2021** RunNo: **67832**
Client ID: **BATCH** Batch ID: **32598** Analysis Date: **6/10/2021** SeqNo: **1368653**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	5,110	100	5,000	17.67	102	70	130				

Sample ID: **2106101-001CMSD** SampType: **MSD** Units: **µg/L** Prep Date: **6/9/2021** RunNo: **67832**
Client ID: **BATCH** Batch ID: **32598** Analysis Date: **6/10/2021** SeqNo: **1368654**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	5,080	100	5,000	17.67	101	70	130	5,107	0.452	30	

Sample ID: **LCS-32572** SampType: **LCS** Units: **µg/L** Prep Date: **6/7/2021** RunNo: **67824**
Client ID: **LCSW** Batch ID: **32572** Analysis Date: **6/10/2021** SeqNo: **1369164**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	1,060	100	1,000	0	106	85	115				

Date: *6/11/2021*

Work Order: 2106075
CLIENT: Friedman & Bruya
Project: 106055

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID: **2106075-002BDUP** SampType: **DUP** Units: **µg/L** Prep Date: **6/7/2021** RunNo: **67824**
Client ID: **MW4A-0621** Batch ID: **32572** Analysis Date: **6/10/2021** SeqNo: **1369166**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	100						0		30	

Work Order: 2106075
CLIENT: Friedman & Bruya
Project: 106055

QC SUMMARY REPORT

Total Metals by EPA Method 6020B

Sample ID: **MB-32565** SampType: **MBLK** Units: **mg/Kg** Prep Date: **6/7/2021** RunNo: **67775**
Client ID: **MBLKS** Batch ID: **32565** Analysis Date: **6/7/2021** SeqNo: **1367248**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	8.13									
Iron	ND	8.13									

Sample ID: **LCS-32565** SampType: **LCS** Units: **mg/Kg** Prep Date: **6/7/2021** RunNo: **67775**
Client ID: **LCSS** Batch ID: **32565** Analysis Date: **6/7/2021** SeqNo: **1367249**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	433	7.87	393.7	0	110	80	120				

Sample ID: **2106053-002AMS** SampType: **MS** Units: **mg/Kg-dry** Prep Date: **6/7/2021** RunNo: **67775**
Client ID: **BATCH** Batch ID: **32565** Analysis Date: **6/7/2021** SeqNo: **1367252**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	69,400	9.29	464.5	73,130	-805	75	125				ES
Iron	40,500	9.29	464.5	52,650	-2,620	75	125				ES

Sample ID: **2106053-002AMSD** SampType: **MSD** Units: **mg/Kg-dry** Prep Date: **6/7/2021** RunNo: **67775**
Client ID: **BATCH** Batch ID: **32565** Analysis Date: **6/7/2021** SeqNo: **1367253**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	77,300	9.36	467.9	73,130	896	75	125	69,400	10.8	20	ES
Iron	54,100	9.36	467.9	52,650	315	75	125	40,490	28.8	20	ERS

NOTES:
R - High RPD observed. The method is in control as indicated by the LCS.

Work Order: 2106075
CLIENT: Friedman & Bruya
Project: 106055

QC SUMMARY REPORT

Total Metals by EPA Method 6020B

Sample ID: **LCS-32565** SampType: **LCS** Units: **mg/Kg** Prep Date: **6/7/2021** RunNo: **67775**
Client ID: **LCSS** Batch ID: **32565** Analysis Date: **6/10/2021** SeqNo: **1369177**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	410	7.87	393.7	0	104	80	120				

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2106075**
Logged by:	**Gabrielle Coeuille**	Date Received:	**6/4/2021 2:45:00 PM**

Chain of Custody

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

Log In

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

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Sample 1	1.9

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

2106075

Page # 1 of 1

Report To: Michael Erdahl

Company: Friedman and Bruya, Inc.

Address: 3012 16th Ave W

City, State, ZIP: Seattle, WA 98119

Phone: (206) 285-8282 Email: merdahl@friedmanandbruya.com

SUBCONTRACTOR: Fremont

PROJECT NAME/NO.: 106055

PO #: B-277

REMARKS: Email Report

TURNAROUND TIME
- [x] Standard (1 Week)
- [ ] RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
- [ ] Dispose after 30 days
- [ ] Return samples
- [ ] Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Containers	ANALYSES REQUESTED: Cl- F-	Aluminum	Iron							
MW5A-0621		6.3.2021	0840	Water	2	X	x								
MW4A-0621			0945		2	X	x								
MW6-0621			1116		2	X	x								
MW3A-0621			1214		2	X	x								
DUP-0621			0800		2	X	x								
SED-1-0621			1345	Soil	1	X	x	x							

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Ann Webber-Bruya	F&B	6/4/21	
Received by: Claire Anderson	Claire Anderson	FBI	6/4/21	1445
Relinquished by:				
Received by:				

FORMS\COC\Subcontract COCML.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

June 15, 2021

Grant Hainsworth, Project Manager
Crete Consulting
16300 Christensen Road, Suite 214
Tukwila, WA 98188

Dear Mr Hainsworth:

Included are the results from the testing of material submitted on June 9, 2021 from the Maralco, Kent WA, F&BI 106138 project. There are 12 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Rusty Jones
CTC0615R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on June 9, 2021 by Friedman & Bruya, Inc. from the Crete Consulting Maralco, Kent WA, F&BI 106138 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
106138 -01	SED-02-0621 0-0.5'
106138 -02	SED-02-0621 0.5-1'
106138 -03	SED-03-0621 0-0.5'
106138 -04	SED-03-0621 0.5-1'

The samples were sent to Fremont Analytical for chloride, fluoride, aluminum, and iron testing. The report is enclosed.

All quality control requirements were acceptable.

Analysis For Total Metals By EPA Method 6020B

Client ID:	SED-02-0621 0-0.5'	Client:	Crete Consulting
Date Received:	06/09/21	Project:	Maralco, Kent WA, F&BI 106138
Date Extracted:	06/10/21	Lab ID:	106138-01
Date Analyzed:	06/10/21	Data File:	106138-01.116
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Arsenic	3.79
Cadmium	<1
Lead	10.4

Analysis For Total Metals By EPA Method 6020B

Client ID:	SED-02-0621 0-0.5'	Client:	Crete Consulting
Date Received:	06/09/21	Project:	Maralco, Kent WA, F&BI 106138
Date Extracted:	06/10/21	Lab ID:	106138-01 x2
Date Analyzed:	06/11/21	Data File:	106138-01 x2.134
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Chromium	11.6
Cobalt	4.21
Copper	41.2
Manganese	222
Nickel	10.7
Zinc	109

Analysis For Total Metals By EPA Method 6020B

Client ID:	SED-02-0621 0.5-1'	Client:	Crete Consulting
Date Received:	06/09/21	Project:	Maralco, Kent WA, F&BI 106138
Date Extracted:	06/10/21	Lab ID:	106138-02
Date Analyzed:	06/10/21	Data File:	106138-02.117
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Arsenic	2.18
Cadmium	<1
Chromium	10.1
Cobalt	2.85
Copper	20.2
Lead	8.24
Manganese	80.3
Nickel	7.54
Zinc	58.1

Analysis For Total Metals By EPA Method 6020B

Client ID:	SED-03-0621 0-0.5'	Client:	Crete Consulting
Date Received:	06/09/21	Project:	Maralco, Kent WA, F&BI 106138
Date Extracted:	06/10/21	Lab ID:	106138-03
Date Analyzed:	06/11/21	Data File:	106138-03.142
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<8
Arsenic	19.2
Cadmium	<2
Lead	40.2

Reporting limits may be raised due to high moisture content.

Analysis For Total Metals By EPA Method 6020B

Client ID:	SED-03-0621 0-0.5'	Client:	Crete Consulting
Date Received:	06/09/21	Project:	Maralco, Kent WA, F&BI 106138
Date Extracted:	06/10/21	Lab ID:	106138-03 x5
Date Analyzed:	06/11/21	Data File:	106138-03 x5.135
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Chromium	31.4
Cobalt	<10
Copper	159
Manganese	321
Nickel	25.5
Zinc	325

Reporting limits may be raised due to high moisture content.

Analysis For Total Metals By EPA Method 6020B

Client ID:	SED-03-0621 0.5-1'	Client:	Crete Consulting
Date Received:	06/09/21	Project:	Maralco, Kent WA, F&BI 106138
Date Extracted:	06/10/21	Lab ID:	106138-04
Date Analyzed:	06/10/21	Data File:	106138-04.119
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	55.4
Arsenic	7.21
Cadmium	11.8
Lead	189

Reporting limits may be raised due to high moisture content.

Analysis For Total Metals By EPA Method 6020B

Client ID:	SED-03-0621 0.5-1'	Client:	Crete Consulting
Date Received:	06/09/21	Project:	Maralco, Kent WA, F&BI 106138
Date Extracted:	06/10/21	Lab ID:	106138-04 x5
Date Analyzed:	06/11/21	Data File:	106138-04 x5.143
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Chromium	208
Cobalt	<10
Copper	1,410
Manganese	346
Nickel	64.2

Reporting limits may be raised due to high moisture content.

Analysis For Total Metals By EPA Method 6020B

Client ID:	SED-03-0621 0.5-1'	Client:	Crete Consulting
Date Received:	06/09/21	Project:	Maralco, Kent WA, F&BI 106138
Date Extracted:	06/10/21	Lab ID:	106138-04 x25
Date Analyzed:	06/14/21	Data File:	106138-04 x25.062
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Zinc	2,190

Reporting limits may be raised due to high moisture content.

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Maralco, Kent WA, F&BI 106138
Date Extracted:	06/10/21	Lab ID:	I1-361 mb
Date Analyzed:	06/10/21	Data File:	I1-361 mb.067
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<2
Arsenic	<1
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	<5
Lead	<1
Manganese	<1
Nickel	<1
Zinc	<5

Date of Report: 06/15/21
Date Received: 06/09/21
Project: Maralco, Kent WA, F&BI 106138

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 106139-04 x5 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/kg (ppm)	20	<5	83	76	75-125	9
Arsenic	mg/kg (ppm)	10	<5	83	82	75-125	1
Cadmium	mg/kg (ppm)	10	<5	94	93	75-125	1
Chromium	mg/kg (ppm)	50	19.3	92	87	75-125	6
Cobalt	mg/kg (ppm)	20	8.29	87	84	75-125	4
Copper	mg/kg (ppm)	50	<25	90	87	75-125	3
Lead	mg/kg (ppm)	50	<5	88	87	75-125	1
Manganese	mg/kg (ppm	20	177	13 b	0 b	75-125	200 b
Nickel	mg/kg (ppm)	25	34.1	82 b	74 b	75-125	10 b
Zinc	mg/kg (ppm)	50	30.5	81	81	75-125	0

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	mg/kg (ppm)	20	101	80-120
Arsenic	mg/kg (ppm)	10	91	80-120
Cadmium	mg/kg (ppm)	10	96	80-120
Chromium	mg/kg (ppm)	50	101	80-120
Cobalt	mg/kg (ppm)	20	97	80-120
Copper	mg/kg (ppm)	50	97	80-120
Lead	mg/kg (ppm)	50	93	80-120
Manganese	mg/kg (ppm)	20	99	80-120
Nickel	mg/kg (ppm)	25	98	80-120
Zinc	mg/kg (ppm)	50	88	80-120

Data Qualifiers & Definitions

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

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

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

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

106138

SAMPLE CHAIN OF CUSTODY ME 6/9/21 BI

Page # 1 of 1

Report To R. Jones, G. Hainsworth

Company Crete Consulting

Address

City, State, ZIP

Phone Email

SAMPLERS (signature) Rusty Jones R. Jones

PROJECT NAME MARALCO, Kent WA

PO #

REMARKS Metals List: Sb, Al, As, Cd, Cr, Co, Cu, Fe, Mn, Pb, Ni, Zn

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME
- ☐ Standard turnaround
- ☒ RUSH 72 Hour

Rush charges authorized by:

SAMPLE DISPOSAL
- ☐ Archive samples
- ☐ Other

Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Select Metals	Cr (FF)			Notes
SED-02-0621 0-0.5'	01 A-B	6.9.21	1225	SEDIMENT	2								X	X			
SED-02-0621 0.5-1'	02		1230		2								X	X			
SED-03-0621 0-0.5'	03		1255		2								X	X			
SED-03-0621 0.5-1'	04		1305		2								X	X			
																	Samples received at 2 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	Crete Consulting	6.9.21	1355
Received by: Hong	HONG NGUYEN	FBI	6/9/21	15:05
Relinquished by:				
Received by:				

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

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

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

RE: 106138
Work Order Number: 2106155

June 14, 2021

Attention Michael Erdahl:

Fremont Analytical, Inc. received 4 sample(s) on 6/9/2021 for the analyses presented in the following report.

Ion Chromatography by EPA Method 300.0
Sample Moisture (Percent Moisture)
Total Metals by EPA Method 6020B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *06/14/2021*

CLIENT: Friedman & Bruya
Project: 106138
Work Order: 2106155

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2106155-001	SED-02-0621 0-0.5'	06/09/2021 12:25 PM	06/09/2021 4:53 PM
2106155-002	SED-02-0621 0.5-1'	06/09/2021 12:30 PM	06/09/2021 4:53 PM
2106155-003	SED-03-0621 0-0.5'	06/09/2021 12:55 PM	06/09/2021 4:53 PM
2106155-004	SED-03-0621 0.5-1'	06/09/2021 1:05 PM	06/09/2021 4:53 PM

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

Original

Case Narrative

WO#: **2106155**
Date: **6/14/2021**

CLIENT: Friedman & Bruya
Project: 106138

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

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

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

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

Qualifiers:

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

Acronyms:

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

CLIENT: Friedman & Bruya
Project: 106138

Lab ID: 2106155-001 **Collection Date:** 6/9/2021 12:25:00 PM
Client Sample ID: **SED-02-0621 0-0.5'** **Matrix:** Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32615		Analyst: SS
Fluoride	6.28	1.24		mg/Kg-dry	1	6/11/2021 11:19:00 AM
Chloride	17.0	2.71		mg/Kg-dry	1	6/11/2021 11:19:00 AM
Total Metals by EPA Method 6020B				Batch ID: 32600		Analyst: EH
Aluminum	12,000	1,210	D	mg/Kg-dry	100	6/11/2021 4:27:36 PM
Iron	19,000	1,210	D	mg/Kg-dry	100	6/11/2021 4:27:36 PM
Sample Moisture (Percent Moisture)				Batch ID: R67823		Analyst: OK
Percent Moisture	35.6	0.500		wt%	1	6/10/2021 10:24:22 AM

Lab ID: 2106155-002 **Collection Date:** 6/9/2021 12:30:00 PM
Client Sample ID: **SED-02-0621 0.5-1'** **Matrix:** Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32615		Analyst: SS
Fluoride	4.73	1.09		mg/Kg-dry	1	6/11/2021 11:42:00 AM
Chloride	24.6	2.39		mg/Kg-dry	1	6/11/2021 11:42:00 AM
Total Metals by EPA Method 6020B				Batch ID: 32600		Analyst: EH
Aluminum	12,100	1,080	D	mg/Kg-dry	100	6/11/2021 4:33:10 PM
Iron	16,500	1,080	D	mg/Kg-dry	100	6/11/2021 4:33:10 PM
Sample Moisture (Percent Moisture)				Batch ID: R67823		Analyst: OK
Percent Moisture	26.8	0.500		wt%	1	6/10/2021 10:24:22 AM

CLIENT: Friedman & Bruya
Project: 106138

Lab ID: 2106155-003 **Collection Date:** 6/9/2021 12:55:00 PM
Client Sample ID: **SED-03-0621 0-0.5'** **Matrix:** Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32615		Analyst: SS
Fluoride	6.99	1.53		mg/Kg-dry	1	6/11/2021 12:05:00 PM
Chloride	45.7	3.34		mg/Kg-dry	1	6/11/2021 12:05:00 PM
Total Metals by EPA Method 6020B				Batch ID: 32600		Analyst: EH
Aluminum	23,200	1,480	D	mg/Kg-dry	100	6/11/2021 4:38:44 PM
Iron	81,800	1,480	D	mg/Kg-dry	100	6/11/2021 4:38:44 PM
Sample Moisture (Percent Moisture)				Batch ID: R67823		Analyst: OK
Percent Moisture	47.6	0.500		wt%	1	6/10/2021 10:24:22 AM

Lab ID: 2106155-004 **Collection Date:** 6/9/2021 1:05:00 PM
Client Sample ID: **SED-03-0621 0.5-1'** **Matrix:** Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 32615		Analyst: SS
Fluoride	31.8	1.45		mg/Kg-dry	1	6/11/2021 12:28:00 PM
Chloride	40.6	3.18		mg/Kg-dry	1	6/11/2021 12:28:00 PM
Total Metals by EPA Method 6020B				Batch ID: 32600		Analyst: EH
Aluminum	115,000	1,440	D	mg/Kg-dry	100	6/11/2021 4:44:18 PM
Iron	29,000	1,440	D	mg/Kg-dry	100	6/11/2021 4:44:18 PM
Sample Moisture (Percent Moisture)				Batch ID: R67823		Analyst: OK
Percent Moisture	45.0	0.500		wt%	1	6/10/2021 10:24:22 AM

Work Order: 2106155
CLIENT: Friedman & Bruya
Project: 106138

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **MB-32615** SampType: **MBLK** Units: **mg/Kg** Prep Date: **6/10/2021** RunNo: **67872**
Client ID: **MBLKS** Batch ID: **32615** Analysis Date: **6/10/2021** SeqNo: **1369479**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	0.800									
Chloride	ND	1.75									

Sample ID: **LCS-32615** SampType: **LCS** Units: **mg/Kg** Prep Date: **6/10/2021** RunNo: **67872**
Client ID: **LCSS** Batch ID: **32615** Analysis Date: **6/10/2021** SeqNo: **1369480**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	5.12	0.800	5.000	0	102	90	110				
Chloride	7.28	1.75	7.500	0	97.1	90	110				

Sample ID: **2106075-006ADUP** SampType: **DUP** Units: **mg/Kg-dry** Prep Date: **6/10/2021** RunNo: **67872**
Client ID: **BATCH** Batch ID: **32615** Analysis Date: **6/10/2021** SeqNo: **1369482**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	92.1	2.10						90.64	1.65	30	E
Chloride	49.2	4.60						49.36	0.347	30	

Sample ID: **2106075-006AMS** SampType: **MS** Units: **mg/Kg-dry** Prep Date: **6/10/2021** RunNo: **67872**
Client ID: **BATCH** Batch ID: **32615** Analysis Date: **6/10/2021** SeqNo: **1369483**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	93.0	2.10	13.16	90.64	18.0	80	120				ES
Chloride	72.6	4.60	19.73	49.36	118	80	120				

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Work Order: 2106155
CLIENT: Friedman & Bruya
Project: 106138

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **2106075-006AMSD** SampType: **MSD** Units: **mg/Kg-dry** Prep Date: **6/10/2021** RunNo: **67872**
Client ID: **BATCH** Batch ID: **32615** Analysis Date: **6/10/2021** SeqNo: **1369484**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	97.5	2.10	13.11	90.64	52.0	80	120	93.01	4.68	30	ES
Chloride	69.1	4.59	19.67	49.36	101	80	120	72.59	4.87	30	

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Work Order: 2106155
CLIENT: Friedman & Bruya
Project: 106138

QC SUMMARY REPORT

Total Metals by EPA Method 6020B

Sample ID: **MB-32600** SampType: **MBLK** Units: **mg/Kg** Prep Date: **6/9/2021** RunNo: **67848**
Client ID: **MBLKS** Batch ID: **32600** Analysis Date: **6/10/2021** SeqNo: **1368947**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	7.87									
Iron	ND	7.87									

Sample ID: **LCS-32600** SampType: **LCS** Units: **mg/Kg** Prep Date: **6/9/2021** RunNo: **67848**
Client ID: **LCSS** Batch ID: **32600** Analysis Date: **6/10/2021** SeqNo: **1368948**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	390	7.81	390.6	0	99.9	80	120				
Iron	380	7.81	390.6	0	97.2	80	120				

Sample ID: **2106117-004AMS** SampType: **MS** Units: **mg/Kg-dry** Prep Date: **6/9/2021** RunNo: **67848**
Client ID: **BATCH** Batch ID: **32600** Analysis Date: **6/10/2021** SeqNo: **1368953**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	18,800	8.70	435.2	16,820	460	75	125				ES
Iron	20,400	8.70	435.2	18,710	390	75	125				ES

NOTES:
S - Analyte concentration was too high for accurate spike recovery (Al, Fe).

Sample ID: **2106117-004AMSD** SampType: **MSD** Units: **mg/Kg-dry** Prep Date: **6/9/2021** RunNo: **67848**
Client ID: **BATCH** Batch ID: **32600** Analysis Date: **6/10/2021** SeqNo: **1368954**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	16,800	8.98	449.2	16,820	4.10	75	125	18,820	11.1	20	ES
Iron	19,400	8.98	449.2	18,710	156	75	125	20,410	5.01	20	ES

NOTES:
S - Analyte concentration was too high for accurate spike recovery (Al, Fe).

Work Order: 2106155
CLIENT: Friedman & Bruya
Project: 106138

QC SUMMARY REPORT

Total Metals by EPA Method 6020B

Sample ID: **2106117-004APDS** SampType: **PDS** Units: **mg/Kg-dry** Prep Date: **6/9/2021** RunNo: **67848**
Client ID: **BATCH** Batch ID: **32600** Analysis Date: **6/10/2021** SeqNo: **1368955**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	18,600	8.84	442	16,800	403	75	125				ES
Iron	20,200	8.84	442	18,700	347	75	125				ES

NOTES:
S - Analyte concentration was too high for accurate spike recovery (Al, Fe).

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2106155**
Logged by:	**Gabrielle Coeuille**	Date Received:	**6/9/2021 4:53:00 PM**

Chain of Custody

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

Log In

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

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Sample 1	1.4

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY 210615

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Fremont

PROJECT NAME/NO.	PO #
106138	B-286

REMARKS

Please Email Results

TURNAROUND TIME

☐ Standard TAT

☒ RUSH 3-Day TAT

Rush charges authorized by: MG

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Return samples

☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Chloride	Fluoride	Al + Fe					Notes
SED-02-0621 0-0.5'		6/9/21	1225	Soil	1				X	X	X					
SED-02-0621 0.5-1'		"	1230	"	1				X	X	X					
SED-03-0621 0-0.5'		"	1255	"	1				X	X	X					
SED-03-0621 0.5-1'		"	1305	"	1				X	X	X					

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	6/9/21	1515
Received by:		Oliver Kroll	FAT	6/9/21	1653
Relinquished by:					
Received by:					

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

September 3, 2021

Grant Hainsworth, Project Manager
Crete Consulting
16300 Christensen Road, Suite 214
Tukwila, WA 98188

Dear Mr Hainsworth:

Included are the results from the testing of material submitted on August 26, 2021 from the Bridge Maralco, F&BI 108413 project. There are 8 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
CTC0903R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on August 26, 2021 by Friedman & Bruya, Inc. from the Crete Consulting Bridge Maralco, F&BI 108413 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
108413 -01	KCDD-N-0.5-1
108413 -02	KCDD-S-0.5-1

The samples were sent to Fremont Analytical for fluoride, chloride, and aluminum analyses. The report will be forwarded upon receipt.

All quality control requirements were acceptable.

Analysis For Total Metals By EPA Method 6020B

Client ID:	KCDD-N-0.5-1	Client:	Crete Consulting
Date Received:	08/26/21	Project:	Bridge Maralco, F&BI 108413
Date Extracted:	08/27/21	Lab ID:	108413-01
Date Analyzed:	08/27/21	Data File:	108413-01.098
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	2.95
Arsenic	10.8
Cadmium	2.01
Lead	54.7
Silver	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	KCDD-N-0.5-1	Client:	Crete Consulting
Date Received:	08/26/21	Project:	Bridge Maralco, F&BI 108413
Date Extracted:	08/27/21	Lab ID:	108413-01 x5
Date Analyzed:	08/27/21	Data File:	108413-01 x5.102
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Chromium	23.1
Cobalt	5.27
Copper	98.6
Manganese	201
Nickel	14.7

Analysis For Total Metals By EPA Method 6020B

Client ID:	KCDD-S-0.5-1	Client:	Crete Consulting
Date Received:	08/26/21	Project:	Bridge Maralco, F&BI 108413
Date Extracted:	08/27/21	Lab ID:	108413-02
Date Analyzed:	08/27/21	Data File:	108413-02.100
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	2.89
Arsenic	18.9
Cadmium	<2
Lead	60.6
Silver	<2

The reporting limits are raised due to high moisture content.

Analysis For Total Metals By EPA Method 6020B

Client ID:	KCDD-S-0.5-1	Client:	Crete Consulting
Date Received:	08/26/21	Project:	Bridge Maralco, F&BI 108413
Date Extracted:	08/27/21	Lab ID:	108413-02 x5
Date Analyzed:	08/27/21	Data File:	108413-02 x5.103
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Chromium	38.7
Cobalt	6.81
Copper	64.6
Manganese	295
Nickel	20.8

The reporting limits are raised due to high moisture content.

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Bridge Maralco, F&BI 108413
Date Extracted:	08/27/21	Lab ID:	I1-531 mb2
Date Analyzed:	08/27/21	Data File:	I1-531 mb2.055
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<1
Arsenic	<1
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	<5
Lead	<1
Manganese	<1
Nickel	<1
Silver	<1

Date of Report: 09/03/21
Date Received: 08/26/21
Project: Bridge Maralco, F&BI 108413

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 108412-01 x5 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/kg (ppm)	20	<5	87	92	75-125	6
Arsenic	mg/kg (ppm)	10	<5	88	96	75-125	9
Cadmium	mg/kg (ppm)	10	<5	97	104	75-125	7
Chromium	mg/kg (ppm)	50	26.2	85	95	75-125	11
Cobalt	mg/kg (ppm)	20	6.44	87	95	75-125	9
Copper	mg/kg (ppm)	50	<25	88	95	75-125	8
Lead	mg/kg (ppm)	50	<5	94	101	75-125	7
Manganese	mg/kg (ppm	20	181	41 b	91 b	75-125	76 b
Nickel	mg/kg (ppm)	25	34.1	84	99	75-125	16
Silver	mg/kg (ppm)	10	<5	94	102	75-125	8

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	mg/kg (ppm)	20	96	80-120
Arsenic	mg/kg (ppm)	10	92	80-120
Cadmium	mg/kg (ppm)	10	96	80-120
Chromium	mg/kg (ppm)	50	100	80-120
Cobalt	mg/kg (ppm)	20	96	80-120
Copper	mg/kg (ppm)	50	96	80-120
Lead	mg/kg (ppm)	50	96	80-120
Manganese	mg/kg (ppm)	20	99	80-120
Nickel	mg/kg (ppm)	25	97	80-120
Silver	mg/kg (ppm)	10	99	80-120

Data Qualifiers & Definitions

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

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

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

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

108413

SAMPLE CHAIN OF CUSTODY

ME 08/26/21

Page # 1 of 1 BTJ

Report To Grant Hainsworth

Company Crete

Address 16300 Christensen Rd, Ste 214

City, State, ZIP Tukwila, WA 98188

Phone 253-797-6323 Email grant.hainsworth@crete consulting.com

SAMPLERS (signature) Grant Hainsworth

PROJECT NAME Bridge Manalco

PO #

REMARKS

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME
☑ Standard turnaround
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Archive samples
☐ Other
Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Metals *	Aluminum	Fluoride	Chloride	Notes
KCDD-N-0.5-1	01 AB	8/24/21	1610	Soil	2								✓	✓	✓	✓	* Metals =
KCDD-S-0.5-1	02 AB	"	1615	"	2								✓	✓	✓	✓	As, Cd, Cr,
																	Co, Cu, Mn,
																	Ni, Pb,
																	antimony,
																	& silver
																	Samples received at 5 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Grant Hainsworth	Grant Hainsworth	CRETE	8/26/21	1100
Received by: Will Radford	Will Radford	F&BI	8/26/21	11:00
Relinquished by:				
Received by:				

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

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

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

RE: 108413
Work Order Number: 2108377

September 03, 2021

Attention Michael Erdahl:

Fremont Analytical, Inc. received 2 sample(s) on 8/26/2021 for the analyses presented in the following report.

Ion Chromatography by EPA Method 300.0
Sample Moisture (Percent Moisture)
Total Metals by EPA Method 6020B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *09/03/2021*

CLIENT: Friedman & Bruya
Project: 108413
Work Order: 2108377

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2108377-001	KCDD-N-0.5-1	08/24/2021 4:10 PM	08/26/2021 2:18 PM
2108377-002	KCDD-S-0.5-1	08/24/2021 4:15 PM	08/26/2021 2:18 PM

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

Case Narrative

WO#: **2108377**
Date: **9/3/2021**

CLIENT: Friedman & Bruya
Project: 108413

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

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

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

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

Qualifiers:

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

Acronyms:

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

Analytical Report

Work Order: **2108377**
Date Reported: **9/3/2021**

Client: Friedman & Bruya
Project: 108413
Lab ID: 2108377-001
Client Sample ID: **KCDD-N-0.5-1**

Collection Date: 8/24/2021 4:10:00 PM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 33514		Analyst: TN
Fluoride	22.8	1.06		mg/Kg-dry	1	9/1/2021 6:54:00 AM
Chloride	155	23.1	D	mg/Kg-dry	10	9/1/2021 1:03:00 PM
Total Metals by EPA Method 6020B				Batch ID: 33549		Analyst: EH
Aluminum	23,600	231	D	mg/Kg-dry	20	9/3/2021 11:32:01 AM
Sample Moisture (Percent Moisture)				Batch ID: R69599		Analyst: ALB
Percent Moisture	31.8	0.500		wt%	1	8/31/2021 10:34:37 AM

Analytical Report

Work Order: **2108377**
Date Reported: **9/3/2021**

Client: Friedman & Bruya
Project: 108413
Lab ID: 2108377-002
Client Sample ID: **KCDD-S-0.5-1**

Collection Date: 8/24/2021 4:15:00 PM
Matrix: Soil

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Ion Chromatography by EPA Method 300.0				Batch ID: 33514		Analyst: TN
Fluoride	6.08	1.68		mg/Kg-dry	1	9/1/2021 7:17:00 AM
Chloride	9.72	3.68		mg/Kg-dry	1	9/1/2021 7:17:00 AM
Total Metals by EPA Method 6020B				Batch ID: 33549		Analyst: EH
Aluminum	18,400	326	D	mg/Kg-dry	20	9/3/2021 11:37:36 AM
Sample Moisture (Percent Moisture)				Batch ID: R69599		Analyst: ALB
Percent Moisture	53.1	0.500		wt%	1	8/31/2021 10:34:37 AM

Work Order: 2108377
CLIENT: Friedman & Bruya
Project: 108413

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **MB-33514**	SampType: **MBLK**	Units: **mg/Kg**	Prep Date: **8/26/2021**	RunNo: **69632**
Client ID: **MBLKS**	Batch ID: **33514**		Analysis Date: **9/1/2021**	SeqNo: **1411516**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	0.800									
Chloride	ND	1.75									

Sample ID: **LCS-33514**	SampType: **LCS**	Units: **mg/Kg**	Prep Date: **8/26/2021**	RunNo: **69632**
Client ID: **LCSS**	Batch ID: **33514**		Analysis Date: **9/1/2021**	SeqNo: **1411517**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	4.92	0.800	5.000	0	98.4	90	110				
Chloride	7.12	1.75	7.500	0	94.9	90	110				

Sample ID: **2108369-010ADUP**	SampType: **DUP**	Units: **mg/Kg-dry**	Prep Date: **8/26/2021**	RunNo: **69632**
Client ID: **BATCH**	Batch ID: **33514**		Analysis Date: **9/1/2021**	SeqNo: **1411519**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	8.80						0		30	D
Chloride	36.7	19.2						35.57	3.18	30	D

Sample ID: **2108369-010AMS**	SampType: **MS**	Units: **mg/Kg-dry**	Prep Date: **8/26/2021**	RunNo: **69632**
Client ID: **BATCH**	Batch ID: **33514**		Analysis Date: **9/1/2021**	SeqNo: **1411520**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	9.01	5.632	5.211	43.5	80	120				SD
Chloride	42.9	19.7	8.448	35.57	87.0	80	120				D

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Work Order: 2108377
CLIENT: Friedman & Bruya
Project: 108413

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **2108369-010AMSD** SampType: **MSD** Units: **mg/Kg-dry** Prep Date: **8/26/2021** RunNo: **69632**
Client ID: **BATCH** Batch ID: **33514** Analysis Date: **9/1/2021** SeqNo: **1411521**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	9.06	5.664	5.211	46.0	80	120	0		30	SD
Chloride	43.2	19.8	8.496	35.57	89.3	80	120	42.92	0.568	30	D

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Sample ID: **2108392-003ADUP** SampType: **DUP** Units: **mg/Kg-dry** Prep Date: **8/26/2021** RunNo: **69632**
Client ID: **BATCH** Batch ID: **33514** Analysis Date: **9/1/2021** SeqNo: **1411536**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	ND	8.12						0		30	D
Chloride	ND	17.8						0		30	D

Sample ID: **2108392-003AMS** SampType: **MS** Units: **mg/Kg-dry** Prep Date: **8/26/2021** RunNo: **69632**
Client ID: **BATCH** Batch ID: **33514** Analysis Date: **9/1/2021** SeqNo: **1411537**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	8.39	8.18	5.115	5.207	62.2	80	120				SD
Chloride	ND	17.9	7.672	9.087	76.2	80	120				SD

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Work Order: 2108377
CLIENT: Friedman & Bruya
Project: 108413

QC SUMMARY REPORT

Total Metals by EPA Method 6020B

Sample ID: **MB-33549** SampType: **MBLK** Units: **mg/Kg** Prep Date: **8/31/2021** RunNo: **69685**
Client ID: **MBLKS** Batch ID: **33549** Analysis Date: **9/2/2021** SeqNo: **1412547**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	ND	8.00									

Sample ID: **LCS-33549** SampType: **LCS** Units: **mg/Kg** Prep Date: **8/31/2021** RunNo: **69685**
Client ID: **LCSS** Batch ID: **33549** Analysis Date: **9/2/2021** SeqNo: **1412548**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	380	7.81	390.6	0	97.4	80	120				

Sample ID: **2108402-014AMS** SampType: **MS** Units: **mg/Kg-dry** Prep Date: **8/31/2021** RunNo: **69685**
Client ID: **BATCH** Batch ID: **33549** Analysis Date: **9/2/2021** SeqNo: **1412551**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	13,000	8.08	404.1	12,280	168	75	125				ES

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Sample ID: **2108402-014AMSD** SampType: **MSD** Units: **mg/Kg-dry** Prep Date: **8/31/2021** RunNo: **69685**
Client ID: **BATCH** Batch ID: **33549** Analysis Date: **9/2/2021** SeqNo: **1412552**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	13,600	8.27	413.4	12,280	325	75	125	12,960	5.00	20	ES

NOTES:
S - Analyte concentration was too high for accurate spike recovery(ies).

Sample ID: **2108402-014APDS** SampType: **PDS** Units: **mg/Kg-dry** Prep Date: **8/31/2021** RunNo: **69685**
Client ID: **BATCH** Batch ID: **33549** Analysis Date: **9/2/2021** SeqNo: **1412553**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	12,800	8.67	433	12,300	111	75	125				E

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2108377**
Logged by:	**Gabrielle Coeuille**	Date Received:	**8/26/2021 2:18:00 PM**

Chain of Custody

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

Log In

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

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Sample 1	4.8

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

2108371

Page # 1 of 1

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Fremont

PROJECT NAME/NO.	PO #
108413	B-382

REMARKS

TURNAROUND TIME
- [x] Standard TAT
- [ ] RUSH
- Rush charges authorized by:

SAMPLE DISPOSAL
- [ ] Dispose after 30 days
- [ ] Return samples
- [ ] Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Dioxins/Furans	EPH	VPH	Aluminum	Fluoride	Chloride					Notes
KCDD-N-0.5-1		8/24/21	1610	Soil	1				x	x	x					
KCDD-S-0.5-1		↓	1615	Soil	1				x	x	x					

ANALYSES REQUESTED

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	8/26/21	
Received by:	Justine Mantz	Justine Mantz	FAI	8/26/21	14:18
Relinquished by:					
Received by:					

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Report Transmission Cover Page

Bill To:	Crete Consulting Inc. 16300 Christensen Road, Suite Tukwila, WA, United States 98188	Project ID:	Maralco	Lot ID:	**1540363**
		Project Name:	Maralco	Control Number:	
		Project Location:	Kent, WA, US	Date Received:	Dec 3, 2021
		LSD:		Date Reported:	Jan 4, 2022
Attn:	Grant Hainsworth	P.O.:	1540363	Report Number:	2699893
Sampled By:	Rusty Jones	Proj. Acct. code:			
Company:	CRETE Consulting				

Contact	Company	Address
Grant Hainsworth	**Crete Consulting Inc.**	16300 Christensen Road, Suite 214 Tukwila, WA 98188 Phone: (206) 491-7554 Fax: Email: grant.hainsworth@creteconsulting.

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice
Email - Single Report	PDF	Test Report

Contact	Company	Address
Rusty Jones	**Crete Consulting Inc.**	16300 Christensen Road, Suite 214 Tukwila, WA 98188 Phone: (000) 000-0000 Fax: Email: rusty.jones@creteconsulting.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / COA
Email - Merge Reports	PDF	COC / Test Report

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Analytical Report

Bill To: Crete Consulting Inc.
16300 Christensen Road, Suite
Tukwila, WA, United States
98188
Attn: Grant Hainsworth
Sampled By: Rusty Jones
Company: CRETE Consulting

Project ID: Maralco
Project Name: Maralco
Project Location: Kent, WA, US
LSD:
P.O.: 1540363
Proj. Acct. code:

Lot ID: **1540363**
Control Number:
Date Received: Dec 3, 2021
Date Reported: Jan 4, 2022
Report Number: 2699893

Reference Number	1540363-1	1540363-2	1540363-3
Sample Date	Nov 30, 2021	Nov 30, 2021	Nov 30, 2021
Sample Time	08:45	08:45	08:45
Sample Location			
Sample Description	Maralco / Pile-A / 2.6°C	Maralco / Pile-E / 2.6°C	Maralco / Pile-Outdoor-Washed / 2.6°C
Matrix	Soil	Soil	Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	µg/g	<0.005	<0.005	0.017	0.005
Toluene	Dry Weight	µg/g	<0.02	0.04	<0.02	0.02
Ethylbenzene	Dry Weight	µg/g	<0.005	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	µg/g	<0.03	0.06	<0.03	0.03
Styrene	Dry Weight	µg/g	<0.01	<0.01	<0.01	0.01
Methyl t-Butyl Ether	Dry Weight	µg/g	<0.01	<0.01	<0.01	0.01
4-Bromofluorobenzene	Surrogate	%	109	109	118	60-140
Toluene-d8	Surrogate	%	102	106	117	60-140
Methanol Field Preservation			Yes	Yes	Yes	
Volatile Petroleum Hydrocarbons - Soil						
VHs6-10	Dry Weight	µg/g	<50	<50	<50	50
VPHs (VHs6-10 minus BTEX)	Dry Weight	µg/g	<50	<50	<50	50
Extractable Petroleum Hydrocarbons - Soil						
EPHs10-19	Dry Weight	µg/g	<20	20	<20	20
EPHs19-32	Dry Weight	µg/g	212	519	95	20
LEPHs	Dry Weight	µg/g	<20	<20	<20	20
HEPHs	Dry Weight	µg/g	212	519	95	20
2-Methylnonane	Surrogate	%	89	85	84	60-140
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	30.80	20.00	50.20	
Polycyclic Aromatic Hydrocarbons - Soil						
Acenaphthene	Dry Weight	µg/g	<0.02	<0.02	<0.02	0.02
Acenaphthylene	Dry Weight	µg/g	<0.02	<0.02	<0.02	0.02
Anthracene	Dry Weight	µg/g	<0.02	<0.02	<0.02	0.02
Benzo(a)anthracene	Dry Weight	µg/g	0.04	0.02	<0.02	0.02
Benzo(a)pyrene	Dry Weight	µg/g	0.03	<0.02	<0.02	0.02
Benzo(b)fluoranthene	Dry Weight	µg/g	0.08	0.03	<0.02	0.02
Benzo(b+j)fluoranthene	Dry Weight	µg/g	0.12	<0.04	<0.04	0.04
Benzo(g,h,i)perylene	Dry Weight	µg/g	0.08	<0.02	<0.02	0.02
Benzo(k)fluoranthene	Dry Weight	µg/g	0.03	<0.02	<0.02	0.02
Chrysene	Dry Weight	µg/g	0.05	0.03	<0.02	0.02
Dibenzo(a,h)anthracene	Dry Weight	µg/g	<0.02	<0.02	<0.02	0.02
Fluoranthene	Dry Weight	µg/g	0.09	0.10	<0.02	0.02
Fluorene	Dry Weight	µg/g	<0.02	<0.02	<0.02	0.02
Indeno(1,2,3-c,d)pyrene	Dry Weight	µg/g	0.05	<0.02	<0.02	0.02
1-Methylnaphthalene	Dry Weight	µg/g	0.02	0.05	<0.02	0.02
2-Methylnaphthalene	Dry Weight	µg/g	0.04	0.10	<0.02	0.02

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Analytical Report

Bill To: Crete Consulting Inc.
16300 Christensen Road, Suite
Tukwila, WA, United States
98188
Attn: Grant Hainsworth
Sampled By: Rusty Jones
Company: CRETE Consulting

Project ID: Maralco
Project Name: Maralco
Project Location: Kent, WA, US
LSD:
P.O.: 1540363
Proj. Acct. code:

Lot ID: **1540363**
Control Number:
Date Received: Dec 3, 2021
Date Reported: Jan 4, 2022
Report Number: 2699893

Reference Number	1540363-1	1540363-2	1540363-3
Sample Date	Nov 30, 2021	Nov 30, 2021	Nov 30, 2021
Sample Time	08:45	08:45	08:45
Sample Location			
Sample Description	Maralco / Pile-A / 2.6°C	Maralco / Pile-E / 2.6°C	Maralco / Pile-Outdoor-Washed / 2.6°C
Matrix	Soil	Soil	Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Polycyclic Aromatic Hydrocarbons - Soil - Continued						
Naphthalene	Dry Weight	µg/g	0.03	0.08	0.02	0.01
Phenanthrene	Dry Weight	µg/g	0.06	0.09	<0.02	0.02
Pyrene	Dry Weight	µg/g	0.09	0.09	<0.02	0.02
Quinoline	Dry Weight	µg/g	<0.02	<0.02	<0.02	0.02
PAH - Soil - Surrogate Recovery						
2-Fluorobiphenyl	PAH - Surrogate	%	96	107	101	50-140
Naphthalene-d8	PAH - Surrogate	%	81.2	89.5	85.7	50-140
Quinoline-d7	PAH - Surrogate	%	82.5	94.9	84.3	50-140
p-Terphenyl-d14	PAH - Surrogate	%	93.5	92.4	83.9	50-140

Approved by:

Jimmy Tran
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

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Methodology and Notes

Bill To: Crete Consulting Inc.
16300 Christensen Road, Suite
Tukwila, WA, United States
98188
Attn: Grant Hainsworth
Sampled By: Rusty Jones
Company: CRETE Consulting

Project ID: Maralco
Project Name: Maralco
Project Location: Kent, WA, US
LSD:
P.O.: 1540363
Proj. Acct. code:

Lot ID: **1540363**
Control Number:
Date Received: Dec 3, 2021
Date Reported: Jan 4, 2022
Report Number: 2699893

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
BTEX-VPH - Soil (CLG)	BCELM	*	Calculation of Volatile Petroleum Hydrocarbons in Solids, Waters, or Air (Vapour) – VPH (June 26, 2009), VPH	Dec 10, 2021	Element Calgary
BTEX-VPH - Soil (CLG)	BCELM	*	Volatile Hydrocarbons in Soil by GC/FID, VH Soil	Dec 10, 2021	Element Calgary
EPH - Soil (CLG)	BCELM		Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Waters (LEPH & HEPH)., LEPH/HEPH Calculation	Dec 10, 2021	Element Calgary
EPH - Soil (CLG)	BCELM	*	Extractable Petroleum Hydrocarbons (EPH) in Solids by GC/FID, EPH Solids	Dec 10, 2021	Element Calgary
PAH - Soil (FSJ)	BCELM	*	Polycyclic Aromatic Hydrocarbons in Solids by GC/MS - PBM, PAH Solids	Dec 11, 2021	Element Calgary

** Reference Method Modified*

References

BCELM B.C. Environmental Laboratory Manual

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted.
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Project Information

Project ID: MARALCO
Project Name: MARALCO
Project Location: Kent, WA, US
Legal Location:
PO/AFE#:
Proj. Acct. Code:
Quote #:

Invoice To

Company: CRETE Consulting
Address:
Tukwila, WA
Attention: Grant Hainsworth
Phone:
Cell:
E-mail:
Government Funded Work YES / NO
SRP #
Agreement ID:

Report To

Company: CRETE Consulting
Address: 16300 Christensen Rd, Ste 214
Tukwila, WA 98188
Attention: Grant Hainsworth
Phone:
Cell:
Fax:
E-mail 1:
E-mail 2:
Copy of Invoice: YES / NO

Additional Reports to

1) Name: Grant Hainsworth
E-mail: grant.hainsworth@creteconsulting.com
2) Name: Rusty Jones
E-mail: rusty.jones@creteconsulting.com

Sample Custody

Sampled by: Rusty Jones
Company: CRETE Consulting
I authorize Element to proceed with the work indicated on this form:
Signature: R. Jones
Date/Time: 11/30/2021 1700

RUSH Priority

- ☐ Same Day (200%)
- ☐ Next Day/Two Day (100%)
- ☐ Three or Four Days (50%)
- ☒ 5 to 7 Days (Regular TAT)

Date Required

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Report Results

- ☒ Email
- ☐ Online
- ☐ Fax
- ☒ QA/QC
- ☒ PDF
- ☒ Excel

Requirements

- ☐ HCDWQ
- ☐ AB Tier 1
- ☐ SPIGEC
- ☐ BCCSR

Other (list below)

Special Instructions/Comments (please include contact information including phone number if different from above).

	Site I.D.	Sample Description	Depth start	Depth end	Date/Time sampled	Matrix	Sampling method	# Containers	MeOH Field Preserved? ✓	EPH (LEPH/HEPH) ✓	Enter tests above (✓ relevant samples below)
1	MARALCO	PILE-A			11.30.2021 0845	SOLIDS	GRAB	3	✓	✓	
2	↓	PILE-E			11.30.2021 0915	↓	↓	3	✓	✓	
3	↓	PILE-OUTDOOR-WASHED			11.30.2021 1100	↓	↓	3	✓	✓	
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											

Please indicate any potentially hazardous samples

Submission of this form acknowledges acceptance of Element's Standard of terms and conditions (https://www.element.com/terms/terms-and-conditions)

Page 1 of 1 Control #

ED 120-06

Indicate lot # or affix barcode here

Lot: 1540363 COC

Temp. received: 2.6 °C

Date/Time stamp: DEC 3 '21 AM 9:15

Delivery Method: FEDEX EXPRESS INTL

Waybill:

Received by:

Element
7217 Roper Road NW
Edmonton, Alberta
T6B 3J4, Canada

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Report Transmission Cover Page

Bill To:	CRETE Consulting Edmonton, AB, Canada	Project ID:	Maralco	Lot ID:	**1541083**
Attn:	Grant Hainsworth	Project Name:	Maralco	Control Number:	
Sampled By:	Rusty Jones	Project Location:	Kent, WA, USA	Date Received:	Dec 7, 2021
Company:	CRETE Consulting	LSD:		Date Reported:	Dec 16, 2021
		P.O.:	1541083	Report Number:	2701322
		Proj. Acct. code:			

Contact	Company	Address
Grant Hainsworth	**Cash Account**	
		Edmonton, AB null
		Phone: (780) 438-5522 Fax:
		Email: grant.hainsworth@creteconsulting.

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / COA
Email - Merge Reports	PDF	COC / Test Report
Email - Merge Reports	PDF	Invoice

Notes To Clients:

- Dec 16, 2021 - Reduction of analytical volume was necessary for metals to bring results within the analytical range for sample 1541083. Detection limits are adjusted accordingly.

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Analytical Report

Bill To:	CRETE Consulting	Project ID:	Maralco	Lot ID:	**1541083**
	Edmonton, AB, Canada	Project Name:	Maralco	Control Number:	
Attn:	Grant Hainsworth	Project Location:	Kent, WA, USA	Date Received:	Dec 7, 2021
Sampled By:	Rusty Jones	LSD:		Date Reported:	Dec 16, 2021
Company:	CRETE Consulting	P.O.:	1541083	Report Number:	2701322
		Proj. Acct. code:			

Reference Number	1541083-1
Sample Date	December 06, 2021
Sample Time	08:10
Sample Location	
Sample Description	Pile-A / Maralco
Sample Matrix	Solids

Analyte		Units	Result	Nominal Detection Limit
Classification				
Carbon	Total Organic	%	1.10	0.04
Leachate Inorganic - TCLP				
Antimony	TCLP Leachate	mg/L	<0.005	0.005
Arsenic	TCLP Leachate	mg/L	<0.002	0.002
Barium	TCLP Leachate	mg/L	0.09	0.05
Beryllium	TCLP Leachate	mg/L	0.004	0.001
Boron	TCLP Leachate	mg/L	3.9	0.2
Cadmium	TCLP Leachate	mg/L	0.010	0.001
Chromium	TCLP Leachate	mg/L	0.018	0.005
Cobalt	TCLP Leachate	mg/L	0.010	0.001
Copper	TCLP Leachate	mg/L	5.2	0.1
Iron	TCLP Leachate	mg/L	0.1	0.1
Lead	TCLP Leachate	mg/L	<0.05	0.05
Mercury	TCLP Leachate	mg/L	<0.001	0.001
Nickel	TCLP Leachate	mg/L	0.28	0.050
Selenium	TCLP Leachate	mg/L	0.003	0.002
Silver	TCLP Leachate	mg/L	<0.005	0.05
Thallium	TCLP Leachate	mg/L	<0.0005	0.0005
Uranium	TCLP Leachate	mg/L	<0.005	0.005
Vanadium	TCLP Leachate	mg/L	0.02	0.01
Zinc	TCLP Leachate	mg/L	8.3	0.1
Zirconium	TCLP Leachate	mg/L	<0.01	0.01
pH	Initial		8.7	
pH	Final		5.8	
Metals Strong Acid Digestion				
Aluminum	Strong Acid Extractable	mg/kg	151000	20
Antimony	Strong Acid Extractable	mg/kg	21	0.2
Arsenic	Strong Acid Extractable	mg/kg	8	0.2
Barium	Strong Acid Extractable	mg/kg	115	1
Beryllium	Strong Acid Extractable	mg/kg	3	0.1
Bismuth	Strong Acid Extractable	mg/kg	10	0.5
Cadmium	Strong Acid Extractable	mg/kg	4.4	0.01
Chromium	Strong Acid Extractable	mg/kg	231	0.5
Calcium	Strong Acid Extractable	mg/kg	11600	200
Cobalt	Strong Acid Extractable	mg/kg	4	0.1
Copper	Strong Acid Extractable	mg/kg	2340	1
Iron	Strong Acid Extractable	mg/kg	9900	100
Lead	Strong Acid Extractable	mg/kg	165	0.1
Lithium	Strong Acid Extractable	mg/kg	52	1.0
Magnesium	Strong Acid Extractable	mg/kg	20100	100
Manganese	Strong Acid Extractable	mg/kg	1340	10

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Analytical Report

Bill To: CRETE Consulting
Edmonton, AB, Canada
Attn: Grant Hainsworth
Sampled By: Rusty Jones
Company: CRETE Consulting

Project ID: Maralco
Project Name: Maralco
Project Location: Kent, WA, USA
LSD:
P.O.: 1541083
Proj. Acct. code:

Lot ID: **1541083**
Control Number:
Date Received: Dec 7, 2021
Date Reported: Dec 16, 2021
Report Number: 2701322

Reference Number	1541083-1
Sample Date	December 06, 2021
Sample Time	08:10
Sample Location	
Sample Description	Pile-A / Maralco
Sample Matrix	Solids

Analyte		Units	Result	Nominal Detection Limit
Metals Strong Acid Digestion - Continued				
Mercury	Strong Acid Extractable	mg/kg	<0.5	0.05
Molybdenum	Strong Acid Extractable	mg/kg	<9.9	1
Nickel	Strong Acid Extractable	mg/kg	67	0.5
Phosphorus	Strong Acid Extractable	mg/kg	290	30
Selenium	Strong Acid Extractable	mg/kg	<3	0.3
Silicon	Strong Acid Extractable	mg/kg	550	50
Silver	Strong Acid Extractable	mg/kg	1	0.1
Strontium	Strong Acid Extractable	mg/kg	355	1
Sulfur	Strong Acid Extractable	mg/kg	400	300
Thallium	Strong Acid Extractable	mg/kg	<0.5	0.05
Tin	Strong Acid Extractable	mg/kg	43.8	1
Titanium	Strong Acid Extractable	mg/kg	2590	0.5
Tungsten	Strong Acid Extractable	mg/kg	<5	0.5
Uranium	Strong Acid Extractable	mg/kg	<5	0.5
Vanadium	Strong Acid Extractable	mg/kg	199	0.1
Zinc	Strong Acid Extractable	mg/kg	1950	1
Metals Total (Fusion)				
Aluminum Al2O3	Whole Rock Analysis	%	41.4	0.0038
Barium BaO	Whole Rock Analysis	%	0.0233	0.00008
Calcium CaO	Whole Rock Analysis	%	2.26	0.0042
Chromium Cr2O3	Whole Rock Analysis	%	0.0453	0.0001
Iron Fe2O3	Whole Rock Analysis	%	1.91	0.0028
Copper CuO	Whole Rock Analysis	%	0.306	0.0001
Magnesium MgO	Whole Rock Analysis	%	6.09	0.0033
Manganese MnO	Whole Rock Analysis	%	0.172	0.0006
Phosphorus P2O5	Whole Rock Analysis	%	<0.10	0.0023
Potassium K2O	Whole Rock Analysis	%	1.89	0.012
Silicon as SiO2	Whole Rock Analysis	%	19.8	0.0107
Sodium Na2O	Whole Rock Analysis	%	2.45	0.0027
Strontium SrO	Whole Rock Analysis	%	0.0487	0.00005
Titanium TiO2	Whole Rock Analysis	%	0.674	0.0002
Zinc ZnO	Whole Rock Analysis	%	0.210	0.0002
Zirconium ZrO2	Whole Rock Analysis	%	0.0384	0.0001
Loss on Ignition @ 900C	Whole Rock Analysis	%	14.2	
Total Oxides	Whole Rock Analysis	%	91.5	
Beryllium	Total	µg/g	5.7	0.3
Cobalt	Total	µg/g	11	1
Molybdenum	Total	µg/g	9.5	1
Nickel	Total	µg/g	124	5
Vanadium	Total	µg/g	382	3

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Analytical Report

Bill To:	CRETE Consulting	Project ID:	Maralco	Lot ID:	**1541083**
	Edmonton, AB, Canada	Project Name:	Maralco	Control Number:	
Attn:	Grant Hainsworth	Project Location:	Kent, WA, USA	Date Received:	Dec 7, 2021
Sampled By:	Rusty Jones	LSD:		Date Reported:	Dec 16, 2021
Company:	CRETE Consulting	P.O.:	1541083	Report Number:	2701322
		Proj. Acct. code:			

Reference Number	1541083-1
Sample Date	December 06, 2021
Sample Time	08:10
Sample Location	
Sample Description	Pile-A / Maralco
Sample Matrix	Solids

Analyte		Units	Result	Nominal Detection Limit
Physical and Aggregate Properties				
Moisture	Wet Weight @ 105°C	%	22.4	0.1
Particle Size Analysis - Dry Sieve				
1.18 mm sieve	% Retained	% by weight	18.80	0.01
150 micron sieve	% Retained	% by weight	38.30	0.01
75 micron sieve	% Retained	% by weight	41.90	0.01
Metals				
Tellurium		µg/g	7.55	
Acid Soluble				
Chloride	Acid Soluble	%	0.795	0.002

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Analytical Report

Bill To:	CRETE Consulting	Project ID:	Maralco	Lot ID:	**1541083**
	Edmonton, AB, Canada	Project Name:	Maralco	Control Number:	
Attn:	Grant Hainsworth	Project Location:	Kent, WA, USA	Date Received:	Dec 7, 2021
Sampled By:	Rusty Jones	LSD:		Date Reported:	Dec 16, 2021
Company:	CRETE Consulting	P.O.:	1541083	Report Number:	2701322
		Proj. Acct. code:			

Reference Number	1541083-2
Sample Date	December 06, 2021
Sample Time	08:20
Sample Location	
Sample Description	Pile-E / Maralco
Sample Matrix	Solids

Analyte		Units	Result	Nominal Detection Limit
Classification				
Carbon	Total Organic	%	1.05	0.04
Leachate Inorganic - TCLP				
Antimony	TCLP Leachate	mg/L	<0.005	0.005
Arsenic	TCLP Leachate	mg/L	<0.002	0.002
Barium	TCLP Leachate	mg/L	0.09	0.05
Beryllium	TCLP Leachate	mg/L	0.003	0.001
Boron	TCLP Leachate	mg/L	4.3	0.2
Cadmium	TCLP Leachate	mg/L	0.012	0.001
Chromium	TCLP Leachate	mg/L	0.012	0.005
Cobalt	TCLP Leachate	mg/L	0.010	0.001
Copper	TCLP Leachate	mg/L	5.0	0.1
Iron	TCLP Leachate	mg/L	<0.1	0.1
Lead	TCLP Leachate	mg/L	<0.05	0.05
Mercury	TCLP Leachate	mg/L	<0.001	0.001
Nickel	TCLP Leachate	mg/L	0.24	0.050
Selenium	TCLP Leachate	mg/L	<0.002	0.002
Silver	TCLP Leachate	mg/L	<0.005	0.05
Thallium	TCLP Leachate	mg/L	<0.0005	0.0005
Uranium	TCLP Leachate	mg/L	<0.005	0.005
Vanadium	TCLP Leachate	mg/L	0.02	0.01
Zinc	TCLP Leachate	mg/L	7.4	0.1
Zirconium	TCLP Leachate	mg/L	<0.01	0.01
pH	Initial		8.7	
pH	Final		6.0	
Metals Strong Acid Digestion				
Aluminum	Strong Acid Extractable	mg/kg	144000	20
Antimony	Strong Acid Extractable	mg/kg	18	0.2
Arsenic	Strong Acid Extractable	mg/kg	7	0.2
Barium	Strong Acid Extractable	mg/kg	112	1
Beryllium	Strong Acid Extractable	mg/kg	3	0.1
Bismuth	Strong Acid Extractable	mg/kg	11	0.5
Cadmium	Strong Acid Extractable	mg/kg	4.3	0.01
Chromium	Strong Acid Extractable	mg/kg	214	0.5
Calcium	Strong Acid Extractable	mg/kg	11100	200
Cobalt	Strong Acid Extractable	mg/kg	4	0.1
Copper	Strong Acid Extractable	mg/kg	2340	1
Iron	Strong Acid Extractable	mg/kg	10200	100
Lead	Strong Acid Extractable	mg/kg	163	0.1
Lithium	Strong Acid Extractable	mg/kg	47	1.0
Magnesium	Strong Acid Extractable	mg/kg	19200	100
Manganese	Strong Acid Extractable	mg/kg	1280	10

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Analytical Report

Bill To:	CRETE Consulting	Project ID:	Maralco	Lot ID:	**1541083**
	Edmonton, AB, Canada	Project Name:	Maralco	Control Number:	
Attn:	Grant Hainsworth	Project Location:	Kent, WA, USA	Date Received:	Dec 7, 2021
Sampled By:	Rusty Jones	LSD:		Date Reported:	Dec 16, 2021
Company:	CRETE Consulting	P.O.:	1541083	Report Number:	2701322
		Proj. Acct. code:			

Reference Number	1541083-2
Sample Date	December 06, 2021
Sample Time	08:20
Sample Location	
Sample Description	Pile-E / Maralco
Sample Matrix	Solids

Analyte		Units	Result	Nominal Detection Limit
Metals Strong Acid Digestion - Continued				
Mercury	Strong Acid Extractable	mg/kg	<0.5	0.05
Molybdenum	Strong Acid Extractable	mg/kg	<9.6	1
Nickel	Strong Acid Extractable	mg/kg	69	0.5
Phosphorus	Strong Acid Extractable	mg/kg	240	30
Selenium	Strong Acid Extractable	mg/kg	<3	0.3
Silicon	Strong Acid Extractable	mg/kg	690	50
Silver	Strong Acid Extractable	mg/kg	1	0.1
Strontium	Strong Acid Extractable	mg/kg	300	1
Sulfur	Strong Acid Extractable	mg/kg	400	300
Thallium	Strong Acid Extractable	mg/kg	<0.5	0.05
Tin	Strong Acid Extractable	mg/kg	44.2	1
Titanium	Strong Acid Extractable	mg/kg	2560	0.5
Tungsten	Strong Acid Extractable	mg/kg	<5	0.5
Uranium	Strong Acid Extractable	mg/kg	<5	0.5
Vanadium	Strong Acid Extractable	mg/kg	197	0.1
Zinc	Strong Acid Extractable	mg/kg	1860	1
Metals Total (Fusion)				
Aluminum Al2O3	Whole Rock Analysis	%	39.6	0.0038
Barium BaO	Whole Rock Analysis	%	0.0229	0.00008
Calcium CaO	Whole Rock Analysis	%	2.35	0.0042
Chromium Cr2O3	Whole Rock Analysis	%	0.0533	0.0001
Iron Fe2O3	Whole Rock Analysis	%	1.94	0.0028
Copper CuO	Whole Rock Analysis	%	0.320	0.0001
Magnesium MgO	Whole Rock Analysis	%	5.60	0.0033
Manganese MnO	Whole Rock Analysis	%	0.166	0.0006
Phosphorus P2O5	Whole Rock Analysis	%	<0.10	0.0023
Potassium K2O	Whole Rock Analysis	%	1.80	0.012
Silicon as SiO2	Whole Rock Analysis	%	19.6	0.0107
Sodium Na2O	Whole Rock Analysis	%	2.43	0.0027
Strontium SrO	Whole Rock Analysis	%	0.0518	0.00005
Titanium TiO2	Whole Rock Analysis	%	0.738	0.0002
Zinc ZnO	Whole Rock Analysis	%	0.229	0.0002
Zirconium ZrO2	Whole Rock Analysis	%	0.100	0.0001
Loss on Ignition @ 900C	Whole Rock Analysis	%	13.7	
Total Oxides	Whole Rock Analysis	%	88.6	
Beryllium	Total	µg/g	5.6	0.3
Cobalt	Total	µg/g	13	1
Molybdenum	Total	µg/g	6	1
Nickel	Total	µg/g	158	5
Vanadium	Total	µg/g	363	3

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Analytical Report

Bill To:	CRETE Consulting	Project ID:	Maralco	Lot ID:	**1541083**
	Edmonton, AB, Canada	Project Name:	Maralco	Control Number:	
Attn:	Grant Hainsworth	Project Location:	Kent, WA, USA	Date Received:	Dec 7, 2021
Sampled By:	Rusty Jones	LSD:		Date Reported:	Dec 16, 2021
Company:	CRETE Consulting	P.O.:	1541083	Report Number:	2701322
		Proj. Acct. code:			

Reference Number	1541083-2
Sample Date	December 06, 2021
Sample Time	08:20
Sample Location	
Sample Description	Pile-E / Maralco
Sample Matrix	Solids

Analyte		Units	Result	Nominal Detection Limit
Physical and Aggregate Properties				
Moisture	Wet Weight @ 105°C	%	8.7	0.1
Particle Size Analysis - Dry Sieve				
1.18 mm sieve	% Retained	% by weight	10.5	0.01
150 micron sieve	% Retained	% by weight	33.40	0.01
75 micron sieve	% Retained	% by weight	55.70	0.01
Metals				
Tellurium		µg/g	6.14	
Acid Soluble				
Chloride	Acid Soluble	%	0.750	0.002

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Analytical Report

Bill To:	CRETE Consulting	Project ID:	Maralco	Lot ID:	**1541083**
	Edmonton, AB, Canada	Project Name:	Maralco	Control Number:	
Attn:	Grant Hainsworth	Project Location:	Kent, WA, USA	Date Received:	Dec 7, 2021
Sampled By:	Rusty Jones	LSD:		Date Reported:	Dec 16, 2021
Company:	CRETE Consulting	P.O.:	1541083	Report Number:	2701322
		Proj. Acct. code:			

Reference Number	1541083-3
Sample Date	December 06, 2021
Sample Time	08:30
Sample Location	
Sample Description	Pile-Outdoor-Washed / Maralco
Sample Matrix	Solids

Analyte		Units	Result	Nominal Detection Limit
Classification				
Carbon	Total Organic	%	0.67	0.04
Leachate Inorganic - TCLP				
Antimony	TCLP Leachate	mg/L	0.030	0.005
Arsenic	TCLP Leachate	mg/L	<0.002	0.002
Barium	TCLP Leachate	mg/L	<0.05	0.05
Beryllium	TCLP Leachate	mg/L	0.022	0.001
Boron	TCLP Leachate	mg/L	0.3	0.2
Cadmium	TCLP Leachate	mg/L	0.014	0.001
Chromium	TCLP Leachate	mg/L	0.058	0.005
Cobalt	TCLP Leachate	mg/L	0.011	0.001
Copper	TCLP Leachate	mg/L	0.5	0.1
Iron	TCLP Leachate	mg/L	1.0	0.1
Lead	TCLP Leachate	mg/L	<0.05	0.05
Mercury	TCLP Leachate	mg/L	<0.001	0.001
Nickel	TCLP Leachate	mg/L	0.12	0.050
Selenium	TCLP Leachate	mg/L	<0.002	0.002
Silver	TCLP Leachate	mg/L	<0.005	0.05
Thallium	TCLP Leachate	mg/L	<0.0005	0.0005
Uranium	TCLP Leachate	mg/L	<0.005	0.005
Vanadium	TCLP Leachate	mg/L	0.03	0.01
Zinc	TCLP Leachate	mg/L	6.1	0.1
Zirconium	TCLP Leachate	mg/L	<0.01	0.01
pH	Initial		8.2	
pH	Final		5.6	
Metals Strong Acid Digestion				
Aluminum	Strong Acid Extractable	mg/kg	110000	20
Antimony	Strong Acid Extractable	mg/kg	47	0.2
Arsenic	Strong Acid Extractable	mg/kg	7	0.2
Barium	Strong Acid Extractable	mg/kg	217	1
Beryllium	Strong Acid Extractable	mg/kg	10	0.1
Bismuth	Strong Acid Extractable	mg/kg	17	0.5
Cadmium	Strong Acid Extractable	mg/kg	5.5	0.01
Chromium	Strong Acid Extractable	mg/kg	296	0.5
Calcium	Strong Acid Extractable	mg/kg	13800	200
Cobalt	Strong Acid Extractable	mg/kg	5	0.1
Copper	Strong Acid Extractable	mg/kg	2030	1
Iron	Strong Acid Extractable	mg/kg	6600	100
Lead	Strong Acid Extractable	mg/kg	169	0.1
Lithium	Strong Acid Extractable	mg/kg	196	1.0
Magnesium	Strong Acid Extractable	mg/kg	31700	100
Manganese	Strong Acid Extractable	mg/kg	840	10

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Analytical Report

Bill To: CRETE Consulting
Edmonton, AB, Canada
Attn: Grant Hainsworth
Sampled By: Rusty Jones
Company: CRETE Consulting

Project ID: Maralco
Project Name: Maralco
Project Location: Kent, WA, USA
LSD:
P.O.: 1541083
Proj. Acct. code:

Lot ID: **1541083**
Control Number:
Date Received: Dec 7, 2021
Date Reported: Dec 16, 2021
Report Number: 2701322

Reference Number 1541083-3
Sample Date December 06, 2021
Sample Time 08:30
Sample Location
Sample Description Pile-Outdoor-Washed / Maralco
Sample Matrix Solids

Analyte		Units	Result	Nominal Detection Limit
Metals Strong Acid Digestion - Continued				
Mercury	Strong Acid Extractable	mg/kg	<0.5	0.05
Molybdenum	Strong Acid Extractable	mg/kg	<9.8	1
Nickel	Strong Acid Extractable	mg/kg	85	0.5
Phosphorus	Strong Acid Extractable	mg/kg	250	30
Selenium	Strong Acid Extractable	mg/kg	<3	0.3
Silicon	Strong Acid Extractable	mg/kg	1490	50
Silver	Strong Acid Extractable	mg/kg	2	0.1
Strontium	Strong Acid Extractable	mg/kg	499	1
Sulfur	Strong Acid Extractable	mg/kg	400	300
Thallium	Strong Acid Extractable	mg/kg	<0.5	0.05
Tin	Strong Acid Extractable	mg/kg	47.8	1
Titanium	Strong Acid Extractable	mg/kg	3550	0.5
Tungsten	Strong Acid Extractable	mg/kg	5	0.5
Uranium	Strong Acid Extractable	mg/kg	<5	0.5
Vanadium	Strong Acid Extractable	mg/kg	158	0.1
Zinc	Strong Acid Extractable	mg/kg	1670	1
Metals Total (Fusion)				
Aluminum Al2O3	Whole Rock Analysis	%	44.9	0.0038
Barium BaO	Whole Rock Analysis	%	0.0303	0.00008
Calcium CaO	Whole Rock Analysis	%	2.06	0.0042
Chromium Cr2O3	Whole Rock Analysis	%	0.0699	0.0001
Iron Fe2O3	Whole Rock Analysis	%	1.04	0.0028
Copper CuO	Whole Rock Analysis	%	0.269	0.0001
Magnesium MgO	Whole Rock Analysis	%	9.00	0.0033
Manganese MnO	Whole Rock Analysis	%	0.137	0.0006
Phosphorus P2O5	Whole Rock Analysis	%	<0.10	0.0023
Potassium K2O	Whole Rock Analysis	%	4.81	0.012
Silicon as SiO2	Whole Rock Analysis	%	12.4	0.0107
Sodium Na2O	Whole Rock Analysis	%	4.03	0.0027
Strontium SrO	Whole Rock Analysis	%	0.0736	0.00005
Titanium TiO2	Whole Rock Analysis	%	0.715	0.0002
Zinc ZnO	Whole Rock Analysis	%	0.212	0.0002
Zirconium ZrO2	Whole Rock Analysis	%	0.165	0.0001
Loss on Ignition @ 900C	Whole Rock Analysis	%	8.73	
Total Oxides	Whole Rock Analysis	%	88.6	
Beryllium	Total	µg/g	15.0	0.3
Cobalt	Total	µg/g	13	1
Molybdenum	Total	µg/g	23	1
Nickel	Total	µg/g	171	5
Vanadium	Total	µg/g	398	3

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Analytical Report

Bill To:	CRETE Consulting	Project ID:	Maralco	Lot ID:	**1541083**
	Edmonton, AB, Canada	Project Name:	Maralco	Control Number:	
Attn:	Grant Hainsworth	Project Location:	Kent, WA, USA	Date Received:	Dec 7, 2021
Sampled By:	Rusty Jones	LSD:		Date Reported:	Dec 16, 2021
Company:	CRETE Consulting	P.O.:	1541083	Report Number:	2701322
		Proj. Acct. code:			

Reference Number	1541083-3
Sample Date	December 06, 2021
Sample Time	08:30
Sample Location	
Sample Description	Pile-Outdoor-Washed / Maralco
Sample Matrix	Solids

Analyte		Units	Result	Nominal Detection Limit
Physical and Aggregate Properties				
Moisture	Wet Weight @ 105°C	%	34.9	0.1
Particle Size Analysis - Dry Sieve				
1.18 mm sieve	% Retained	% by weight	2.73	0.01
150 micron sieve	% Retained	% by weight	48.40	0.01
75 micron sieve	% Retained	% by weight	34.90	0.01
Metals				
Tellurium		µg/g	7.24	
Acid Soluble				
Chloride	Acid Soluble	%	0.080	0.002

Approved by:

Darlene Lintott, MSc
Consulting Scientist

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

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Methodology and Notes

Bill To:	CRETE Consulting Edmonton, AB, Canada	Project ID:	Maralco	Lot ID:	**1541083**
		Project Name:	Maralco	Control Number:	
Attn:	Grant Hainsworth	Project Location:	Kent, WA, USA	Date Received:	Dec 7, 2021
Sampled By:	Rusty Jones	LSD:		Date Reported:	Dec 16, 2021
Company:	CRETE Consulting	P.O.:	1541083	Report Number:	2701322
		Proj. Acct. code:			

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Chloride (Acid Soluble) in cement	Technical Standards Branch		Total Chloride Content in Cement, Mortar and Concrete, TLT-520	Dec 15, 2021	Element Edmonton - Roper Road
Leachate Inorganic (TCLP) ICP-MS	US EPA	*	Toxicity Characteristic Leaching Procedure, SW-846, EPA 1311	Dec 14, 2021	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	EPA	*	Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements, October 1999, 200.2	Dec 14, 2021	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	US EPA	*	Determination of Metals and Trace Elements by Inductively Coupled Plasma-Atomic Emission Spectrometry., 200.7	Dec 14, 2021	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Dec 14, 2021	Element Edmonton - Roper Road
Metals in solids (VAN)	US EPA	*	Metals & Trace Elements by ICP-AES, 6010C	Dec 13, 2021	Element Vancouver
Metals SemiTrace (Oxides) in solids (VAN)	US EPA	*	Metals & Trace Elements by ICP-AES, 6010C	Dec 14, 2021	Element Vancouver
Moisture	Carter	*	Sample Moisture Content, 4.4	Dec 15, 2021	Element Edmonton - Roper Road
Particle Size by Dry Sieve	Carter	*	Sieve Analysis (Mechanical Method), 55.4	Dec 15, 2021	Element Edmonton - Roper Road
Total Carbon, Nitrogen in Soil by Leco Combustion (VAN)	SSSA Book Series 5	*	Total Carbon, Organic Carbon, and Organic Matter, Ch 34	Dec 14, 2021	Element Vancouver

** Reference Method Modified*

References

Carter	Soil Sampling and Methods of Analysis.
EPA	Environmental Protection Agency Test Methods - US
SSSA Book Series 5	Methods of Soil Analysis, Part 3
Technical Standards	Alberta Transportation and Utilities
US EPA	US Environmental Protection Agency Test Methods

Comments:

- Dec 16, 2021 - Reduction of analytical volume was necessary for metals to bring results within the analytical range for sample 1541083. Detection limits are adjusted accordingly.

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted.
The test report shall not be reproduced except in full, without the written approval of the laboratory.

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Project Information

Project ID: MARALCO
Project Name: MARALCO
Project Location: Kent, WA, USA
Legal Location:
PO/AFE#:
Proj. Acct. Code:
Quote #:

Invoice To

Company: CRETE Consulting
Address: Tukwila, WA
Attention:
Phone:
Cell:
E-mail:
Government Funded Work YES / NO
SRP #
Agreement ID:

Report To

Company: CRETE Consulting
Address: 16300 Christensen Rd, Ste 214, Tukwila WA 98188
Attention: Grant Hainsworth
Phone:
Cell: grant.hainsworth@creteconsulting.com
Fax:
E-mail 1:
E-mail 2:
Copy of Invoice: (YES) / NO

Additional Reports to

1) Name: Rusty Jones
E-mail: rusty.jones@creteconsulting.com
2) Name:
E-mail:

Sample Custody

Sampled by: Rusty Jones
Company: CRETE Consulting
I authorize Element to proceed with the work indicated on this form:
Signature: R. Jones
Date/Time: 12/6/2021 0900

RUSH Priority

- ☐ Same Day (200%)
- ☐ Next Day/Two Day (100%)
- ☐ Three or Four Days (50%)
- ☒ 5 to 7 Days (Regular TAT)

Date Required ______

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Report Results

- ☒ Email
- ☐ Online
- ☐ Fax
- ☒ QA/QC
- ☒ PDF
- ☒ Excel

Requirements

- ☐ HCDWQ
- ☐ AB Tier 1
- ☐ SPIGEC
- ☐ BCCSR

Other (list below)

Special Instructions/Comments (please include contact information including phone number if different from above).

	Site I.D.	Sample Description	Depth start (in cm m)	Depth end	Date/Time sampled	Matrix	Sampling method	Number of Containers #	MeOH Field Preserved? ✓	WRA1	TT9 + Hg	MTTE, MTS	MTLI, MTU	MTW, MTTET	TCLT	CLAS	CL31 (TOC)	PS16, PS18 (#100, #200)	PS36 (1.18mm)	05 (dry, grind, 2mm)
1	MARALCO	PILE-A			12.6.2021 0810	SOLIDS	GRAB	3		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2		PILE-E			↓ 0820	↓	↓	3		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3		PILE-OUTDOOR-WASHED			↓ 0830	↓	↓	2		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4																				
5																				
6																				
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8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				

Enter tests above (✓ relevant samples below)

DEC 7 '21 PM 12:10

Please indicate any potentially hazardous samples

Submission of this form acknowledges acceptance of Element's Standard of terms and conditions (https://www.element.com/terms/terms-and-conditions)

...affix barcode here

Lot: 1541083 COC

Temp. received: 2.1 °C
Date/Time stamp:
Delivery Method:
Waybill:
Received by: [signature]

Page 1 of 1   Control #

ED 120-06

element

Element
#104, 19575-55 A Ave
Surrey, British Columbia
Canada, V3S 8P8

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E: info.vancouver@element.com
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Cash Account
Cash Account
c/o Exova
#104 19575 55A Ave
Surrey, BC, Canada V3S 8P8
Phone: (604) 514-3322
Fax:
Email:

Agreement ID: 112534
Negotiated Date: April 27, 2017
Expiry Date: December 31, 2021
Representative: Rachel Eden
Surrey, BC

Quote ID: 33648

Washed Aluminum Oxide Testing - Rev.2

Sample Name	Service	Service Requested	QTY	Quoted	Total
Washed Aluminum Oxide Testing					
	DISP	Environmental Disposal Fee Environmental Disposal Fee	3.00	$5.00	$15.00
	WRA1	Whole rock analysis Sample ground to -100 mesh, LOI @ 900 and fused. Al, Ba, Ca, Fe, Mg, Mn, Na, K, P, Si,Sr, Ti, Zr as oxides and trace elements Be, Co, Cr, Mo, V, Zn	3.00	$185.51	$556.53
	TT9	ICP Trace Metals plus Mercury Includes: Al, Sb, As, Ba, Be, Bi, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, P, Se, Si, Ag, Sr, Tl, Sn, Ti, V, Zn plus Hg	3.00	$168.20	$504.60
	MTTE	Tellerium, excluding ICP set-up	3.00	$15.43	$46.29
	MTS	Sulphur, excluding ICP set-up	3.00	$15.43	$46.29
	MTLI	Lithium, excluding ICP set-up	3.00	$15.43	$46.29
	MTU	Uranium, excluding ICP set-up	3.00	$15.43	$46.29
	MTW	Tungsten, excluding ICP set-up	3.00	$77.49	$232.47
	MWET	Moisture (wet weight) Moisture reported on a wet weight basis	3.00	$14.17	$42.51
	TCLT	TCLP leachate (metals) Metals analysis for Landfill requirements: Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Fe, Pb, Hg, Ni, Se, Ag, Tl, U, V, Zn, Zr.	3.00	$252.28	$756.84
	CLAS	Acid Soluble Chloride	3.00	$53.54	$160.62
	CL31	TOC - soil Total organic carbon (TOC) by combustion	3.00	$44.10	$132.30
	PS16	CSSC dry sieve #100 (150 um)	3.00	$18.59	$55.77
	PS18	CSSC dry sieve #200 (75 um)	3.00	$18.59	$55.77
	PS36	CSSC dry sieve 1.18 mm (0.0469" (#16)	3.00	$37.16	$111.48
	05	Drying,Grinding, 2mm sieve Charged one time per sample where 1 or more analyses are requested requiring this preparation	3.00	$13.85	$41.55
					$2,850.60
				Total	$2,850.60

When analytical method is a modified reference method, modifications to the reference method can be provided to the customer upon request.
Quote name and client name must be indicated on all information sheets submitted with samples.
Payment due within 30 days from the date of original invoice.
Prices quoted in Canadian dollars and do not include GST/HST.
Our liability is limited to the cost of the analyses.

June 28, 2021

Michael Erdahl
Friedman and Bruya
3012 16th Avenue W
Seattle, WA 98059
Tel: (206) 285-8282
E-mail: merdahl@friedmanandbruya.com

Report No.: FAI-2021-0573
Revision No.: 0
Project No.: DST 9292

Dear Michael,

In response to your request, Fauske and Associates, LLC (FAI) performed the following Class 4 test per *UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria – Division 4.3, Test N.5: Test Method for Substances Which in Contact with Water Emit Flammable.* This test was performed on the following material labeled:

1. DC-052421
Sample received on June 1, 2021.

The summary of test results for this sample is summarized in Table 1.

Table 1: Summary of Test Results

Type of test: Division 4.3, Test N.5

Material	Amount of Material Tested (g)	Maximum Rate of Gas Evolved (L/kg*hr)	Elapsed Time of Observation (hour)	Spontaneous Combustion of Gas (yes/no)	Classification	Packing Group
DC-052421	15	0	~7	No	**Not** a Class 4, Division 4.3 material	n/a

The following paragraphs describe the methods, procedures, and detailed results for the tests conducted at Fauske and Associates, LLC.

Proprietary Property of Fauske & Associates, LLC

Material Preparation

The sample was tested in its "as received" form.

UN Class 4, Division 4.3 – Dangerous when Wet Test

The test was performed per UN Manual of Tests and Criteria, Section 33, Classification Procedures, Test Methods and Criteria Relating to Class 4, *Test N.5, "Test Method for Substances Which In Contact With Water Emit Flammable Gases".*

Procedure

The test was performed three times at ambient temperature (~20°C) and at atmospheric pressure in air. A 15-g sample of the test material was placed into an Erlenmeyer flask (volume 250-ml). For the evolved gas measurement, a 500-ml (and/or 1000-ml) graduated cylinder was filled with water, inverted and connected to the flask via a rubber stopper and flexible tubing. Thirty (30) ml of water was added to the Erlenmeyer flask and a stopwatch was started.

The volume of gas evolved was measured by (utilizing a graduated cylinder) using a water displacement method. The rate-of-evolution of gas is calculated over 7 hours at 1-hour (or 30 minutes) intervals. The time taken for all the gas to be evolved was noted and where possible, intermediate readings were taken.

Criteria

If during any stage of the test the gas emitted ignited spontaneously, then no further testing was necessary and the substance should be assigned to Division 4.3. If spontaneous ignition of the emitted gas did not occur, then the final stage of the test should be performed to determine the rate of emission of flammable gas.

Whether a substance is a water-reactive substance of Division 4.3 or whether Packing Group I, II, or III should be assigned is decided on the basis of the gas evolution rate.

Overall criteria for Class 4, Division 4.3

A substance should be classified in Division 4.3 if:

(1) Spontaneous ignition takes place in any step of the test procedure; or

(2) There is an evolution of a flammable gas at a rate greater than 1 liter per kilogram of the substance per hour.

According to Code of Federal Regulations (CFR) 49, Transportation, Parts 100 to 185, §§ 173.125, Class 4 – Assignment of Packing Groups and UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, the packing group assignment are as follows:

(1) Packing Group I, if the material reacts vigorously with water at ambient temperatures and demonstrates a tendency for the gas produced to ignite spontaneously, or which reacts readily with water at ambient temperatures such that the rate-of-evolution of flammable gases is equal or greater than 10 liters per kilogram of material over any one minute;

(2) Packing Group II, if the material reacts readily with water at ambient temperatures such that the maximum rate-of-evolution of flammable gases is equal to or greater than 20 liters per kilogram of material per hour, and which does not meet the criteria for Packing Group I; or

(3) Packing Group III, if the material reacts slowly with water at ambient temperatures such that the maximum rate-of-evolution of flammable gases is greater than 1 L per kilogram of material per hour, and which does not meet the criteria for Packing Group I or II.

Dangerous When Wet Test Results

The detailed test results are summarized in Table 2. This material, when in contact with water, did not emit gas at a rate greater than 1 liter per kilogram per hour. Therefore, the sample is not classified as a Class 4, Division 4.3 material.

Table 2: UN Class 4, Division 4.3 (Dangerous when Wet) Test Results

Amount of test sample: 15 g — Operator: R. Andreasen
Amount of water: 30 ml — Test Temperature: 20°C

Sample	Maximum Rate of Gas Evolved (L/kg*hr)	Elapsed Time of Observation (hour)	Test #1 Volume of Gas Evolved (ml)	Test #2 Volume of Gas Evolved (ml)	Test #3 Volume of Gas Evolved (ml)	Spontaneous Combustion of Gas (yes/no)	Overall Test Result
DC-052421	0	0	2*	4*	2*	No	**Not** Class 4, Division 4.3 material
		1	0	0	0		
		2	0	0	0		
		3	0	0	0		
		4	0	0	0		
		5	0	0	0		
		6	0	0	0		
		7	0	0	0		
		Total	**2**	**4**	**2**		

**air bubbles trapped in transfer line*

CONCLUSION

The results of the Class 4, Division 4.3 (Dangerous when Wet) test indicate that the sample did not produce enough flammable gas to meet the minimum standards to be classified as a Class 4, Division 4.3 sample. Therefore, this material is not classified as a Dangerous When Wet material.

If you have any further questions regarding the content of this report, please feel free to contact us.

Respectfully submitted,
Fauske and Associates, LLC.

Prepared by:
Rachelle Andreasen
Manager, Dust Testing Technician

Reviewed by:
Marie-Christin Holt
Laboratory Testing Technician

Note that the conclusions and recommendations in this report are based on the specific considerations stated and laboratory test methodologies used. These considerations include (but are not limited to) exact sample materials tested [including particle size distribution, particle morphology, moisture content and level of oxidation]; formulae/composition tested, conditions of the test, and assumed plant physical parameters. The conclusions and recommendations may not be applicable for conditions not identical to those considered. Consult local building and fire codes or transportation codes, in addition to NFPA 652, 70, 1, 101 and other relevant NFPA codes, for instructions and guidance.

RECORD OF REVISIONS

Rev.	Date	Revision Description
0	See front cover	Original Issue

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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fbi@isomedia.com
www.friedmanandbruya.com

January 6, 2022

Grant Hainsworth, Project Manager
Crete Consulting
16300 Christensen Road, Suite 214
Tukwila, WA 98188

Dear Mr Hainsworth:

Included are the results from the testing of material submitted on December 1, 2021 from the Maralco, F&BI 112011 project. There are 22 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Rusty Jones
CTC0106R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on December 1, 2021 by Friedman & Bruya, Inc. from the Crete Consulting Maralco, F&BI 112011 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
112011 -01	Pile-A
112011 -02	Pile-E
112011 -03	Pile-B
112011 -04	Pile-F
112011 -05	Pile-C
112011 -06	Pile-D
112011 -07	Bags
112011 -08	Pile-Outdoor-Washed
112011 -09	Pile-Outdoor-Nonwashed

Samples Pile-B, Pile-F, Pile-C , Pile-D, and Bags were sent to Amtest for fluoride, chloride, potassium, boron, strontium, titanium, and magnesium analyses. In addition, samples Pile-B, Pile-F, Pile-D, and Bags were sent to Amtest for ammonia analysis. Review of the enclosed report indicates that all quality assurance were acceptable. The report generated by Amtest will be forwarded to your office upon receipt.

All quality control requirements were acceptable.

Date of Report: 01/06/22
Date Received: 12/01/21
Project: Maralco, F&BI 112011
Date Extracted: 12/01/21
Date Analyzed: 12/01/21

RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR pH USING EPA METHOD 9045D

Sample ID Laboratory ID	pH
Pile-B 112011-03	8.2
Pile-F 112011-04	8.4
Pile-C 112011-05	8.0
Pile-D 112011-06	8.0
Bags 112011-07	4.5

Analysis For Total Metals By EPA Method 6020B

Client ID:	Pile-B	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-03
Date Analyzed:	12/03/21	Data File:	112011-03.276
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	18.4
Arsenic	3.93
Cadmium	4.35
Chromium	201
Cobalt	2.59
Manganese	1,160
Nickel	111

Analysis For Total Metals By EPA Method 6020B

Client ID:	Pile-B	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-03 x10
Date Analyzed:	12/06/21	Data File:	112011-03 x10.034
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Copper	5,010
Lead	235
Zinc	2,950

Analysis For Total Metals By EPA Method 6020B

Client ID:	Pile-F	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-04
Date Analyzed:	12/03/21	Data File:	112011-04.277
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.65
Cadmium	4.55
Lead	94.3

Analysis For Total Metals By EPA Method 6020B

Client ID:	Pile-F	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-04 x2
Date Analyzed:	12/06/21	Data File:	112011-04 x2.051
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	7.90
Chromium	171
Cobalt	2.58
Manganese	1,640
Nickel	66.0
Zinc	1,480

Analysis For Total Metals By EPA Method 6020B

Client ID:	Pile-F	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-04 x10
Date Analyzed:	12/06/21	Data File:	112011-04 x10.035
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Copper	4,460

Analysis For Total Metals By EPA Method 6020B

Client ID:	Pile-C	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-05
Date Analyzed:	12/03/21	Data File:	112011-05.278
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	17.8
Arsenic	<1
Cadmium	1.93
Chromium	86.1
Cobalt	1.29
Manganese	403
Nickel	59.2

Analysis For Total Metals By EPA Method 6020B

Client ID:	Pile-C	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-05 x10
Date Analyzed:	12/06/21	Data File:	112011-05 x10.047
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Copper	4,810
Lead	192
Zinc	3,270

Analysis For Total Metals By EPA Method 6020B

Client ID:	Pile-D	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-06
Date Analyzed:	12/03/21	Data File:	112011-06.279
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	5.49
Arsenic	1.15
Cadmium	9.23
Cobalt	3.65
Lead	106
Nickel	61.2

Analysis For Total Metals By EPA Method 6020B

Client ID:	Pile-D	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-06 x2
Date Analyzed:	12/06/21	Data File:	112011-06 x2.053
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Chromium	2,350
Zinc	1,030

Analysis For Total Metals By EPA Method 6020B

Client ID:	Pile-D	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-06 x10
Date Analyzed:	12/06/21	Data File:	112011-06 x10.048
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Copper	5,430
Manganese	3,240

Analysis For Total Metals By EPA Method 6020B

Client ID:	Bags	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-07
Date Analyzed:	12/03/21	Data File:	112011-07.280
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	23.9
Arsenic	3.23
Cadmium	5.46

Analysis For Total Metals By EPA Method 6020B

Client ID:	Bags	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-07 x10
Date Analyzed:	12/06/21	Data File:	112011-07 x10.038
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Lead	345

Analysis For Total Metals By EPA Method 6020B

Client ID:	Bags	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-07 x20
Date Analyzed:	12/06/21	Data File:	112011-07 x20.134
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Chromium	583
Cobalt	<20
Copper	8,350
Manganese	1,340
Nickel	318
Zinc	5,070

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	I1-791 mb2
Date Analyzed:	12/02/21	Data File:	I1-791 mb2.059
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<1
Arsenic	<1
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	<5
Lead	<1
Manganese	<1
Nickel	<1
Zinc	<5

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Pile-Outdoor-Nonwashed	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	112011-09
Date Analyzed:	12/03/21	Data File:	112011-09.142
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1	0.2
Selenium	<1	1.0
Silver	<1	5.0

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Maralco, F&BI 112011
Date Extracted:	12/02/21	Lab ID:	I1-802 mb
Date Analyzed:	12/03/21	Data File:	I1-802 mb.131
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1	0.2
Selenium	<1	1.0
Silver	<1	5.0

Date of Report: 01/06/22
Date Received: 12/01/21
Project: Maralco, F&BI 112011

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR pH BY METHOD 9045D

Laboratory Code: 112011-03 (Duplicate)

Analyte	Sample Result	Duplicate Result	Relative Percent Difference	Acceptance Criteria
pH	8.2	8.2	0	0-20

Date of Report: 01/06/22
Date Received: 12/01/21
Project: Maralco, F&BI 112011

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 111537-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/kg (ppm)	20	<1	90	93	75-125	3
Arsenic	mg/kg (ppm)	10	4.12	77	85	75-125	10
Cadmium	mg/kg (ppm)	10	<1	100	118	75-125	17
Chromium	mg/kg (ppm)	50	16.1	106	111	75-125	5
Cobalt	mg/kg (ppm)	20	3.86	84	86	75-125	2
Copper	mg/kg (ppm)	50	18.6	77	84	75-125	9
Lead	mg/kg (ppm)	50	25.4	92	93	75-125	1
Manganese	mg/kg (ppm	20	255	0 b	128 b	75-125	200 b
Nickel	mg/kg (ppm)	25	14.5	89	99	75-125	11
Zinc	mg/kg (ppm)	50	50.0	74 b	93 b	75-125	23 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	mg/kg (ppm)	20	100	80-120
Arsenic	mg/kg (ppm)	10	84	80-120
Cadmium	mg/kg (ppm)	10	101	80-120
Chromium	mg/kg (ppm)	50	112	80-120
Cobalt	mg/kg (ppm)	20	98	80-120
Copper	mg/kg (ppm)	50	102	80-120
Lead	mg/kg (ppm)	50	101	80-120
Manganese	mg/kg (ppm)	20	99	80-120
Nickel	mg/kg (ppm)	25	104	80-120
Zinc	mg/kg (ppm)	50	100	80-120

Date of Report: 01/06/22
Date Received: 12/01/21
Project: Maralco, F&BI 112011

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL/SOLID SAMPLES FOR TCLP METALS USING EPA METHODS 6020B AND 1311

Laboratory Code: 110571-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	mg/L (ppm)	1.0	<1	89	94	75-125	5
Barium	mg/L (ppm)	5.0	<1	96	102	75-125	6
Cadmium	mg/L (ppm)	0.5	<1	96	101	75-125	5
Chromium	mg/L (ppm)	2.0	<1	96	99	75-125	3
Lead	mg/L (ppm)	1.0	<1	92	97	75-125	5
Mercury	mg/L (ppm)	1.0	<0.1	108	109	75-125	1
Selenium	mg/L (ppm)	0.5	<1	97	101	75-125	4
Silver	mg/L (ppm)	0.5	<1	92	103	75-125	11

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/L (ppm)	1.0	86	80-120
Barium	mg/L (ppm)	5.0	92	80-120
Cadmium	mg/L (ppm)	0.5	92	80-120
Chromium	mg/L (ppm)	2.0	93	80-120
Lead	mg/L (ppm)	1.0	88	80-120
Mercury	mg/L (ppm)	1.0	110	80-120
Selenium	mg/L (ppm)	0.5	92	80-120
Silver	mg/L (ppm)	0.5	92	80-120

Data Qualifiers & Definitions

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

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

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

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

112011

SAMPLE CHAIN OF CUSTODY

12-01-21 BIU / VSI

Page # 1 of 1

Report To R. Jones / G. Hainsworth

Company CRETE Consulting

Address

City, State, ZIP

Phone Email

SAMPLERS (signature) Rusty Jones R. Jones

PROJECT NAME: MARALCO

PO #

REMARKS: Email for Metals List

Project specific RLs? - Yes / No

INVOICE TO: CRETE

TURNAROUND TIME
- X Standard turnaround
- ☐ RUSH
- Rush charges authorized by:

SAMPLE DISPOSAL
- X Archive samples
- ☐ Other
- Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	TCLP-RCRA Metals PCBs EPA 8082	Total RCRA Metals	Fluoride, Chloride	Potassium, Na	Ammonia	Notes
PILE-A	01 A-F	11.30.2021	0845	SOILS	6 2 PB												HOLD
PILE-E	02		0915		6 2 PB												HOLD
PILE-B	03 A-C		0945		3								X	X	X	X	
PILE-F	04		1015		3								X	X	X	X	
PILE-C	05 A-D		1030		4								X	X	X		Incl. Strontium, Titanium, Boron
PILE-D	06		1045		4								X	X	X	X	Incl. pH + magnesium
BAGS	07 A-C		0930		3								X	X	X	X	Incl. pH + magnesium
PILE-OUTDOOR-WASHED	08 A-F		1100		6 2 PB												HOLD
PILE-OUTDOOR-NONWASHED	09 A-B	↓	1115	↓	2							X					TCLP-RCRA Metals

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	CRETE Consulting	12/1/2021 11:3-RS	1147
Received by: James Bruya	James Bruya	F&B	12/1	1147
Relinquished by:				
Received by:		Samples received at ___ °C		

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

Am Test Inc.
13600 NE 126TH PL
Suite C
Kirkland, WA 98034
(425) 885-1664

Professional Analytical Services

Jan 5 2022
Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL

Dear MICHAEL ERDAHL:

Enclosed please find the analytical data for your project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AMTEST ID	TEST
PILE-B	Soil	21-A018148	MIN, NUT, MET
PILE-F	Soil	21-A018149	MIN, NUT, MET
PILE-C	Soil	21-A018150	MIN, MET
PILE-D	Soil	21-A018151	MIN, NUT, MET
BAGS	Soil	21-A018152	MIN, NUT, MET

Your samples were received on Thursday, December 2, 2021. At the time of receipt, the samples were logged in and properly maintained prior to the subsequent analysis.

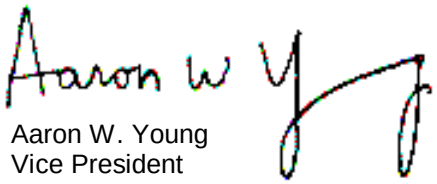
The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the Quality Control (QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,



Aaron W. Young
Vice President

Project #: 112011
PO Number: B-512

BACT = Bacteriological
CONV = Conventionals
MET = Metals
ORG = Organics
NUT=Nutrients
DEM=Demand
MIN=Minerals

Am Test Inc.
13600 NE 126TH PL
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Kirkland, WA 98034
(425) 885-1664
www.amtestlab.com

Professional Analytical Services

ANALYSIS REPORT

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project #: 112011
PO Number: B-512
All results reported on an as received basis.

Date Received: 12/02/21
Date Reported: 1/ 5/22

AMTEST Identification Number **21-A018148**
Client Identification **PILE-B**
Sampling Date **11/30/21, 09:45**

Minerals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fluoride	1400	ug/g		1900	EPA 300.0	KS	12/10/21
Magnesium	11000	ug/g		19.	EPA 6010D	JDR	12/17/21
Sodium	49100	ug/g		76.	EPA 6010D	JDR	12/08/21
Chloride	85000	ug/g		10.	EPA 300.0	KS	12/10/21

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia	180.	ug/g		5	SM 4500NH3-E	KS	01/04/22

Total Metals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Acid Digestion	Y				SW-846 3050B	JDR	12/07/21
Aluminum	134000	ug/g		190	EPA 6010D	JDR	12/17/21
Boron	151.	ug/g		11.	EPA 6010D	JDR	12/08/21
Iron	3350	ug/g		38.	EPA 6010D	JDR	12/08/21
Strontium	156.	ug/g		1.9	EPA 6010D	JDR	12/08/21
Titanium	543.	ug/g		3.8	EPA 6010D	JDR	12/08/21

AMTEST Identification Number **21-A018149**
Client Identification **PILE-F**
Sampling Date **11/30/21, 10:15**

Minerals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fluoride	460	ug/g		1400	EPA 300.0	KS	12/09/21
Magnesium	7300	ug/g		14.	EPA 6010D	JDR	12/17/21
Sodium	9020.	ug/g		57.	EPA 6010D	JDR	12/08/21
Chloride	6700	ug/g		10.	EPA 300.0	KS	12/10/21

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia	33.2	ug/g		5	SM 4500NH3-E	KS	01/04/22

Total Metals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Acid Digestion	Y				SW-846 3050B	JDR	12/07/21
Aluminum	210000	ug/g		140	EPA 6010D	JDR	12/17/21
Boron	241.	ug/g		8.5	EPA 6010D	JDR	12/08/21
Iron	6290	ug/g		28.	EPA 6010D	JDR	12/17/21
Strontium	167.	ug/g		1.4	EPA 6010D	JDR	12/08/21
Titanium	377.	ug/g		2.8	EPA 6010D	JDR	12/08/21

AMTEST Identification Number **21-A018150**
Client Identification **PILE-C**
Sampling Date **11/30/21, 10:50**

Minerals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fluoride	2200	ug/g		1900	EPA 300.0	KS	12/10/21
Magnesium	2800	ug/g		19.	EPA 6010D	JDR	12/08/21
Sodium	58800	ug/g		77.	EPA 6010D	JDR	12/08/21
Chloride	20000	ug/g		10.	EPA 300.0	KS	12/10/21

Total Metals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Acid Digestion	Y				SW-846 3050B	JDR	12/07/21
Aluminum	178000	ug/g		190	EPA 6010D	JDR	12/17/21
Boron	17.2	ug/g		12.	EPA 6010D	JDR	12/08/21
Iron	4020	ug/g		39.	EPA 6010D	JDR	12/08/21
Strontium	35.3	ug/g		1.9	EPA 6010D	JDR	12/08/21
Titanium	245.	ug/g		3.9	EPA 6010D	JDR	12/08/21

AMTEST Identification Number **21-A018151**
Client Identification **PILE-D**
Sampling Date **11/30/21, 10:45**

Minerals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fluoride	340	ug/g		1700	EPA 300.0	KS	12/09/21
Magnesium	4800	ug/g		17.	EPA 6010D	JDR	12/17/21
Sodium	25100	ug/g		66.	EPA 6010D	JDR	12/17/21
Chloride	59000	ug/g		10.	EPA 300.0	KS	12/10/21

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia	958.	ug/g		5	SM 4500NH3-E	KS	01/04/22

Total Metals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Acid Digestion	Y				SW-846 3050B	JDR	12/07/21
Aluminum	194000	ug/g		170	EPA 6010D	JDR	12/17/21
Boron	651.	ug/g		9.9	EPA 6010D	JDR	12/08/21
Iron	3500	ug/g		33.	EPA 6010D	JDR	12/08/21
Strontium	258.	ug/g		1.7	EPA 6010D	JDR	12/08/21
Titanium	181.	ug/g		3.3	EPA 6010D	JDR	12/08/21

AMTEST Identification Number **21-A018152**
Client Identification **BAGS**
Sampling Date **11/30/21, 09:30**

Minerals

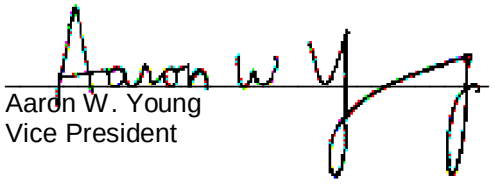
PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fluoride	150	ug/g		26000	EPA 300.0	KS	12/14/21
Magnesium	< 2.6	ug/g		260	EPA 6010D	JDR	12/08/21
Sodium	1320.	ug/g		1100	EPA 6010D	JDR	12/08/21
Chloride	14000	ug/g		10.	EPA 300.0	KS	12/10/21

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia	2010	ug/g		5	SM 4500NH3-E	KS	01/04/22

Total Metals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Acid Digestion	Y				SW-846 3050B	JDR	12/07/21
Aluminum	169000	ug/g		2600	EPA 6010D	JDR	12/17/21
Boron	19.5	ug/g		160	EPA 6010D	JDR	12/08/21
Iron	122000	ug/g		530	EPA 6010D	JDR	12/17/21
Strontium	1.64	ug/g		26.	EPA 6010D	JDR	12/08/21
Titanium	89.2	ug/g		53.	EPA 6010D	JDR	12/08/21



Aaron W. Young
Vice President

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Professional Analytical Services

QC Summary for sample numbers: 21-A018148 to 21-A018152

DUPLICATES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	DUP VALUE	RPD
21-A018152	Chloride	ug/g	14000	13000	7.4
21-A018152	Fluoride	ug/g	89.	50.	56.
21-A019128	Ammonia	ug/g	898.	847.	5.8
21-A018151	Aluminum	ug/g	194000	204000	5.0
21-A018151	Boron	ug/g	651.	776.	18.
21-A018151	Iron	ug/g	3500	3870	10.
21-A018151	Magnesium	ug/g	4800	4700	2.1
21-A018151	Sodium	ug/g	25100	27400	8.8
21-A018151	Strontium	ug/g	258.	256.	0.78
21-A018151	Titanium	ug/g	181.	1190	150

MATRIX SPIKES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	SMPL+ SPK	SPK AMT	RECOVERY
21-A018152	Chloride	ug/g	14000	18000	4000	100.00 %
21-A018152	Fluoride	ug/g	89.	170	100	81.00 %
Duplicate	Aluminum	ug/g	204000	205000	270.	370.37 %
Duplicate	Iron	ug/g	3870	5800	270.	714.82 %
Duplicate	Magnesium	ug/g	4700	5400	600	116.67 %
Duplicate	Sodium	ug/g	27400	27900	600.0	83.33 %
Duplicate	Strontium	ug/g	256.	259.	45.0	6.67 %

STANDARD REFERENCE MATERIALS

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
Chloride	ug/g	2.0	1.9	95.0 %
Fluoride	ug/g	2.0	2.0	100. %
Fluoride	ug/g	2.0	2.0	100. %
Ammonia	ug/g	20.0	19.0	95.0 %
Ammonia	ug/g	20.0	18.0	90.0 %
Aluminum	ug/g	2.00	1.93	96.5 %
Boron	ug/g	0.800	0.772	96.5 %
Boron	ug/g	0.800	0.804	100. %
Iron	ug/g	2.00	2.01	100. %
Iron	ug/g	2.00	1.97	98.5 %
Iron	ug/g	2.00	1.81	90.5 %
Magnesium	ug/g	4.0	4.0	100. %
Magnesium	ug/g	4.0	4.0	100. %
Magnesium	ug/g	4.0	3.7	92.5 %
Sodium	ug/g	20.00	20.20	101. %

QC Summary for sample numbers: 21-A018148 to 21-A018152...

STANDARD REFERENCE MATERIALS continued....

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
Sodium	ug/g	20.00	20.70	104. %
Sodium	ug/g	20.00	19.90	99.5 %
Strontium	ug/g	0.800	0.793	99.1 %
Strontium	ug/g	0.800	0.796	99.5 %
Titanium	ug/g	2.00	1.94	97.0 %
Titanium	ug/g	2.00	1.96	98.0 %

BLANKS

ANALYTE	UNITS	RESULT
Chloride	ug/g	< 10
Fluoride	ug/g	< 5
Fluoride	ug/g	< 5
Ammonia	ug/g	< 5
Ammonia	ug/g	< 5
Aluminum	ug/g	< 0.5
Boron	ug/g	< 0.03
Boron	ug/g	0.036
Iron	ug/g	< 0.1
Iron	ug/g	< 0.1
Iron	ug/g	< 0.1
Magnesium	ug/g	< 0.05
Magnesium	ug/g	< 0.05
Magnesium	ug/g	< 0.05
Sodium	ug/g	< 0.2
Sodium	ug/g	< 0.2
Sodium	ug/g	< 0.2
Strontium	ug/g	< 0.005
Strontium	ug/g	< 0.005
Titanium	ug/g	< 0.01
Titanium	ug/g	< 0.01

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER ~~Friedman~~ Amtest

PROJECT NAME/NO. 112011

PO # BS12

REMARKS

TURNAROUND TIME

☒ Standard TAT

☐ RUSH

Rush charges authorized by:

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Return samples

☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Fluoride, Chloride	Ammonia	Al, Na, Boron, Ti, Fe, Sr, Mg				Notes
PILE-B 18148	48	11/30/21	0945	Solid	1				x	x	x				
PILE-F	49		1015		1				x	x	x				
PILE-C	50		1030		1				x	-	x				Do not analyze for ammonia
PILE-D	51		1045		1				x	x	x				
BAGS	52		0950		1				x	x	x				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	12/1/21	1243
Received by:		Kyle Wataya	Amtest	12/2/21	1455
Relinquished by:					
Received by:					

Fedex T-9.2

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

January 28, 2021

Grant Hainsworth, Project Manager
Crete Consulting
16300 Christensen Road, Suite 214
Tukwila, WA 98188

Dear Mr Hainsworth:

Included are the additional results from the testing of material submitted on December 1, 2021 from the Maralco, F&BI 112011 project. There are 9 pages included in this report.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Rusty Jones
CTC0128R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on December 1, 2022 by Friedman & Bruya, Inc. from the Crete Consulting Maralco, F&BI 112011 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
112011 -01	Pile-A
112011 -02	Pile-E
112011 -03	Pile-B
112011 -04	Pile-F
112011 -05	Pile-C
112011 -06	Pile-D
112011 -07	Bags
112011 -08	Pile-Outdoor-Washed
112011 -09	Pile-Outdoor-Nonwashed

The TCLP mercury analysis was requested outside of the holding time. The data were flagged accordingly.

All other quality control requirements were acceptable.

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Pile-B	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	01/26/22	Lab ID:	112011-03
Date Analyzed:	01/27/22	Data File:	112011-03.046
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1 ht	0.2
Selenium	<1	1.0
Silver	<1	5.0

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Pile-F	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	01/26/22	Lab ID:	112011-04
Date Analyzed:	01/27/22	Data File:	112011-04.049
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1 ht	0.2
Selenium	<1	1.0
Silver	<1	5.0

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Pile-C	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	01/26/22	Lab ID:	112011-05
Date Analyzed:	01/27/22	Data File:	112011-05.050
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1 ht	0.2
Selenium	<1	1.0
Silver	<1	5.0

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Pile-D	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	01/26/22	Lab ID:	112011-06
Date Analyzed:	01/27/22	Data File:	112011-06.051
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1 ht	0.2
Selenium	<1	1.0
Silver	<1	5.0

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Bags	Client:	Crete Consulting
Date Received:	12/01/21	Project:	Maralco, F&BI 112011
Date Extracted:	01/26/22	Lab ID:	112011-07
Date Analyzed:	01/27/22	Data File:	112011-07.052
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	2.10	5.0
Mercury	<0.1 ht	0.2
Selenium	<1	1.0
Silver	<1	5.0

Analysis for TCLP Metals By EPA Method 6020B and 1311

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Maralco, F&BI 112011
Date Extracted:	01/26/22	Lab ID:	I2-66 mb
Date Analyzed:	01/27/22	Data File:	I2-66 mb.038
Matrix:	Soil/Solid	Instrument:	ICPMS2
Units:	mg/L (ppm)	Operator:	SP

Analyte:	Concentration mg/L (ppm)	TCLP Limit
Arsenic	<1	5.0
Barium	<1	100
Cadmium	<1	1.0
Chromium	<1	5.0
Lead	<1	5.0
Mercury	<0.1	0.2
Selenium	<1	1.0
Silver	<1	5.0

Date of Report: 01/28/22
Date Received: 12/01/21
Project: Maralco, F&BI 112011

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL/SOLID SAMPLES FOR TCLP METALS USING EPA METHODS 6020B AND 1311

Laboratory Code: 112011-03 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	mg/L (ppm)	1.0	<1	101	101	75-125	0
Barium	mg/L (ppm)	5.0	<1	103	103	75-125	0
Cadmium	mg/L (ppm)	0.5	<1	101	102	75-125	1
Chromium	mg/L (ppm)	2.0	<1	101	103	75-125	2
Lead	mg/L (ppm)	1.0	<1	92	93	75-125	1
Mercury	mg/L (ppm)	1.0	<0.1	98	96	75-125	2
Selenium	mg/L (ppm)	0.5	<1	103	102	75-125	1
Silver	mg/L (ppm)	0.5	<1	91	97	75-125	6

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/L (ppm)	1.0	96	80-120
Barium	mg/L (ppm)	5.0	98	80-120
Cadmium	mg/L (ppm)	0.5	95	80-120
Chromium	mg/L (ppm)	2.0	96	80-120
Lead	mg/L (ppm)	1.0	96	80-120
Mercury	mg/L (ppm)	1.0	98	80-120
Selenium	mg/L (ppm)	0.5	98	80-120
Silver	mg/L (ppm)	0.5	100	80-120

Data Qualifiers & Definitions

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

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

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

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

112011

SAMPLE CHAIN OF CUSTODY

12-01-21 BDU / V31

Page # 1 of 1

Report To R. Jones / G. Hainsworth

Company CRETE Consulting

Address

City, State, ZIP

Phone Email

SAMPLERS (signature) Rusty Jones R. Jones

PROJECT NAME: MARALCO

PO #

REMARKS: Email for Metals List

Project specific RLs? - Yes / No

INVOICE TO: CRETE

TURNAROUND TIME
- [x] Standard turnaround
- [ ] RUSH
- Rush charges authorized by:

SAMPLE DISPOSAL
- [x] Archive samples
- [ ] Other
- Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	TCLP RCRA Metals PCBs EPA 8082	Total RCRA Metals	Fluoride Chloride	Potassium, Na	Ammonia	● per RJ 1/20/22 AE Notes
PILE-A	01 A-F	11.30.2021	0845	SOLIDS	(6) 2 8												HOLD
PILE-E	02		0915		(6) 2 8												HOLD
PILE-B	03 A-C		0945		3							●	X	X	X	X	
PILE-F	04		1015		3							●	X	X	X	X	
PILE-C	05 A-D		1030		4							●	X	X	X		Incl. Strontium, Titanium, Boron
PILE-D	06		1045		4							●	X	X	X	X	Incl. pH + magnesium
BAGS	07 A-C		0930		3							●	X	X	X	X	Incl. pH + magnesium
PILE OUTDOOR-WASHED	08 A-F		1100		(6) 2 8												HOLD
PILE-OUTDOOR-NONWASHED	09 A-B	↓	1115	↓	2							X					TCLP-RCRA Metals

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	CRETE Consulting	12/1/2021	1147
Received by: James Bruya	James Bruya	F&B	12/1	1147
Relinquished by:				
Received by:		Samples received at ___ °C		

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

Am Test Inc.
13600 NE 126TH PL
Suite C
Kirkland, WA 98034
(425) 885-1664

Professional Analytical Services

Jan 12 2022
Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL

Dear MICHAEL ERDAHL:

Enclosed please find the analytical data for your project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AMTEST ID	TEST
PILE-B	Soil	21-A018148	MIN, NUT, MET
PILE-F	Soil	21-A018149	MIN, NUT, MET
PILE-C	Soil	21-A018150	MIN, MET
PILE-D	Soil	21-A018151	MIN, NUT, MET
BAGS	Soil	21-A018152	MIN, NUT, MET

Your samples were received on Thursday, December 2, 2021. At the time of receipt, the samples were logged in and properly maintained prior to the subsequent analysis.

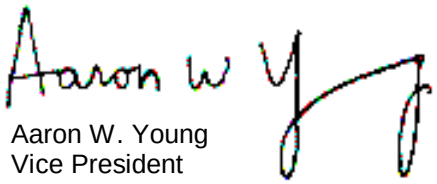
The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the Quality Control (QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,



Aaron W. Young
Vice President

Project #: 112011
PO Number: B-512

BACT = Bacteriological
CONV = Conventionals
MET = Metals
ORG = Organics
NUT=Nutrients
DEM=Demand
MIN=Minerals

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Professional Analytical Services

ANALYSIS REPORT

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Attention: MICHAEL ERDAHL
Project #: 112011
PO Number: B-512
All results reported on an as received basis.

Date Received: 12/02/21
Date Reported: 1/12/22

AMTEST Identification Number **21-A018148**
Client Identification **PILE-B**
Sampling Date **11/30/21, 09:45**

Minerals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fluoride	1400	ug/g		1900	EPA 300.0	KS	12/10/21
Potassium	47100	ug/g		380	EPA 6010D	JDR	12/17/21
Magnesium	11000	ug/g		19.	EPA 6010D	JDR	12/17/21
Sodium	49100	ug/g		76.	EPA 6010D	JDR	12/08/21
Chloride	85000	ug/g		10.	EPA 300.0	KS	12/10/21

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia	180.	ug/g		5	SM 4500NH3-E	KS	01/04/22

Total Metals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Acid Digestion	Y				SW-846 3050B	JDR	12/07/21
Aluminum	134000	ug/g		190	EPA 6010D	JDR	12/17/21
Boron	151.	ug/g		11.	EPA 6010D	JDR	12/08/21
Iron	3350	ug/g		38.	EPA 6010D	JDR	12/08/21
Strontium	156.	ug/g		1.9	EPA 6010D	JDR	12/08/21
Titanium	543.	ug/g		3.8	EPA 6010D	JDR	12/08/21

AMTEST Identification Number **21-A018149**
Client Identification **PILE-F**
Sampling Date **11/30/21, 10:15**

Minerals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fluoride	460	ug/g		1400	EPA 300.0	KS	12/09/21
Potassium	8640	ug/g		280	EPA 6010D	JDR	12/17/21
Magnesium	7300	ug/g		14.	EPA 6010D	JDR	12/17/21
Sodium	9020.	ug/g		57.	EPA 6010D	JDR	12/08/21
Chloride	6700	ug/g		10.	EPA 300.0	KS	12/10/21

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia	33.2	ug/g		5	SM 4500NH3-E	KS	01/04/22

Total Metals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Acid Digestion	Y				SW-846 3050B	JDR	12/07/21
Aluminum	210000	ug/g		140	EPA 6010D	JDR	12/17/21
Boron	241.	ug/g		8.5	EPA 6010D	JDR	12/08/21
Iron	6290	ug/g		28.	EPA 6010D	JDR	12/17/21
Strontium	167.	ug/g		1.4	EPA 6010D	JDR	12/08/21
Titanium	377.	ug/g		2.8	EPA 6010D	JDR	12/08/21

AMTEST Identification Number **21-A018150**
Client Identification **PILE-C**
Sampling Date **11/30/21, 10:50**

Minerals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fluoride	2200	ug/g		1900	EPA 300.0	KS	12/10/21
Potassium	8330	ug/g		390	EPA 6010D	JDR	12/17/21
Magnesium	2800	ug/g		19.	EPA 6010D	JDR	12/08/21
Sodium	58800	ug/g		77.	EPA 6010D	JDR	12/08/21
Chloride	20000	ug/g		10.	EPA 300.0	KS	12/10/21

Total Metals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Acid Digestion	Y				SW-846 3050B	JDR	12/07/21
Aluminum	178000	ug/g		190	EPA 6010D	JDR	12/17/21
Boron	17.2	ug/g		12.	EPA 6010D	JDR	12/08/21
Iron	4020	ug/g		39.	EPA 6010D	JDR	12/08/21
Strontium	35.3	ug/g		1.9	EPA 6010D	JDR	12/08/21
Titanium	245.	ug/g		3.9	EPA 6010D	JDR	12/08/21

AMTEST Identification Number **21-A018151**
Client Identification **PILE-D**
Sampling Date **11/30/21, 10:45**

Minerals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fluoride	340	ug/g		1700	EPA 300.0	KS	12/09/21
Potassium	29200	ug/g		330	EPA 6010D	JDR	12/17/21
Magnesium	4800	ug/g		17.	EPA 6010D	JDR	12/17/21
Sodium	25100	ug/g		66.	EPA 6010D	JDR	12/17/21
Chloride	59000	ug/g		10.	EPA 300.0	KS	12/10/21

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia	958.	ug/g		5	SM 4500NH3-E	KS	01/04/22

Total Metals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Acid Digestion	Y				SW-846 3050B	JDR	12/07/21
Aluminum	194000	ug/g		170	EPA 6010D	JDR	12/17/21
Boron	651.	ug/g		9.9	EPA 6010D	JDR	12/08/21
Iron	3500	ug/g		33.	EPA 6010D	JDR	12/08/21
Strontium	258.	ug/g		1.7	EPA 6010D	JDR	12/08/21
Titanium	181.	ug/g		3.3	EPA 6010D	JDR	12/08/21

AMTEST Identification Number **21-A018152**
Client Identification **BAGS**
Sampling Date **11/30/21, 09:30**

Minerals

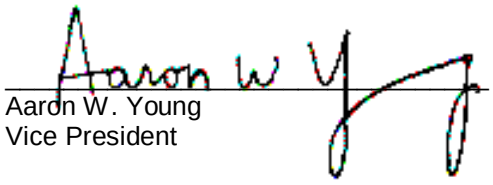
PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fluoride	150	ug/g		26000	EPA 300.0	KS	12/14/21
Potassium	1240	ug/g		5300	EPA 6010D	JDR	12/17/21
Magnesium	< 2.6	ug/g		260	EPA 6010D	JDR	12/08/21
Sodium	1320.	ug/g		1100	EPA 6010D	JDR	12/08/21
Chloride	14000	ug/g		10.	EPA 300.0	KS	12/10/21

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia	2010	ug/g		5	SM 4500NH3-E	KS	01/04/22

Total Metals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Acid Digestion	Y				SW-846 3050B	JDR	12/07/21
Aluminum	169000	ug/g		2600	EPA 6010D	JDR	12/17/21
Boron	19.5	ug/g		160	EPA 6010D	JDR	12/08/21
Iron	122000	ug/g		530	EPA 6010D	JDR	12/17/21
Strontium	1.64	ug/g		26.	EPA 6010D	JDR	12/08/21
Titanium	89.2	ug/g		53.	EPA 6010D	JDR	12/08/21



Aaron W. Young
Vice President

Am Test Inc.
13600 NE 126th PL
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Professional Analytical Services

QC Summary for sample numbers: 21-A018148 to 21-A018152

DUPLICATES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	DUP VALUE	RPD
21-A018152	Chloride	ug/g	14000	13000	7.4
21-A018152	Fluoride	ug/g	89.	50.	56.
21-A019128	Ammonia	ug/g	898.	847.	5.8
21-A018151	Aluminum	ug/g	194000	204000	5.0
21-A018151	Boron	ug/g	651.	776.	18.
21-A018151	Iron	ug/g	3500	3870	10.
21-A018151	Potassium	ug/g	29200	29400	0.68
21-A018151	Magnesium	ug/g	4800	4700	2.1
21-A018151	Sodium	ug/g	25100	27400	8.8
21-A018151	Strontium	ug/g	258.	256.	0.78
21-A018151	Titanium	ug/g	181.	1190	150

MATRIX SPIKES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	SMPL+ SPK	SPK AMT	RECOVERY
21-A018152	Chloride	ug/g	14000	18000	4000	100.00 %
21-A018152	Fluoride	ug/g	89.	170	100	81.00 %
Duplicate	Aluminum	ug/g	204000	205000	270.	370.37 %
Duplicate	Iron	ug/g	3870	5800	270.	714.82 %
Duplicate	Magnesium	ug/g	4700	5400	600	116.67 %
Duplicate	Sodium	ug/g	27400	27900	600.0	83.33 %
Duplicate	Strontium	ug/g	256.	259.	45.0	6.67 %

STANDARD REFERENCE MATERIALS

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
Chloride	ug/g	2.0	1.9	95.0 %
Fluoride	ug/g	2.0	2.0	100. %
Fluoride	ug/g	2.0	2.0	100. %
Ammonia	ug/g	20.0	19.0	95.0 %
Ammonia	ug/g	20.0	18.0	90.0 %
Aluminum	ug/g	2.00	1.93	96.5 %
Boron	ug/g	0.800	0.772	96.5 %
Boron	ug/g	0.800	0.804	100. %
Iron	ug/g	2.00	2.01	100. %
Iron	ug/g	2.00	1.97	98.5 %
Iron	ug/g	2.00	1.81	90.5 %
Potassium	ug/g	4.00	3.75	93.8 %
Magnesium	ug/g	4.0	4.0	100. %
Magnesium	ug/g	4.0	4.0	100. %

QC Summary for sample numbers: 21-A018148 to 21-A018152...

STANDARD REFERENCE MATERIALS continued....

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
Magnesium	ug/g	4.0	3.7	92.5 %
Sodium	ug/g	20.00	20.20	101. %
Sodium	ug/g	20.00	20.70	104. %
Sodium	ug/g	20.00	19.90	99.5 %
Strontium	ug/g	0.800	0.793	99.1 %
Strontium	ug/g	0.800	0.796	99.5 %
Titanium	ug/g	2.00	1.94	97.0 %
Titanium	ug/g	2.00	1.96	98.0 %

BLANKS

ANALYTE	UNITS	RESULT
Chloride	ug/g	< 10
Fluoride	ug/g	< 5
Fluoride	ug/g	< 5
Ammonia	ug/g	< 5
Ammonia	ug/g	< 5
Aluminum	ug/g	< 0.5
Boron	ug/g	< 0.03
Boron	ug/g	0.036
Iron	ug/g	< 0.1
Iron	ug/g	< 0.1
Iron	ug/g	< 0.1
Potassium	ug/g	< 1
Magnesium	ug/g	< 0.05
Magnesium	ug/g	< 0.05
Magnesium	ug/g	< 0.05
Sodium	ug/g	< 0.2
Sodium	ug/g	< 0.2
Sodium	ug/g	< 0.2
Strontium	ug/g	< 0.005
Strontium	ug/g	< 0.005
Titanium	ug/g	< 0.01
Titanium	ug/g	< 0.01

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER ~~Friedman~~ Amtest

PROJECT NAME/NO. 112011

PO # BS12

REMARKS

TURNAROUND TIME

☒ Standard TAT

☐ RUSH

Rush charges authorized by:

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Return samples

☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Fluoride, Chloride	Ammonia	Al, Na, Boron, Ti, Fe, Sr, Mg				Notes
PILE-B 18148	48	11/30/21	0945	Solid	1				x	x	x				
PILE-F	49		1015		1				x	x	x				
PILE-C	50		1030		1				x	-	x				Do not analyze for ammonia
PILE-D	51		1045		1				x	x	x				
BAGS	52		0950		1				x	x	x				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	12/1/21	1243
Received by:		Kyle Wataya	Amtest	12/2/21	1455
Relinquished by:					
Received by:					

Fedex T-9.2

Appendix B COI Screening Evaluation Backup

Table B-1- Soil Data COI Summary
Maralco Property - Kent, WA

	Screening	Max Value	Min Value	Detection above SL	Carried forward as a COI	DPT-1 5-6'		DPT-2 6-7.5'		DPT-5 0.3-0.9'		DPT-6 1.5-2'		DPT-6 2.6-3.1'		DPT-8 8.2-8.4'		DPT-8 9.4-10'		DPT-9 13.2-13.8'		DPT-9 14.5-15'		DPT-11 2.1-3.1'		DPT-11 4.5-5'		DPT-12 8.6-9.2'		DPT-13 7.2-8.2'		DPT-13 9.3-10'		MW-3A (5)		MW-4A (5)
Analyte	**Level**					5/24/21		5/24/21		5/24/21		5/24/21		5/24/21		5/24/21		5/24/21		5/24/21		5/24/21		5/24/21		5/24/21		5/24/21		5/24/21		5/24/21		7/21/17		7/21/17
Aluminum	8000	165000	1400	yes	yes	NA		NA		**7460**		**14500**		**10800**		**17400**		**37500**		**48100**		**15400**		**17100**		**15400**		**16500**		**14700**		**11800**		**7800**		**5600**
Iron	500	37300	9000	yes	yes	NA		NA		**9000**		**12400**		**11200**		**15300**		**37300**		**19600**		**21700**		**18600**		**16500**		**18200**		**16400**		**9420**		NA		NA
Barium	16000	70.2	5	yes	yes	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		5	U	5
Antimony	1.25	4.83	1.2	yes	yes	NA		NA		2	U	2	U	2	U	2	U	2	U	**4.83**		2	U	2	U	2	U	2	U	2	U	2	U	NA		NA
Arsenic	7.3	19	1	yes	yes	NA		NA		5	U	**10.9**		**2.91**		**11.3**		**1.74**		10	U	**7.51**		5	U	**2.1**		5	U	5	U	**3.15**		1.1		1
Cadmium	0.25	4.5	0.7	yes	yes	NA		NA		1	U	1	U	1	U	1	U	1	U	**2.37**		1	U	1	U	1	U	1	U	1	U	1	U	1	U	1
Chromium	48	4530	1	yes	yes	NA		NA		**12**		**10.6**		**8.31**		**17**		**7.32**		**4530**		**13.8**		**25.7**		**19.4**		**18.4**		**19.8**		**9.81**		1.2		1
Cobalt	24	10	2.66	no	no	NA		NA		5	U	5	U	**3.35**		**6.65**		**2.66**		10	U	**4.97**		**6.3**		**6.59**		**6.21**		**6.1**		**4.59**		NA		NA
Copper	36	17100	7.75	yes	yes	NA		NA		25	U	**43.6**		**33.3**		**56.5**		**7.75**		**1530**		**19.4**		**58.1**		25	U	**26.7**		**29.3**		**12.2**		NA		NA
Lead	150	160	1	yes	yes	NA		NA		**2.19**		**14.5**		**3.69**		**8.28**		**2.95**		**108**		**3.43**		**5.17**		**2.78**		**5.72**		**2.77**		**10.1**		1	U	1
Manganese	3700	1860	80.9	no	no	NA		NA		**80.9**		**140**		**92.7**		**194**		**81**		**1860**		**135**		**242**		**230**		**229**		**253**		**85**		NA		NA
Nickel	68	74	5.31	yes	yes	NA		NA		**6.38**		**8.46**		**6.25**		**14**		**5.31**		**32.6**		**9.51**		**27.4**		**22.5**		**21.8**		**20.6**		**7.71**		NA		NA
Thallium		0	0	no	no																															
Zinc	120	2660	13.6	yes	yes	NA		NA		25	U	**353**		**47**		**56**		**13.6**		**364**		**26.6**		**60.7**		**32**		**50.8**		**35**		**29.9**		NA		NA
Mercury	2	0.5	0.0281	no	no	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5
Silver		1.31	0.7	no	no																															
Selenium	400	2.62	0.34	no	no	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		1	U	1
TPH-G	30	5	2	no	no	5	U	5	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		2	U	2
TPH-D	2000	2100	50	yes	yes	50	U	**1100**		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
TPH-O	2000	250	250	no	no	250	U	250	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Benzene	0.02	0.02	0.000522	no	no	0.02	U	0.02	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Ethylbenzene	0.24	0.02	0.02	no	no	0.02	U	0.02	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Toluene	0.4	0.02	0.02	no	no	0.02	U	0.02	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Total Xylenes	16000	0.06	0.06	no	no	0.06	U	0.06	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
PCB-aroclor 1016	NC	1	1	no	no	NA		1	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
PCB-aroclor 1221	NC	1	1	no	no	NA		1	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
PCB-aroclor 1232	NC	1	1	no	no	NA		1	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
PCB-aroclor 1242	NC	1	1	no	no	NA		1	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
PCB-aroclor 1248	NC	1	1	no	no	NA		1	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
PCB-aroclor 1254	NC	1	1	no	no	NA		1	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
PCB-aroclor 1260	NC	1	1	no	no	NA		1	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
PCB-aroclor 1262	NC	1	1	no	no	NA		1	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
PCB-aroclor 1268	NC	1	1	no	no	NA		1	U	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Total PCB Aroclors	1	0	0	no	no	NA		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Chloride	NC	4280	41.4	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Fluoride	4800	35.9	2.75	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Nitrate	130,000	2.25	2.25	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Ammonia Nitrogen	NC	33.1	15.2	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Anthracene	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Acenaphthene	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Acenaphthylene	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Benzo(A)Anthracene	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Benzo(A)Pyrene*	3.9	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Benzo(B)Fluoranthe	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Benzo(G,H,I)Perylen	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Benzo(K)Fluoranthe	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Chrysene*	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Dibenz(A,H)Anthrace	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Fluoranthene	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Fluorene	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Indeno(1,2,3-Cd)Pyr	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Naphthalene	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Phenanthrene	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
Pyrene	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
1-Methylnaphthalen	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
2-Methylnaphthalen	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA
2-Chloronaphthalen	NC	0	0	no	no	ND		ND		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA

Table B-1- Soil Dat
Maralco Property ·

				B-1-5	B-1-17	B-2-4	B-2-16.5	B-3-6	B-3-16	B-4-7	B-4-9	B-4-15	B-5-8	B-5-10	B-5-15	B-6-7.5	B-6-9.5	B-6-15	S1	S2	S3	S4	S5	B1	B2	B3	B4	HB-1	HB-1
		MW-6 (5)		5	17	4	16.5	6	16	7	9	15	8	10	15	7.5	9.5	15	5 ft bgs	10 ft bgs	15 ft bgs	1 ft bgs	1 ft bgs	3 ft bgs	1 ft bgs	3 ft bgs	3 ft bgs	1 ft bgs	2.5 ft bgs
Analyte		**7/21/17**		**10/27/16**	**10/27/16**	**10/27/16**	**10/27/16**	**10/27/16**	**10/27/16**	**10/27/16**	**10/27/16**	**10/27/16**	**10/27/16**	**10/27/16**	**10/27/16**	**10/27/16**	**10/27/16**	**10/27/16**	**Jun-87**	**Jun-87**	**Jun-87**	**Jun-87**	**Jun-87**	**Jun-87**	**Jun-87**	**Jun-87**	**Jun-87**	**May-90**	**May-90**
Aluminum		**9700**		NA	NA	NA	NA	NA	NA	**9370 O1 V**	NA	**12,200**	**5,730**	NA	**8,840**	**16,600**	NA	**19,800**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	**138,000**	**12,800**
Iron		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	U	5	U	NA	NA	NA	NA	NA	NA	**39.6**	NA	**55.7**	**19.1**	NA	**42.1**	**70.2**	NA	**52.2**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1.2**	**3.2**	0.6 U	0.6 U	**1.79 N**	**0.2 N**
Arsenic	U	**1.6**		NA	NA	NA	NA	NA	NA	2.34 U	NA	**2.73**	**3.46**	NA	2.77 U	**2.47 J**	NA	2.88 J	**2.8**	**4.3**	**12**	**11**	**9.2**	**19**	**5.8**	**4.4**	**5.2**	**3**	**1**
Cadmium	U	1	U	NA	NA	NA	NA	NA	NA	0.115 J	NA	0.128 J	0.0759 J	NA	0.692 U	0.153 J	NA	0.234 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2 U	**4.5**	1 U	2 U	0.7	0.2 U
Chromium	U	**4**		NA	NA	NA	NA	NA	NA	**13**	NA	**14.5**	**8.32**	NA	**11.4**	**18**	NA	**20.1**	**19**	**21**	**10**	**13**	**11**	**36**	**232**	**14**	**14**	**83 N**	**12.4 N**
Cobalt		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**19**	**29**	**21**	**21**	**18**	**262**	**1500**	**16**	**21**	**713**	**24.1**
Lead	U	**1.6**		NA	NA	NA	NA	NA	NA	**2.37**	NA	**3.26**	**2.14**	NA	**2.57**	**4.35**	NA	**6**	**10 U**	**26**	**44**	**27**	**27**	**64**	**144**	**14**	**20**	**55**	**1.7**
Manganese		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**23**	**25**	**14**	**13**	**14**	**31**	**74**	**12**	**15**	**24**	**9**
Thallium				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.6 U	0.6 U	0.5 U	0.6 U	0.2 NU	0.2 NU
Zinc		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**55**	**57**	**56**	**60**	**66**	**365**	**1300**	**58**	**67**	**442**	**27.9**
Mercury	U	0.5	U	NA	NA	NA	NA	NA	NA	**0.023 J**	NA	**0.0288**	0.0211 U	NA	**0.0281**	**0.141**	NA	**0.0163 J**	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.26	0.2 U	0.2 U	0.1 U	0.04 U	0.04 U
Silver				NA	NA	NA	NA	NA	NA	1.17 U	NA	1.37 U	1.05 U	NA	1.38 U	**1.31**	NA	1.45 U	NA	NA	NA	NA	NA	3.0 U	3.0 U	2.0 U	3.0 U	0.4 U	0.3 U
Selenium	U	1	U	NA	NA	NA	NA	NA	NA	2.34 U	NA	**1.41 J**	2.11 U	NA	2.77 U	**2.62**	NA	**1.11 J**	0.2 U	**0.34**	0.2 U	0.2 U	0.2 U	0.35	0.3 U	0.2 U	0.3 U	0.6 NU	0.5 NU
TPH-G	U	2	U	NA	0.1U	NA	NA	NA	0.1U	NA	0.1U	NA	NA	0.1U	NA	NA	0.1U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH-D		NA		4.4U	5.38U	4.61U	5.04U	45.1U	5.5U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH-O		NA		11U	13.5U	11.5U	12.6U	113U	13.8U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene		NA		NA	**0.000522**	NA	NA	NA	0.000205J	NA	**0.00132**	NA	NA	**0.000604**	NA	NA	0.00014J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene		NA		NA	0.0005U	NA	NA	NA	0.0005U	NA	0.0005U	NA	NA	0.0005U	NA	NA	0.0005U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene		NA		NA	0.005U	NA	NA	NA	0.005U	NA	**0.000476BJ**	NA	NA	**0.000557BJ**	NA	NA	0.005U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Xylenes		NA		NA	0.0015U	NA	NA	NA	0.0015U	NA	0.0015U	NA	NA	0.0015U	NA	NA	0.0015U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1016		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1221		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1232		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1242		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1248		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1254		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1260		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1262		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1268		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCB Aroclors		NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride		NA		NA	NA	NA	NA	NA	NA	**44.4**	NA	**309**	**41.4**	NA	**4,280**	**212**	NA	**183**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride		NA		NA	NA	NA	NA	NA	NA	**5.03**	NA	**2.75**	**31.8**	NA	**0.544J P1**	**7.72**	NA	**35.9**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate		NA		NA	NA	NA	NA	NA	NA	**2.25**	NA	1.37U	**0.954J**	NA	1.38U	1.31U	NA	1.45U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia Nitrogen		NA		NA	NA	NA	NA	NA	NA	**15.2**	NA	**5.92J**	5.27U	NA	**33.1**	**27.7**	NA	**9.72 J6**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	0.00676 U	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	0.00676 U	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	0.00676 U	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)Anthracene		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.000687 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)Pyrene*		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.000855 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(B)Fluoranthe		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.00114 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(G,H,I)Perylen		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.00184 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(K)Fluoranthe		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	0.00676 U	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene*		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.00153 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(A,H)Anthrac		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	0.00676 U	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.00111 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	0.00676 U	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-Cd)Pyr		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.000801 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene		NA		0.022 U	**0.00473 J**	0.0231 U	0.0252 U	0.0225 U	0.0275 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene		NA		0.0066 U	**0.000954 J**	**0.00132 J**	0.00756 U	**0.00198 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene		NA		0.0066 U	0.00808 U	0.00692 U	0.00756 U	**0.00159 J**	0.00826 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalen		NA		0.022 U	0.0269 U	0.0231 U	0.0252 U	0.0225 U	0.0275 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalen		NA		0.022 U	0.0269 U	0.0231 U	0.0252 U	**0.00249 J**	0.0275 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalen		NA		0.022 U	0.0269 U	0.0231 U	0.0252 U	0.0225 U	0.0275 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B-1- Soil Dat
Maralco Property

	HB-2	HB-2	HB-3	HB-3	MW-5	MW-5	MW-5	DP-1	DP-2	DP-2	DP-3	DP-3	DP-4	DP-5	DP-5	UST PE-1	UST PE-2	UST PE-3	UST PE-4	UST PE-5	SP-1	SP-2	SP-3	UST SB-1	UST SB-1	UST SB-1	UST SB-2
																8-10	8-10	8-10	8-10	8-10	stockpile	stockpile	stockpile	5	8 Water	15	5
Analyte	**May-90**	**May-90**	**May-90**	**May-90**	**1/22/03**	**1/22/03**	**1/22/03**	**2/4/03**	**2/11/03**	**2/11/03**	**2/11/03**	**2/11/03**	**2/11/03**	**2/11/03**	**2/11/03**	**6/29/95**	**6/29/95**	**6/29/95**	**6/29/95**	**6/29/95**	**6/29/95**	**6/29/95**	**6/29/95**	**1/22/2003**	**1/22/2003**	**1/22/2003**	**1/22/2003**
Aluminum	**150,000**	**19,700**	**165,000**	**13,000**	NA	NA	NA	**3,000**	---	**1,400**	---	**2,000**	**2,300**	---	**1,400**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	**5.4N**	**0.2N**	**8.0 N**	**0.1 N**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	6.2 U	**1.9**	**6.6**	**1.6**	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1.5	0.2U	1	0.2U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	**167 N**	**26.3 N**	**228 N**	**12.4 N**	NA	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	**17100**	**91.8**	**1480**	**35.2**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	**160**	**6.2**	**128**	**2.3**	**18**	ND	13.9	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	**71**	**12**	**59**	**9**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	0.2 NU	0.2 NU	0.3 NU	0.2 NU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	**2660**	**67.8**	**1030**	**34.3**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.04 U	0.05 U	0.06 U	0.04 U	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	**1.8 B**	0.2 U	**0.7**	0.3 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	0.6 NU	0.6 NU	0.7 NU	0.6 NU	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH-G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TPH-D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**96**	25 U	25 U	25 U	**1800**	**2100**	**1200**	**1100**	NA	**1800**	25 U
TPH-O	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1221	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1232	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1242	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1262	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-aroclor 1268	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCB Aroclors	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia Nitrogen	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)Pyrene*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(B)Fluoranthe	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(G,H,I)Perylen	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(K)Fluoranthe	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(A,H)Anthrac	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-Cd)Pyr	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalen	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalen	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalen	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B-2 - Groundwater Data COI Summary
Maralco Property - Kent, WA

Analyte (ug/L)	Screening Level	Max Value	Min Value	Detection above SL	Carried forward as a COI	MW-1 10/2/90	MW-2 10/1/90	MW-2 1/24/03	MW-2-D 1/24/03	MW-2 11/2/16	MW-3 10/1/90	MW-3 1/24/03	MW-3A 7/26/17	MW-4A 10/1/90	MW-4A 1/24/03	MW-4A 7/26/21	MW4A 6/3/21	DUP OF MW4A 6/3/21	MW-5 1/24/03	MW5A 7/26/17	MW5A 6/3/21	MW6 7/26/17	MW6 6/3/21	B-1-GW 10/27/16	B-2-GW 11/2/16	B-3-GW 11/2/16	B-4-GW 11/2/16
Aluminum	16,000	363,000	61	yes	yes	**17,800**	**2,350**	**600**	**860**	**174**	**3,850**	**820**	**5,800**	27,500	**3600**	**61**	100 U	100 U	**28,000**	**93,000**	**32,200**	**130**	**273**	**151,000**	**159,000**	**11,000**	**363,000** J
Antimony	5.6	20	2	yes	yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	2 U	NA	NA	20 U	NA	2 U	NA	NA	NA	NA
Barium	1,000	3,850	6	yes	yes	**109**	**33**	ND	ND	**6**	3,530	2,500	50 U	605	77	50 U	NA	NA	170	50 U	--	50 U	NA	**608**	**590**	**164**	**676**
Arsenic	8.8	73	5	yes	yes	**7.96**	**5**	ND	ND	10 U	5	**40**	5 U	**17**	**19**	5 U	**9.45**	**9.37**	**11**	**6**	**73**	5 U	**18.3**	**68.6**	**45.2**	**33.8**	**65.9**
Cadmium	1	10	1	yes	yes	ND	ND	ND	ND	2 U	ND	ND	5 U	ND	ND	5 U	1 U	1 U	ND	5 U	10 U	5 U	1 U	**1.13 J**	**1.5 J**	2 U	**1.56 J**
Chromium	10	124	1	yes	yes	**16**	ND	ND	ND	10 U	ND	**14**	10 U	**25**	**22**	10 U	1 U	**1.01**	**38.0**	**10.0**	**98.6**	10 U	**2.13**	**86.6**	**124**	**15.4**	**108**
Cobalt	4.8	35	1	yes	yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	NA	NA	**34.6**	NA	**2.77**	NA	NA	NA	NA
Copper	11	589	9	yes	yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**8.56**	**9.51**	NA	NA	**589**	NA	**19**	NA	NA	NA	NA
Lead	2.5	54	1	yes	yes	**5.32**	**2.00**	**1.20**	**1.40**	**2.59**	**1**	**2.7**	2 U	**9.51**	**9**	2 U	1 U	1 U	**8.0**	**2.0**	**53.7**	2 U	1 U	**41.9**	**49.3**	**6.73**	**28.5**
Manganese	50	2,750	1,590	yes	yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**2,660**	**2,750**	NA	NA	**2,510**	NA	**1,590**	NA	NA	NA	NA
Iron	1,000	157,000	10,300	yes	yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**62,900**	**64,500**	NA	NA	**157,000**	NA	**47,700**	NA	NA	NA	NA
Mercury	0.77	12	0	yes	yes	**12**	ND	ND	ND	0.2 U	0.1	ND	0.5 U	0.1	ND	0.5 U	--	NA	ND	0.5 U	NA	0.5 U	NA	**0.0726** J	**0.234**	0.2 U	**0.0681** J
Nickel	52	77	1	yes	yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1.06**	**1.06**	NA	NA	**76.7**	NA	**2.71**	NA	NA	NA	NA
Silver	3.2	10	5	yes	yes	ND	ND	ND	ND	5 U	ND	ND	10 U	ND	ND	10 U	NA	NA	ND	10 U	NA	10 U	NA	5 U	5 U	5 U	5 U
Selenium	5	50	5	yes	yes	ND	ND	ND	ND	5 U	ND	**43**	50 U	ND	ND	50 U	NA	NA	ND	50 U	NA	50 U	NA	10 U	10 U	10 U	10 U
Zinc	100	431	5	yes	yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	5 U	NA	NA	**431**	NA	5 U	NA	NA	NA	NA
Ammonia-Nitrogen (mg/L)	NC	40	0	no	no	**0.2**	**0.1**	**1.3**	**0.4**	NA	**14.6**	**33.7**	NA	**6.7**	**1.71**	NA	NA	NA	**2**	NA	NA	NA	NA	**4.07**	**4.57**	**7.03**	**4.15**
Nitrate-Nitrogen (mg/L)	1000	2	0	no	no	NA	NA	ND	ND	NA	NA	ND	NA	NA	ND	NA	NA	NA	**2**	NA	NA	NA	NA	**0.488**	**0.177**	**0.0556** J	**0.363**
Chloride (mg/L)	230	290,000	4	yes	yes	NA	NA	**9.6**	**8.9**	**4**	NA	**9,100**	**78,000**	NA	**92**	**290,000**	**275**	**280**	**442**	**150,000**	**81.3**	**270,000**	**207**	**265**	**177**	**341**	**109**
Fluoride (mg/L)	0.96	27,000	0	yes	yes	NA	NA	ND	ND	**0.1**	NA	ND	**27,000**	NA	**6.86**	200 U	0.8 U	0.80 U	**2**	**230**	**1.92**	**4,100**	**16**	**0.428**	**0.85**	**0.496**	**5.09**
TPH-Gasoline	100	100	100	no	no	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100 U	100 U	NA	NA	NA	NA	100 U	NA	NA	NA	NA
Diesel Range Oil - sg	500	4,500	50	yes	yes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50 U	50 U	NA	NA	NA	NA	50 U	NA	NA	NA	NA
Residual Range Oil - sg	500	430	250	no	no	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 U	250 U	NA	NA	NA	NA	250 U	NA	NA	NA	NA
Diesel Range Oil	500	12,000	50	yes	yes	NA	NA	NA	NA	250 U	NA	NA	NA	NA	NA	NA	**200**	**210**	NA	NA	NA	NA	50 U	**160** J	250 U	**235** J	250 U
Residual Range Oil	500	1,700	250	yes	yes	NA	NA	NA	NA	500 U	NA	NA	NA	NA	NA	NA	250 U	250 U	NA	NA	NA	NA	250 U	500 U	500 U	500	500 U
Benzene	0.44	1.00	1.00	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	29	1.00	1.00	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	57	1.00	1.00	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	1600	3.00	3.00	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	na	0.10	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.1 U	0.1 U
Acenaphthene	na	0.46	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.112**	0.05 U	**0.459**	0.1 U
Acenaphthylene	na	0.10	0.01	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.0136** J	0.05 U	**0.0735** J	0.1 U
Benzo(A)Anthracene*	na	0.10	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.1 U	0.1 U
Benzo(A)Pyrene*	0.1 (Method A)	0.10	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.0812**	0.05 U	0.1 U	0.1 U
Benzo(B)Fluoranthene*	na	0.10	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.1 U	0.1 U
Benzo(G,H,I)Perylene	na	0.10	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.1 U	0.1 U
Benzo(K)Fluoranthene*	na	0.10	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.1 U	0.1 U
Chrysene*	na	0.10	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.1 U	0.1 U
Dibenz(A,H)Anthracene*	na	0.10	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.1 U	0.1 U
Fluoranthene	na	0.10	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.1 U	0.1 U
Fluorene	na	0.48	0.04	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.0431** J	0.05 U	**0.483**	0.1 U
Indeno(1,2,3-Cd)Pyrene*	na	0.10	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.1 U	0.1 U
Naphthalene	160 (Method A)	0.61	0.04	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.167** J	**0.0429** J	**0.614**	0.5 U
Phenanthrene	na	0.10	0.01	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.0124** J	0.05 U	**0.0249** J	0.1 U
Pyrene	na	0.10	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.1 U	0.1 U
1-Methylnaphthalene	na	2.38	0.02	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.147** J	**0.0167** J	**2.38**	0.5 U
2-Methylnaphthalene	na	0.50	0.02	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.0585** J	**0.0165** J	**0.226** J	0.5 U
2-Chloronaphthalene	na	0.50	0.25	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.25 U	0.25 U	0.5 U	0.5 U
Total cPAH concentration (ND = 0)	0.1 (Method A)	0.10	0.05	no	no	NA	NA	NA	NA	NA U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.0812**	0.05 U	0.05 U	0.05 U

NOTES:
Units - ug/L for except mg/L for chloride and fluoride
Bold - analyte detected
sg - with silica gel cleanup
U - not detected at reporting limit
NA - not analyzed
Reported concentration exceeds screening level
1990 GW sample data is not included in this table.
ug/l = micrograms per liter
mg/l = milligrams per liter

Table B-2 - Groundwater Da
Maralco Property - Kent, W

	B-6-GW	B-5-GW	DPT-1-0521	DPT-2-0521
Analyte (ug/L)	11/2/16	11/2/16	5/24/21	5/24/21
Aluminum	**43,500**	**7,880**	**405**	**1160**
Antimony	NA	NA	2 U	2 U
Barium	**325**	**3,850**	NA	NA
Arsenic	**64**	**43.9**	**13.3**	**13.6**
Cadmium	2 U	2 U	1 U	1 U
Chromium	**44.3**	**18.7**	**2.41**	**1.74**
Cobalt	NA	NA	**4.29**	1 U
Copper	NA	NA	**11.1**	**9.63**
Lead	**40.3**	**9.4**	1 U	1
Manganese	NA	NA	**2720**	NA
Iron	NA	NA	**32200**	**10300**
Mercury	**0.338**	**0.0502** J	NA	NA
Nickel	NA	NA	**8.14**	**1.02**
Silver	5 U	5 U	NA	NA
Selenium	10 U	10 U	NA	NA
Zinc	NA	NA	5 U	5 U
Ammonia-Nitrogen (mg/L)	**0.516**	**39.8**	NA	NA
Nitrate-Nitrogen (mg/L)	0.1 U	0.1 U	NA	NA
Chloride (mg/L)	**111**	**8970**	**224**	**51.6**
Fluoride (mg/L)	**52.9**	**7.74**	0.8 U	**1.38**
TPH-Gasoline	NA	NA	100 U	100 U
Diesel Range Oil - sg	NA	NA	**140**	**4500**
Residual Range Oil - sg	NA	NA	250	**430**
Diesel Range Oil	250 U	250 U	**850**	**12000**
Residual Range Oil	500 U	500 U	**370** U	**1700**
Benzene	NA	NA	1 U	1 U
Ethylbenzene	NA	NA	1 U	1 U
Toluene	NA	NA	1 U	1 U
Total Xylenes	NA	NA	3 U	3 U
Anthracene	0.1 U	0.1 U	NA	NA
Acenaphthene	0.1 U	0.1 U	NA	NA
Acenaphthylene	0.1 U	0.1 U	NA	NA
Benzo(A)Anthracene*	0.1 U	0.1 U	NA	NA
Benzo(A)Pyrene*	0.1 U	0.1 U	NA	NA
Benzo(B)Fluoranthene*	0.1 U	0.1 U	NA	NA
Benzo(G,H,I)Perylene	0.1 U	0.1 U	NA	NA
Benzo(K)Fluoranthene*	0.1 U	0.1 U	NA	NA
Chrysene*	0.1 U	0.1 U	NA	NA
Dibenz(A,H)Anthracene*	0.1 U	0.1 U	NA	NA
Fluoranthene	0.1 U	0.1 U	NA	NA
Fluorene	0.1 U	0.1 U	NA	NA
Indeno(1,2,3-Cd)Pyrene*	0.1 U	0.1 U	NA	NA
Naphthalene	0.5 U	0.5 U	NA	NA
Phenanthrene	0.1 U	0.1 U	NA	NA
Pyrene	0.1 U	0.1 U	NA	NA
1-Methylnaphthalene	0.5 U	0.5 U	NA	NA
2-Methylnaphthalene	0.5 U	0.5 U	NA	NA
2-Chloronaphthalene	0.5 U	0.5 U	NA	NA
Total cPAH concentration (ND = 0)	0.05 U	0.1 U	NA	NA

NOTES:
Units - ug/L for except mg/L for
Bold - analyte detected
sg - with silica gel cleanup
U - not detected at reporting lir
NA - not analyzed

1990 GW sample data is not inc
ug/l = micrograms per liter
mg/l = milligrams per liter

Appendix C Quality Assurance Project Plan

REMEDIAL INVESTIGATION WORK PLAN APPENDIX C: QUALITY ASSURANCE PROJECT PLAN

Maralco Property
7730 South 202nd Street, Kent WA

March 16, 2022

Prepared for:

BRIDGE

REMEDIAL INVESTIGATION WORK PLAN
APPENDIX C: QUALITY ASSURANCE PROJECT PLAN

Maralco Property
7730 South 202nd Street, Kent WA

March 16, 2022

Prepared by:

CRETE
CONSULTING, INC.

Table of Contents

List of Tables

Acronyms and Abbreviations

COI	contaminant of interest
COC	contaminant of concern
CLP	Contract Laboratory Program
cPAH	carcinogenic polyaromatic hydrocarbon
CTD	conductivity, temperature, and depth
DQO	data quality objective
EDD	electronic data deliverable
EPA	United States Environmental Protection Agency
HCID	hydrocarbon identification
ISL	interim screening level
LCS/LCSD	laboratory control sample/laboratory control sample duplicate
MDL	method detection limit
MLLW	mean lower low water
MRL	method reporting limit
MS/MSD	matrix spike/matrix spike duplicate
PARCC	precision, accuracy, representativeness, comparability, and completeness
Property	Former Bunge Foods facility
PDF	portable document format
PQL	practical quantitation limit
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RIWP	Remedial Investigation Work Plan
RPD	relative percent difference
SOP	standard operating procedure
SVOC	semi-volatile organic compound
TPH	total petroleum hydrocarbons
VOC	volatile organic compound
WAC	Washington Administrative Code

1 Introduction

1.1 Background

This Quality Assurance Project Plan accompanies the Remedial Investigation Work Plan for the former Bunge Foods facility (Property), located at 7730 South 202nd Street in Kent, Washington (Property, Figure 1; King County Parcel Number 6315000300)).

This QAPP describes quality assurance/quality control (QA/QC) procedures associated with collecting, analyzing, validating, and using soil and groundwater data to fill data gaps identified in the Remedial Investigation Work Plan (RIWP). This QAPP uses Ecology's Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. July 2004. Publication No. 04-03-030 (Ecology 2004).

The history, contaminants of interest (COIs), initial screening levels (ISLs), and other background information for the Site are described in the Previous Investigation Results Report (PIRR) and the RIWP.

1.2 Project Description

This QAPP pertains to the following tasks that are part of the larger RI to be conducted, as described in the RIWP (where the goals and objectives of this work are defined):

- Fieldwork
- Laboratory analyses
- Data validation and management
- Data analysis and report preparation.

Fieldwork- Soil, Sediment and Groundwater

Soil and sediment testing will include collection of soil samples for analysis of COIs and other hydrogeological data such as grain type and standard penetration test (SPT) blow counts (collected from soil borings). Groundwater field measurements will be taken for pH, specific conductance, temperature, oxidation-reduction potential, and dissolved oxygen to during well purging and as an indicator that samples are collected under stable conditions. Groundwater samples for COI will be collected from direct push locations and from permanent monitoring wells.

Soil, sediment and groundwater samples will be analyzed for the analytes in Tables 2 and 3. This table also includes reporting limits and analysis methods.

Fieldwork- Dross Samples

Stockpile testing will also include collection of solid samples for analysis of waste disposal compounds from several dross piles located on the site. The indoor stockpiles are a combination of dross, excess washed oxides otherwise not stored outside, KBI dross, and baghouse dust (bins). The indoor stockpiles require additional characterization under 173-

303-090 WAC and 173-303-100 WAC. Analysis of the dross samples is summarized on Table 4. These samples will be used for waste disposal characterization profiling purposes.

Laboratory Analyses

Analyses will be completed using EPA methods (EPA 2001, 2006) listed in Tables 2 through. Unique analytical procedures are described in Section 5.

Level 2B laboratory data reports will be provided in portable document format (PDF), and electronic data deliverables (EDDs) will be provided in a text or Excel file format suitable for import into the Ecology Environmental Information Management System (EIMS) for soil, sediment and groundwater samples.

Data Validation and Management

Data verification will be completed by the Quality Assurance Officer for data generated in the field and laboratory prior to database import.

The accuracy and completeness of the final database will be verified by the Quality Assurance Officer. Following verification, data collected during the RI will be uploaded to Ecology's EIMS database. Stockpile samples collected for waste disposal characterization profiling purposes will not be submitted to the EIMS database.

Data Analysis and Report Preparation

The data collected under the RIWP will provide the information needed to complete the RI/FS. The results of those efforts will be documented in the RI/FS Report.

1.3 Organization and Schedule

1.3.1 Roles and Responsibilities

Roles and responsibilities are defined in Table 1.

Friedman & Bruya will perform the majority of chemical analyses of the soil and groundwater samples collected by CRETE Consulting, Inc. Other laboratories may be added should specialized testing be required.

1.3.2 Schedule

Field work will follow the schedule in the RIWP.

Samples will be delivered to the laboratory within applicable holding times and within 24 hours of collection time, when possible with schedule constraints. Samples will be delivered to the laboratory by field personnel or arranged for pickup by laboratory couriers. Chain-of-custody procedures will be maintained during transit to the laboratory.

Data verification and validation will be completed prior to entry into the project database.

Soil, sediment and groundwater data will be uploaded to the Ecology EIMS at the conclusion of the RI/FS.

2 Quality Objectives

The overall data quality objective for this project is the collection of representative data of known and acceptable quality. The QA procedures and measurements that will be used for this project are based on EPA guidance (EPA 2001, 2002, 2006). Parameters related to precision, accuracy or bias, representativeness, completeness, and comparability (PARCC) will be used to assess the quality of RI data (Table 5).

2.1 Precision

Precision is a measure of how closely one result matches another result expected to have the same value. Field precision will be assessed by collecting one duplicate sample for every ten field samples of each media. Field precision is determined by the relative percent difference (RPD) between a sample and its duplicate. However, results from the analysis of a duplicate sample also test laboratory precision. Therefore, the RPD between the sample and the field replicate provides an indication of both the field and laboratory precision. The tolerance limit for percent differences between field duplicates will be $\pm$ 50 percent for soil and $\pm$ 35 percent for groundwater. If the RPDs exceed these limits, a replicate sample may be run to verify laboratory precision. If any RPD exceedance is linked to field sampling, the Field Manager will recheck field sampling procedures and identify the problem. Resampling and analysis may be required.

Laboratory precision can be measured through the evaluation of laboratory control samples/duplicates (LCS/ LCSD). The laboratory will perform the analysis of one set of LCS/LCSD samples for every 20 samples. Laboratory precision will be evaluated by the RPD for each analyte between LCS/LCSD samples.

$$RPD = \frac{ABS(R1-R2)}{(R1+R2)/2} \times 100$$

Where:
ABS = absolute value
R1 = Sample result
R2 = Duplicate sample result.

The tolerance limit for percent differences between laboratory duplicates will be $\pm$ 20 percent for soil samples and $\pm$ 20 percent for groundwater samples. If the precision values are outside this limit, the laboratory will recheck the calculations and/or identify the problem. Reanalysis may be required.

2.2 Accuracy

Accuracy is an expression of the degree to which a measured or computed value represents the true value. Accuracy may be expressed as a percentage of the true or reference value for reference material or as spike recovery from matrix spike/matrix spike

duplicate (MS/MSD) samples. The RPD between the MS and MSD is used to evaluate laboratory precision. The following equations are used to express accuracy:

- For reference materials:
  - Percent of true value = (measured value/true value) x 100
- For spiked samples:
  - Percent recovery = ([SQ – NQ]/S) x 100

    SQ = quantity of spike or surrogate found in sample
    NQ = quantity found in native (unspiked) sample
    S = quantity of spike or surrogate added to native sample

The performance of the method will be monitored using surrogate compounds or elements. Surrogate standards are added to all samples, method blanks, matrix spikes, and calibration standards.

Laboratory method reporting limits (MRL) are listed in Tables 2 and 3. All RLs are below ISLs; otherwise ISLs derived in the PIRR were set to the practical quantitation limit, which is identical to the MRL for this project.

3 Sampling Process Design

The adequacy of the sampling design is evaluated by representativeness, comparability, and completeness of the data produced. The data must also be adequate to characterize nature and extent of contamination and to evaluate the completeness of pathways.

3.1 Representativeness

Representativeness is the degree to which data from the project accurately represent a particular characteristic of the environmental matrix which is being tested. Representativeness of samples is achieved by adherence to standard field sampling protocols and standard laboratory protocols. Representativeness is achieved through following of the sampling plan design, sampling techniques, and sample handling protocols.

3.2 Comparability

Comparability is the qualitative similarity of one dataset to another (i.e., the extent to which different datasets can be combined for use). Comparability will be addressed through the use of field and laboratory methods that are consistent with methods and procedures recommended by Ecology and that are commonly used for groundwater and soil studies.

3.3 Completeness

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows:

Completeness =
(number of valid measurements/ total number of data points planned) x 100

The data quality objective (DQO) for completeness for all analytes is 95%. Data that have been qualified as estimated (J qualified) will be considered valid for the purpose of assessing completeness. Data that have been qualified as rejected will not be considered valid for the purpose of assessing completeness. Results will be considered valid if all the precision and accuracy targets are met. Resampling or re-analysis of remaining sample aliquots may be required if the completeness DQO is not met.

3.4 Laboratory QC Procedures

Additional laboratory QC procedures will be evaluated to provide supplementary information regarding overall quality of the data, performance of instruments and measurement systems, and sample-specific matrix effects.

QC samples and procedures are specified in each method protocol. All QC requirements will be completed by the laboratory as described in the protocols, including the following (as applicable to each analysis):

- Instrument tuning
- Initial calibration
- Initial calibration verification
- Continuing calibration
- Calibration or instrument blanks
- Method blanks
- LCS/LCSD
- Internal standards
- Surrogate spikes
- Serial dilutions
- MS/MSD.

3.5 Additional Field Quality Control

Field quality control samples will be collected during the groundwater and soil investigations. The field quality control samples consist of a trip blank (one for each day samples for chemical analysis are collected), decontamination field blanks (one per day that sampling equipment is reused), and field duplicates (one for every ten samples).

The goal is to have no detectable contaminants in the trip and decontamination blanks. If contamination is detected, the nature of the interference and the effect on the analysis of each sample in the batch will be evaluated. Data from affected samples may require qualification as “estimated” or “rejected.”

4 Sampling Procedures

The sampling program addressed in this QAPP is to:

- Monitoring well removal and installation (4.1)
- Collect soil samples (4.2)
- Collect sediment samples (4.3)
- Collect water samples from temporary well points/Geoprobe borings (4.4)
- Install and develop permanent monitoring wells, collect groundwater and soil samples, and conduct tidal studies (4.5)
- Collected waste disposal characterization stockpile samples (4.6).

4.1 Monitoring Well Abandonment and Installation

4.1.1 Monitoring Well Abandonment

Existing site monitoring wells (MW-1 through MW-6, including MW-3A, MW-4A and MW-5A) will be evaluated and potentially decommissioned. Wells will be decommissioned in accordance with the Ecology's Water Well Construction Act (1971), RCW 18.104 (WAC 173-160-460).

4.1.2 Monitoring Well Installation

Wells will be installed in accordance with Washington Administrative Code (WAC) 173-160. As the soil cuttings are removed, field staff will log visual observations, similar to those for soil sampling, on a well log/well construction diagram.

Monitoring well construction and installation will involve drilling a borehole using either a sonic or a hollow-stem auger drill rig, installing a 2-inch diameter 0.010-inch slot Schedule 40 PVC well, filling the annular space with 10-20 (sieve size) Colorado silica sand below bentonite, and developing the well prior to sampling.

Upon reaching the target depth below ground (15 ft), the 10-ft long well screen and riser pipe are inserted into the borehole. The full length of the slotted portion of the well screen as well as the unslotted portion of the bottom of the screen should be measured with the measuring tape, and these measurements should be recorded on the well construction diagram. The well screen will be placed such that it intercepts the water table. The water table depth below ground is determined after the borehole depth has been achieved by placing a water level meter inside the borehole. Moisture observations are also made on the soil cuttings removed from the borehole.

After the static water level measurement has been taken, the drilling subcontractor will begin assembling the well in conformance with any modifications to the well design made by the geologist based on field conditions. As the assembled well is lowered, extra attention will be given to centering it in the hole if centralizers are not used. The well should be temporarily capped before filter sand and other annular materials are installed.

The drilling subcontractor should fill the annular space surrounding the screened section of the monitoring well to at least one foot above the top of the screen with a clean sand or fine gravel. In general, the filter pack should not extend more than three feet above the top of the screen to limit the thickness of the monitoring zone. A minimum 2-foot thick layer of bentonite pellets or slurry seal will be installed by the drilling subcontractor immediately above the well screen filter pack in all monitoring wells.

The borehole annulus will be grouted with seal materials to within three feet of the ground surface. Drill cuttings, even those known not to be contaminated, will not be used as backfill material. The grout seal should consist of a bentonite/cement mix with a ratio of bentonite to cement of between 1:5 and 1:20. The drilling subcontractor will cut the top of the well casing to a height that will allow installation of a locking cap with the monument closed. Wells completed in the sloping shipways ramp will be completed with a water tight monument.

All newly installed monitoring wells will be surveyed to the nearest 0.01-ft vertical at the top of casing and less than 1-ft horizontal accuracy. All other sampling locations will be located to 1-ft horizontal and vertical accuracy.

4.2 Soil Sample Collection

For subsurface soil sample collection, a Washington-licensed driller will complete Geoprobe borings using a push probe to advance a 2-inch diameter sampler. Water and soil samples will be collected at the intervals prescribed in the RIWP. The probe will be decontaminated before each use. Drill cuttings and decontamination water will be drummed for appropriate disposal.

Soil will be removed from the subsurface in 5-ft sleeves. Each sleeve will be cut open on a table and positioned with the upper end at the same side of the table each time. A photograph of the open sleeve placed next to a tape measure will be taken of each 5-foot sleeve. Percent recovery for the sleeve as a whole, and for any specific portions of the sleeve that differ from the general recovery will be recorded on a field form/boring log. As soon as feasible after the core sleeve is opened, the photo-ionization detector will be scanned over the soil for a qualitative indication of soil quality. Any areas with measurement spikes will be evaluated more closely.

The soil will be visually classified, and the following information will be recorded:

- Depth of visual observations and sample collection, with sample ID
- Physical soil description (soil type and color, stratification per ASTM 2488)
- Other distinguishing characteristics or features, such as debris or concrete
- If odors are noted, a photo-ionization detector reading will be recorded by placing soil in a plastic bag, shaking it, and inserting the probe into the bag; indigo-blue dye test kits may also be used for soils exhibiting gasoline- or diesel-like odors.
- Qualitative moisture content (dry, damp, moist, wet, saturated).

Sample containers for all analyses except VOCs and TPH-gasoline will be filled directly from the Geoprobe sleeve using a gloved hand and clean stainless steel spoon, if appropriate. Disposable soil sampler will be used to obtain soil for VOC and TPH-gasoline analyses. Gloves will be changed between samples. Stainless steel spoons will be decontaminated prior to each use (and between samples). Sample containers will be clearly labeled with sample ID, collection date and time, and project name, and then placed in an iced cooler for delivery to the laboratory within 24 hours of sample collection. Chain of custody will be maintained. The sample ID is the boring name (including initials for the subarea) and the depth below ground surface.

4.3 Dross Samples

Samples from indoor dross piles Pile-A through Pile-F will be grab samples. For each pile, the sampling will be conducted through the entire depth of the pile at the given sample location using a hand auger. Waste material will be laid out in sequence on plastic sheeting for inspection and sampling. Maximum stockpile high is estimated to be 6-ft. Each auger bucket of waste material will be emptied in sequence from top to bottom on the plastic sheeting.

Up to 8 bins of bag house dust (BHD) may be present in the refinery building. For these bins, a composite samples will be collected as all of the bins are reported to comprised of BHD.

Sample containers for all analyses except will be filled directly from the stainless steel bowl using a gloved hand and clean stainless steel spoon, if appropriate. Gloves will be changed between samples. Stainless steel spoons will be decontaminated prior to each use (and between samples). Sample containers will be clearly labeled with sample ID, collection date and time, and project name, and then placed in an iced cooler for delivery to the laboratory within 24 hours of sample collection. Chain of custody will be maintained. The sample ID is the boring name (including initials for the subarea) and the depth below ground surface.

4.4 Sediment Samples

In the surface sediment samples will be composite samples that will be collected with a hand held tool, such as a trowel, or a shovel to collect surficial soil (0 to 1.0 ft bgs) into a stainless steel bowl.

Sample containers for all analyses except will be filled directly from the stainless steel bowl using a gloved hand and clean stainless steel spoon, if appropriate. Gloves will be changed between samples. Stainless steel spoons will be decontaminated prior to each use (and between samples). Sample containers will be clearly labeled with sample ID, collection date and time, and project name, and then placed in an iced cooler for delivery to the laboratory within 24 hours of sample collection. Chain of custody will be maintained. The

sample ID is the boring name (including initials for the subarea) and the depth below ground surface.

4.5 Groundwater Sampling from Geoprobe Locations

Groundwater samples collected from Geoprobe borings will be collected with a temporary screen, placed to intercept the water table, and peristaltic pump as follows:

- Lower the new, clean polyethylene tubing into the well until the tubing intake is in the middle of the screened interval, or slightly above the middle of the screened interval. Secure the tubing to the top of the well and leave approximately 5 feet of tubing outside the well. Attach a 1-foot length of silicon tubing that is appropriate for a peristaltic pump to the polyethylene tubing.
- Attach the silicon tubing to the peristaltic pump. Purge (remove with pump) water from the well into a calibrated 5-gallon pail or similar and monitor flow rate.
- Purge at approximately 100-300 milliliters (0.03-0.09 gallons) per minute until turbidity has decreased. The goal is to create minimal screen velocities during purging such that fines, which may bias sampling results, are not captured. This goal may be difficult to achieve under some circumstances and may require adjustment based on site-specific conditions and professional judgment.
- Sampling may begin when turbidity has stabilized. Other field parameters at the time of sampling will be recorded. Field instruments are to be calibrated prior to use, according to the manufacturer's instructions.
- Collect samples of water for laboratory analysis in a manner that minimizes volatilization of potential contaminants from the water into the air. Hands and clothing will be clean when handling sampling equipment and during sampling.
- Clean, disposable, latex, nitrile, or equivalent–material gloves will be worn when filling bottles for analyses. Gloves will be changed when dirty and between samples.
- All water samples will be collected from the pump discharge lines directly into the appropriate sample containers following the procedures described for filling sampling containers from monitoring wells (Section B1.6).

4.6 Sampling from Monitoring Wells

Monitoring well construction and installation will involve drilling a borehole using either a sonic or a hollow-stem auger drill rig, installing a 2-inch diameter 0.010-inch slot Schedule 40 PVC well, filling the annular space with 10-20 (sieve size) Colorado silica sand below bentonite, and developing the well prior to sampling.

All wells will be installed in accordance with Washington Administrative Code (WAC) 173-160. As the soil cuttings are removed, field staff will log visual observations, similar to those for soil sampling, on a well log/well construction diagram. In some wells soil samples will be collected from the water table for laboratory analysis of COIs (Table 5 of RIWP).

Upon reaching the target depth below ground (20 ft), the 10-ft long well screen and riser pipe are inserted into the borehole. The full length of the slotted portion of the well screen as well as the unslotted portion of the bottom of the screen should be measured with the measuring tape, and these measurements should be recorded on the well construction diagram. The well screen will be placed such that it intercepts the water table. The water table depth below ground is determined after the borehole depth has been achieved by placing a water level meter inside the borehole. Moisture observations are also made on the soil cuttings removed from the borehole.

After the static water level measurement has been taken, the drilling subcontractor will begin assembling the well in conformance with any modifications to the well design made by the geologist based on field conditions. As the assembled well is lowered, extra attention will be given to centering it in the hole if centralizers are not used. The well should be temporarily capped before filter sand and other annular materials are installed. The drilling subcontractor should fill the annular space surrounding the screened section of the monitoring well to at least one foot above the top of the screen with a clean sand or fine gravel. In general, the filter pack should not extend more than three feet above the top of the screen to limit the thickness of the monitoring zone. A minimum 2-foot thick layer of bentonite pellets or slurry seal will be installed by the drilling subcontractor immediately above the well screen filter pack in all monitoring wells.

The borehole annulus will be grouted with seal materials to within three feet of the ground surface. Drill cuttings, even those known not to be contaminated, will not be used as backfill material. The grout seal should consist of a bentonite/cement mix with a ratio of bentonite to cement of between 1:5 and 1:20. The drilling subcontractor will cut the top of the well casing to a height that will allow installation of a locking cap with the monument closed. Wells completed in the sloping shipways ramp will be completed with a water tight monument.

Following well installation, the well will be developed by surging and bailing or pumping until turbidity has decreased and stabilized. At least three casing volumes should be purged during development. Field measurements (turbidity, temperature, pH) collected during well development and the volume of water removed will be recorded on a field form. The well will be allowed to sit for a minimum of seven days prior to sampling to allow bentonite seals to set.

Groundwater sampling will include measurement of field parameters to evaluate stability of groundwater collected from wells and in support of fate and transport analyses. Field water quality instruments will be calibrated at the beginning (prior to sampling) and middle of each day. Calibration data will be recorded on a field form or log book.

New, disposable, polyethylene tubing will be used to draw water from each monitoring well. The following tasks will be performed at each well:

- Measure and record static water level (distance from top of casing) to the nearest 0.01 foot using an electric well sounder and measuring tape.
- Use the EPA Low-Flow Groundwater Sampling Procedure (EPA, 2010b). This procedure includes several steps and can be summarized as follows. First, purge groundwater at a low rate (~100-200 mL/min). Second, monitor the discharge water for temperature, pH, and specific conductance at least three times during the purging period. Third, measure the purge volume using a calibrated bucket. Fourth, record purge water volume, time, and field parameter values in the field notes.
- Sampling may begin after three consecutive field parameter measurements (temperature, specific conductance, and pH) are stable. Continue purging water until three consecutive stable measurements are recorded. Sampling may be conducted without stabilization if the parameter trends are reasonably attributed to in-aquifer variability such as tidal flux.
- Collect samples of water for laboratory analysis in a manner that minimizes volatilization of constituents. Hands and clothing will be clean when handling sampling equipment and during sampling. Clean, disposable, latex gloves will be worn when filling bottles for analyses. Gloves will be changed when dirty and between samples. All water samples will be collected from the pump discharge lines directly into the appropriate sample containers. Samples submitted for dissolved metals analyses only will be filtered in the field prior to filling the sample container.

Collect samples in the following manner:

- VOCs and TPH-gasoline: For each sample, fill three 40-ml vials preserved with hydrochloric acid. Slowly fill each vial until all air is removed and sample water bulges slightly over the top of the vial. Wet cap with sample water and screw onto top of vial. Invert vial and tap with finger. The properly filled vial has NO visible air bubbles.
- Metals: Samples will be collected directly into lab-supplied bottles with acid preservative after passing through an in-line, disposable, 0.45-micron filter such as the Sample Filter Plus or equivalent installed in the discharge line of the pump. A new filter will be used for each sample. Sample bottles will be filled almost to the top but not overfilled.
- Other Parameters: There are no headspace or filtering concerns related to the other water quality parameters. Fill the laboratory prepared sample bottles almost to the top, taking care not to overfill.
- Record sample identification data on each sample container, in the field notes, and on the chain-of-custody. Sample identification will be the same as the well name/number and the sample collection date.

Stable is defined as:

- Specific conductance and temperature that do not indicate a trend (continuously increase or decrease between readings) and do not vary by more than 10 percent between readings.

- pH measurements that do not vary by more than 0.1 pH units between readings.

The container and preservative requirements are listed in Table 3.

4.7 Sampling Equipment

Field equipment and supplies include sampling equipment (e.g., bowls, tape measures), utensils (e.g., spoons), decontamination supplies, sample containers, coolers, log books and forms, personal protection equipment, and personal gear. Protective wear (e.g., hard hats, gloves) are described in the Health and Safety Plan. Sample containers, coolers, and packaging material will be supplied by the analytical laboratory.

4.8 Decontamination

If used, stainless-steel sampling equipment will be washed with Liquinox™ detergent and rinsed with distilled water prior to use and between sampling stations. The following decontamination steps will be performed on stainless-steel bowls and spoons using for compositing prior to use at each station:

- Wash with Liquinox™
- Double rinse with distilled/deionized water
- Final rinse with distilled/deionized water.

If a residual petroleum sheen remains on the sampling equipment or is difficult to remove using the standard decontaminations procedures above, a hexane rinse may be added, followed by a final rinse with distilled/deionized water. Sample equipment will be kept wrapped in aluminum foil until time for use. To minimize sample cross-contamination, disposable gloves will be replaced between samples. If any equipment decontamination occurs, an equipment blank will be collected by pouring distilled water over the equipment and collecting in a set of the same sample containers as those used for the environmental samples the equipment is used to collect.

Geoprobe sleeves are disposable, and subsurface soil will be placed in containers using gloved hands. Gloves will be changed between each sample. Tubing used to collect groundwater samples is also disposable. Water level and field parameter meters will require decontamination between sample collection locations.

4.9 Sample Nomenclature

The sample nomenclature is identified in Table 5 of the RIWP.

4.10 Sampling Containers

Requirements for sample containers and storage conditions are provided in Tables 2 and 3. Samples analyzed for TPH-diesel, VOCs, and dissolved metals (groundwater only) will require chemical preservation, which will be present in the laboratory-supplied containers.

All sample containers will have screw-type lids so that they are adequately sealed. Lids of the glass containers will have Teflon™ inserts to prevent sample reaction with the plastic lid and to improve the quality of the seal. Commercially available, pre-cleaned jars will be used, and the laboratory will maintain a record of certification from the suppliers. The container shipment documentation will record batch numbers for the bottles. With this documentation, containers can be traced to the supplier, and bottle rinse blank results can be reviewed.

Sampling containers will be filled to minimize head space, and will be appropriately labeled and stored prior to shipment or delivery to the laboratory. Samples must be packed to prevent damage to the sample containers and labeled to allow sample identification. All samples must be packaged so that they do not leak, break, vaporize or cause cross-contamination of other samples. Each individual sample must be properly labeled and identified. When refrigeration is required for sample preservation, samples must be kept cool, by means of ice packs or double-bagged ice in coolers, during the time between collection and final packaging.

4.11 Field Logs

All field activities and observations will be noted on weatherproof paper at the time they occur. The field logs will be compiled in a binder in the chronological order they were completed. Information will include personnel, date, time, station designation, sampler, types and number of samples collected, photographs taken, weather conditions, health and safety meetings conducted (tailgate meeting), and general observations. Any changes that occur at the site (e.g., personnel, responsibilities, deviations from the RIWP) and the reasons for these changes will be documented in the field log. It will also identify onsite visitors observing the sampling. The Site is an actively used property, therefore only those specifically visiting/observing sampling activities will be documented. The Field Manager is responsible for ensuring that the field logs are correct.

All field activities and observations will be noted during fieldwork. The descriptions will be clearly written with enough detail so that participants can reconstruct events later, if necessary. Requirements for entries include:

- Field logs will be compiled in chronological order in a 3-ring binder, with the date and observer clearly marked on all field forms and note sheets.
- Entries will be made legibly with black (or dark) waterproof ink or pencil.
- Unbiased, accurate language will be used.
- Entries will be made while activities are in progress or as soon afterward as possible (the date and time that the notation is made should be noted, as well as the time of the observation itself).
- Each consecutive day's first entry will be made on a new, blank page.
- The date and time, based on a 24-hour (military) clock (e.g., 0900 for 9 a.m. and 2100 for 9 p.m.), will appear on each page.
- When the field activity is complete, the field binder will be physically entered into the project file and the pages will be scanned to a PDF file and saved in the

electronic project library. Scanning of sheets may also occur after each day's field activities.

- The person recording the information must initial and date each sheet. If more than one individual makes entries on the same sheet, each recorder must initial and date each entry. The bottom of the page must be signed and dated by the individual who makes the last entry.
- The Field Manager, after reading the day's entries, also must sign and date the last page of each daily entry.
- Corrections will be made by drawing a single line through the original entry allowing the original entry to be read. The corrected entry will be written alongside the original. Corrections will be initialed, dated, and explained.

4.12 Chain-of-Custody Procedures

All samples must be clearly identified immediately upon collection. Each sample container label will list:

- Client and project name
- A unique sample description/sample ID
- Sample collection date and time.

Additionally, the container's label may include:

- Sampler's name or initials
- Preservative, if applicable
- Analyses to be performed.

Chain-of-custody procedures will be used to document sample possession from the time of collection, through analysis, to disposal. Chain-of-custody forms will document transfers of sample custody. A sample is considered to be under custody if it is in one's possession, view, or in a designated secure area. One set of chain-of-custody forms will be used per laboratory shipment. The chain-of-custody record will include, at a minimum, the following information:

- Client and project name
- Sample collector's name
- Sampler's company mailing address and telephone number
- Designated recipient of data (name, email, and telephone number)
- Analytical laboratory's name and city
- Description of each sample (i.e., unique identifier and matrix)
- Date and time of collection
- Quantity of each sample or number of containers
- Type of analysis required
- Any unique features of analysis, such as lower reporting limits
- Any requests to hold/archive samples
- Addition of preservative, if applicable
- Requested turn-around times
- Date and method of shipment.

When transferring custody, both the staff relinquishing custody of samples and the staff receiving custody of samples will sign, date, and note the time on the form. Samples to be analyzed by Friedman & Bruya Laboratory will not be shipped, but will be delivered by project personnel to the laboratory at the end of each sampling day. If samples are to be analyzed by other laboratories, they will either be delivered or shipped, depending on the location. All samples will be stored appropriately by the laboratory.

5 Measurement Procedures

Soil and groundwater samples will be analyzed by the methods and to the reporting limits identified in Tables 2 and 3. The number of samples and the sample nomenclature are described in the RIWP.

The standard SVOC analytical method (8270D – selective ion monitoring [SIM]) for aqueous samples has a polycyclic aromatic hydrocarbon (PAH) reporting limit of 0.1 µg/L, 10-fold higher than the benzo(a)pyrene (or carcinogenic PAH [cPAH] toxicity equivalent [TEQ]) ISL. Therefore, a trace-level modification of 8270D – SIM will be used to achieve 0.01 µg/L MRLs for the cPAHs. This modification requires collection of 2-liter sample, as opposed to 500 mL needed to achieve the 0.1 µg/L MRL.

6 Quality Control

6.1 Laboratory Quality Control

Only laboratories accredited in accordance with WAC 173-50, Accreditation of Environmental Laboratories will be used for this project. EPA Contract Laboratory Program (CLP) QA/QC procedures or similar efforts will be used for the analyses. Internal quality control procedures are used to produce consistently high-quality data. A routine QC protocol is an essential part of the analytical process. The minimum requirements for each analytical run are described here. Additional description of laboratory QA/QC procedures can be found in the laboratory's QA manual. A project narrative detailing analytical results must accompany all data packages submitted by the laboratory.

Preparation batches have a maximum of 20 field samples of the same matrix. QA/QC samples processed with each batch are:

- **One method blank**. The method blank is used to assess the preparation batch for possible contamination during the preparation and processing steps. It is processed along with and under the same conditions as the environmental samples. Concentrations of compounds detected in the blank will be compared to the samples. Any concentration of common laboratory contaminants (i.e., phthalates, acetone, methylene chloride, or 2-butanone) in a sample lower than 10 times that found in the blank will be considered a laboratory contaminant and will be so qualified. For other contaminants, any compounds detected at concentrations lower than five times that found in the blank will be considered laboratory contamination (EPA 2008). Values reported for the method blanks are expected to be below the MDLs for all analytes, except the common laboratory contaminants. Deviations from this must be explained in the laboratory project narrative(s).
- **One LCS**. The LCS is used to evaluate the performance of the total analytical system, including all preparation and analysis steps.
- **One MS**. Matrix specific QA/QC samples indicate the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. The information from these controls is sample/matrix specific and is not normally used to determine the validity of the entire batch.
- **At least one duplicate**. Duplicates are replicate aliquots of the same sample taken through the entire analytical procedure. The results from this analysis indicate the precision of the results for the specific sample using the selected method. One duplicate sample is analyzed with each preparation batch. If sufficient sample is provided, this will be either an MSD. If not, an LCSD will be analyzed.
- **Initial and continuing calibration:** A calibration standard will be analyzed each time an instrument is calibrated. The instruments used to perform the analyses will be calibrated, and the calibrations will be verified as required by EPA methodologies. For example, a standard five-point initial calibration will be

utilized to determine the linearity of response with the gas chromatograph/electron capture detection. Once calibrated, the system must be verified every 12 hours. All relative response factors, as specified by the analytical method, must be greater than or equal to 0.05. All relative standard deviations, as specified by the analytical method, must be less than or equal to 30 percent for the initial calibration and less than or equal to 25 percent for the continuing calibration.

- **Surrogate evaluations:** Surrogate recovery is a QC measure used in organics analyses. Surrogates are compounds added to every sample at the initiation of preparation to monitor the success of the sample preparation on an individual sample basis (accuracy). Although some methods have established surrogate recovery acceptance criteria that are part of the method or contract compliance, for the most part, acceptable surrogate recoveries need to be determined by the laboratory. Recoveries of surrogates will be calculated for all samples, blanks, and QC samples. Acceptance limits will be listed for each surrogate and sample type and will be compared against the actual result by the data validator.
- **Laboratory management review:** The Laboratory Project Manager will review all analytical results prior to final external distribution (preliminary results will be reported before this review). If the QA Officer finds that the data meet project quality requirements, the data will be released as "final" information. Data which are not acceptable will be held until the problems are resolved, or the data will be flagged appropriately.

6.2 Field Quality Control

QA/QC samples will be collected during all sampling activities. Trip blank, field duplicate, and matrix spike/matrix spike duplicate samples will be collected as follows:

One water trip blank per sampling day will be prepared by the laboratory and will travel with the sample containers from and to the lab for analysis. This sample will be handled in the same manner as the groundwater samples. The blank will be submitted to the lab and will be analyzed for the EPA Method 8260 VOCs.

Field duplicate samples will use the same naming system as the environmental samples do that they are submitted "blind" to the laboratory. Field duplicates are useful in identifying problems with sample collection or sample processing. One duplicate sample will be collected for every 10 field samples of the same matrix. Each field duplicate will be analyzed for the same parameters as the samples to evaluate heterogeneity attributable to sample handling.

One matrix spike/matrix spike duplicate sample (MS/MSD) will be collected for every 20 field samples. Extra sample containers (the same as those for the environmental sample) collected for MS/MSD analyses will be noted in field notes and on chain-of-custody forms submitted to the analytical laboratory. Extra sample bottles for MS/MSD will be labeled with a "-MS/MSD" suffix for clarity in sample processing.

Rinsate and equipment blanks will not be collected for groundwater samples because samples will be collected using either disposable or dedicated sample tubing, which prevents cross-contamination.

6.3 Instrument and Equipment Testing, Inspection, and Maintenance

The primary objective of an instrument/equipment testing, inspection, and maintenance program is to aid in the timely and effective completion of a measurement effort by minimizing the downtime due to component failure.

Testing, inspection, and maintenance will be carried out on all field and laboratory equipment in accordance with manufacturer's recommendations and professional judgment. Hand-held field monitors will be used to monitor groundwater for field parameters. They will be calibrated and maintained according to the manufacturer's recommendations.

Analytical laboratory equipment preventative testing, inspection, and maintenance will be addressed in the laboratory QA manual, which will be kept on file at the contracted laboratory.

As appropriate, schedules and records of calibration and maintenance of field equipment will be maintained in the field notebook. Equipment that is out of calibration or is malfunctioning will be removed from operation until it is recalibrated or repaired.

6.4 Instrument and Equipment Calibration and Frequency

Field equipment and laboratory instrumentation used for monitoring and sample analysis will be subject to the following calibration requirements:

- **Identification**. Either the manufacturer's serial number or the calibration system identification number will be used to uniquely identify equipment. This identification, along with a label indicating when the next calibration is due, will be attached to the equipment. If this is not possible, records traceable to the equipment will be readily available for reference.
- **Standards**. Equipment will be calibrated, whenever possible, against reference standards having known valid relationships to nationally recognized standards (e.g., National Institute of Standards and Technology) or accepted values of natural physical constraints. If national standards do not exist, the basis for calibration will be described and documented.
- **Frequency.** Equipment will be calibrated at prescribed intervals and/or prior to use. Frequency will be based on the type of equipment, inherent stability, manufacturers' recommendations, intended use, and observation of equipment

readings over the course of the field work. All sensitive equipment to be used in the field or laboratory will be calibrated or checked prior to use.

- **Records**. Calibration records (certifications, logs, etc.) will be maintained for all measuring and test equipment used.

If field or laboratory equipment is found to be out of calibration, the validity of previous measurements will be investigated, and/or corrective action will be implemented. The Field QA Manager or the Laboratory QA Manager, respectively, will lead the evaluation process, which will be document in the field forms or laboratory log book, respectively.

All laboratory calibration requirements must be met before sample analysis may begin. The laboratory will follow the calibration procedures dictated by the analytical methods to be performed. If calibration non-conformances are noted, samples will be reanalyzed under compliant calibration conditions within method-specified hold times.

6.5 Inspection and Acceptance of Supplies and Consumables

The Field Manager will be responsible for material procurement and control. The Field Manager will verify upon receipt that materials meet the required specifications and that, as applicable, material or standard certification documents are provided, maintained, and properly stored with the project files. The Field Manager will also verify that material storage is properly maintained and that contamination of materials is not allowed.

The laboratory must document and follow procedures related to:

- Checking purity standards, reagent grade water, and other chemicals relative to intended use
- Preparing and storing chemicals
- Handling disposable glassware (including appropriate grade).

The Field Manager will be responsible for procuring and transporting the appropriate sample containers, equipment, and consumables (e.g., soap) to the Site. The containers will be pre-cleaned and certified by lot. If needed, reagents provided will be of the appropriate grade for the analysis. Records of these certifications and grades of material will be maintained on file at the laboratory.

7 Corrective Actions

Upon receipt of data, the QA Officer will evaluate field and laboratory precision by the RPDs between the field duplicate and sample data (using calculated totals for total PCBs, and cPAH TEQ and using other individual constituents). Non-conforming items and activities are those which do not meet the project requirements or approved work procedures. Non-conformance may be identified by any of the following groups:

- **Field staff/Manager**: during the performance of field activities, supervision of subcontractors, performance of audits
- **Laboratory staff**: during the preparation for and performance of laboratory testing, calibration of equipment, and QC activities
- **QA Staff**: during the performance of audits and during data validation, through the use of data to make decisions (i.e., do the data make sense?).

If possible, the Field Manager will identify any action that can be taken in the field to correct any non-conformance observed during field activities. If necessary and appropriate, corrective action may consist of a modification of methods or a re-collection of samples. If implementation of corrective action in the field is not possible, the non-conformance and its potential impact on data quality will be discussed in the data quality section of the RI/FS Report.

Corrective action to be taken as a result of non-conformance during field activities will be situation-dependent. The laboratory will be contacted regarding any deviations from the QAPP, will be asked to provide written justification for such deviations, and in some instances, will be asked to reanalyze the sample(s) in question. All corrective actions must be documented. The person identifying the nonconformance will be responsible for its documentation.

Documentation will include the following information:

- Name(s) of the individual(s) identifying or originating the nonconformance
- Description of the nonconformance
- Any required approval signatures
- Method(s) for correcting the nonconformance or description of the variance granted.

Documentation will be made available to project, laboratory, and/or QA management. Appropriate personnel will be notified by the management of any significant nonconformance detected by the project, laboratory, or QA staff. Implementation of corrective actions will be the responsibility of the Field Manager or the QA Officer. Any significant recurring nonconformance will be evaluated by project or laboratory personnel to determine its cause. Appropriate changes will then be instituted in project requirements and procedures to prevent future recurrence. When such an evaluation is performed, the

results will be documented. If there are unavoidable deviations from this QAPP, the Project Manager will document the alteration and track the change in the subsequent deliverables.

8 Audits and Reports

Field investigators will maintain field notes in a bound notebook or on field forms, and all documents, records, and data collected will be kept in a case file in a secure records filing area. All laboratory deliverables with verifiable supporting documentation shall be submitted by the laboratory to the QA Officer. The following documents will be archived at the laboratory: 1) signed hard copies of sampling and chain-of-custody records; and 2) electronic files of analytical data including extraction and sample preparation bench sheets, raw data, and reduced analytical data. The laboratory will store all laboratory documentation of sample receipt and login; sample extraction, cleanup, and analysis; and instrument output in accordance with the laboratory Standard Operating Procedure (SOP) or QA manual.

PDFs of all analytical reports will be retained in the laboratory files, and at the discretion of laboratory management, the data will be stored electronically for a minimum of 1 year. After 1 year, or whenever the data become inactive, the files will be transferred to archives in accordance with standard laboratory procedure. Data may be retrieved from archives upon request.

No audits, other than the identified data verification and validation will be conducted.

9 Data Verification and Validation

Analytes detected at concentrations between the MRL and the method detection limit (MDL) will be reported with a J qualifier to indicate that the value is an estimate (i.e., the analyte concentration is below the calibration range). J-qualified data are considered valid when completeness is calculated. Undetected data will be reported at the MRL. The MRL will be adjusted by the laboratory as necessary to reflect sample dilution or matrix interference.

No guidelines are available for validation of data for TOC. These data will be validated using procedures described in the functional guidelines for inorganic data review (EPA 2010), as applicable.

Verification of completeness and method compliance, as well as raw data entry and calculations by analysts will be reviewed by the Laboratory Project Manager. The Laboratory Project Manager will be responsible for checking each group or test data package for precision, accuracy, method compliance, compliance to special client requirements, and completeness. The Laboratory Project Manager will also be responsible certifying that data in PDFs and EDDs are identical prior to release from the laboratory.

Data validation will be completed by a third-party data validator. Data validation will be completed within two weeks after receipt of the complete laboratory data package.

The laboratory will generate Level 2B data package for all analytes. Validation of the analytical data will comply with criteria set forth in the CLP National Functional Guidelines for Superfund Organic Methods Data Review (EPA 2008).

10 Data Quality (Usability) Assessment

The QA Officer will review the field notebooks, laboratory reports, and the data validation report to determine if the data quality objectives have been met. Instances where the data quality objectives were not met will be documented. The usability of the data will depend on the magnitude of the data quality objective exceedance. Data that has been rejected will be flagged as "R" and will not be included in the database. The QA Officer will determine if rejected data trigger additional sample collection.

The achieved MRLs will be compared to the ISL in order to determine if the produced laboratory data can answer the study questions. In some cases the ISL was set to the practical quantitation limit (PQL, also the MRL), and therefore those MRLs need to be achieved in order for the data to be usable.

11 References

Ecology 2004. Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. Publication No. 04-03-030. July 2004.

EPA 2006. SW-846 on-line, test methods for evaluating solid waste— physical/chemical methods. http://www.epa.gov/epaoswer/hazwaste/test/main.htm.

EPA 2008. Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review. EPA-540-R-08-01. June 2008.

EPA 2010. Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review. OSWER 9240.1-51. EPA 540-R-10-011. January 2010.

EPA 2010b. Low Stress Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells. Revision 3, January 19, 2010. EQASOP-GW-001

Plumb, R.H. 1981. Procedures for handling and chemical analysis of sediment and water samples. Technical report EPA/CE-81-1. U.S. Army Corps of Engineers, Vicksburg, MS.

PSEP 1986. Puget Sound Estuary Program: Recommended protocols for measuring conventional sediment variables in Puget Sound. Final Report TC-3991-04. Prepared for U.S. Environmental Protection Agency, Region 10, Seattle, WA. Tetra Tech and HRA, Inc., Bellevue, WA. (Minor corrections, April 2003).

Tables

Table 1 Project Roles and Responsibilities

Role	Person	Responsibilities
Ecology Project Manager	TBD	• Direct other Ecology staff and their consultants to review and comment on materials • Grant final approval on this QAPP, on data use, and on further data collection.
Consultant Team Project Manager	Grant Hainsworth (253-797-6323)	• Primary point of contact with the Port • Review all technical documents associated with the project for technical accuracy and feasibility, as well as adherence to budget and schedule.
Quality Assurance Officer	Jamie Stevens (206-799-2744)	• Monitor all aspects of the project to verify that work follows project plans • Review laboratory analytical data • Serve as liaison between the laboratory and Field Manager • Maintain a complete set of laboratory data • Evaluate conformance of the analyses with the specifications of this QAPP • Verify the reported results with the raw data • Check that EDDs match the analytical reports • Review compliance with field methods and procedures.
Field Manager	Rusty Jones (832-330-1359)	• Collect or direct collection of soil and groundwater samples • Maintain a log (field log book) for all sampling-related activities • Coordinate the sampling operations to verify that the this QAPP is followed • Identify any deviations from this QAPP • Prepare the field data and information for RI/FS • Maintain the integrity of samples throughout sample collection and transport to the laboratory.
Laboratory Project Manager	Eric Young (206-285-8282)	• Conduct analysis of soil and water samples • Practice quality assurance methods per internal laboratory SOPs and this QAPP, and document such practices • Verify quality of samples (e.g., cooler temperature) as they're received at the laboratory • Verify accuracy and completeness of laboratory reports and EDDs.

Table 2 Soil and Sediment Sample Analytes

Analyte	Preparation Method	Analytical Method	Method Reporting Limit	Lowest Initial Screening Level	Holding Time	Sample Container
Metals other than Mercury (mg/kg)	3050	EPA 6010	0.3 to 5	Selenium = 0.38	1 year	4-ounce glass
Mercury (mg/kg)	3050	CVAA	0.025	0.07	28 days	4-ounce glass
Diesel Range Organics (mg/kg)	3550	NWTPH-Dx with silica gel cleanup	5	2,000	14 days to extract; 40 days to analysis	4-ounce glass
Gasoline Range Organics (mg/kg)	5035	NWTPH-G with silica gel cleanup	5	TPH-Gx with benzene = 30	14 days (if preserved)	Three methanol-preserved 40-ml VOA vials

Table 3 Groundwater Sample Analytes

Analyte	Preparation Method	Analytical Method	Method Reporting Limit	Lowest Initial Screening Level	Holding Time	Sample Container
Dissolved/Total Metals other than Mercury (µg/L)	200.8	200.8 with reductive precipitation	0.0068 – 0.18 (CAS-calculated MDLs)	Copper = 2.4	6 months	Field filter into 500-mL plastic bottle with HNO_3 preservative to pH <2
Mercury (µg/L); groundwater only	200.8 (same extract as other metals)	1631	0.2	0.2 (PQL)	28 days	Same as other metals
Diesel Range Organics (mg/L)	3510	NWTPH-Dx with silica gel cleanup	0.1	0.5	14 days to extract; 40 days to analysis	500-ml amber glass
Gasoline Range Organics (mg/L)	5030	NWTPH-G with silica gel cleanup	0.2	0.8	14 days (if preserved)	Three 40-ml vials preserved with hydrochloric acid
Chloride and fluoride (mg/L)	NA	300.0	0.8 (Fluoride) -2 (chloride)	960 (fluoride, lowest)	6 months	500-mL plastic bottle
Ammonia (mg/L)	NA	351.1	0.01	NA	6 months	500-mL plastic bottle

Table 4 Dross Sample Analytes

Analyte	Analytical Method	Holding Time	Sample Container
Metals other than Mercury (mg/kg)	EPA 6010	1 year	4-ounce glass
Potassium	EPA 6010	14 days to extract; 40 days to analysis	4-ounce glass
Sodium	EPA 6010	48 hours to freeze; 14 days to analysis	Three methanol-preserved 40-ml VOA vials
Chloride Cations/anions	300.0	14 days to extract; 40 days to analysis	4-ounce glass
TCLP	1311, 6000/7000 series	14 days (if preserved)	Three methanol-preserved 40-ml VOA vials
Reactivity and corrosively	ASTM D4978-95	28 days	8-ounce glass jar
Ignitable (RCI)	1030	28 days	8-ounce glass jar
pH	9045C	1 day	8-ounce glass jar
Fish/Rat bioassay	80-12	NA	4-ounce glass jar (Fish) 16-ounce glass jar (Rat)

Note:
Samples may be combined based on direction from the lab.
Screening values and method reporting limits are not provided for these waste disposal samples, as these are not being compared to site cleanup goals.

Table 5 Measurement Quality Objectives

Parameter	Precision (RPD; lab/field)	Accuracy	Completeness	Preservation/ Storage
Metals	Soil: 20%/50% Water: 20%/35%	70-130%	100%	Dark, 4°C; freeze VOCs with 48 hours if not analyzed.
Petroleum Hydrocarbons				
SVOCs				
VOCs				

Note

1. These data quality objectives will be applied to soil, sediment and groundwater samples only.

Appendix D Health and Safety Plan

APPENDIX D: HEALTH AND SAFETY PLAN

Maralco Property
Kent, Washington

March 4, 2022

Prepared for:

Prepared by:

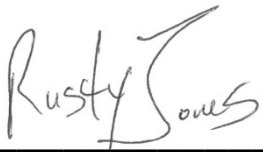
CRETE
CONSULTING, INC.

APPENDIX D: HEALTH AND SAFETY PLAN

Maralco Property
Kent, Washington

March 4, 2022

Prepared by:



Rusty Jones, Project Geologist

Reviewed by:

Jamie Stevens, P.E.

Table of Contents

List of Tables

List of Figures

List of Appendices

Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
APR	air purifying respirator
BRIDGE	Bridge Industrial
CAA	Cleanup Action Areas
CRETE	CRETE Consulting, Inc.
CRZ	contaminant reduction zone
COVID-19	coronavirus disease 2019
cVOC	chlorinated volatile organic compound
EPA	United States Environmental Protection Agency
HASP	Health and Safety Plan
HEPA	high-efficiency particulate air
IDHL	immediately dangerous to health and life
JHA	job hazard analysis
kV	kilovolt
MARALCO	Former Maralco Aluminum Property
MSDS	material safety data sheet
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protective equipment
REL	reasonable exposure limit
SDS	Safety Data Sheet
Site	Maralco Property, also referenced as Property
STEL	short-term exposure limit
SSO	Site Safety Officer
SVOC	semi-volatile organic compound
TCE	trichloroethene
TPH	total petroleum hydrocarbons
TLV	threshold limit value
TWA	time weighted average
VOC	volatile organic compound
WAC	Washington Administrative Code

MINIMUM TRAINING REQUIREMENTS

Maralco Property (Site)

All workers entering a designated **exclusion zone,** as described below, must have a current 40- or 24-hour training certificate in Hazardous Waste Operations or current 8-hour refresher. All workers on site will be required to have read and signed the Site-Specific Health and Safety Plan and attended a safety orientation. Specific types of site work, hazards, and training requirements are listed in the Job Hazard Assessment in Appendix F of this Plan.

The following table is intended to provide a summary of minimum levels of training for specific workers and job activities on site.

Type of Work Involved	**Minimum Level of Training**
Laborers and Equipment Operators in the Exclusion Zones engaged in disturbance of contaminated media, evaluating potential employee exposures, and otherwise potentially contacting contaminated media where **respiratory protection is or may be required.**	• 40-Hour Hazardous Waste Operations Training and Current 8-Hour Refresher • Project Safety Plan including Health and Safety Orientation • Read/Sign Site-Specific Health and Safety Plan
Laborers and Equipment Operators in the Exclusion Zones engaged in excavation of contaminated soil, evaluating potential employee exposures, and otherwise potentially contacting contaminated soils so long as respiratory protection is not required.	• 24-Hour Hazardous Waste Operations Training and Current 8-Hour Refresher • Project Safety Plan including Health and Safety Orientation • Read/Sign Site-Specific Health and Safety Plan
Workers onsite in clean or support zones for more than 8 hours, such as laborers, repair persons, inspectors, etc. ***Note*: None of these workers are permitted in any portion of the exclusion or contamination reduction zones.**	• Project Safety Plan including Health and Safety Orientation • Read/Sign Site-Specific Health and Safety Plan

1 Introduction

This Health and Safety Plan (HASP) describes the health and safety protocols to be used during activities at completed at the Maralco Property, also referenced as Property (Site). The Contractors, such as drillers, involved in this work will follow their own HASPs. CRETE Consulting, Inc. (CRETE) will oversee remediation activities, such as concrete slab removals, soil excavations, soil confirmation sampling, waste removal/hauling, trench installation, water treatment at the Site. Additionally, limited well/soil drilling, and Geoprobe boring, soil vapor borings to collect soil, groundwater and vapor samples may be conducted during confirmation sampling and post-remediation activities at the Site.

This plan was written by CRETE, who will work with various contractors, such as remediation contractors, equipment operators, trucking contractors, utility locators, to perform work on the Site. This HASP is unique to activities to be performed by CRETE staff/field managers/Site Safety Officer (SSO). General site information is summarized in Table 1-1. Background information pertaining to site history and general hazards is listed in Table 1-2.

In addition to the requirements set forth in this HASP, Crete personnel shall comply with the HASPs and related protocols of all onsite Contractors and any health and safety protocols required by Bridge Industrial (BRIDGE).

1.1 COVID-19 Infection Control Procedures

This section will be updated as procedures, local and federal laws change to the Covid-19 situation. Appendix A-1 includes details and a field checklist/screening form.

Crete has established infection control procedures (Procedures) to address the coronavirus disease 2019 (COVID-19) pandemic impacting the Puget Sound region. The intent of these Procedures is to protect all employees, subcontractors, and visitors from infection by COVID-19 at sites where Crete is actively working. A detail of all Procedures in included in Appendix A-1.

These Procedures are based on what is currently known about COVID-19. The Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) are continually updating recommended protections as needed and as additional information becomes available. These Procedures will be updated as this information evolves.

Coronaviruses are a large family of viruses that are common in humans and many different species of animals, including cattle, cats, and bats. Rarely, animal coronaviruses can infect people and then spread between people, such as with MERS-CoV and SARS-CoV. The virus that causes COVID-19 is spreading from person-to-person across the United States and much

of the world. It should be noted, however, that respiratory illnesses like seasonal influenza, are also currently widespread in many communities.

Reported COVID-19 cases have ranged from mild symptoms to severe illness and death. The following symptoms are most commonly reported. Symptoms may appear **2-14 days after exposure.**

- Loss of sense of smell
- Sore throat
- Fever
- Dry cough

If you develop **emergency warning signs** for COVID-19 get **medical attention immediately**. Emergency warning signs include:

- Difficulty breathing or shortness of breath
- Persistent pain or pressure in the chest
- New confusion or inability to arouse
- Bluish lips or face

SOCIAL DISTANCING

Based on the knowledge that COVID-19 can be spread through droplet transmission, the CDC has established a safe distance parameter of six feet between people. The following procedures are designed to provide guidance for spatial distancing on the jobsite.

- Workers, if working in a team, will take separate vehicles to the job site.
- A minimum distance of six feet should be maintained from other individuals on the worksite.
- Workers will not congregate in groups of more than four other individuals.
- Workers will not be permitted to come to work if they feel sick or exhibit any symptoms common to cold, flu or COVID-19. These symptoms include a fever, sore throat, or dry cough.
- No person will eat, drink, chew gum or tobacco in potentially contaminated areas or around other people. Drinking replacement fluids for heat stress control will be permitted only in areas that are free from contamination, except in emergency situations.
- Food should be consumed in a car or away from other individuals.
- All personnel leaving potentially contaminated areas will wash their hands and face prior to entering any new area. If that is not possible, hands should be sanitized with hand-sanitizer. Hands and face should be washed with soap and water as soon as it is feasible after leaving a job site.

1.2 Subcontractor Distribution / Acknowledgment

As required by regulation, the Site Safety Officer (SSO) will make available a copy of this Site-Specific Health and Safety Plan to subcontractors hired by CRETE working in contaminated areas and others who may enter the site. Subcontractors and others will read, sign, and return the attached acknowledgment form (Appendix A-2) and follow these provisions as minimum requirements. Due to their unique work activities, some subcontractors may need to follow more stringent health and safety measures in accordance with applicable regulations (e.g. heavy equipment operation safety, crane operators, etc.). It is anticipated that subcontractors will manage the hazards specific to their trade and equipment, as detailed in each contractor's Accident Prevention Plan or company Health and Safety Plan.

The SSO shall be responsible for informing all individuals assigned to work on the site, or who visit the site within the exclusion or contaminant reduction zones, of the contents of this HASP and for ensuring that each person signs the Site Safety Plan Acknowledgment Form (Appendix A-2). By signing the Site Safety Plan Acknowledgment Form, individuals recognize the site health and safety hazards, known or suspected, and will adhere to the protocols required to minimize exposure to such hazards. Subcontractors will also adhere to their own HASPs related to the work they are performing (e.g., safe drill operation).

All visitors who enter the work zone are required to sign in and sign out with the Field Manager or SSO (Appendix B).

1.3 Site Health and Safety Meetings

A pre-work meeting addressing site-specific health and safety issues shall be held on the first day of mobilization to the site and prior to the commencement of any work activities. Mandatory attendance is required for all personnel assigned to the particular tasks for which the equipment was mobilized. For example, a work meeting with the excavation contractors will occur at a different time than the meetings with the ISS drillers, as these activities will be performed on different days and each have their own mobilization events. The intent of these meetings is to discuss the site-specific health and safety issues (such as known or suspected contaminants).

At the conclusion of the meeting, personnel are to sign the Site Safety Plan Acknowledgment Form in Appendix A-2, indicating their attendance and understanding of the health and safety protocols. As additional personnel are assigned to the site, it is the responsibility of the SSO to ensure that new personnel are briefed on site-specific health and safety information and that they also have signed the Site Safety Plan Acknowledgment Form (Appendix A-2).

Daily tailgate meetings will be held by the SSO or field staff in charge of the day's activities and attendance will be documented in the tailgate meeting form Appendix C).

1.4 Training Requirements

All personnel assigned to work on this site beyond the support zone must have successfully completed 40 hours of Training for Hazardous Waste Site Work, in accordance with Occupational Safety Health Act (OSHA) 29 CFR 1910.120(e)(3), and must be current with their 8-hour Refresher Training, in accordance with OSHA 29 CFR 1910.120(e)(8).

Personnel managing or supervising work on site must also have successfully completed 8 hours of Manager/Supervisor Training, meeting the requirements of 29 CFR 1910.120(e)(4). Documentation of CRETE staff training is maintained in each company's respective databases. Each contractor must maintain documentation of OSHA training for personnel working on site.

Any exceptions to the training requirements will be explicitly specified either in this HASP or through a HASP amendment.

1.5 Medical Monitoring Requirements

All CRETE personnel assigned to work on this site beyond the support zone must be enrolled in a medical surveillance program meeting the requirements of OSHA 29 CFR 1910.120(f). Personnel must have successfully passed an occupational physical within the past 12 months, be medically cleared to work on hazardous waste sites, and be capable of wearing appropriate personal protective equipment (PPE), including any respiratory protection.

Any exceptions to the medical monitoring requirements will be explicitly specified either in this HASP or through a HASP amendment.

1.6 Fit Testing Requirements

All CRETE personnel assigned to work on this site beyond the support zone must be familiar with the requirements in the OSHA respiratory standard (29 CFR 1910.134). All personnel who are required to wear respiratory protection must have successfully passed a respirator fit test within the past 12 months. Personnel who do not have a current fit test are prohibited from working in areas where any potential exists for exceeding OSHA Permissible Exposure Limits. Documentation of a successful respirator fit test for the appropriate type of respirator needed for this work (half-face) must be maintained by each contractor performing onsite work. The SSO will check that the respirator being worn by personnel is the same size, make, and model as that specified on any respirator fit test records from the past 12-month period.

1.7 Project Staff Responsibilities

The SSO is responsible for overall project administration and for coordinating health and safety protocols and procedures for all onsite CRETE personnel at all times. All applicable United States Environmental Protection Agency (EPA), OSHA, state, and local health and

safety requirements shall be followed throughout the course of the project. This HASP covers only CRETE personnel onsite. Any person who observes health and safety problems or infractions should immediately report the problem or infraction to appropriate personnel.

1.8 Access to Employee Exposure and Medical Records

OSHA provides employees and their designated representatives a right-of-access to relevant exposure and medical records (29 CFR 1910.20). The "Notification of Access to Employee Exposure and Medical Records" (Appendix D) is to be made accessible to all employees involved with these field operations.

1.9 Hazard Communication

The SSO will advise all CRETE personnel assigned to this site of the hazards associated with working onsite and of the methods to mitigate those hazards and prevent exposures. This information will be presented to personnel prior to initiation of any field activities. The following information regarding site contaminants or any chemicals brought to the site to conduct the work will be presented to site personnel prior to conducting any field work:

- Material Safety Data Sheets (MSDS)/Safety Data Sheets (SDS) - Appendix E
- Chemical/physical hazards
- Appropriate PPE for protection from exposure
- Labeling

Table 1-1 General Information

Client: BRIDGE	**Project ID**
Site Name: Maralco Property	
Site Location: 7730 South 202nd Street, Kent WA	
Description of Field Activities: Site inspection, remediation investigation activities, and confirmation sampling.	
Dates of Field Activities: Q1 2022 through Q1 2023	
Project Manager: Jamie Stevens and Grant Hainsworth, CRETE	**Project Manager Telephone Number:** Jamie: 206-799-2744 Grant: 253-797-6323
QA Officer: Jamie Stevens, CRETE	**Office:** Tukwila
Site Safety Officer (SSO): Rusty Jones, CRETE	**Field Manger Telephone #** 832-330-1359
The following requirements have been fulfilled for each employee to work onsite: ☒**Completed OSHA 40-Hour HAZWOPER Training** ☒**Current OSHA 8-Hour HAZWOPER Refresher (within last 12 months)** ☒**Current Medical Surveillance Examination (within last 12 months)** ☒**Current Respirator Fit-test (within last 12 months)** ☒**Current First Aid and CPR Training (within last 2 years)** **Note:** CRETE employees may not enter a site beyond the support zone unless the training/qualifications listed above are current. **The field manager and the SSO meets all the training requirements listed above and records can be provided upon request.**	

Table 1-2 Site Background

Overall Hazard Is:			
High: ☐	**Moderate:** ☒	**Low:** ☐	**Unknown:** ☐
Facility Description: The site has known extensive surface metals and metal oxide contamination from historic on-site refining and smelting activities. Limited hydrocarbon soil and groundwater impacts from a former UST. No known chlorinated volatile organic compound (cVOC) impacts. Surface soil contamination (arsenic, chromium, et al.) are present in outdoor and indoor stockpiles. Several of the indoor stockpiles may be classified as hazardous waste and extra caution should be taken when working inside.			
Status: The site has been primarily vacant for some time and property transaction is underway (completion of purchase expected Q4 2022). The site is frequented by forklift traffic, as the neighboring facility stores and stacks pipe in the pavement areas. Much of the property is overgrown with dense vegetation, including blackberry thorny bushes. Wild animals may live in the densely vegetated area. Miscellaneous debris, including sharp metals are present throughout the refinery building.			
Unusual Features (containers, dikes, buildings, power lines, terrain, etc.): Large uneven stockpiles of smelt waste (granular dross). Ammonia odors have been noted as occasionally emanating from the stockpiles.			
Site History (worker injury, complaints, regulatory agency action): There are known areas of groundwater and soil contamination above state and federal criteria. Voids may form in the stockpiles and care must be given in case of stockpile void-collapse or shifting.			
Potential Waste Types: Soil and groundwater contamination, metal-laden dust. Unknown pits or sumps may exist with sludge or other waste.			
Liquid: ☒	**Solid:** ☒	**Sludge:** ☒	**Debris:** ☒
Characteristics: Dust			
Corrosive: ☒	**Ignitable:** ☐	**Volatile:** ☒	**Toxic:** ☒
Reactive: ☐	**Unknown:** ☒	**Radioactive:** ☐	**Other (name):** ☐
Hazards posed by site activities (Job Hazard Analysis in Appendix F): Potential exposure to contaminants including petroleum hydrocarbons, VOCs, metals. Free phase petroleum products unlikely to be encountered. Trips, slips, falls, sharp objects and dust inhalation are the main hazards.			
Unusual Hazards: Thorny vegetation is present, and animal wildlife may be present.			

2 Health & Safety Risk Analysis

This section identifies the specific hazards associated with the remedial investigation work and presents an analysis of documented or potential chemical hazards at the site. Every effort must be made to reduce or eliminate exposure to these hazards. Hazards that cannot be eliminated must be abated by use of engineering controls and/or PPE.

2.1 Description of Site Tasks

This HASP is intended to cover activities in areas where contamination may be encountered at the Project. These activities include:

- Mobilization to the site and driving on the site; coordination with contractors on equipment and supply staging.
- Clearing vegetation for site surveys.
- Excavation surveying and marking/flagging.
- Coordination and oversight of remedial activities including soil excavation, soil stockpiling and loading (roll-offs boxes and trucks), including benching and shoring activities.
- Coordination and oversight of ISS drilling and mixing, including working around heavy equipment.
- Soil borings, Geoprobe, test pits, and sampling to collect soil data, as needed.
- Confirmation sampling and GPS data collection and mapping.
- Construction oversight of subsurface interceptor trench and remediation barrier.
- Archaeological monitoring=, as needed.

A job hazard assessment that evaluates the hazards associated with each of these tasks is included with this Plan as Appendix F.

2.2 General Site Hazards

2.2.1 Lighting

Work areas must have adequate lighting for employees to see to work and identify hazards (5-foot candles minimum, comparable to a single 75- to 100-watt bulb). Personnel should have flashlights available in all indoor or dimly lighted areas for use in the event of a power failure, or if working outdoors after daylight hours. Applicable OSHA standards for lighting (29 CFR 1910.120(m)) shall apply. **Al investigation activities are expected to occur outside and mostly during daylight hours.**

2.2.2 Utilities

All electrical power must have a ground fault circuit interrupter as part of the circuit, including generators. All equipment must be suitable and approved for the class of hazardous atmosphere in which it is being used. Applicable OSHA standards for electric power (29 CFR 1910 Subpart S) shall apply. **The site is absent any building structures and at grade and below grade concrete structures remain in several Site areas. Any electrical power used at the site will require outdoor use of a portable electrical generator or portable battery-operated tools.**

All underground utility hazards shall be identified and/or inspected prior to conducting operations involving potential contact. Some work will occur where numerous current and historical utilities exist, and special caution should be exercised in all ground disturbing work.

Any time work is performed in the vicinity of overhead utilities, including power lines, a spotter will be assigned to help operators maneuver equipment in and around the wires. The following distances will always be maintained around high-tension wires:

- For lines rated 50 kilovolts (kV) or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet.
- For lines rated over 50 kV, minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kV over 50 kV, or twice the length of the line insulator, but never less than 10 feet.
- In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50 kV, 10 feet for voltages over 50 kV, up to and including 345 kV, and 16 feet for voltages up to and including 750 kV.

In addition, all utility pole “guy-wire” support cables will be identified, marked, and/or barricaded prior to work. Unintended equipment or vehicle contact with these guy wires may result in utility poles or power lines falling on personnel or equipment.

2.2.3 Heat Stress

Work will be performed in accordance with WAC 296-62-095 with regard to heat stress.
Site personnel may be required to perform their work tasks in ambient temperatures of 70 degrees F or above or while wearing impervious clothing. All personnel must be instructed on the symptoms of the primary heat-related disorders and how to minimize their chances of becoming affected by them. These disorders, their symptoms, and first-aid measures are outlined below:

- **Heat Rash:** Decreased ability to tolerate heat raised red vesicle on affected areas, and clothes that chafe. Maintain good personnel hygiene and use drying powders or lotions.
- **Heat Cramps:** Muscle spasms and pain in the extremities and abdomen. Rest in cool area and drink plenty of fluids. If pain persists, seek medical attention.
- **Heat Exhaustion:** Shallow breathing; pale, cool, moist, clammy skin, profuse sweating, dizziness, lassitude, and fainting. Rest in a cool area and drink plenty of fluids. Get medical attention prior to returning to work.

- **Heat Stroke:** Red, hot, dry skin, no perspiration, nausea, dizziness, confusion, strong rapid pulse, coma. Cool victim immediately with cool or cold water. Seek immediate medical attention.

At a minimum, personnel wearing non-breathable clothing at temperatures greater than 70 degrees F should take a break every one to two hours and drink plenty of fluids. The intake of an average of one quart of fluids per hour is recommended. CRETE is required to provide enough water on site for each employee to drink one quart per hour on site. A cool or shaded rest area should be used.

2.2.4 Cold Stress

Site personnel will be instructed on the signs, symptoms, and the prevention of cold-related disorders prior to performing specific work tasks. The two major effects of cold stress are frostbite and hypothermia.

- Frostbite: Sudden blanching of the skin progressing to skin with a waxy or white appearance, which is firm to the touch, but the tissue beneath the skin, is resilient to the touch.
- Hypothermia: The symptoms of systematic hypothermia are exhibited as follows: (1) shivering, (2) apathy, listlessness, and (sometimes) rapid cooling of the body to less than 90F, (3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate, (4) freezing of the extremities, and (5) death.

Personnel will monitor themselves and other team members for signs of frostbite and hypothermia. If temperatures fall below 20°F, thermal clothing may be required. Field activities will be curtailed if equivalent wind chill temperatures are less than 0°F, unless operations are of an emergency nature.

2.2.5 Noise

When the noise level of any operation exceeds the 8-hour Time Weighted Average (TWA) of 85 decibels (dB), a hearing protection program meeting the requirements of 29 CFR 1910.95 will be implemented. Noise generation at the site will primarily be created by heavy power equipment (excavators), haul truck, drilling rig equipment, generators, and power equipment attachments (e.g. jack-hammer on excavators during concrete demolition).

2.2.6 Fire Prevention

Operations involving the potential for fire hazards shall be conducted in a manner that minimizes the risk. Non-sparking tools and fire extinguishers shall be used or available as required. Sources of ignition shall be removed. When necessary, explosion-proof instruments and/or bonding and grounding will be used to prevent explosion and/or fire. All power equipment, cranes, trucks, generators, and drilling rigs will be required to have inspected, current fire extinguishers.

2.2.7 Severe Weather and Lightning

The SSO will monitor local media resources to identify possible severe weather situations at the project site. Site work may be delayed, postponed, or cancelled due to severe weather based on the SSO's discretion. In the event of a weather emergency, the site will be evacuated in accordance with Section 7 of this document.

Lightning can strike up to a distance of 10 miles, but thunder can only be heard at a distance of 8 miles. Therefore, if site personnel working outdoors hear thunder and/or see lightning, work will be stopped and personnel will move to an indoor location. If indoor facilities are not available, personnel will move inside of passenger vehicles such as cars and pickups. During a thunderstorm with thunder/lightning, avoid trees/poles, standing water, high areas, and metal structures (fences, scaffolding, etc.). Work will resume 30 minutes following the final observance of thunder and/or lightning.

2.2.8 Heavy Equipment

Heavy equipment to be used on this project includes excavators and drill rigs. Equipment must be maintained in good working condition and operated in a safe manner. Heavy equipment operators must be trained in the operation and handling of the applicable piece of equipment. Equipment must have audible alarms, rollover protection, seat belts, and be equipped with a fire extinguisher. Subcontractors shall not use equipment that they judge to be unsafe due to deterioration, missing parts, or obvious defects. Visual safety inspections shall be conducted daily and documented inspections shall be conducted monthly.

2.2.9 Slips, Trips, and Falls

Slips, trips, and falls are a major concern while working on any site and account for a large number of occupational accidents. Personnel must be aware of their surroundings while moving about the site. Pathways and work areas must be kept free of debris and supplies to prevent unsafe walking and working conditions. Changes in elevation such as ruts, holes, broken pavement, or berms should be marked, if possible. When water is used during any of the work tasks, care must be taken to avoid creating muddy or slippery conditions. If slippery conditions are unavoidable, barriers and warning signs must be used to warn of these dangers.

2.2.10 Water Safety

Work will include upland work adjacent to Salmon Bay. Work will not include activities from boats or barges. All personnel working below the OHW mark (e.g., during installation of TESC measures) must wear a properly fastened (e.g. zipped and clipped) U.S. Coast Guard approved personal flotation device (PFD). The "buddy system" shall be mandatory for all crew members working on, over, or near the water.

2.3 Chemical Hazards

Data summarized in the Cleanup Action Plan (CAP) indicate that the chemicals listed in Table 2-1 exist at the site in soil and/or groundwater. Detailed hazard information for selected chemicals is available through MSDS/SDS in Appendix E. Workers will use appropriate PPE if exposure to a known or suspected contaminated medium is likely.

2.3.1 Chemicals Potentially Used

In addition to the site contaminants, chemical products will be purchased for use at the site. These chemicals may include diesel fuel, gasoline, bentonite, Portland cement, silica sand, and decontamination materials such as isopropyl alcohol, n-hexane, and soaps (e.g., Alconox). Other materials may be purchased as needed. MSDS/SDS required by OSHA will be obtained for chemical products used at the site. Copies of the MSDS/SDS will be maintained at the site for worker review.

2.3.2 Sample Preservatives

Preservatives including hydrochloric acid and nitric acid may be encountered during sampling activities. Safe and proper handling techniques are to be used when collecting samples. Individuals should work upwind from the open sample keeping the bottle away from the breathing zone (approximately one arm's length) to minimize potential exposure. Personnel should be aware of any changes in wind direction that may also affect potential for exposure to vapors. Gloves and safety glasses will always be worn when collecting samples. Sample vessel seals should be immediately replaced after sample is gathered.

Should any sample preservatives come in contact with skin, the exposed area should be thoroughly irrigated with fresh water immediately.

2.3.3 Hazardous Chemicals Present in Materials

Total Petroleum Hydrocarbons (present in site soils, groundwater and potentially vapor)

Total Petroleum Hydrocarbons (TPH) is a generic term based on analytical test procedures for the range of hydrocarbon materials from gasoline through heavier fuel oils. These materials typically consist of n-paraffins, isoparaffins, naphthenes, and aromatics in the boiling point range from approximately 50 to 250°C. Based on materials such as gasoline and fuel oils, TPH can be expected to typically act as a central nervous system depressant, resulting in slurred speech and mental confusion. Higher doses can result in unconsciousness and possibly death from respiratory failure. Skin contact can result in irritation, dermatitis, and defatting. Liver and kidney damage can also result following acute or chronic exposure. Exposure to diesel fuel liquid product may produce skin irritation, and inhalation of the product mist may result in headache, nausea, and confusion.

Benzene (present in site soils, groundwater and potentially vapor)

Benzene exposure can occur by inhalation, percutaneous absorption, ingestion, and skin and eye contact. Like other aliphatic and aromatic hydrocarbons, acute overexposure to benzene can cause central nervous system depression. Headache, dizziness, nausea, convulsions, coma, and death can result from elevated exposures. In some cases, acute exposure has resulted in death due to ventricular fibrillation. The principal chronic hazard associated with benzene exposures is its ability to cause changes in blood cells, including anemia and cell abnormalities. Benzene has been demonstrated to cause leukemia in epidemiological studies, and it is recognized as a human carcinogen by the National Institute for Occupational Safety and Health (NIOSH) and other agencies. The Environmental Protection Agency (EPA) currently classifies benzene as a Class A, or confirmed, human carcinogen.

Metals – Aluminum, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, nickel, lead, and zinc (present in in site soils, dross, and groundwater)

The major route of exposure to metals is via inhalation of dusts, mists, and fumes or through ingestion of dust or contaminated foods. Numerous metals may be inhaled via cigarette smoke. Avoid smoking or eating onsite or prior to doffing PPE. Many of the metal compounds may be encountered as metal oxides at the site. Like all metal compounds, the level of harm depends upon the dose, duration, and work being done. Particulate respirators shall be worn with interacting with the dross materials.

Aluminum has been linked to declining performance in neuropsychological tests (attention, learning, memory). Elevated aluminum content has been found in the brains of persons with Alzheimer's disease. It remains unclear whether this is a cause or an effect of the disease. There is conflicting evidence on carcinogenicity. (NIH website)
Aluminum dross is located at this site and may react slowly with water to produce methane, ammonia, and hydrogen. Outdoor piles have been wetted and may be less reactive, but indoor dross piles may still be reactive with water.
The OSHA PEL-TWA for aluminum dust is 10 mg/m3 and the NIOSH REL-TWA is 10 mg/m3.

Antimony powder is a strong reducing agent and may react violently or explosively with water. Antimony is spontaneously flammable in fluorine, chlorine, and bromine.
The OSHA PEL-TWA and NIOSH REL-TWA for antimony is 0.5 mg/m3 and the NIOSH IDLH is 50 mg/m3.

Arsenic-containing dust exposure causes irritation of the upper respiratory tract, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and darkening of the skin and small corns or warts. Ingestion of arsenic-laden dust from swallowing inhaled dust or ingesting contaminated soil may also cause gastrointestinal effects including nausea and vomiting.
The OSHA PEL-TWA for arsenic dust is 0.01 mg/m3 and NIOSH REL-15min is 0.002 mg/m3.

Workers in industries where beryllium is present may be exposed to beryllium by inhaling or contacting beryllium in the air or on surfaces. Inhaling or contacting beryllium can cause an immune response that results in an individual becoming sensitized to beryllium. Individuals with beryllium sensitization are at risk for developing a debilitating disease of the lungs called chronic beryllium disease (CBD) if they inhale airborne beryllium after becoming sensitized. Beryllium-exposed workers may also develop other adverse health effects such as acute beryllium disease, and lung cancer. Beryllium compounds may be present at the site and are generally white, crystalline or powdered material and are generally soluble in water.
The OSHA PEL-TWA for beryllium is 0.2 ug/m3 and the OSHA-STEL is 2.0 ug/m3.

Cadmium can be associated with carcinogenesis, primarily in the lung, but also in the prostate, kidneys, breast, urinary bladder, nasopharynx, pancreas, and hematopoietic system. The liver and kidneys are extremely sensitive to cadmium's toxic effects due to the ability of these tissues to synthesize metallothioneins, which are Cd-inducible proteins that protect the cell by tightly binding the toxic cadmium ions. (NIH website).
The OSHA PEL for cadmium dust is 0.05 mg/m3.

Acute inhaling exposure to chromium concentration and chromic-acid causes upper respiratory tract irritation and occasional asthmatic symptom and dermal exposure causes deep, sharply defined ulcers that are slow to heal. Chromates are also irritating to the skin and mucous membranes. Chronic exposure has been associated with an increased incidence of lung cancer. Chromium accumulates mainly in the liver, spleen, soft tissue, and bone. In the blood, most chromium is bound to plasma proteins, particularly transferrin. Chromium is excreted mainly in the urine.
The OSHA PEL-TWA for chromium dust is 1 mg/m3 and NIOSH REL-TWA is 0.5 mg/m3.

Cobalt is a hard, gray metal that occurs naturally. It can harm the eyes, skin, heart, and lungs. Exposure to cobalt may cause cancer. Workers may be harmed from exposure to cobalt and cobalt-containing products. The level of harm depends upon the dose, duration, and work being done.
The OSHA PEL-TWA for cobalt dust and fume is 0.1 mg/m3 and the NIOSH REL-TWA is 0.05 mg/m3.

Copper compounds can irritate the eyes, nose, throat and can damage the eyes skin, lungs, liver, kidneys. It may increase risk of anemia and Wilson's Disease.
The OSHA PEL-TWA and NIOSH REL-TWA for copper fume is 0.1 mg/m3. The OSHA PEL-TWA and NIOSH REL-TWA for copper compounds is 1 mg/m3.

Nickel exposure may cause irritation to the skin and eyes, harm the lungs, stomach, and kidneys, and may lead to cancer. Chronic nickel exposure has been connected with increased risk of lung cancer, cardiovascular disease, neurological deficits, developmental deficits in childhood, and high blood pressure.
The OSHA PEL-TWA for nickel dust is 0.05 mg/m3 and NIOSH REL-TWA is 0.015 mg/m3.

Lead can affect almost every organ and system in your body. Children bodies absorb more lead than adults do and their brains and nervous systems are more sensitive to the damaging effects of lead, including behavior and learning problems, lower IQ, and hearing problems. Lead can also cause slowed growth and anemia in children. Lead in adults, including pregnant women, can cause hypertension and increased blood pressure. Lead can also cause kidney and reproductive problems in both men and women. In pregnant women, lead can be passed to the unborn baby. In rare cases, lead can cause seizures, coma, and even death.
The OSHA PEL for lead dust is 0.05 mg/m3 and the NIOSH REL-TWA is 0.05 mg/m3.

Zinc would most likely be found in the form of zinc oxide. Primary exposure is inhalation and may produce shills, muscle ache, nausea, fever dry throat, cough, weakness and exhaustion, headache, blurred vision.
The OSHA PEL-TWA and NIOSH REL-TWA for zinc oxide dust and fume is 5 mg/m3 and the NIOSH REL-STEL is 10 mg/m3.

Ammonia (NH3) gas
Ammonia odors have been reported in the past in association with the dross stockpiles and may be a by-product of the oxides and salts when wetted. Anhydrous ammonia is a colorless gas with a pungent, suffocating odor. Ammonia gas is corrosive to the skin, eyes, and lungs. Ammonia has a distinct and irritating odor when it is released, so your nose is usually the first warning of exposure. If you breathe ammonia into your lungs, you may cough, wheeze, or feel shortness of breath. If liquid ammonia or liquids possibly containing ammonia are encountered, avoid skin contact as can cause redness, pain, irritation, and burns. Swallowing ammonia can cause burns to the mouth, throat, and stomach and can be fatal. Always wash your hands after using ammonia products and before you smoke, eat or drink. Do not store food and beverages near ammonia products.
The OSHA PEL and NIOSH REL-TWA for ammonia gas is 25 ppm (mg/m3) and the NIOSH REL-STEL is 35 ppm (mg/m3).

Chlorinated Volatile Organic Compounds (cVOCs)

cVOCs such as tetrachloroethene, trichloroethene/-ethane, and dichloroethenes/-ethanes have not been identified at the Site. cVOCs exposure can occur by inhalation, percutaneous absorption, ingestion, and skin and eye contact. It is colorless liquid which has a chloroform-like odor. Exposure can result in effects to the immune and reproductive systems, liver, kidneys, central nervous system, and may affect fetal development during pregnancy. Long term exposures to TCE can increase the risk of kidney cancer. There is also evidence that TCE exposure can increase the risk for non-Hodgkin's lymphoma and liver cancer. Exposure symptoms may include eye irritation, headache, dizziness, nausea; convulsions, coma, and death can result from elevated exposures. TCE is recognized as a human carcinogen by the National Institute for Occupational Safety and Health (NIOSH) and other agencies.

Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAH)

Epidemiological evidence suggests that workers exposed to these compounds are at increased risk of cancer at many organ sites, including lungs, kidney and skin. The major route of exposure to these compounds on this project is through inhalation of or skin contact with contaminated soils. *No appreciable concentrations of cPAHs have been identified at the Site.*

Table 2-1 Chemical Hazards

Contaminant	Unit	PEL[a]	TLV[b]	REL[c]	STEL[d]	IDLH[e]	Odor Threshold	IP[f] (in eV)
Benzene	ppm	1	0.1	0.1	1	500	34-119	9.24
Diesel (as mist)	mg/m^3	5	5	5	10	Ca	None Reported	NA
Gasoline	ppm	None	300	LOQ 15	C, 500	Ca	None Reported	9.24
Trichloroethylene (TCE)	ppm	100	50	25	NA	1000	1.36	9.45
Arsenic	mg/m^3	0.01	0.01	0.002	NA	5 Ca	None Reported	NA

Note:

[a] OSHA Permissible Exposure Limit (PEL) (8-hour time weighted average [TWA])

[b] American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) (8-hour TWA)

[c] National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) (8-hour TWA)

[d] Short-Term Exposure Limit (15-minute TWA that should not be exceeded at any time during the work day)

[e] Immediately Dangerous to Life & Health

[f] Ionization Potential

C = Ceiling Limit (Concentration that should not be exceeded during any part of the working exposure)

CA = Carcinogenic

mg/m^3: milligrams per cubic meter

2.4 Biological Hazards

Project personnel should be provided with the information and training necessary to avoid accidental injury or illness that can result from exposure to biological hazards. This includes ensuring that the site is carefully assessed when personnel are on site so that the hazards associated with biological entities are recognized and eliminated or controlled. Potential biological hazards associated with the project site include animals, such as raccoons and rats; stinging insects, such as bees and yellow jackets; and plants, such as blackberries.

3 Personal Protective Equipment

PPE is required for all field work. The level of PPE required varies by the type and duration of potential exposures. The EPA terminology for protective equipment (Levels A, B, C, and D) provides guidance on typical work levels and required PPE. Additional training is required for Levels A and B; CRETE personnel are not permitted to use Level A or Level B at the Site. A guide to the type of chemical protective clothing and respirator cartridges to be used for chemicals commonly encountered during remedial investigations is provided in Table 3-1, and requirements for Level C or Level D PPE are described below.

Respiratory protective equipment shall be NIOSH-approved and use shall conform to OSHA 29 CFR 1910.134.

Table 3-1 PPE Selection Guide

Chemical Hazard	Glove Material	Coverall Material	Boot Material	Respirator Cartridge
Acids • Hydrochloric • Sulfuric	Butyl rubber	Saranex or Butyl rubber apron	Butyl rubber	Acid vapor
Coal Tar • Polyisocyanate • Naphtha	Nitrile rubber	Polycoated Tyvek	Nitrile rubber	Organic vapor
Creosote	Butyl rubber	Polycoated Tyvek	Butyl rubber	Organic vapor
Dry Particulates • Metals • Asbestos	Nitrile rubber	Tyvek	Tyvek	HEPA
Fuel Hydrocarbons • Gasoline • Diesel	Nitrile rubber	Polycoated Tyvek	Nitrile rubber	Organic vapor
Halogens, Aliphatic • Carbon tetrachloride • Ethylene dichloride	Teflon	Polycoated Tyvek	Nitrile rubber	Organic vapor
Halogens, Vinylic • Vinyl chloride	Nitrile rubber	Polycoated Tyvek	Nitrile rubber	Organic vapor

Forsberg, K. and Mansdorf, S.Z., 1997. Quick Selection Guide to Chemical Protective Clothing, Third Edition. John Wiley & Sons, Inc.

3.1 Level C

Level C protection shall be used when:

- Substance(s) require the same level of skin protection as Level B, but a lesser level of respiratory protection.
- The types of air contaminants have been identified, concentrations have been measured, and respirator decision logic indicates that air purifying respirators (APRs) are sufficient to remove the contaminants.

- The substance has adequate warning properties (odor threshold is below occupational exposure limits) and all criteria for the selection of APR have been met.

Table 3-2 Level C PPE to be Utilized

(Check Appropriate PPE)

☒	Half-face APR (OSHA/NIOSH-approved)
☐	Full-face APR (OSHA/NIOSH-approved)
☒	Type of Cartridges to be Used: AG/OV/P100
☐	Chemical-resistant clothing <u>check appropriate garments</u> (one-piece coverall; hooded one- or two-piece; chemical splash suit; chemical-resistant hood and apron; disposable chemical coveralls [i.e., Tyvek]) ☐ One-piece coverall ☐ Hooded one- or-two piece chemical splash suit ☐ Chemical-resistant hood and apron ☐ Disposable chemical-resistant coveralls **Fabric Type:**
☒	Disposable inner gloves (surgical)
☐	Disposable chemical-resistant outer gloves **Material Type:**
☐	Chemical-resistant boots with safety toe and steel shank or disposable boot covers for safety toe/work boots **Material Type:**
☒	Work boots with steel toe
☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
☐	Safety goggles
☒	Safety glasses
☒	Hard hat
☐	Hard hat with face shield
☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA). **Type:** foam or rubber ear plugs
☐	**Modifications:** Nitrile gloves when sampling, face mask (Covid)

3.2 Level D

Level D protection will be used when:

- The atmosphere contains no known hazard.

- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals.
- Atmospheric concentrations of contaminants are less than the Threshold Limit Value (TLV).

Table 3-3 Level D PPE (Minimum Work Uniform Permitted)

(Check Appropriate PPE)

☒	Full-legged pants, safety vest
☒	Work boots with safety toe
☒	Work gloves
☐	Safety goggles
☒	Safety glasses
☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA)
☒	Hard hat
☐	Hard hat with face shield
☐	**Modifications:** Nitrile gloves when sampling, face mask (Covid)

Table 3-4 Activity vs. Level of Protection

Activity	Level of PPE	Special Requirements
Groundwater, Vapor, and Soil Sampling	Level D or Level C	Wear proper protection from contaminants.
Geoprobe borings, Well Installation and Development	Level D or Level C	Hearing protection around heavy equipment
Remediation oversight and confirmation sampling	Level D or Level C	All excavations to be properly trench shored per OSHA 29 CFR 1926.650, 29 CFR 1926.651, and 29 CFR 1926.652.Personnel will not enter excavations greater than 4-feet unless properly shored or benched. A personal floatation device may be required if work is below the ordinary high water mark.

4 Air Monitoring and Action Levels

According to 29 CFR 1910.120(h) and Washington Administrative Code (WAC), air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection required for personnel working on site.

Air monitoring and visual observations of the site are required to determine the effectiveness of engineering controls, to reevaluate levels of protection, and determine if site conditions have changed. The monitoring will occur only during work that will disturb environmental media known to contain contaminants. This may consist of use of a 4-gas meter, as needed in excavations. Any space outside of an excavation will be unlikely to need such air monitoring.

- Personal air monitoring for metals (arsenic) will be conducted if visible dust emissions are occurring during excavation oversight and soil sampling or other site activities;
- Area sampling for VOCs with a photoionization detector (PID) will be conducted if odors are detected. A 4-gas meter includes a PID, a methane probe for lower explosive limit % (LEL), carbon monoxide (equipment exhaust) and hydrogen sulfide (common groundwater off-gassing).

Volatile organic concentrations will be assessed using a photoionization detector (PID) or 4-gas meter, such as a MultiRAE or RKI, if required.

Table 4-1 below describes the actions that will be initiated if and when air monitoring indicates potentially hazardous exposures on site.

Table 4-1 Chemicals Requiring Initial Determination Air Monitoring

Monitoring Device	Result	Action Required
Photoionization Detector for VOCs	0 to 10 units above background sustained for 1 minute	Continue Periodic Monitoring
	10 to 25 units above background sustained for 1 minute	Cease operations until the SSO has evaluated the situation Notify the project CIH who will decide whether to modify the plan (including changing engineering controls) and/or upgrade to level C, including respiratory protection
	> 25 units above background sustained for 1 minute	Cease operations until the SSO has evaluated the situation Notify the project CIH who will decide whether to modify the plan and will upgrade to level C

Air monitoring is conducted at the following times or as specified by the SSO:

- Upon initial entry to rule out oxygen deficient, flammable, and/or IDLH conditions. At this site there is no “entry”, as no work in to be completed in excavations, trenches, or small spaces.
- When the possibility of an oxygen deficient, flammable, and/or IDLH condition or flammable atmosphere has developed
- As an on-going check of the levels of contaminants in the breathing zone
- When work is initiated on a different portion of the site
- When contaminants other than those previously identified are encountered
- When a different operation is initiated
- When work involves the handling of leaking drums, containers, or when working in areas with obvious liquid contamination
- During confined space entry
- At the perimeter of the site as required
- Outside the site perimeter as required (e.g., adjacent buildings).

If deemed necessary, per the conditions noted above, real time air monitoring with direct reading instruments will conform to, at a minimum, the criteria listed in Table 4-2. All air monitoring data will be recorded in the daily field logs/notes or logged digitally and archived for future reference. All air monitoring equipment calibration

data is to be recorded in the daily field logs/notes. Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications.

Table 4-2 Air Monitoring/Instrumentation

X	**Photoionization Detector** Please Check Bulb Size:		
	9.5eV: ☐	**10.2eV:** ☒	**11.7eV:** ☐
Use:	Detection of Organic Gases and Vapors, Program to TWA & STEL for benzene		
Action Level:	PID reading >15 ppm at point of operations for more than 1 minute → **Establish 25-ft diameter exclusion zone around work area**, monitor worker's breathing zone. PID reading >15 ppm in worker's breathing zone for more than 1 minute→ **Evacuate area or upgrade to Level C-half face respirator with organic vapor/HEPA cartridge**, establish contamination reduction zone with waste containers and decontamination fluids provided for personal decontamination. With respirator: PID reading >75 ppm in worker's breathing zone for more than 1 minute→ **Evacuate area and move upwind** to allow vapors to dissipate, may resume work after vapors dissipate. With respirator: PID reading >100 ppm in worker's breathing zone for more than 1 minute OR >300 ppm instantaneous →**Evacuate area and move upwind.** If elevated levels persist, cover impacted materials and notify SSO.		
Frequency:	Sample the breathing space and work area periodically throughout field activities.		

4.1 Respirator Cartridge Change Out

In the event of the use of respiratory protection, cartridges will be replaced daily during field work. For organic cartridges, these conditions may dictate that the cartridges be replaced more frequently:

- If the organic chemical's boiling point is <70°F and the concentration is greater than 200 ppm, contact the SSO to discuss cartridge replacement and options for respiratory protection.
- If physical work rate exceeds a moderate level, replace cartridges every 4 hours of work.
- If relative humidity exceeds 85%, replace cartridges every 4 hours of work.

5 Work Zones

Site control will be maintained by establishing clearly identified work zones. These will include exclusion zones, contamination reduction zones, support zones, and other work areas on site where the potential for airborne or contact exposure to hazardous substances is minimal.

5.1 Exclusion Zone

Exclusion zones will be established around each work activity (excavation or disturbance of soil, sediment, or groundwater) conducted in contaminated areas of the site. Only persons with appropriate training (40- or 24-hour Hazardous Waste Operations Training as described below in Section 8.0) and authorization from the SSO may enter exclusion zones. Traffic cones, barrier tape, and warning signs will be used, as necessary, to establish the zone boundaries.

Exclusion zones for subsurface work, including drilling, excavation, trenching, etc. will consist, at a minimum, of the entire excavation plus a 6-foot or greater buffer surrounding the excavation, as site configuration allows. This buffer may be expanded at the discretion of the SSO depending on site conditions, including weather and the results of air monitoring. Note: The buffer zone surrounding the excavation will be larger than six feet where the heavy equipment is located, as the track hoe will be located within the exclusion zone.

5.2 Contamination Reduction Zone

A contamination reduction zone will be established just outside each exclusion zone to decontaminate equipment and personnel.

This zone will be clearly delineated from the exclusion zone and support zone. The contamination reduction zone shall have boot, glove, and rain gear wash and rinse buckets, brushes, and a source of additional water (hose or water buckets) for cleaning. Care will be taken to prevent contact with used wash water. Damaged or disposable Personal Protective Equipment will be placed in plastic garbage bags for disposal as solid waste.

The exteriors of heavy equipment will be cleaned using sprayed water and brushes prior to leaving the exclusion zone to remove any loose dirt. A wheel wash will be installed in the contamination reduction zone to remove dirt from wheel treads.

5.3 Support Zone

A support zone will be established outside the contamination reduction zone to stage clean equipment, don personal protective equipment, take rest breaks, rehydrate, etc. This zone will be clearly delineated from the contamination reduction zone.

In summary, exclusion zones will be established for excavations and site work in areas of identified contamination. Given the site history, it is possible that contaminated soil (not previously identified) will be encountered. Should excavation or site work uncover soil or water with visible contamination or noticeable odor, the SSO will be notified, PPE will be upgraded as appropriate, and the work area will be monitored. It should be noted that metals contamination may not provide visible or other sensory clues. Because of this, general work procedures, such as minimizing dust generation and good personal hygiene, will be practiced.

Minimization of Contamination
To ensure effective work zone procedures, the amount of equipment and number of personnel permitted to enter contaminated areas must be minimized. Do not kneel on contaminated ground, stir up unnecessary dust, or perform any practice that increases the probability of hand-to-mouth transfer of contaminated materials. Use plastic drop cloths and equipment covers, where possible.

5.4 General Site Control Safety Procedures

- Whenever possible, avoid contact with contaminated (or potentially contaminated) surfaces. Walk around (not through) puddles and discolored surfaces. Do not kneel or set equipment on the ground. Stay away from waste drums unless it is necessary to sample or handle the drums. Protect equipment from contamination by bagging.
- Eating, drinking, and/or smoking are only permitted in designated areas in the support zone.
- Hands and face must be thoroughly washed upon leaving the CRZ.
- Beards and/or other facial hair that interferes with respirator fit will preclude admission to the exclusion zone.
- All equipment must be decontaminated or properly discarded upon exit from the exclusion zone as determined by the SSO.
- All personnel exiting the exclusion zone must go through the decontamination procedures as described in this HASP.
- PPE as described in this HASP will be required for all field personnel working on site.
- Contact lenses may be worn on the site provided safety glasses or goggles are also worn. Any exceptions to wearing of contact lenses will be specified in this HASP or through a HASP amendment.

6 Decontamination

In general, everything that enters the exclusion zone must either be decontaminated or properly discarded upon exit from the exclusion zone. All personnel, including any visitors, must enter and exit the exclusion zone through the CRZ.

Contaminated equipment and heavy equipment will be decontaminated and inspected by the equipment operator/contractor). Material that is generated by decontamination procedures will be discharged through the water treatment system, or drummed for offsite disposal is at tail-end of project completion.

6.1 Personnel Decontamination

Personnel may become contaminated in a number of ways including, not limited to:

- Contacting vapors, gases, mists, or particulates in the air
- Being splashed by materials during sampling
- Walking through puddles or on contaminated soil
- Using contaminated instruments or equipment.

Even with safeguards, personnel contamination may occur. Harmful materials can be transferred into the clean area, exposing unprotected personnel. In removing contaminated clothing, personnel may contact contaminants on clothing or inhale them. To prevent such occurrences, decontamination procedures must be developed and established before anyone enters the site and must continue throughout site operations.

Personnel decontamination procedures will be based on the contaminants of concern and the level of protection being worn by site personnel.

6.2 Sampling Equipment

Sampling devices, when used onsite, require special cleaning procedures (Table 6-1).

6.3 Disposal of Contaminated Materials

All materials and equipment used for decontamination must be disposed of properly (Table 6-1).

6.4 Emergency Decontamination

Personnel with medical problems or injuries may also require decontamination. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt lifesaving, first aid, and medical treatment are required,

decontamination procedures will be omitted. In either case, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination.

6.5 Sanitizing of Personal Protective Equipment

Respirators, reusable protective clothing, and other personal articles not only must be decontaminated before being reused, but also sanitized. The insides of masks and clothing become soiled due to exhalation, body oils, and perspiration. Manufacturer's instructions should be used to sanitize the respirator masks. If practical, reusable protective clothing should be machine-washed after a thorough decontamination; otherwise, it must be cleaned by hand.

Table 6-1 Decontamination Procedures

☐	**Level C:** Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, boot cover removal, outer glove removal, suit/safety boot wash, suit/safety boot rinse, (canister or mask change), safety boot removal, splash suit removal, inner glove wash, face piece removal, inner glove removal, inner clothing removal, field wash, re-dress. **Modifications**:
☒	**Level D:** Segregated equipment drop, boot and glove wash, boot and glove rinse, or dispose of gloves. PPE shall not be shared. Each personnel to have their own, dedicated PPE (boots, safety glasses, respirators, etc.) **Modifications:** Change gloves between samples, or when soiled during non-sampling activities.
☒	**Heavy Equipment:** Decontamination: The surfaces of all heavy equipment that come into contact with soils will be cleaned prior to removal from site with power-washer or heavy brooms. The SSO is responsible for assuring decontamination activities.

7 Emergency Response/Contingency Plan

It is essential that site personnel be prepared in the event of an emergency. Emergencies can take many forms: illnesses, injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in weather. Table 7-1 outlines the contact information for emergencies. The first two numbers should be called in the order listed for all emergencies requiring immediate assistance. The other numbers are specific to emergency type (e.g., spill, poisoning). The Project Manager and the client contact are to be notified of the incident after the emergency situation is addressed.

Table 7-1 Emergency Contacts/Telephone Numbers

1. Fire, Police, Ambulance	911 or
Capable of Transporting Contaminated Personnel?	**Yes:** ☒ **No:** ☐
2. Site Security	NONE
Hospital:	**Valley Medical Center in Renton, WA** **ER Tele: 425-690-1000**
Chemical Trauma Capabilities?	**Yes:** ☒ **No:** ☐
Decontamination Capabilities?	**Yes:** ☒ **No:** ☐
Directions from Site to Hospital:	Go east on S 202nd St, turn left (north) onto 80th Ave S, then follow as 80th Ave turns right (east) into S 200th St. Continue for 0.5-miles. Turn left (north) onto 84th Ave S (aka E Valley Hwy) and continue 1.7-miles. Turn right (east) onto S 180th St and go 0.3-miles, then turn left (north) onto Talbot Rd. Hospital and ER is the left (west). Follow signs to ER.
Note: See map for route to hospital at the end of this section. ***The route to the hospital was verified by:*** Rusty Jones Distance from the Site to the hospital is: 2.6 miles. The approximate driving time is: 9 minutes.	
Poison Control Center:	(800) 732-6985
Electric Company: Seattle City Light	(2062) 684.300
Gas Company: Puget Sound Energy (PSE)	(888) 225-5773 or 911
Water Company: Seattle Public Utilities, Operations Control Center (24/7)	(206) 386-1800 or 911
Airport: SeaTac	(206) 433-5217
National Response Center (for spill reporting)	(800) 424-8802
Washington Emergency Management Division (for spill reporting)	(800) 258-5990 or (800) OILS-911
Center for Disease Control	(404) 639-3311 (24-hour)
ATF (explosion information)	(202) 927-8210

Chemtrec	(800) 424-9300
CRETE Consulting Office and Project Managers	Grant Hainsworth (253) 797-6323 Jamie Stevens (206) 799-2744
CRETE Consulting Personnel Medical Consultant	UW Valley Medical Center Occupation Health and Safety
Client Contact	Kyle Siekawitch (509) 969-5667

7.1 Emergency Response Plan

7.1.1 Pre-Emergency Planning

The SSO is responsible for emergency contingency planning and as such, is responsible for:

- Posting emergency telephone numbers and route to the hospital in the field
- Conducting a weekly inventory of site emergency equipment, spill response and supplies
- Familiarizing themselves with emergency procedures for personnel injury or suspected overexposures, fires, explosions or releases
- Identifying the names of all personnel on site who are certified in CPR and first aid
- Briefing new employees on the emergency response plan before they perform fieldwork.

7.1.2 Emergency Equipment and Supplies

The following emergency equipment and supplies will be available on site during days with field sampling:

- Fire extinguishers;
- Industrial first aid kit; and
- Eye wash.

7.1.3 Emergency Recognition and Prevention

Prevention of emergencies will be aided by the effective implementation of the health and safety procedures specified in this Site-Specific Health and Safety Plan. The following hazards which could lead to emergency situations have been identified as being potentially present during the course of field activities:

- Traumatic injury from heavy equipment accidents, rusty or sharp demolition debris, and/or falling into holes or trenches; and

- Exposure to harmful chemical dusts and vapors.

7.1.4 Emergency Medical Treatment and First Aid

- Prevent further injury, perform appropriate decontamination and notify the SSO.
- Depending upon the type and severity of the injury, the SSO will call 911 for an ambulance.
- Notify CRETE personnel.
- Prepare an incident report.

7.1.5 Emergency Decontamination

Personnel will be decontaminated to the extent feasible but life saving and first aid procedures take priority over decontamination efforts. Workers shall grossly decontaminate the injured person.

7.1.6 Evacuation Routes and Procedures

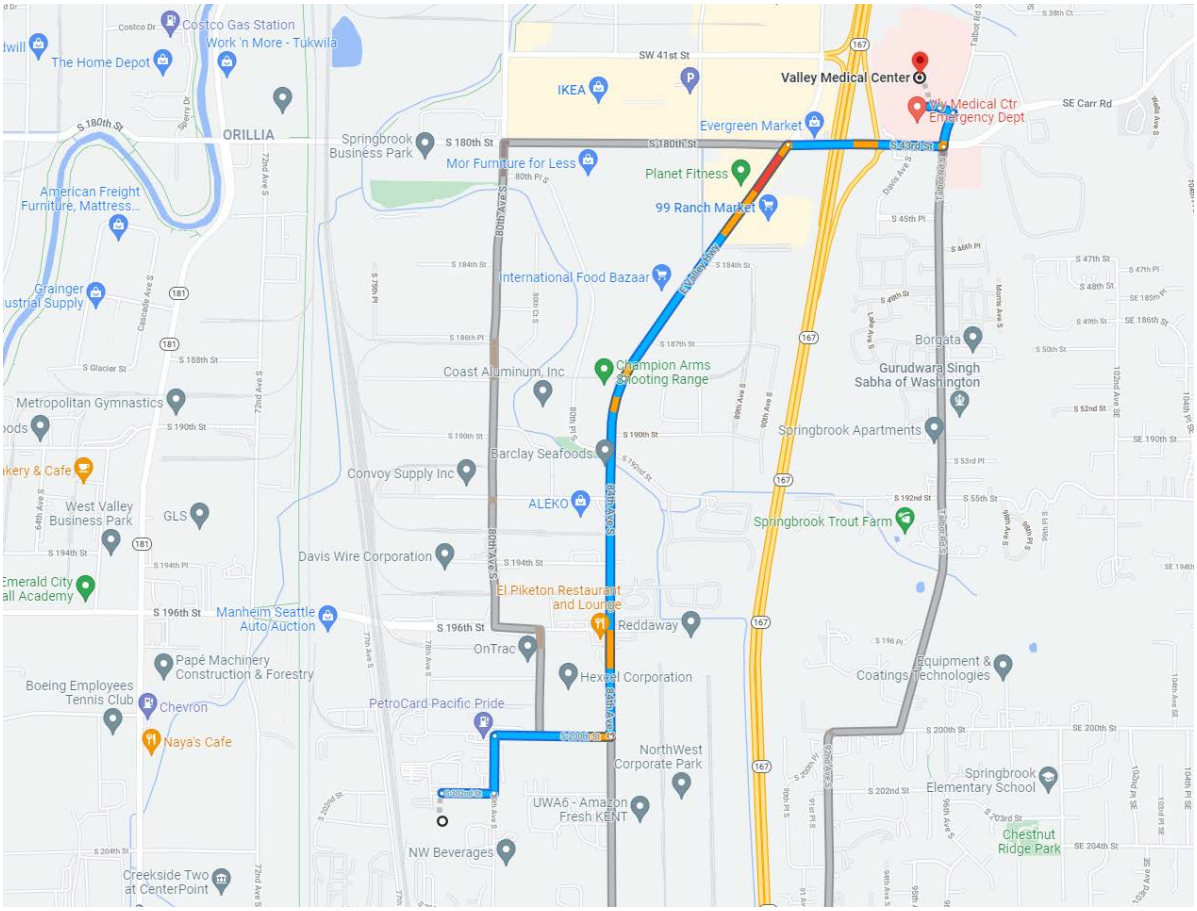
In case of emergencies, evacuation routes will be designated. Personnel will exit the site and assemble at the designated point in the support zone. The SSO will account for personnel at the on-site assembly point and notify local emergency responders. The SSO will assess the need for site evacuation based on the degree of hazard posed to personnel in the support zone.

Evacuation routes will be determined on a site-by-site basis. Elements that will be considered in the selection of the route include: wind direction, obstructions, topography, and type of emergency. Assembly Points will be determined, as needed.

7.1.7 Critique of Response and Follow-up

The Project Manager or their designee will evaluate the effectiveness of the emergency response and recommend procedures for improving emergency response to the Project CIH. Follow-up activities include notification of the CRETE Project Manager within 24 hours of the injury, investigation of cause and implementation of measures to prevent reoccurrence.

Figure 7-1 Route to Hospital



Valley Medical center in Renton. Site to Hospital
Hospital Address: 400 S 43rd St, Renton, WA 98055
Main Telephone: 425-228-3450
ER Telephone: 425-690-1000

Appendix A-1

COVID-19 Infection Control Procedures

APPENDIX A-1

Protecting Workers: Guidance on Mitigating and Preventing the Spread of COVID-19 in the Workplace

About COVID-19

SARS-CoV-2, the virus that causes **COVID-19**, is highly infectious and spreads from person to person, including through aerosol transmission of particles produced when an infected person exhales, talks, vocalizes, sneezes, or coughs. COVID-19 is less commonly transmitted when people touch a contaminated object and then touch their eyes, nose, or mouth. The virus that causes COVID-19 is highly transmissible and can be spread by people who have no symptoms and who do not know they are infected. Particles containing the virus can travel more than 6 feet, especially indoors and in dry conditions with relative humidity below 40%. The Centers for Disease Control and Prevention (CDC) estimates that over fifty percent of the spread of the virus is from individuals with no symptoms at the time of spread.

More information on COVID-19 is available from the Centers for Disease Control and Prevention.

What Workers Need To Know about COVID-19 Protections in the Workplace

SARS-CoV-2, the virus that causes COVID-19, spreads mainly among unvaccinated people who are in close contact with one another - particularly indoors and especially in poorly ventilated spaces.

Vaccination is the key element in a multi-layered approach to protect workers. Learn about and take advantage of opportunities that your employer may provide to take time off to get vaccinated. Vaccines authorized by the U.S. Food and Drug Administration are highly effective at protecting vaccinated people against symptomatic and severe COVID-19 illness and death. According to the CDC, a growing body of evidence suggests that fully vaccinated people are less likely to have symptomatic infection or transmit the virus to others. See CDC's Guidance for Fully Vaccinated People; and Science Brief.

You should follow recommended precautions and policies at your workplace. Multi-layered controls tailored to your workplace are especially important for those workers who are unvaccinated or otherwise at-risk. Many employers have established COVID-19 prevention programs that include a number of important steps to keep unvaccinated and otherwise at-risk workers safe. These COVID-19 prevention programs include measures such as telework and flexible schedules, engineering controls (especially ventilation), administrative policies (e.g., vaccination policies), PPE, face coverings, physical distancing, and enhanced cleaning programs with a focus on high-touch surfaces.

In addition, the CDC recommends that fully vaccinated people wear a mask in public indoor settings if they are in an area of substantial or high transmission. Fully vaccinated people might choose to mask regardless of the level of transmission, particularly if they or someone in their household is immunocompromised or at increased risk for severe disease, or if someone in

their household is unvaccinated. Ask your employer about plans in your workplace. In addition, employees with disabilities who are at-risk may request reasonable accommodation under the ADA.

Even if your employer does not have a COVID-19 prevention program, if you are unvaccinated or otherwise at risk, you can help protect yourself by following the steps listed below:

- You should get a COVID-19 vaccine as soon as you can. Ask your employer about opportunities for paid leave, if necessary, to get vaccinated and recover from any side effects.
- Properly wear a face covering over your nose and mouth. Face coverings are simple barriers worn over the face, nose and chin. They work to help prevent your respiratory droplets or large particles from reaching others. Individuals are encouraged to choose higher quality masks so that they are providing a greater measure of protection to themselves as well as those around them. CDC provides general guidance on masks, including face coverings.
- If you are working outdoors, you may opt not to wear face coverings in many circumstances; however, your employer should support you in safely continuing to wear a face covering if you choose, especially if you work closely with other people.
- Unless you are fully vaccinated and not otherwise at-risk, stay far enough away from other people so that you are not breathing in particles produced by them – generally at least 6 feet (about 2 arm lengths), although this approach by itself is not a guarantee that you will avoid infection, especially in enclosed or poorly ventilated spaces. Ask your employer about possible telework and flexible schedule options at your workplace, and take advantage of such policies if possible. Perform work tasks, hold meetings, and take breaks outdoors when possible.
- Participate in any training offered by your employer/building manager to learn how rooms are ventilated effectively, encourage your employer to provide such training if it does not already exist, and notify the building manager if you see vents that are clogged, dirty, or blocked by furniture or equipment.
- Practice good personal hygiene and wash your hands often. Always cover your mouth and nose with a tissue, or the inside of your elbow, when you cough or sneeze, and do not spit. Monitor your health daily and be alert for COVID-19 symptoms (e.g., fever, cough, or shortness of breath). See CDC's Daily Activities and Going Out and CDC's Interim Public Health Recommendations for Fully Vaccinated People.
- Get tested regularly, especially in areas of substantial or high community transmission.

COVID-19 vaccines are highly effective at keeping you from getting COVID-19. If you are not yet fully vaccinated or are otherwise at risk, optimum protection is provided by using multiple layers of interventions that prevent exposure and infection.

The Roles of Employers and Workers in Responding to COVID-19

Under the OSH Act, employers are responsible for providing a safe and healthy workplace free from recognized hazards likely to cause death or serious physical harm.

CDC's Interim Public Health Recommendations for Fully Vaccinated People explains that under some circumstances, fully vaccinated people need not take all the precautions that unvaccinated people should take, except where required by federal, state, local, tribal, or

territorial laws, rules and regulations, including local business and workplace guidance. However, in light of evidence related to the Delta variant of the SARS-CoV-2 virus, the CDC updated its guidance to recommend that even people who are fully vaccinated wear a mask in public indoor settings in areas of substantial or high transmission, or if they have had a known exposure to someone with COVID-19 and have not had a subsequent negative test 3-5 days after the last date of that exposure. Schools should continue to follow applicable CDC guidance, which recommends universal indoor masking for all teachers, staff, students, and visitors to K-12 schools, regardless of vaccination status.

Employers should engage with workers and their representatives to determine how to implement multi-layered interventions to protect unvaccinated and otherwise at-risk workers and mitigate the spread of COVID-19, including:

1. ***Facilitate employees getting vaccinated***. Employers should grant paid time off for employees to get vaccinated and recover from any side effects. The Department of Labor and OSHA, as well as other federal agencies, are working diligently to ensure access to COVID-19 vaccinations. CDC provides information on the benefits and safety of vaccinations. Businesses with fewer than 500 employees may be eligible for tax credits under the American Rescue Plan Act if they provide paid time off from April 1, 2021, through September 30, 2021, for employees who decide to receive the vaccine or to accompany a family or household member to receive the vaccine and to recover from any potential side effects from the vaccine. Employers should also consider working with local public health authorities to provide vaccinations in the workplace for unvaccinated workers. Finally, OSHA suggests that employers consider adopting policies that require workers to get vaccinated or to undergo regular COVID-19 testing – in addition to mask wearing and physical distancing – if they remain unvaccinated.
2. ***Instruct any workers who are infected, unvaccinated workers who have had close contact with someone who tested positive for SARS-CoV-2, and all workers with COVID-19 symptoms to stay home from work*** to prevent or reduce the risk of transmission of the virus that causes COVID-19. As recommended by the CDC, fully vaccinated people who have a known exposure to someone with suspected or confirmed COVID-19 should get tested 3-5 days after exposure and should wear a mask in public indoor settings for 14 days or until they receive a negative test result. People who are not fully vaccinated should be tested immediately after being identified, and, if negative, tested again in 5–7 days after last exposure or immediately if symptoms develop during quarantine. Ensure that absence policies are non-punitive. Eliminate or revise policies that encourage workers to come to work sick or when unvaccinated workers have been exposed to COVID-19. Businesses with fewer than 500 employees may be eligible for refundable tax credits under the American Rescue Plan (ARP) Act if they provide paid time off for sick and family leave to their employees due to COVID-19-related reasons. The ARP tax credits are available to eligible employers that pay sick and family leave for qualified leave from April 1, 2021, through September 30, 2021. More information is available from the IRS.
3. ***Implement physical distancing in all communal work areas for unvaccinated and otherwise at-risk workers.*** A key way to protect such workers is to physically distance them from other such people (workers or customers) – generally at least 6 feet of

distance is recommended, although this is not a guarantee of safety, especially in enclosed or poorly ventilated spaces. In a workplace, workers often are required to work in close proximity to each other and/or customers or clients for extended periods of time. Maintaining physical distancing at the workplace for such workers is an important control to limit the spread of COVID-19.

Employers could also limit the number of unvaccinated or otherwise at-risk workers in one place at any given time, for example by implementing flexible worksites (e.g., telework); implementing flexible work hours (e.g., rotate or stagger shifts to limit the number of such workers in the workplace at the same time); delivering services remotely (e.g., phone, video, or web); or implementing flexible meeting and travel options, for such workers.

At fixed workstations where unvaccinated or otherwise at-risk workers are not able to remain at least 6 feet away from other people, transparent shields or other solid barriers can separate these workers from other people. Barriers should block face-to-face pathways between individuals in order to prevent direct transmission of respiratory droplets, and any openings should be placed at the bottom and made as small as possible. The height and posture (sitting or standing) of affected workers, directional airflow, and fire safety should be considered when designing and installing barriers, as should the need for enhanced ventilation.

4. ***Provide workers with face coverings or surgical masks,[4] as appropriate, unless their work task requires a respirator or other PPE.*** In addition to unvaccinated and otherwise at-risk workers, CDC recommends that even fully vaccinated people wear masks in public indoor settings in areas of substantial or high transmission and notes that fully vaccinated people may appropriately choose to wear masks in public indoor settings regardless of community level of transmission, particularly if they are at risk or have someone in their household who is at risk or not fully vaccinated.

   Workers should wear a face covering that covers the nose and mouth to contain the wearer's respiratory droplets and to help protect others and potentially themselves. Face coverings should be made of at least two layers of a tightly woven breathable fabric, such as cotton, and should not have exhalation valves or vents. They should fit snugly over the nose, mouth, and chin with no large gaps on the outside of the face. Employers should provide face coverings to workers who request them at no cost (and make replacements available to workers when they request them). Under federal anti-discrimination laws, employers may need to provide reasonable accommodations for any workers who are unable to wear or have difficulty wearing certain types of face coverings due to a disability or who need a religious accommodation under Title VII of the Civil Rights Act of 1964. In workplaces with employees who are deaf or hard of hearing, employers should consider acquiring masks with clear coverings over the mouth to facilitate lip-reading.

   Unless otherwise provided by federal, state, or local requirements, workers who are outdoors may opt not to wear face coverings unless they are at risk, for example, if they are immunocompromised. Regardless, all workers should be supported in continuing to wear a face covering if they choose, especially in order to safely work closely with other people.

When an employer determines that PPE is necessary to protect unvaccinated and otherwise at-risk workers from exposure to COVID-19, the employer must provide PPE in accordance with **relevant mandatory OSHA standards** and should consider providing PPE in accordance with other industry-specific guidance. Respirators, if necessary, must be provided and used in compliance with 29 CFR 1910.134 (e.g., medical determination, fit testing, training on its correct use), including certain provisions for voluntary use when workers supply their own respirators, and other PPE must be provided and used in accordance with the applicable standards in 29 CFR part 1910, Subpart I (e.g., 1910.132 and 133). There are times when PPE is not called for by OSHA standards or other industry-specific guidance, but some workers may have a legal right to PPE as a reasonable accommodation under the ADA. Employers are encouraged to proactively inform employees who have a legal right to PPE as a reasonable accommodation for their disability about how to make such a request. Other workers may want to use PPE if they are still concerned about their personal safety (e.g., if a family member is at higher risk for severe illness, they may want to wear a face shield in addition to a face covering as an added layer of protection). Encourage and support voluntary use of PPE in these circumstances and ensure the equipment is adequate to protect the worker.

For operations where the face covering can become wet and soiled, provide workers with replacements daily or more frequently, as needed. Face shields may be provided for use with face coverings to protect them from getting wet and soiled, but they do not provide adequate protection by themselves. See CDC's Guide to Masks.

Employers with workers in a setting where face coverings may increase the risk of heat-related illness indoors or outdoors or cause safety concerns due to introduction of a hazard (for instance, straps getting caught in machinery) may wish to consult with an occupational safety and health professional to help determine the appropriate face covering/respirator use for their setting.

5. ***Educate and train workers on your COVID-19 policies and procedures using accessible formats and in languages they understand.*** Train managers on how to implement COVID-19 policies. Communicate supportive workplace policies clearly, frequently, and via multiple methods to promote a safe and healthy workplace. Communications should be in plain language that unvaccinated and otherwise at-risk workers understand (including non-English languages, and American Sign Language or other accessible communication methods, if applicable) and in a manner accessible to individuals with disabilities. Training should be directed at employees, contractors, and any other individuals on site, as appropriate, and should include:
    A. Basic facts about COVID-19, including how it is spread and the importance of physical distancing (including remote work), ventilation, vaccination, use of face coverings, and hand hygiene.
    B. Workplace policies and procedures implemented to protect workers from COVID-19 hazards.

    For basic facts, see About COVID-19 and What Workers Need to Know About COVID-19 above and see more on vaccinations, improving ventilation, physical distancing (including remote work), PPE, and face coverings, respectively, elsewhere in this

document. Some means of tracking which workers have received this information, and when, could be utilized by the employer as appropriate.
In addition, ensure that workers understand their rights to a safe and healthful work environment, whom to contact with questions or concerns about workplace safety and health, and their right to raise workplace safety and health concerns free from retaliation. (See Implementing Protections from Retaliation, below.) This information should also be provided in a language that workers understand. Ensure supervisors are familiar with workplace flexibilities and other human resources policies and procedures.

6. ***Suggest or require that unvaccinated customers, visitors, or guests wear face coverings in public-facing workplaces such as retail establishments, and that all customers, visitors, or guests wear face coverings in public, indoor settings in areas of substantial or high transmission***. This could include posting a notice or otherwise suggesting or requiring that people wear face coverings, even if no longer required by your jurisdiction. Individuals who are under the age of 2 or are actively consuming food or beverages on site need not wear face coverings.
7. ***Maintain Ventilation Systems.*** The virus that causes COVID-19 spreads between people more readily indoors than outdoors. Improving ventilation is a key engineering control that can be used as part of a layered strategy to reduce the concentration of viral particles in indoor air and the risk of virus transmission to unvaccinated and otherwise at-risk workers in particular. A well-maintained ventilation system is particularly important in any indoor workplace setting and when working properly, ventilation is an important control measure to limit the spread of COVID-19. Some measures to improve ventilation are discussed in CDC's Ventilation in Buildings and in the OSHA Alert: COVID-19 Guidance on Ventilation in the Workplace. These recommendations are based on American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Guidance for Building Operations and Industrial Settings during the COVID-19 Pandemic. Adequate ventilation will protect all people in a closed space. Key measures include ensuring heating, ventilation, and air conditioning (HVAC) systems are operating in accordance with the manufacturer's instructions and design specifications, conducting all regularly scheduled inspections and maintenance procedures, maximizing the amount of outside air supplied, installing air filters with a Minimum Efficiency Reporting Value (MERV) 13 or higher where feasible, maximizing natural ventilation in buildings without HVAC systems by opening windows or doors, when conditions allow (if that does not pose a safety risk), and considering the use of portable air cleaners with High Efficiency Particulate Air (HEPA) filters in spaces with high occupancy or limited ventilation.
8. ***Perform routine cleaning and disinfection***. If someone who has been in the facility within 24 hours is suspected of having or confirmed to have COVID-19, follow the CDC cleaning and disinfection recommendations. Follow requirements in **mandatory OSHA standards** 29 CFR 1910.1200 and 1910.132, 133, and 138 for hazard communication and PPE appropriate for exposure to cleaning chemicals.
9. ***Record and report COVID-19 infections and deaths:*** Under **mandatory OSHA rules in 29 CFR part 1904**, employers are required to record work-related cases of COVID-19 illness on OSHA's Form 300 logs if the following requirements are met: (1) the case is a

confirmed case of COVID-19; (2) the case is work-related (as defined by 29 CFR 1904.5); and (3) the case involves one or more relevant recording criteria (set forth in 29 CFR 1904.7) (e.g., medical treatment, days away from work). Employers must follow the requirements in 29 CFR part 1904 when reporting COVID-19 fatalities and hospitalizations to OSHA. More information is available on OSHA's website. Employers should also report outbreaks to local health departments as required and support their contact tracing efforts.

In addition, employers should be aware that Section 11(c) of the Act prohibits reprisal or discrimination against an employee for speaking out about unsafe working conditions or reporting an infection or exposure to COVID-19 to an employer. In addition, **mandatory OSHA standard** 29 CFR 1904.35(b) also prohibits discrimination against an employee for reporting a work-related illness.

Note on recording adverse reactions to vaccines: OSHA, like many other federal agencies, is working diligently to encourage COVID-19 vaccinations. OSHA does not want to give any suggestion of discouraging workers from receiving COVID-19 vaccination or to disincentivize employers' vaccination efforts. As a result, OSHA will not enforce 29 CFR part 1904's recording requirements to require any employers to record worker side effects from COVID-19 vaccination at least through May 2022. OSHA will reevaluate the agency's position at that time to determine the best course of action moving forward. Individuals may choose to submit adverse reactions to the federal Vaccine Adverse Event Reporting System.

10. ***Implement protections from retaliation and set up an anonymous process for workers to voice concerns about COVID-19-related hazards:*** Section 11(c) of the OSH Act prohibits discharging or in any other way discriminating against an employee for engaging in various occupational safety and health activities. Examples of violations of Section 11(c) could include discriminating against employees for raising a reasonable concern about infection control related to COVID-19 to the employer, the employer's agent, other employees, a government agency, or to the public, such as through print, online, social, or any other media; or against an employee for voluntarily providing and safely wearing their own PPE, such as a respirator, face shield, gloves, or surgical mask. In addition to notifying workers of their rights to a safe and healthful work environment, ensure that workers know whom to contact with questions or concerns about workplace safety and health, and that there are prohibitions against retaliation for raising workplace safety and health concerns or engaging in other protected occupational safety and health activities (see educating and training workers about COVID-19 policies and procedures, above); also consider using a hotline or other method for workers to voice concerns anonymously.
11. ***Follow other applicable mandatory OSHA standards:*** All of OSHA's standards that apply to protecting workers from infection remain in place. These **mandatory OSHA standards** include: requirements for PPE (29 CFR part 1910, Subpart I (e.g., 1910.132 and 133)), respiratory protection (29 CFR 1910.134), sanitation (29 CFR 1910.141), protection from bloodborne pathogens: (29 CFR 1910.1030), and OSHA's requirements for employee access to medical and exposure records (29 CFR 1910.1020). Many healthcare workplaces will be covered by the **mandatory OSHA COVID-19 Emergency Temporary**

Standard. More information on that standard is available on OSHA's website. Employers are also required by the General Duty Clause, Section 5(a)(1) of the OSH Act, to provide a safe and healthful workplace free from recognized hazards that are causing or likely to cause death or serious physical harm.

Appendix: Measures Appropriate for Higher-Risk Workplaces with Mixed-Vaccination Status Workers

Employers should take additional steps to mitigate the spread of COVID-19 among unvaccinated or otherwise at-risk workers due to the following types of workplace environmental factors, especially in locations of substantial or high transmission:

- **Close contact**– where unvaccinated and otherwise at-risk workers are working close to one another, for example, on production or assembly lines or in busy retail settings. Such workers may also be near one another at other times, such as when clocking in or out, during breaks, or in locker/changing rooms.
- **Duration of contact** – where unvaccinated and otherwise at-risk workers often have prolonged closeness to coworkers (e.g., for 6–12 hours per shift). Continued contact with potentially infectious individuals increases the risk of SARS-CoV-2 transmission.
- **Type of contact** – where unvaccinated and otherwise at-risk workers may be exposed to the infectious virus through respiratory particles in the air—for example, when infected workers in a manufacturing or factory setting cough or sneeze, especially in poorly ventilated spaces. Confined spaces without adequate ventilation increase the risk of viral exposure and transmission. It is also possible, although less likely, that exposure could occur from contact with contaminated surfaces or objects, such as tools, workstations, or break room tables. Shared closed spaces such as break rooms, locker rooms, and interior hallways in the facility may contribute to risk.
- **Other distinctive factors that may increase risk among unvaccinated or otherwise at-risk workers include:**
    - A common practice at some workplaces of sharing employer-provided transportation such as ride-share vans or shuttle vehicles;
    - Frequent contact with other individuals in community settings, especially in areas where there is substantial or high community transmission; and
    - Communal housing or living quarters onboard vessels with other unvaccinated or otherwise at-risk individuals.

In these types of higher-risk workplaces – which include manufacturing; meat, seafood, and poultry processing; high-volume retail and grocery; and agricultural processing settings – this Appendix provides best practices to protect unvaccinated and otherwise at-risk workers. Please note that these recommendations are *in addition to* those in the general precautions described above, including isolation of infected or possibly infected workers, and other precautions.

In all workplaces with heightened risk due to workplace environmental factors where there are unvaccinated or otherwise at-risk workers in the workplace:

- Stagger break times in these generally high-population workplaces, or provide temporary break areas and restrooms to avoid groups of unvaccinated or otherwise at-risk workers congregating during breaks. Such workers should maintain at least 6 feet of distance from others at all times, including on breaks.

- Stagger workers' arrival and departure times to avoid congregations of unvaccinated or otherwise at-risk workers in parking areas, locker rooms, and near time clocks.
- Provide visual cues (e.g., floor markings, signs) as a reminder to maintain physical distancing.
- Require unvaccinated or otherwise at-risk workers, and also fully vaccinated workers in areas of substantial or high community transmission, to wear masks whenever possible, encourage and consider requiring customers and other visitors to do the same.
- Implement strategies (tailored to your workplace) to improve ventilation that protects workers as outlined in CDC's Ventilation in Buildings and in the OSHA Alert: COVID-19 Guidance on Ventilation in the Workplace, and ASHRAE Guidance for Building Operations and Industrial Settings During the COVID-19 Pandemic.

Unvaccinated or otherwise at-risk workers are also at risk when traveling to and from work in employer-provided buses and vans.

- Notify unvaccinated and otherwise at-risk workers of this risk and, to the extent feasible, help them limit the number of such workers in one vehicle.
- Make sure all unvaccinated and otherwise at-risk workers sharing a vehicle are wearing appropriate face coverings. Make sure all workers wear appropriate face coverings in areas of substantial or high community transmission.
- Where not prohibited by weather conditions, open vehicle windows.

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[1] CDC provides information about face coverings as one type of mask among other types of masks. OSHA differentiates face coverings from the term “mask” and from respirators that meet OSHA’s Respiratory Protection Standard.
CDC’s definition of masks includes those that are made of cloth, those that are disposable, and those that meet a standard. Cloth face coverings may be commercially produced or improvised (i.e., homemade) and are not considered personal protective equipment (PPE). Surgical masks are typically cleared by the U.S. Food and Drug Administration as medical devices and are used to protect workers against splashes and sprays (i.e., droplets) containing potentially infectious materials; in this capacity, surgical masks are considered PPE.
[2] People who are not fully vaccinated should be tested immediately after being identified (with known exposure to someone with suspect or confirmed COVID-19), and, if negative, tested again in 5–7 days after last exposure or immediately if symptoms develop during quarantine.
[3] The CDC and the Department of Education have addressed situations where a student cannot wear a mask because of disability. See Guidance for COVID-19 Prevention in K-12 Schools and COVID-19 Manual - Volume 1 (updated).
[4] See footnote 1 for more on masking.

SOURCE:
https://www.osha.gov/coronavirus/safework

Types of Masks and Respirators (Updated Jan. 28, 2022)

Key Messages:

- Masking is a critical public health tool for preventing spread of COVID-19, and it is important to remember that any mask is better than no mask.
- To protect yourself and others from COVID-19, CDC continues to recommend that you wear the most protective mask you can that fits well and that you will wear consistently.
- Masks and respirators are effective at reducing transmission of SARS-CoV-2, the virus that causes COVID-19, when worn consistently and correctly.
- Some masks and respirators offer higher levels of protection than others, and some may be harder to tolerate or wear consistently than others. It is most important to wear a well-fitting mask or respirator correctly that is comfortable for you and that provides good protection.
- While all masks and respirators provide some level of protection, properly fitting respirators provide the highest level of protection. Wearing a highly protective mask or respirator may be most important for certain higher risk situations, or by some people at increased risk for severe disease.
- CDC's mask recommendations provide information that people can use to improve how well their masks protect them.

For information about how to use your N95 correctly, see How to Use Your N95 Respirator.
This page describes different types of masks and respirators that you can use to protect yourself and others from getting and spreading COVID-19. Masks and respirators can provide varying degrees of protection, with well-fitting National Institute for Occupational Safety and Health (NIOSH)-approved respirators offering the most protection. Masking is a critical public health tool for preventing spread of COVID-19, and it is important to remember that any mask is better than no mask. This page presents options in order of least to most protective. To protect yourself and others from COVID-19, CDC continues to recommend that you wear the most protective mask you can that fits well and that you will wear consistently.

Types of Masks and Respirators

Masks are made to contain droplets and particles you breathe, cough, or sneeze out. If they fit closely to the face, they can also provide you some protection from particles spread by others, including the virus that causes COVID-19.
Respirators are made to protect you by filtering the air and fitting closely on the face to filter out particles, including the virus that causes COVID-19. They can also contain droplets and particles you breathe, cough, or sneeze out so you do not spread them to others.

Choosing a Mask or Respirator for Different Situations

Masks and respirators (i.e., specialized filtering masks such as "N95s") can provide different levels of protection depending on the type of mask and how they are used. Loosely woven cloth products provide the least protection, layered finely woven products offer more protection, well-fitting disposable surgical masks and KN95s offer even more protection, and well-fitting NIOSH-approved respirators (including N95s) offer the highest level of protection.

Whatever product you choose, it should provide a good fit (i.e., fitting closely on the face without any gaps along the edges or around the nose) and be comfortable enough when worn properly (covering your nose and mouth) so that you can keep it on when you need to. Learn how to improve how well your mask protects you by visiting CDC's Improve How Your Mask Protects You page.

A respirator has better filtration, and if worn properly the whole time it is in use, can provide a higher level of protection than a cloth or procedural mask. A mask or respirator will be less effective if it fits poorly or if you wear it improperly or take it off frequently. Individuals may consider the situation and other factors when choosing a mask or respirator that offers greater protection.

- When caring for someone who is sick with COVID-19.
- If you are at increased risk for severe illness, for example, people who are immunocompromised, older adults, and people with certain underlying medical conditions.
- When working at a job where you interact with large numbers of the public, especially when not everyone is consistently wearing a mask. For example, bus drivers and grocery store workers.
- When riding on planes, buses, trains, or other forms of public transportation*, especially if it is for a long period of time on crowded conveyances.
- When physical distancing is not possible or when you are in crowded indoor or outdoor public settings.
- If you are not up to date on COVID-19 vaccinations.

*Note: The options listed on this page may be used to fulfill the requirements of CDC's Mask Order for public transportation. Learn more about attributes of masks needed to fulfill the requirements of the Order at this website.

Masks

When choosing a mask, look at how well it fits. Gaps can let air with respiratory droplets leak in and out around the edges of the mask. Gaps can be caused by choosing the wrong size or type of mask and when a mask is worn with facial hair.

It is important to check that it fits snugly over your nose, mouth, and chin.

- Check for gaps by cupping your hands around the outside edges of the mask.
- Make sure no air is flowing from the area near your eyes or from the sides of the mask.
- If the mask has a good fit, you will feel warm air come through the front of the mask and may be able to see the mask material move in and out with each breath.

Cloth Masks can be made from a variety of fabrics and many types of cloth masks are available. Wear cloth masks with:

- A proper fit over your nose, mouth, and chin to prevent leaks
- Multiple layers of tightly woven, breathable fabric
- Nose wire
- Fabric that blocks light when held up to bright light source

Do NOT wear cloth masks with:

- Gaps around the sides of the face or nose
- Exhalation valves, vents, or other openings

- Single-layer fabric or those made of thin fabric that don't block light
- Wet or dirty material

Procedure Masks: Disposable **procedure** masks are widely available. They are sometimes referred to as surgical masks or medical procedure masks.

Wear procedure masks with:

- A proper fit over your nose, mouth, and chin to prevent leaks
- Multiple layers of non-woven material
- A nose wire

Do NOT wear procedure masks with:

- Gaps around the sides of the face or nose
- Wet or dirty material

Ways to have better fit and extra protection with cloth and disposable masks:

- Wear two masks (disposable mask underneath **AND** cloth mask on top)
- Combine either a cloth mask or disposable mask with a fitter or brace
- Knot and tuck ear loops of a 3-ply mask where they join the edge of the mask
    - For disposable procedure masks, fold and tuck the unneeded material under the edges. (For instructions, see the following https://youtu.be/GzTAZDsNBe0external icon)
- Use masks that attach behind the neck and head with either elastic bands or ties (instead of ear loops)

Masks that Meet a Standard: Some masks are designed and tested to ensure they perform at a consistent level. These masks are labeled to tell you what standard they meet. These masks are labeled:

- MEETS ASTM F3502external icon
- MEETS WORKPLACE PERFORMANCE
- MEETS WORKPLACE PERFORMANCE PLUS

These are new standards. Lists of masks that meet these standards and more information on their availability can be found on the NIOSH Personal Protective Equipment Information (PPE-Info) webpage. These masks have markings printed on the product to indicate they are authentic.

Follow manufacturer's instructions on how to wear, store, and clean or properly dispose of the mask. These should be worn according to the manufacturer's instructions without modifications.

Wear masks that meet a standard with:

- A proper fit over your nose and mouth to prevent leaks
- Multiple layers of non-woven material
- A nose wire

Do NOT wear masks that meet a standard:

- If it is hard to breathe while wearing them
- If they are wet or dirty
- With other masks or respirators
- As a replacement for NIOSH-approved respiratory protection when required by your job

Respirators: When choosing a respirator, look at how well it fits and read the manufacturer instructions. These instructions should include information on how to wear, store, and clean or properly dispose of the respirator. Respirators have markings printed on the product to indicate they are authentic, see appropriate N95 markings image icon and KN95 markings.
It is important to wear your respirator properly, so it forms a seal to your face. Gaps can let air with respiratory droplets leak in and out around the edges of the respirator. Gaps can be caused by choosing the wrong size or type of respirator or when a respirator is worn with facial hair. **For information about how to use your N95 correctly, see How to Use Your N95 Respirator.** The information on this page is about N95 respirators but also applies to international respirators, like KN95 respirators.
Most publicly available respirators are disposable and should be discarded when they are dirty, damaged, or difficult to breathe through.
More information on these two types of respirators is provided below.
Respirators that Meet International Standards: Some respirators are designed and tested to meet international standards. The most widely available respirators that meet an international standard are **KN95 respirators**. Other examples include 1st, DL2, DL3, DS2, DS3, FFP2, FFP3, KN100, KP95, KP100, P2, P3, PFF2, PFF3, R95, and Special.
Poor quality KN95 respirators:

- **About 60% of KN95 respirators NIOSH evaluated during the COVID-19 pandemic in 2020 and 2021 did not meet the requirements that they intended to meet.**
    - Using a poor-quality product may not provide the level of protection indicated.
- Learn about factors to consider when purchasing an international respirator. This webpage and a webinar provide reliable information to guide you.

What to know about international respirators:

- They are designed to standards that do not often have a quality requirement.
- They filter varying levels of particles in the air depending on the standard they are designed to meet.
- They seal tightly to your face when fitted properly.
- It is important to pick a respirator that fits your face and seals well since not all fit the same.

Do NOT wear international respirators:

- If they have exhalation valves, vents, or other openings
- If it is hard to breathe while wearing them
- If they are wet or dirty
- With other masks or respirators
- As a replacement for NIOSH-approved respiratory protection when required by your job

NIOSH-Approved Respirators: NIOSH approves many types of filtering facepiece respirators. The most widely available are **N95 respirators**, but other types (N99, N100, P95, P99, P100, R95, R99, and R100) offer the same or better protection as an N95 respirator. Lists of respirators that are NIOSH-approved can be found on the NIOSH-Approved Particulate Filtering Facepiece Respirators webpage.
CDC recommends that specially labeled “surgical” N95 respirators — a special subtype of N95 respirators that provide additional protection against hazards present during medical procedures, such as blood splatter — should be reserved for use by healthcare personnel.

Employers who want to distribute N95 respirators to employees shall follow an Occupational Safety and Health (OSHA) respiratory protection program external icon.

What to know about NIOSH-approved respirators:

- When worn consistently and properly, they provide the highest level of protection from particles, including the virus that causes COVID-19. Additionally, they contain your respiratory droplets and particles so you do not expose others.
- They seal tightly to your face when fitted properly.
- It is important to pick a respirator that fits your face and seals well since not all fit the same.
- Respirators approved by NIOSH are evaluated against a specific US standard that includes a quality requirement.
- They filter at least 95% of particles in the air when approved by NIOSH and when you have a proper fit.
- If you have COVID-19, an N95 or other filtering facepiece respirator with a valve may not protect others as well as one without a valve. To make a filtering facepiece respirator with a valve as protective as one without a valve, follow the manufacturer's instructions for covering the valve.

Do NOT wear NIOSH-approved respirators:

- If it is hard to breathe while wearing them
- If they are wet or dirty
- With other masks or respirators

SOURCE:
https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/types-of-masks.html

Stay Up to Date with Your Vaccines (Updated Jan. 16, 2022)

Get Vaccinated and Stay Up to Date: Up to date means a person has received all recommended COVID-19 vaccines, including any booster dose(s) when eligible.
Fully vaccinated means a person has received their primary series of COVID-19 vaccines.
COVID-19 Vaccines: COVID-19 vaccines available in the United States are effective at protecting people from getting seriously ill, getting hospitalized, and even dying. As with vaccines for other diseases, people who are up to date are optimally protected. CDC recommends that everyone 5 years and older get their primary series of COVID-19 vaccines, and receive a booster dose when eligible.
When Are You Up to Date? You are up to date with your COVID-19 vaccines when you have followed the current recommendations listed below. The recommendations will be different depending on your age, your health status, and when you first got vaccinated.
Many people who are immunocompromised may need an additional dose as part of their primary vaccine series.
Note that booster shots are not recommended for everyone at this time.

Pfizer-BioNTech[1]
Ages Recommended
5+ years old
Primary Series
2 doses[3,4]
Given 3 weeks (21 days) apart [5]
Fully Vaccinated
2 weeks after final dose in primary series
Booster Dose
Everyone ages 12+ should get a booster dose at least 5 months after the last dose in their primary series.

- Teens 12–17 should only get a Pfizer-BioNTech COVID-19 Vaccine booster
- Everyone 18+ should get a booster dose of either Pfizer-BioNTech or Moderna (mRNA COVID-19 vaccines)

When Boosted
A person is considered "boosted" and **up to date** right after getting their booster dose.

Moderna[1]
Ages Recommended
18+ years old
Primary Series
2 doses [3]
Given 4 weeks (28 days) apart [5]
Fully Vaccinated
2 weeks after final dose in primary series

Moderna[1](continued)

Booster Dose

Everyone ages 18+ should get a booster dose of either Pfizer-BioNTech or Moderna (mRNA COVID-19 vaccines) at least 5 months after the last dose in their primary series.

When Boosted

A person is considered "boosted" and **up to date** right after getting their booster dose.

Johnson & Johnson's Janssen[1,2]

Johnson & Johnson's Janssen[1,2]

Ages Recommended

18+ years old

Primary Series

1 dose

Fully Vaccinated

2 weeks after 1st dose

Booster Dose

Everyone ages 18+ should get a booster dose of either Pfizer-BioNTech or Moderna (mRNA COVID-19 vaccines) at least 2 months after the first dose of J&J/Janssen COVID-19 Vaccine. You may get J&J/Janssen in some situations.

When Boosted

A person is considered "boosted" and **up to date** right after getting their booster dose.

---

[1] If you had a severe allergic reaction after a previous dose or if you have a known (diagnosed) allergy to a COVID-19 vaccine ingredient, you should not get that vaccine. If you have been instructed not to get one type of COVID-19 vaccine, you may still be able to get another type.

[2] CDC has updated its recommendations for COVID-19 vaccines with a preference for mRNA (Pfizer-BioNTech or Moderna) vaccines. Learn more about the updated guidance on the use of Janssen (Johnson & Johnson) COVID-19 vaccine.

[3] The primary series of these vaccinations includes a third dose for people ages 18 years and older with moderate to severe immunocompromise. This third dose occurs 28 days after the second dose in the primary series.

[4] The primary series of this vaccination includes a third dose for people ages 5–17 years with moderate to severe immunocompromise. The third dose occurs 28 days after the second dose in the primary series.

[5] You should get your second shot as close to the recommended 3-week or 4-week interval as possible. You should not get the second dose early.

SOURCE:

https://www.cdc.gov/coronavirus/2019-ncov/vaccines/stay-up-to-date.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fvaccines%2Ffully-vaccinated-guidance.html

Appendix A-2

Site Safety Plan Acknowledgment Form

Site Safety Plan
Acknowledgment Form

have been informed, understand, and will abide by all the procedures and protocols set forth in this Site Health and Safety Plan for the MARALCO site.

Name (Print)	Signature	Affiliation	Date

Appendix B

Visitor Sign-In Log

Visitor Sign-In Log

Client:_____ **Project Name**:_____

Location:_____ **Field Activity:**_____

Project Mgr.:_____ **Field Manager**:_____

Date	Name	Affiliation	Purpose of Visit	Site EHS Training		Do you have Level D PPE?		Time In	Time Out
				Yes	No	Yes	No		

Visitor Sign-In Log

Client:_____ **Project Name**:_____

Location:_____ **Field Activity:**_____

Project Mgr.:_____ **Field Manager**:_____

Date	Name	Affiliation	Purpose of Visit	Site EHS Training		Do you have Level D PPE?		Time In	Time Out
				Yes	No	Yes	No		

Visitor Sign-In Log

Client:_____ **Project Name**:_____

Location:_____ **Field Activity:**_____

Project Mgr.:_____ **Field Manager**:_____

Date	Name	Affiliation	Purpose of Visit	Site EHS Training		Do you have Level D PPE?		Time In	Time Out
				Yes	No	Yes	No		

Appendix C

Site Safety/Tailgate Meeting Form

Our behavior-based safety process is the key to our success!

Site Safety/Tailgate Meeting Form

Project Name:_____ **Location**:_____
Date:_____ **Time**:_____
Project Number:_____ **Instructor**:_____

Safety Topics Presented

JHA:_____

Lessons Learned:_____

General Safety Topics:_____

Name	Attendee's Signature

Our behavior-based safety process is the key to our success!

Site Safety/Tailgate Meeting Form

Project Name:_____ **Location**:_____
Date:_____ **Time**:_____
Project Number:_____ **Instructor**:_____

Safety Topics Presented

JHA:_____

Lessons Learned:_____

General Safety Topics:_____

Name	Attendee's Signature

Our behavior-based safety process is the key to our success!

Site Safety/Tailgate Meeting Form

Project Name:_____ **Location**:_____
Date:_____ **Time**:_____
Project Number:_____ **Instructor**:_____

Safety Topics Presented

JHA:_____

Lessons Learned:_____

General Safety Topics:_____

Name	Attendee's Signature

Appendix D
Notification of Access to Employee Exposure and Medical Records

Notice

To All Employees: This Notice Is to Provide Information for Compliance with 29 CFR Part 1910 Subpart C - General Safety and Health Provisions - Paragraph 1910.1020, Access to Employee Exposure and Medical Records.

(i) The existence, location, and availability of any records covered by this section is as follows:

CRETE Consulting, Inc.

16300 Christensen Rd, Ste 214,
Tukwila WA 98188
PH: (253) 797-6323

Attn: Grant Hainsworth

Grant.hainsworth@creteconsulting.com

(ii) The person responsible for maintaining and providing access to these records is CRETE's Environmental Health and Safety Manager.

(iii) Each employee has the right to access these records.

Appendix E

Material Safety Data Sheets

Safety Data Sheets

MATERIAL SAFETY DATA SHEET

LIQUINOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	**LIQUINOX®**
CHEMICAL FAMILY NAME:	Detergent.
PRODUCT USE:	Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER:	Not Applicable
U.N. DANGEROUS GOODS CLASS:	Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME:	Alconox, Inc.
ADDRESS:	30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE:	**TOLL-FREE in USA/Canada** 800-255-3924
	International calls 813-248-0585
BUSINESS PHONE:	914-948-4040
DATE OF PREPARATION:	May 2011
DATE OF LAST REVISION:	February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a pale yellow liquid no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable liquid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS	CANADA (WHMIS) SYMBOLS	EUROPEAN and (GHS) Hazard Symbols
Non-Regulated	Not Controlled	None

Signal Word: **Caution!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1
EC# 231-791-2 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC
CAS# 84133-50-6 Not Listed in EU Chemical Inventory
EC# 232-483-0 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 215-090-9 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 241-543-5 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):
None

Hazard Statement(s):
None

Precautionary Statement(s):
P264: Wash hands thoroughly after handling
P271: Use only in well ventilated area.

Hazard Symbol(s):
Not Classified

Risk Phrases:
None

Safety Phrases:
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS: ACUTE: Eye, respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Water	7732-18-5	231-791-2	Not Listed	40 – 60%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Alcohol Ethoxylate	84133-50-6	Not Listed	Not Listed	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Coconut Diethanolamide	8051-30-7	232-483-0	Not Listed	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Xylene Sulfonate	1300-72-7	215-090-9	1514	2 – 7%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tripotassium EDTA	17572-97-3	241-543-5	Not Listed	1 - 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing dificulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

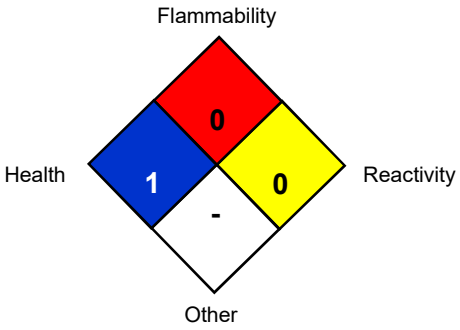
FLASH POINT: Not Flammable
AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA
FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is non-flammable, however containers may rupture if exposed to heat or fire.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM	
HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Soak up with an absorbent material and place in an appropriate container for disposal. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Water	7732-18-5	Not Listed	Not Listed	Not Listed
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	Not Listed	Not Listed	Not Listed
Alcohol Ethoxylate	84133-50-6	Not Listed	Not Listed	Not Listed
Coconut Diethanolamide	8051-30-7	Not Listed	Not Listed	Not Listed
Sodium Xylene Sulfonate	1300-72-7	Not Listed	Not Listed	Not Listed
Tripotassium EDTA	17572-97-3	Not Listed	Not Listed	Not Listed

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Liquid
APPEARANCE & ODOR:	Pale yellow liquid with no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	17 @ 20°C (68°F)
VAPOR DENSITY (AIR=1):	>1
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	<1
BOILING POINT (C°):	100°C (212°F)
FREEZING POINT (C°):	Not Available
pH:	8.5
SPECIFIC GRAVITY 20°C: (WATER =1)	1.083
SOLUBILITY IN WATER (%)	Complete
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable
DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx), and Hydrocarbons
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is not available for mixture:

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.
IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.
SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No Data available at this time.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.
PROPER SHIPPING NAME: Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable
UN IDENTIFICATION NUMBER: Not Applicable
PACKING GROUP: Not Applicable.
DOT LABEL(S) REQUIRED: Not Applicable
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable
MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):
This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Not Controlled Product, as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF LIQUINOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, disk drives, clean rooms, medical devices, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, pipes, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. Used for phosphate sensitive analysis ware. FDAcertified. Used to remove: Soil, grit, grime, slime, grease, oils, blood, tissue, particulates, deposits, chemical and solvents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, cement and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Used for art restoration. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-inplace. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 ml per liter) in cold, warm or hot

water. If available, use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe or ultrasonic method. Not for spray machines, will foam. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic and metal surfaces. Corrosion testing may be advisable.

Material Safety Data Sheet: **Simple Green® All-Purpose Cleaner and Simple Green® Scrubbing Pad**
Version No. 13005-12B Date of Issue: February 2012 *ANSI-Z400.1-2003 Format*

Section 1: PRODUCT & COMPANY IDENTIFICATION

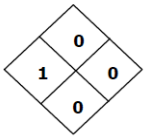
Product Name: Simple Green® All-Purpose Cleaner
Additional Names: Simple Green® Concentrated Cleaner Degreaser Deodorizer
Simple Green® Scrubbing Pad (Fluid in pad only)

Manufacturer's Part Number: **Please refer to page 4*

Company: Sunshine Makers, Inc.
15922 Pacific Coast Highway
Huntington Beach, CA 92649 USA
Telephone: 800-228-0709 ● 562-795-6000 Fax: 562-592-3830
Emergency Phone: Chem-Tel 24-Hour Emergency Service: 800-255-3924

Section 2: HAZARDS IDENTIFICATION

Emergency Overview: **CAUTION. Irritant. This is a Green colored liquid with a sassafras added odor. Scrubbing pad is a green fibrous rectangle infused with Simple Green Cleaner.**



NFPA/HMIS Rating:
Health = 1 = slight
Fire, Reactivity, and Special = 0 = minimal

Potential Health Effects

Eye Contact: Mildly irritating.
Skin Contact: No adverse effects expected under typical use conditions. Prolonged exposure may cause dryness. Chemically sensitive individuals may experience mild irritation.
Ingestion: May cause stomach or intestinal irritation if swallowed.
Inhalation: No adverse effects expected under typical use conditions. Adequate ventilation should be present for prolonged usage in small enclosed areas.

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS Number	Percent Range
Water	7732-18-5	≥ 78%
2-butoxyethanol	111-76-2	≤ 5%
Ethoxylated Alcohol	68439-46-3	≤ 5%
Tetrapotassium Pyrophosphate	7320-34-5	≤ 5%
Sodium Citrate	68-04-2	≤ 5%
Fragrance	Proprietary Mixture	≤ 1%
Colorant	Proprietary Mixture	≤ 1%

Section 4: FIRST AID MEASURES

If Inhaled: If adverse effect occurs, move to fresh air.
If on skin: If adverse effect occurs, rinse skin with water.
If in eyes: Flush with plenty of water. After 5 minutes of flushing, remove contact lenses, if present. Continue flushing for at least 10 more minutes. If irritation persists seek medical attention.
If ingested: Drink plenty of water to dilute.

Section 5: FIRE FIGHTING MEASURES

This formula is stable, non-flammable, and will not burn. No special procedures necessary

Flammability: Non-flammable
Flash Point: Non-flammable

Suitable Extinguishing Media: Use Dry chemical, CO2, water spray or "alcohol" foam.
Extinguishing Media to Avoid High volume jet water.
Special Exposure Hazards: In event of fire created carbon oxides, oxides of phosphorus may be formed.
Special Protective Equipment: Wear positive pressure self-contained breathing apparatus; Wear full protective clothing.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: See section 8 – personal protection.

Environmental Precautions: Do not allow into open waterways and ground water systems.

Method for Clean Up: Dilute with water and rinse into sanitary sewer system or soak up with inert absorbent material.

Section 7: HANDLING AND STORAGE

Handling: Keep container tightly closed. Ensure adequate ventilation. Keep out of reach of children.

Storage: Keep in cool dry area.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limit Values:	OSHA PEL	ACGIH TLV
2-butoxyethanol	TWA 50 ppm (240 mg/m^3)	20 ppm (97 mg/m^3)
Tetrapotassium Pyrophosphate		5 mg/m^3

Exposure Controls:
Eye Contact: Use protective glasses if splashing or spray-back is likely.
Respiratory: Use in well ventilated areas.
Skin Contact: Prolonged exposure or dermal sensitive individuals should use protective gloves.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Green Liquid	**Vapor Pressure:**	18 mmHg @20°C; 23.5 mmHg @26°C	
Odor:	Added Sassafras odor	**Density:**	8.5 lb/gal;	
Specific Gravity:	1.010 ± 0.010	**Water Solubility:**	100%	
pH:	9.5 ± 0.5	**VOC composite Partial Pressure:**		TBD
Boiling Point:	~210°F (98 °C)	**VOC:**	CARB Method 310	3.8%
Freezing Point:	~ 32°F (0 °C)		SCAQMD Method 313	2.8%
Nutrient Content:	Phosphorous: 0.28% Chloride: ~110 ppm	Sulfur: ~180 ppm Fluorine: ~90 ppm		

Section 10: STABILITY AND REACTIVITY

Stability:	Stable
Materials to Avoid:	None known
Hazardous Decomposition Products:	Normal products of combustion - CO, CO2; Oxides of Phosphorous may occur.

Section 11: TOXICOLOGICAL INFORMATION

Acute Toxicity: Oral LD_{50} (rat) > 5 g/kg body weight
Dermal LD_{50} (rabbit) > 5 g/kg body weight
Toxicity calculated from ingredients using OECD SERIES ON TESTING AND ASSESSMENT Number 33

Carcinogens: No ingredients are listed by OSHA, IARC, or NTP as known or suspected carcinogens.

Section 12: ECOLOGICAL INFORMATION

Hazard to wild mammals:	Low, based on toxicology profile
Hazard to avian species:	Low, based on toxicology profile
Hazard to aquatic organisms:	Low, based on toxicology profile
Chemical Fate Information:	Readily Biodegradable per OECD 301D, Closed Bottle Test

Section 13: DISPOSAL CONSIDERATIONS

Appropriate Method for Disposal:

Unused Product:	*Dilute with water to use concentration and dispose by sanitary sewer.
Used Product:	*This product can enter into clarifiers and oil/water separators. Used product may be hazardous depending on the cleaning application and resulting contaminants.
Empty Containers:	*Triple-rinse with water and offer for recycling if available in your area. Otherwise, dispose as non-hazardous waste.

*Dispose of used or unused product, and empty containers in accordance with the local, State, Provincial, and Federal regulations for your location. Never dispose of used degreasing rinsates into lakes, streams, and open bodies of water or storm drains.

Section 14: TRANSPORT INFORMATION

U.S. Department of Transportation (DOT) / Canadian TDG: Not Regulated
IMO / IDMG: Not classified as Dangerous
ICAO/ IATA: Not classified as Dangerous
ADR/RID: Not classified as Dangerous

U.N. Number	Not Required	Proper Shipping Name:	Detergent Solution
Hazard Class:	Non-Hazardous	Marine Pollutant:	No

Section 15: REGULATORY INFORMATION

All components are listed on: EINECS, TSCA, DSL and AICS Inventory.
No components listed under: Clean Air Act Section 112; Clean Water Act 307 & 311

SARA Title III: 2-butoxyethanol is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 as Category N230 – Certain Glycol Ethers.

RCRA Status: Not a hazardous waste CERCLA Status : No components listed

State Right To Know Lists

2-butoxyethanol Illinois, Massachusetts, New Jersey, Pennsylvania, Rhode Island

WHMIS Classification – Category D, subcategory 2B, eye irritant

Name	Toxic Substances List – Schedule 1 – CEPA (Canadian Environmental Protection Act)	NPRI Inventory
2-butoxyethanol	Yes	No

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by Canada's Controlled Products Regulation.

Section 16: OTHER INFORMATION

Questions about the information found on this MSDS should be directed to:
SUNSHINE MAKERS, INC. – TECHNICAL DEPARTMENT
15922 Pacific Coast Hwy. Huntington Beach, CA 92649
Phone: 800/228-0709 [8am-5pm Pacific time, Mon-Fri] *Fax:* 562/592-3830 *Email:* infoweb@simplegreen.com

CAGE CODE 1Z575
GSA/FSS - CONTRACT NO. GS-07F-0065J
Scrubbing Pad GSA/BPA - CONTRACT NO. GS-07F-BSIMP
National Stock Numbers & Industrial Part Numbers:

	Part Number	NSN	Size
Simple Green	13012	7930-01-342-5315	24 oz spray (12/case)
	13005	7930-01-306-8369	1 Gallon (6/case)
	13006	7930-01-342-5316	5 Gallon
	13016	7930-01-342-5317	15 Gallon
	13008	7930-01-342-4145	55 Gallon
	13103	N/A	2oz samples
	13225	N/A	2.5 Gallon
	13275	N/A	275 Gallon tote
	48049	N/A	1 Gallon Conc. w/ 32oz dilution
Scrubbing Pad	10224	7930-01-346-9148	Each (24/case)

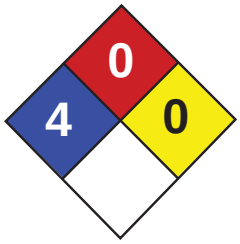
Retail Numbers:

Part Number	Size
13002	16 oz Trigger (12/case)
13005	1 Gallon (6/case)
13013	24 oz Trigger (12/case)
13014	67 oz / 2 L (6/case)
13033	32 oz Trigger (12/case)
80007	Tier display holding 13005 (36/Tier)

part number is for both industrial and retail

****International Part Numbers May Differ.**

DISCLAIMER: The information provided with this MSDS is furnished in good faith and without warranty of any kind. Personnel handling this material must make independent determinations of the suitability and completeness of information from all sources to assure proper use and disposal of this material and the safety and health of employees and customers. Sunshine Makers, Inc. assumes no additional liability or responsibility resulting from the use of, or reliance on this information.



Material Safety Data Sheet
Nitric acid, 65% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nitric acid, 65%

Catalog Codes: SLN2161

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Water; Nitric acid, fuming

CI#: Not applicable.

Synonym: Nitric Acid, 65%

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Water	7732-18-5	35
Nitric acid, fuming	7697-37-2	65

Toxicological Data on Ingredients: Nitric acid, fuming: VAPOR (LC50): Acute: 244 ppm 0.5 hours [Rat]. 344 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to lungs, mucous membranes, upper respiratory

tract, skin, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of combustible materials

Explosion Hazards in Presence of Various Substances:
Explosive in presence of reducing materials, of organic materials, of metals, of alkalis. Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Flammable in presence of cellulose or other combustible materials. Phosphine, hydrogen sulfide, selenide all ignite when fuming nitric acid is dripped into gas. (Nitric Acid, fuming)

Special Remarks on Explosion Hazards:
Reacts exlposively with metallic powders, carbides, cyanides, sulfides, alkalies and turpentine. Can react explosively with many reducing agents. Arsine, phosphine, tetraborane all oxidized explosively in presence of nitric acid. Cesium and rubidium

acetylides explode in contact with nitric acid. Explosive reaction with Nitric Acid + Nitrobenzene + water. Detonation with Nitric Acid + 4-Methylcyclohexane. (Nitric acid, fuming)

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Oxidizing material. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 2 STEL: 4 (ppm) from ACGIH (TLV) [United States] TWA: 2 STEL: 4 from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Acrid. Disagreeable and choking. (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point: 121°C (249.8°F)

Melting Point: -41.6°C (-42.9°F)

Critical Temperature: Not available.

Specific Gravity: 1.408 (Water = 1)

Vapor Pressure: 6 kPa (@ 20°C)

Vapor Density: 2.5 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.29 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Easily soluble in cold water, hot water. Soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances:
Highly reactive with alkalis. Reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper. Non-corrosive in presence of glass, of stainless steel(304), of stainless steel(316), of brass.

Special Remarks on Reactivity:
A strong oxidizer. Reacts violently with alcohol, organic material, turpene, charcoal. Violent reaction with Nitric acid + Acetone and Sulfuric acid. Nitric Acid will react with water or steam to produce heat and toxic, corrosive and flammable vapors. (Nitric acid, fuming)

Special Remarks on Corrosivity:
In presence of traces of oxides, it attacks all base metals except aluminum and special chromium steels. It will attack some forms of plastics, rubber, and coatings. No corrosive effect on bronze. No corrosivity data for zinc, and steel

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

Contains material which may cause damage to the following organs: lungs, mucous membranes, upper respiratory tract, skin, eyes, teeth.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: LDL - Lowest Published Lethal Dose [Human] - Route: Oral; Dose: 430 mg/kg (Nitric acid, fuming)

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (effects on newborn and fetotoxicity) based on animal data. (Nitric acid, fuming)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Severely irritates skin. Causes skin burns and may cause deep and penetrating ulcers of the skin with a characteristic yellow to brownish discoloration. May be fatal if absorbed through skin. Eyes: Severely irritates eyes. Causes eye burns. May cause irreversible eye injury. Ingestion: May be fatal if swallowed. Causes serious gastrointestinal tract irritation or burns with nausea, vomiting, severe abdominal pain, and possible "coffee grounds" appearance of the vomitus . May cause perforation of the digestive tract. Inhalation: May be fatal if inhaled. Vapor is extremely hazardous. Vapor may cause nitrous gas poisoning. Effects may be delayed. May cause irritation of the mucous membranes and respiratory tract with burning pain in the nose and throat, coughing, sneezing, wheezing, shortness of breath and pulmonary edema. Other symptoms may include nausea, and vomiting. Chronic Potential Health Effects: Repeated inhalation may produce changes in pulmonary function and/or chronic bronchitis. It may also affect behavior (headache, dizziness, drowsiness, muscle contaction or spasticity, weakness, loss of coordinaton, mental confusion), and urinary system (kidney faillure, decreased urinary output after several hours of

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Nitric acid UNNA: 2031 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
New York release reporting list: Nitric acid, fuming Rhode Island RTK hazardous substances: Nitric acid, fuming Pennsylvania RTK: Nitric acid, fuming Florida: Nitric acid, fuming Minnesota: Nitric acid, fuming Massachusetts RTK: Nitric acid, fuming

New Jersey: Nitric acid, fuming TSCA 8(b) inventory: Water; Nitric acid, fuming SARA 302/304/311/312 extremely hazardous substances: Nitric acid, fuming SARA 313 toxic chemical notification and release reporting: Nitric acid, fuming 65% CERCLA: Hazardous substances.: Nitric acid, fuming: 1000 lbs. (453.6 kg);

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R8- Contact with combustible material may cause fire. R35- Causes severe burns. S23- Do not breathe gas/fumes/vapour/spray [***] S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S36- Wear suitable protective clothing. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 4

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 10:59 AM

Last Updated: 11/01/2010 12:00 PM

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AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades **MSDS No. 9950**

EMERGENCY OVERVIEW
DANGER!
EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION (rev. Jan-04)

Amerada Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800)424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732)750-6000
MSDS Internet Website www.hess.com/about/environ.html

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS * (rev. Jan-04)

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

3. HAZARDS IDENTIFICATION (rev. Dec-97)

EYES
Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN
Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES (rev. Dec-97)

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES (rev. Dec-97)

FLAMMABLE PROPERTIES:

FLASH POINT:	-45 °F (-43°C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 °F (>280 °C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 “Low Expansion Foam - 1994 Edition.”

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES (rev. Dec-97)

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product

vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE (rev. Dec-97)

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL******
******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION (rev. Jan-04)

EXPOSURE LIMITS

Component (CAS No.)	Exposure Limits			
	Source	TWA (ppm)	STEL (ppm)	Note
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	1	5	
n-Butane (106-97-8)	ACGIH	800	--	2003 NOIC: 1000 ppm (TWA) Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--	
	ACGIH	1000	--	A4
Ethyl benzene (100-41-4)	OSHA	100	--	
	ACGIH	100	125	A3

Component (CAS No.)	Exposure Limits			
	Source	TWA (ppm)	STEL (ppm)	Note
n-Hexane (110-54-3)	OSHA	500	--	
	ACGIH	50	--	skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
	ACGIH	50	--	A4 (skin)
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25	--	
Xylene, mixed isomers (1330-20-7)	OSHA	100	--	
	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES (rev. Jan-04)

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOR

A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 °F (39 to 200 °C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H_2O = 1):	0.70 – 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %

SOLUBILITY (H_2O): Non-oxygenated gasoline - negligible (< 0.1% @ 77 °F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 °F); ethanol is readily soluble in water

10. STABILITY and REACTIVITY (rev. Dec-94)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS

Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES (rev. Dec-97)

ACUTE TOXICITY

Acute Dermal LD50 (rabbits): > 5 ml/kg
Acute Oral LD50 (rat): 18.75 ml/kg
Primary dermal irritation (rabbits): slightly irritating
Draize eye irritation (rabbits): non-irritating
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenicity: OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION (rev. Jan-04)

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS (rev. Dec-97)

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION (rev. Jan-04)

DOT PROPER SHIPPING NAME:	Gasoline
DOT HAZARD CLASS and PACKING GROUP:	3, PG II
DOT IDENTIFICATION NUMBER:	UN 1203
DOT SHIPPING LABEL:	FLAMMABLE LIQUID

PLACARD:

15. REGULATORY INFORMATION (rev. Jan-04)

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)
Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION (rev. Jan-04)

NFPA® HAZARD RATING	HEALTH:	1	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
HMIS® HAZARD RATING	HEALTH:	1 *	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
	* CHRONIC		

SUPERSEDES MSDS DATED: 12/30/97

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than
N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute (212)642-4900
API	American Petroleum Institute (202)682-8000
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation [General Info: (800)467-4922]
EPA	U.S. Environmental Protection Agency
HMIS	Hazardous Materials Information System
IARC	International Agency For Research On Cancer
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association (617)770-3000
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
SCBA	Self-Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short-Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Workplace Hazardous Materials Information System (Canada)

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

EMERGENCY OVERVIEW
CAUTION!
OSHA/NFPA COMBUSTIBLE LIQUID - SLIGHT TO MODERATE IRRITANT
EFFECTS CENTRAL NERVOUS SYSTEM
HARMFUL OR FATAL IF SWALLOWED

Moderate fire hazard. Avoid breathing vapors or mists. May cause dizziness and drowsiness. May cause moderate eye irritation and skin irritation (rash). Long-term, repeated exposure may cause skin cancer.
If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).

NFPA 704 (Section 16)

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800) 424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732) 750-6000
MSDS INTERNET WEBSITE: www.hess.com (See Environment, Health, Safety & Social Responsibility)

SYNONYMS: Ultra Low Sulfur Diesel (ULSD); Low Sulfur Diesel; Motor Vehicle Diesel Fuel; Diesel Fuel #2; Dyed Diesel Fuel; Non-Road, Locomotive and Marine Diesel Fuel; Tax-exempt Diesel Fuel

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and CHEMICAL INFORMATION ON INGREDIENTS

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Diesel Fuel (68476-34-6)	100
Naphthalene (91-20-3)	Typically < 0.01

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher. Diesel fuel may be dyed (red) for tax purposes. May contain a multifunctional additive.

3. HAZARDS IDENTIFICATION

EYES
Contact with liquid or vapor may cause mild irritation.

SKIN
May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information.

IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash).

4. FIRST AID MEASURES

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:	> 125 ^{o}F (> 52 ^{o}C) minimum PMCC
AUTOIGNITION POINT:	494 ^{o}F (257 ^{o}C)
OSHA/NFPA FLAMMABILITY CLASS:	2 (COMBUSTIBLE)
LOWER EXPLOSIVE LIMIT (%):	0.6
UPPER EXPLOSIVE LIMIT (%):	7.5

FIRE AND EXPLOSION HAZARDS
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA
SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Diesel fuel, and in particular low and ultra low sulfur diesel fuel, has the capability of accumulating a static electrical charge of sufficient energy to cause a fire/explosion in the presence of lower flashpoint products such as gasoline. The accumulation of such a static charge occurs as the diesel flows through pipelines, filters, nozzles and various work tasks such as tank/container filling, splash loading, tank cleaning; product sampling; tank gauging; cleaning, mixing, vacuum truck operations, switch loading, and product agitation. There is a greater potential for static charge accumulation in cold temperature, low humidity conditions.

Documents such as 29 CFR OSHA 1910.106 "Flammable and Combustible Liquids, NFPA 77 Recommended Practice on Static Electricity, API 2003 "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents and ASTM D4865 "Standard Guide for Generation and Dissipation of Static

Electricity in Petroleum Fuel Systems" address special precautions and design requirements involving loading rates, grounding, bonding, filter installation, conductivity additives and especially the hazards associated with "switch loading." ["Switch Loading" is when a higher flash point product (such as diesel) is loaded into tanks previously containing a low flash point product (such as gasoline) and the electrical charge generated during loading of the diesel results in a static ignition of the vapor from the previous cargo (gasoline).]

Note: When conductivity additives are used or are necessary the product should achieve 25 picosiemens/meter or greater at the handling temperature.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

Components (CAS No.)	Source	Exposure Limits TWA/STEL	Note
Diesel Fuel: (68476-34-6)	OSHA	5 mg/m, as mineral oil mist	
	ACGIH	100 mg/m^3 (as totally hydrocarbon vapor) TWA	A3, skin
Naphthalene (91-20-3)	OSHA	10 ppm TWA	
	ACGIH	10 ppm TWA / 15 ppm STEL	A4, Skin

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile, neoprene, or PVC are recommended. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION
A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE
Clear, straw-yellow liquid. Dyed fuel oil will be red or reddish-colored.

ODOR
Mild, petroleum distillate odor

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	320 to 690 oF (160 to 366 ^{o}C)
VAPOR PRESSURE:	0.009 psia @ 70 ^{o}F (21 ^{o}C)
VAPOR DENSITY (air = 1):	> 1.0
SPECIFIC GRAVITY (H_2O = 1):	0.83 to 0.88 @ 60 ^{o}F (16 ^{o}C)
PERCENT VOLATILES:	100 %
EVAPORATION RATE:	Slow; varies with conditions
SOLUBILITY (H_2O):	Negligible

10. STABILITY and REACTIVITY

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID and INCOMPATIBLE MATERIALS
Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers; Viton ®; Fluorel ®

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

11. TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY
Acute dermal LD50 (rabbits): > 5 ml/kg
Acute oral LD50 (rats): 9 ml/kg
Primary dermal irritation: extremely irritating (rabbits)
Draize eye irritation: non-irritating (rabbits)
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY
Carcinogenic: OSHA: NO IARC: NO NTP: NO ACGIH: A3

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

MUTAGENICITY (genetic effects)
This material has been positive in a mutagenicity study.

12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

PROPER SHIPPING NAME:	Diesel Fuel	Placard (International Only):
HAZARD CLASS and PACKING GROUP:	3, PG III	
DOT IDENTIFICATION NUMBER:	NA 1993 (Domestic) UN 1202 (International)	
DOT SHIPPING LABEL:	None	

Use Combustible Placard if shipping in bulk domestically

15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the *de minimis* levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

CALIFORNIA PROPOSITON 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

INGREDIENT NAME (CAS NUMBER)	Date Listed
Diesel Engine Exhaust (no CAS Number listed)	10/01/1990

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 3 (Combustible Liquid) and Class D, Division 2, Subdivision B (Toxic by other means)

16. OTHER INFORMATION

NFPA® HAZARD RATING HEALTH: 0
FIRE: 2
REACTIVITY: 0

Refer to NFPA 704 "Identification of the Fire Hazards of Materials" for further information

HMIS® HAZARD RATING HEALTH: 1 * * Chronic
FIRE: 2
PHYSICAL: 0

SUPERSEDES MSDS DATED: 02/28/2001

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than
N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

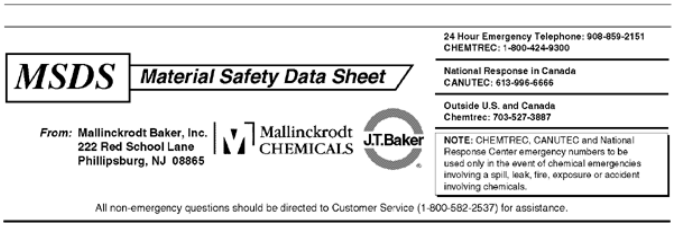
ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute (212) 642-4900
API	American Petroleum Institute (202) 682-8000
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation [General info: (800) 467-4922]
EPA	U.S. Environmental Protection Agency
HMIS	Hazardous Materials Information System
IARC	International Agency For Research On Cancer
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association (617)770-3000
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
SCBA	Self-Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short-Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Canadian Workplace Hazardous Materials Information System

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

MSDS Number: **I8840** * * * * * *Effective Date:* ***08/27/04*** * * * * * *Supercedes:* ***05/07/03***



ISOPROPYL ALCOHOL (90 - 100%)

1. Product Identification

Synonyms: 2-Propanol; sec-propyl alcohol; isopropanol; sec-propanol; dimethylcarbinol
CAS No.: 67-63-0
Molecular Weight: 60.10
Chemical Formula: (CH3)2 CHOH
Product Codes:
J.T. Baker: 0562, 5082, 9037, 9080, U298
Mallinckrodt: 0562, 3027, 3031, 3032, 3035, 3037, 3043, 4359, 6569, H604, H982, V555, V566, V681

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Isopropyl Alcohol	67-63-0	90 - 100%	Yes
Water	7732-18-5	0 - 10%	No

3. Hazards Identification

Emergency Overview

WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE IRRITATION TO SKIN.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors irritates the respiratory tract. Exposure to high concentrations has a narcotic effect, producing symptoms of dizziness, drowsiness, headache, staggering, unconsciousness and possibly death.
Ingestion:
Can cause drowsiness, unconsciousness, and death. Gastrointestinal pain, cramps, nausea, vomiting, and diarrhea may also result. The single lethal dose for a human adult = about 250 mls (8 ounces).
Skin Contact:
May cause irritation with redness and pain. May be absorbed through the skin with possible systemic effects.
Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.
Chronic Exposure:
Chronic exposure may cause skin effects.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired liver, kidney, or pulmonary function may be more susceptible to the effects of this agent.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:

Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Call a physician if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Flash point: 12C (54F) CC
Autoignition temperature: 399C (750F)
Flammable limits in air % by volume:
lel: 2.0; uel: 12.7
Listed fire data is for Pure Isopropyl Alcohol.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.
Fire Extinguishing Media:
Water spray, dry chemical, alcohol foam, or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Small quantities of peroxides can form on prolonged storage. Exposure to light and/or air significantly increases the rate of peroxide formation. If evaporated to a residue, the mixture of peroxides and isopropanol may explode when exposed to heat or shock.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Isopropyl Alcohol (2-Propanol):
-OSHA Permissible Exposure Limit (PEL):
400 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):
200 ppm (TWA), 400 ppm (STEL), A4 - not classifiable as a human carcinogen.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene and nitrile rubber are recommended materials.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Rubbing alcohol.
Solubility:
Miscible in water.
Specific Gravity:
0.79 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):

100
Boiling Point:
82C (180F)
Melting Point:
-89C (-128F)
Vapor Density (Air=1):
2.1
Vapor Pressure (mm Hg):
44 @ 25C (77F)
Evaporation Rate (BuAc=1):
2.83

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Heat and sunlight can contribute to instability.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Heat, flame, strong oxidizers, acetaldehyde, acids, chlorine, ethylene oxide, hydrogen-palladium combination, hydrogen peroxide-sulfuric acid combination, potassium tert-butoxide, hypochlorous acid, isocyanates, nitroform, phosgene, aluminum, oleum and perchloric acid.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Oral rat LD50: 5045 mg/kg; skin rabbit LD50: 12.8 gm/kg; inhalation rat LC50: 16,000 ppm/8-hour; investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Isopropyl Alcohol (67-63-0)	No	No	3
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to quickly evaporate. When released into the soil, this material may leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. When released into water, this material may biodegrade to a moderate extent. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.
Environmental Toxicity:
The LC50/96-hour values for fish are over 100 mg/l. This material is not expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ISOPROPANOL
Hazard Class: 3
UN/NA: UN1219
Packing Group: II
Information reported for product/size: 200L

International (Water, I.M.O.)

Proper Shipping Name: ISOPROPANOL
Hazard Class: 3
UN/NA: UN1219
Packing Group: II
Information reported for product/size: 200L

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Isopropyl Alcohol (67-63-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

Ingredient	Korea	Canada-- DSL	Canada-- NDSL	Canada-- Phil.
Isopropyl Alcohol (67-63-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

Ingredient	-SARA 302- RQ	TPQ	-SARA 313- List	Chemical Catg.
Isopropyl Alcohol (67-63-0)	No	No	Yes	No
Water (7732-18-5)	No	No	No	No

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Isopropyl Alcohol (67-63-0)	No	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2[S]2
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **1** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE IRRITATION TO SKIN.
Label Precautions:
Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor or mist.
Avoid contact with eyes, skin and clothing.
Label First Aid:
If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 16.
Disclaimer:
****
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****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

SAFETY DATA SHEET

Ammonia

Section 1. Identification

GHS product identifier : Ammonia

Chemical name : ammonia

Other means of identification : ammonia; anhydrous ammonia

Product type : Gas.

Product use : Synthetic/Analytical chemistry.

Synonym : ammonia; anhydrous ammonia

SDS # : 001003

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 2
GASES UNDER PRESSURE - Liquefied gas
ACUTE TOXICITY (inhalation) - Category 4
SKIN CORROSION - Category 1
SERIOUS EYE DAMAGE - Category 1
AQUATIC HAZARD (ACUTE) - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.
Harmful if inhaled.
Causes severe skin burns and eye damage.
Very toxic to aquatic life.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Avoid breathing gas. Wash hands thoroughly after handling.

Section 2. Hazards identification

Response : Collect spillage. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Store locked up. Protect from sunlight. Store in a well-ventilated place.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : ammonia

Other means of identification : ammonia; anhydrous ammonia

Product code : 001003

CAS number/other identifiers

CAS number : 7664-41-7

Ingredient name	%	CAS number
ammonia	100	7664-41-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention immediately. Call medical doctor or poison control center immediately.Chemical burns must be treated promptly by a physician.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately. Call medical doctor or poison control center immediately. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Continue to rinse for at least 10 minutes. Get medical attention immediately. Call medical doctor or poison control center immediately. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Section 4. First aid measures

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Harmful if inhaled.

Skin contact : Causes severe burns.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. This material is very toxic to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
nitrogen oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Do not breathe gas. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Store locked up. Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).
Refer to ANSI/CGA G-2.1, Section 5.13 for electrical classification of anhydrous ammonia storage and handling areas. Where anhydrous ammonia is stored indoors, use electrical (ventilating, lighting and material handling) equipment with the appropriate electrical classification rating and use only non-sparking tools.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
ammonia	**California PEL for Chemical Contaminants (*Table AC-1*) (United States).** PEL: 25 ppm 8 hours. STEL: 35 ppm 15 minutes. **ACGIH TLV (United States, 3/2017).** TWA: 25 ppm 8 hours. TWA: 17 mg/m³ 8 hours. STEL: 35 ppm 15 minutes. STEL: 24 mg/m³ 15 minutes. **OSHA PEL 1989 (United States, 3/1989).** STEL: 35 ppm 15 minutes. STEL: 27 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2016).** TWA: 25 ppm 10 hours. TWA: 18 mg/m³ 10 hours. STEL: 35 ppm 15 minutes. STEL: 27 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 50 ppm 8 hours. TWA: 35 mg/m³ 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Section 8. Exposure controls/personal protection

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Compressed gas.]

Color : Colorless.

Odor : Pungent.

Odor threshold : Not available.

pH : Approx. 11.6

Melting point : -77.7°C (-107.9°F)

Boiling point : -33°C (-27.4°F)

Critical temperature : 132.85°C (271.1°F)

Flash point : Not available.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 16%
Upper: 25%

Vapor pressure : 114.1 (psig)

Vapor density : 0.59 (Air = 1)

Specific Volume (ft^3/lb) : 20.79

Gas Density (lb/ft^3) : 0.0481 (32°C / 89.6 to °F)

Relative density : SPECIFIC GRAVITY (AIR=1): @ 70°F (21.1°C) = 0.59

Solubility : Soluble in water. Soluble in alcohol and ether.

Solubility in water : 540 g/l

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : 651°C (1203.8°F)

Decomposition temperature : Not available.

Viscosity : Not applicable.

Flow time (ISO 2431) : Not available.

Molecular weight : 17.03 g/mole

Aerosol product

Heat of combustion : -18589392 J/kg

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Section 10. Stability and reactivity

Incompatible materials : Oxidizers and Yellow Metals (brass & copper)

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
ammonia	LC50 Inhalation Gas.	Rat	7338 ppm	1 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Harmful if inhaled.

Skin contact : Causes severe burns.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Section 11. Toxicological information

Ingestion : Adverse symptoms may include the following:, stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Other information : IDLH : 300 ppm

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
ammonia	Acute EC50 29.2 mg/l Marine water Acute LC50 2080 µg/l Fresh water Acute LC50 0.53 ppm Fresh water Acute LC50 300 µg/l Fresh water Chronic NOEC 0.204 mg/l Marine water	Algae - Ulva fasciata - Zoea Crustaceans - Gammarus pulex Daphnia - Daphnia magna Fish - Hypophthalmichthys nobilis Fish - Dicentrarchus labrax	96 hours 48 hours 48 hours 96 hours 62 days

Persistence and degradability

Not available.

Bioaccumulative potential

Not available.

Mobility in soil

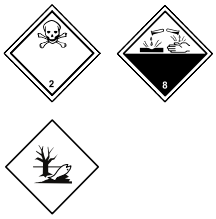
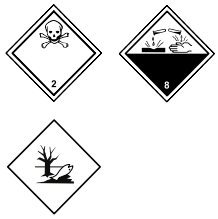
Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1005	UN1005	UN1005	UN1005	UN1005
UN proper shipping name	AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS; OR ANHYDROUS AMMONIA	AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS
Transport hazard class(es)	2.2 	2.3 (8) 	2.3 (8) 	2.3 (8) 	2.3 (8) 
Packing group	-	-	-	-	-
Environmental hazards	Yes.	Yes.	Yes. The environmentally hazardous substance mark is not required.	Yes.	Yes. The environmentally hazardous substance mark is not required.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Additional information

DOT Classification : Inhalation hazard
This product is not regulated as a marine pollutant when transported on inland waterways in sizes of ≤5 L or ≤5 kg or by road, rail, or inland air in non-bulk sizes, provided the packagings meet the general provisions of §§ 173.24 and 173.24a.
Reportable quantity 100 lbs / 45.4 kg. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
Limited quantity Yes.
Quantity limitation Passenger aircraft/rail: Forbidden. Cargo aircraft: Forbidden.
Special provisions 13,T50

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2), 2.40-2.42 (Class 8), 2.7 (Marine pollutant mark).
The marine pollutant mark is not required when transported by road or rail.
Explosive Limit and Limited Quantity Index 0
ERAP Index 3000
Passenger Carrying Ship Index Forbidden
Passenger Carrying Road or Rail Index Forbidden

Section 14. Transport information

Special provisions

Mexico Classification : Toxic Inhalation Hazard Zone D

IMDG : The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.

IATA : The environmentally hazardous substance mark may appear if required by other transportation regulations.
Quantity limitation Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: Forbidden. Limited Quantities - Passenger Aircraft: Forbidden.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

Clean Water Act (CWA) 311: ammonia

Clean Air Act (CAA) 112 regulated toxic substances: ammonia

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ (lbs)	SARA 302 TPQ (gallons)	SARA 304 RQ (lbs)	SARA 304 RQ (gallons)
ammonia	100	Yes.	500	-	100	-

SARA 304 RQ : 100 lbs / 45.4 kg

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	ammonia	7664-41-7	100
Supplier notification	ammonia	7664-41-7	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : This material is listed.

Section 15. Regulatory information

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : **Japan inventory (ENCS)**: This material is listed or exempted.
Japan inventory (ISHL): This material is listed or exempted.

Malaysia : This material is listed or exempted.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Thailand : Not determined.

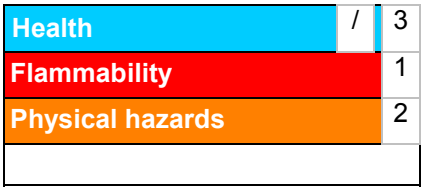
Turkey : This material is listed or exempted.

United States : This material is listed or exempted.

Viet Nam : Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

Section 16. Other information

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 2	Expert judgment
GASES UNDER PRESSURE - Liquefied gas	Expert judgment
ACUTE TOXICITY (inhalation) - Category 4	Expert judgment
SKIN CORROSION - Category 1	Expert judgment
SERIOUS EYE DAMAGE - Category 1	Expert judgment
AQUATIC HAZARD (ACUTE) - Category 1	Expert judgment

History

Date of printing : 1/10/2019

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Date of previous issue : 10/9/2018

Version : 1.09

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

CAMEO Chemicals

Print

Chemical Datasheet

ALUMINUM DROSS

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
none	3170	Dangerous When Wet	none

NIOSH Pocket Guide
none

International Chem Safety Card
none

NFPA 704
data unavailable

General Description

Gray to black granules with an odor of ammonia. Contains some aluminum, but consists principally of byproducts obtained during the refinement of aluminum. Contact with solid or with vapors arising from the solid can irritate the eyes severely.

Hazards

Reactivity Alerts

none

Air & Water Reactions

Reacts slowly with water to produce methane, ammonia, and hydrogen.

Fire Hazard

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

Produce flammable gases on contact with water. May ignite on contact with water or moist air. Some react vigorously or explosively on contact with water. May be ignited by heat, sparks or flames. May re-ignite after fire is extinguished. Some are transported in highly flammable liquids. Runoff may create fire or explosion hazard. (ERG, 2016)

Health Hazard

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

Inhalation or contact with vapors, substance or decomposition products may cause severe injury or death. May produce corrosive solutions on contact with water. Fire will produce irritating, corrosive and/or toxic gases. Runoff from fire control may cause pollution. (ERG, 2016)

Reactivity Profile

ALUMINUM DROSS contains some aluminum, but consists principally of byproducts obtained during the refinement of aluminum.

Belongs to the Following Reactive Group(s)

- Metals, Elemental and Powder, Active

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase, in the downwind direction, as necessary, the isolation distance shown above.

FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

Firefighting

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

DO NOT USE WATER OR FOAM.

SMALL FIRE: Dry chemical, soda ash, lime or sand.

LARGE FIRE: DRY sand, dry chemical, soda ash or lime or withdraw from area and let fire burn. Move containers from fire area if you can do it without risk.

FIRE INVOLVING METALS OR POWDERS (ALUMINUM, LITHIUM, MAGNESIUM, ETC.): Use dry chemical, DRY sand, sodium chloride powder, graphite powder or Met-L-X® powder; in addition, for Lithium you may use Lith-X® powder or copper powder. Also, see ERG Guide 170.

FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. (ERG, 2016)

Non-Fire Response

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not touch or walk through spilled material. Stop leak if you can do it without risk. Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. DO NOT GET WATER on spilled substance or inside containers.

SMALL SPILL: Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain. Dike for later disposal; do not apply water unless directed to do so.

POWDER SPILL: Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry. DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. (ERG, 2016)

Protective Clothing

Excerpt from GUIDE 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

Wear positive pressure self-contained breathing apparatus (SCBA). Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible. (ERG, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. Move victim to fresh air. Call 911 or emergency medical service. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Remove and isolate contaminated clothing and shoes. In case of contact with substance, wipe from skin immediately; flush skin or eyes with running water for at least 20 minutes. Keep victim calm and warm. (ERG, 2016)

Physical Properties

Chemical Formula: data unavailable

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Potential: data unavailable

IDLH: data unavailable

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

No PAC information available.

Regulatory Information

EPA Consolidated List of Lists

No regulatory information available.

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ALUMINUM DROSS
- ALUMINUM REMELTING BY-PRODUCTS
- ALUMINUM SMELTING BY-PRODUCTS

CAMEO Chemicals

Print

Chemical Datasheet

ANTIMONY POWDER

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7440-36-0	2871	Poison	none

NIOSH Pocket Guide
Antimony

International Chem Safety Card
ANTIMONY

NFPA 704

data unavailable

General Description

A silvery or gray solid in the form of dust. Denser than water and insoluble in water. Toxic by inhalation and by ingestion. May burn and emit toxic fumes if heated or exposed to flames. Used to make electric storage batteries and semiconductors.

Hazards

Reactivity Alerts

- Strong Reducing Agent

Air & Water Reactions

Insoluble in water.

Fire Hazard

Excerpt from ERG Guide 170 [Metals (Powders, Dusts, Shavings, Borings, Turnings, or Cuttings, etc.)]:

May react violently or explosively on contact with water. Some are transported in flammable liquids. May be ignited by friction, heat, sparks or flames. Some of these materials will burn with intense heat. Dusts or fumes may form explosive mixtures in air. Containers may explode when heated. May re-ignite after fire is extinguished. (ERG, 2016)

Health Hazard

Excerpt from ERG Guide 170 [Metals (Powders, Dusts, Shavings, Borings, Turnings, or Cuttings, etc.)]:

Oxides from metallic fires are a severe health hazard. Inhalation or contact with substance or decomposition products may cause severe injury or death. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may cause pollution. (ERG, 2016)

Reactivity Profile

ANTIMONY is spontaneously flammable in fluorine, chlorine, and bromine. With iodine, the reaction produces heat, which can cause flame or even an explosion if the quantities are great enough [Mellor 9:379 1946-47]. Even at 10° C. bromine trifluoride reacts with antimony incandescently. Bromine trifluoride reacts similarly with arsenic, boron, bromine, iodine, phosphorus, and sulfur [Mellor 2:113 1946-47]. Bromoazide explodes on contact with antimony, arsenic, phosphorus, silver foil, or sodium. It is very shock sensitive. Explosions of chloric acid have been due to the formation of unstable compounds with antimony, bismuth, ammonia, and organic matter [Chem. Abst. 46:2805e 1952]. The reaction of finely divided antimony and nitric acid can be violent [Pascal 10:504 1931-34]. Powdered antimony mixed with potassium nitrate explodes when heated [Mellor 9:282 1946-47]. When antimony or arsenic and solid potassium permanganate are ground together, the metals ignite [Mellor 12:322 1946-47]. Sodium peroxide oxidizes antimony, arsenic, copper, potassium, tin, and zinc with incandescence [Mellor 2:490-93 1946-47].

Belongs to the Following Reactive Group(s)

- Metals, Elemental and Powder, Active

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 170 [Metals (Powders, Dusts, Shavings, Borings, Turnings, or Cuttings, etc.)]:

As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

LARGE SPILL: Consider initial downwind evacuation for at least 50 meters (160 feet).

FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

Firefighting

Excerpt from ERG Guide 170 [Metals (Powders, Dusts, Shavings, Borings, Turnings, or Cuttings, etc.)]:

DO NOT USE WATER, FOAM OR CO2. Dousing metallic fires with water will generate hydrogen gas, an extremely dangerous explosion hazard, particularly if fire is in a confined environment (i.e., building, cargo hold, etc.). Use DRY sand, graphite powder, dry sodium chloride-based extinguishers, G-1® or Met-L-X® powder. Confining and smothering metal fires is preferable rather than applying water. Move containers from fire area if you can do it without risk.

FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. (ERG, 2016)

Non-Fire Response

Excerpt from ERG Guide 170 [Metals (Powders, Dusts, Shavings, Borings, Turnings, or Cuttings, etc.)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. (ERG, 2016)

Protective Clothing

Skin: Wear appropriate personal protective clothing to prevent skin contact.

Eyes: Wear appropriate eye protection to prevent eye contact.

Wash skin: The worker should immediately wash the skin when it becomes contaminated.

Remove: Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premise. (NIOSH, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

Physical Properties

Chemical Formula: Sb

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 1167.3 ° F (NTP, 1992)

Vapor Pressure: 1 mm Hg at 1627 ° F (NTP, 1992)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 6.684 at 77 ° F (NTP, 1992)

Boiling Point: 3182 ° F at 760 mm Hg (NTP, 1992)

Molecular Weight: 121.75 (NTP, 1992)

Water Solubility: Insoluble (NIOSH, 2016)

Ionization Potential: data unavailable

IDLH: 50 mg/m3 (as Sb) (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Antimony (7440-36-0)	1.5 mg/m3	13 mg/m3	80 mg/m3

(DOE, 2016)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Antimony	7440-36-0			5000 pounds	313		
Antimony Compounds	N010			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ANTIMONY
- ANTIMONY BLACK
- ANTIMONY ELEMENT
- ANTIMONY METAL
- ANTIMONY POWDER
- ANTIMONY, REGULUS
- C.I. 77050
- STIBIUM

CAMEO Chemicals

Print

Chemical Datasheet

ARSENIC COMPOUND, SOLID, N.O.S.

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
none	1557	Poison	none

NIOSH Pocket Guide
Arsenic (inorganic compounds, as As)

International Chem Safety Card
none

NFPA 704

data unavailable

General Description

Various colored solid materials containing arsenic. Generally not soluble in water. Toxic by inhalation (dust) and by ingestion. Obtain the technical name of the material from the shipping paper and contact CHEMTREC (800-424-9300) for specific response information.

Hazards

Reactivity Alerts

none

Air & Water Reactions

Usually insoluble in water.

Fire Hazard

Excerpt from ERG Guide 152 [Substances - Toxic (Combustible)]:

Combustible material: may burn but does not ignite readily. Containers may explode when heated. Runoff may pollute waterways. Substance may be transported in a molten form. (ERG, 2016)

Health Hazard

Excerpt from ERG Guide 152 [Substances - Toxic (Combustible)]:

Highly toxic, may be fatal if inhaled, swallowed or absorbed through skin. Contact with molten substance may cause severe burns to skin and eyes. Avoid any skin contact. Effects of contact or inhalation may be delayed. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution. (ERG, 2016)

Reactivity Profile

ARSENIC reacts incandescently with bromine trifluoride, even at 10°C [Mellor 2:113 1946-47]. Causes bromoazide to explode upon contact. Ignites if ground up together with solid potassium permanganate [Mellor 12:322 1946-47]. Is oxidized by sodium peroxide with incandescence [Mellor 2:490-93 1946-47]. A combination of finely divided arsenic with finely divided bromates (also chlorates and iodates) of barium, calcium, magnesium, potassium, sodium, or zinc can explode by heat, percussion, and friction [Mellor 2:310 1946-47]. Bromine pentafluoride reacts readily in the cold with arsenic. Ignition usually occurs. Reacts vigorously with fluorine at ordinary temperatures [Mellor 9:34 1946-47].

Belongs to the Following Reactive Group(s)

- Insufficient Information for Classification

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 152 [Substances - Toxic (Combustible)]:

As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase, in the downwind direction, as necessary, the isolation distance shown above.

FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

Firefighting

Excerpt from ERG Guide 152 [Substances - Toxic (Combustible)]:

SMALL FIRE: Dry chemical, CO2 or water spray.

LARGE FIRE: Water spray, fog or regular foam. Move containers from fire area if you can do it without risk. Dike fire-control water for later disposal; do not scatter the material. Use water spray or fog; do not use straight streams.

FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2016)

Non-Fire Response

Excerpt from ERG Guide 152 [Substances - Toxic (Combustible)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. Cover with plastic sheet to prevent spreading. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. DO NOT GET WATER INSIDE CONTAINERS. (ERG, 2016)

Protective Clothing

Excerpt from GUIDE 152 [Substances - Toxic (Combustible)]:

Wear positive pressure self-contained breathing apparatus (SCBA). Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible. (ERG, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Excerpt from ERG Guide 152 [Substances - Toxic (Combustible)]:

Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. Move victim to fresh air. Call 911 or emergency medical service. Give artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. For minor skin contact, avoid spreading material on unaffected skin. Keep victim calm and warm. Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed. (ERG, 2016)

Physical Properties

Chemical Formula: data unavailable

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Potential: data unavailable

IDLH: 5 mg/m3 for Arsenic (inorganic compounds, as As); A potential occupational carcinogen. (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

No PAC information available.

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Arsenic Compounds	N020			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ARSENIC COMPOUND, SOLID, N.O.S.
- ARSENIC COMPOUND, SOLID, N.O.S., INORGANIC
- ARSENIC COMPOUNDS
- ARSENIC COMPOUNDS, [SOLID]

CAMEO Chemicals

Print

Chemical Datasheet

BERYLLIUM COMPOUND, N.O.S.

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7440-41-7	1566	Poison	none

NIOSH Pocket Guide
Beryllium & beryllium compounds (as Be)

International Chem Safety Card
BERYLLIUM

NFPA 704

Diamond	Hazard	Value	Description
1 3 0	Health	3	Can cause serious or permanent injury.
	Flammability	1	Must be preheated before ignition can occur.
	Instability	0	Normally stable, even under fire conditions.
	Special		

(NFPA, 2010)

General Description

Beryllium compounds, n.o.s. are generally white, crystalline or powdered material containing beryllium. They are generally soluble in water. They are toxic by inhalation and by ingestion.

Hazards

Reactivity Alerts

none

Air & Water Reactions

Generally soluble in water.

Fire Hazard

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.). Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. For electric vehicles or equipment, ERG Guide 147 (lithium ion batteries) or ERG Guide 138 (sodium batteries) should also be consulted. (ERG, 2016)

Health Hazard

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

TOXIC; inhalation, ingestion or skin contact with material may cause severe injury or death. Contact with molten substance may cause severe burns to skin and eyes. Avoid any skin contact. Effects of contact or inhalation may be delayed. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution. (ERG, 2016)

Reactivity Profile

When inhaled, Beryllium and its compounds cause serious and irreversible damage to lungs.

Belongs to the Following Reactive Group(s)

- Insufficient Information for Classification

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase, in the downwind direction, as necessary, the isolation distance shown above.

FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

Firefighting

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

SMALL FIRE: Dry chemical, CO2 or water spray.

LARGE FIRE: Dry chemical, CO2, alcohol-resistant foam or water spray. Move containers from fire area if you can do it without risk. Dike fire-control water for later disposal; do not scatter the material.

FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. (ERG, 2016)

Non-Fire Response

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. DO NOT GET WATER INSIDE CONTAINERS. (ERG, 2016)

Protective Clothing

Excerpt from GUIDE 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

Wear positive pressure self-contained breathing apparatus (SCBA). Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible. (ERG, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. Move victim to fresh air. Call 911 or emergency medical service. Give artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. For minor skin contact, avoid spreading material on unaffected skin. Keep victim calm and warm. Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed. (ERG, 2016)

Physical Properties

Chemical Formula: data unavailable

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Potential: data unavailable

IDLH: 4 mg/m3 As Be; A potential occupational carcinogen. (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

Chemical	ERPG-1	ERPG-2	ERPG-3
Beryllium (7440-41-7)	NA	0.025 mg/m3	0.1 mg/m3

NA = not appropriate.

(AIHA, 2016)

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Beryllium (7440-41-7)	0.0023 mg/m3	0.025 mg/m3	0.1 mg/m3

(DOE, 2016)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Beryllium	7440-41-7			10 pounds	313	P015	
Beryllium Compounds	N050			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- BERYLLIUM COMPOUND, N.O.S.
- BERYLLIUM COMPOUNDS

CAMEO Chemicals

Print

Chemical Datasheet

BERYLLIUM POWDER

Chemical Identifiers

CAS Number
7440-41-7

UN/NA Number
1567

DOT Hazard Label
Poison
Flammable Solid

USCG CHRIS Code
BEM

NIOSH Pocket Guide
Beryllium & beryllium compounds (as Be)

International Chem Safety Card
BERYLLIUM

NFPA 704

Diamond	Hazard	Value	Description
1 3 0	Health	3	Can cause serious or permanent injury.
	Flammability	1	Must be preheated before ignition can occur.
	Instability	0	Normally stable, even under fire conditions.
	Special		

(NFPA, 2010)

General Description

A grayish-white hard light metal. Denser than water, but the powder may float. May be toxic by inhalation. Will burn if involved in a fire.

Hazards

Reactivity Alerts

- Highly Flammable
- Strong Reducing Agent

Air & Water Reactions

Insoluble in water. Beryllium is a flammable solid that will ignite if its surroundings are on fire. It can react with water under fire conditions, but is unlikely to do so otherwise.

Fire Hazard

Special Hazards of Combustion Products: Combustion yields beryllium oxide fume, which is toxic if inhaled.

Behavior in Fire: Powder may form explosive mixture with air. (USCG, 1999)

Health Hazard

Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Dust is extremely toxic when inhaled; symptoms include coughing, shortness of breath, and acute or chronic lung disease. There is no record of illness from ingestion of beryllium. Contact with dust causes conjunctival inflammation of eyes and dermatitis. (USCG, 1999)

Reactivity Profile

Boron trifluoride reacts with incandescence when heated with alkali metals or alkaline earth metals except magnesium [Merck 11th ed. 1989]. Finely divided or amalgamated metal reacts with HCl, dil HNO3, or dil H2SO4; attacked by strong base with evolution of hydrogen gas [Merck 11th ed. 1989]. It has been determined experimentally that a mixture of beryllium powder with carbon tetrachloride or with trichloroethylene will flash or spark on heavy impact [ASESB Pot. Incid. 39 1968]. The reaction between beryllium and the vapors of phosphorus proceeds with incandescence [Mellor 8:842 1946-47].

Belongs to the Following Reactive Group(s)

- Metals, Elemental and Powder, Active

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 134 [Flammable Solids - Toxic and/or Corrosive]:

As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions.

LARGE SPILL: Consider initial downwind evacuation for at least 100 meters (330 feet).

FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

Firefighting

Excerpt from ERG Guide 134 [Flammable Solids - Toxic and/or Corrosive]:

SMALL FIRE: Dry chemical, CO2, water spray or alcohol-resistant foam.

LARGE FIRE: Water spray, fog or alcohol-resistant foam. Move containers from fire area if you can do it without risk. Use water spray or fog; do not use straight streams. Do not get water inside containers. Dike fire-control water for later disposal; do not scatter the material.

FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. (ERG, 2016)

Non-Fire Response

Excerpt from ERG Guide 134 [Flammable Solids - Toxic and/or Corrosive]:

Fully encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Prevent entry into waterways, sewers, basements or confined areas. Use clean, non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal. (ERG, 2016)

Protective Clothing

Skin: Wear appropriate personal protective clothing to prevent skin contact.

Eyes: Wear appropriate eye protection to prevent eye contact.

Wash skin: The worker should wash daily at the end of each work shift.

Remove: Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premise.

Provide: Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance; this is irrespective of the recommendation involving the wearing of eye protection. (NIOSH, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Eye: If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. Other measures are usually unnecessary. (NIOSH, 2016)

Physical Properties

Chemical Formula: Be

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 2349 ° F (NIOSH, 2016)

Vapor Pressure: 0 mm Hg (approx) (NIOSH, 2016)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 1.85 at 68 ° F (USCG, 1999)

Boiling Point: 4532 ° F at 760 mm Hg (NIOSH, 2016)

Molecular Weight: 9.01 (USCG, 1999)

Water Solubility: Insoluble (NIOSH, 2016)

Ionization Potential: data unavailable

IDLH: 4 mg/m3 As Be; A potential occupational carcinogen. (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

Chemical	ERPG-1	ERPG-2	ERPG-3
Beryllium (7440-41-7)	NA	0.025 mg/m3	0.1 mg/m3

NA = not appropriate.
(AIHA, 2016)

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Beryllium (7440-41-7)	0.0023 mg/m3	0.025 mg/m3	0.1 mg/m3

(DOE, 2016)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Beryllium	7440-41-7			10 pounds	313	P015	
Beryllium Compounds	N050			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- BERYLLIUM
- BERYLLIUM ATOM
- BERYLLIUM ELEMENT
- BERYLLIUM METAL: BERYLLIUM
- BERYLLIUM POWDER
- BERYLLIUM, (DUST OR POWDER), METAL
- BERYLLIUM, [POWDER]
- BERYLLIUM-9
- GLUCINIUM

CAMEO Chemicals

Print

Chemical Datasheet

CADMIUM

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7440-43-9	2570	Poison	none

NIOSH Pocket Guide
Cadmium dust (as Cd)

International Chem Safety Card
CADMIUM

NFPA 704

data unavailable

General Description

PHYSICAL DESCRIPTION: Silver-white blue tinged lustrous metallic solid. (NTP, 1992)

Hazards

Reactivity Alerts

⚠ Pyrophoric

Air & Water Reactions

The finely divided metal is pyrophoric. Slowly oxidized by moist air to form cadmium oxide. Insoluble in water.

Fire Hazard

Flammable in powder form. Combustible. (NTP, 1992)

Health Hazard

Exposure Routes: inhalation, ingestion

Symptoms: Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]

Target Organs: respiratory system, kidneys, prostate, blood (NIOSH, 2016)

Reactivity Profile

A violent explosion occurred 30 minutes after placement of a CADMIUM rod into hydrazoic acid [Mellor 8 Supp. 2:50 1967]. Fused ammonium nitrate with powdered metal often produces a violent explosive reaction. Reactivity similar to zinc. May be incompatible with oxidants.

Belongs to the Following Reactive Group(s)

- Metals, Elemental and Powder, Active

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for

solids.

SPILL: Increase, in the downwind direction, as necessary, the isolation distance shown above.

FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

Firefighting

To extinguish a fire involving this chemical you may use a dry chemical, carbon dioxide, foam or halon extinguisher; a water spray may also be used. (NTP, 1992)

Non-Fire Response

SMALL SPILLS AND LEAKAGE: If you spill this chemical, you should dampen the solid spill material with water, then transfer the dampened material to a suitable container. Use absorbent paper dampened with water to pick up any remaining material. Seal your contaminated clothing and the absorbent paper in a vapor-tight plastic bag for eventual disposal. Wash all contaminated surfaces with a strong soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.

STORAGE PRECAUTIONS: You should keep this material in a tightly-closed container under an inert atmosphere, and store it in a freezer. (NTP, 1992)

Protective Clothing

Skin: No recommendation is made specifying the need for personal protective equipment for the body.

Eyes: No recommendation is made specifying the need for eye protection.

Wash skin: The worker should wash daily at the end of each work shift.

Remove: No recommendation is made specifying the need for removing clothing that becomes wet or contaminated.

Change: Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premise. (NIOSH, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital.

OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

Physical Properties

Chemical Formula: Cd

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 609.6 ° F (NTP, 1992)

Vapor Pressure: 1 mm Hg at 741 ° F (NTP, 1992)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 8.642 (NTP, 1992)

Boiling Point: 1409 ° F at 760 mm Hg (NTP, 1992)

Molecular Weight: 112.41 (NTP, 1992)

Water Solubility: Insoluble (NIOSH, 2016)

Ionization Potential: data unavailable

IDLH: 9 mg/m3 (as Cd); A potential occupational carcinogen. (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

Interim AEGLs for Cadmium (7440-43-9)

Exposure Period	AEGL-1	AEGL-2	AEGL-3
10 minutes	0.13 mg/m3	1.4 mg/m3	8.5 mg/m3
30 minutes	0.13 mg/m3	0.96 mg/m3	5.9 mg/m3
60 minutes	0.1 mg/m3	0.76 mg/m3	4.7 mg/m3
4 hours	0.063 mg/m3	0.4 mg/m3	1.9 mg/m3
8 hours	0.041 mg/m3	0.2 mg/m3	0.93 mg/m3

(NAC/NRC, 2017)

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Cadmium (7440-43-9)	0.1 mg/m3	0.76 mg/m3	4.7 mg/m3

(DOE, 2016)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Cadmium	7440-43-9			10 pounds	313		
Cadmium Compounds	N078			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- C.I. 77180
- CADMIUM
- CADMIUM DUST (AS CD)
- CADMIUM METAL: CADMIUM

CAMEO Chemicals

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Chemical Datasheet

CADMIUM OXIDE

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
1306-19-0	2570	Poison	COX

NIOSH Pocket Guide
Cadmium fume (as Cd)

International Chem Safety Card
CADMIUM OXIDE

NFPA 704

data unavailable

General Description

Brown crystals or brown amorphous powder. Used as an electroplating chemical and in the manufacture of cadmium electrodes. Is a component of silver alloys, phosphors, semiconductors, glass and ceramic glazes. Formerly used by veterinarians to kill worms and parasites. (EPA, 1998)

Hazards

Reactivity Alerts

none

Air & Water Reactions

Insoluble in water.

Fire Hazard

When heated to decomposition, it emits toxic fumes of cadmium. (Non-Specific -- Cadmium Compounds) Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution. Oxides of cadmium react explosively with magnesium when heated. (EPA, 1998)

Health Hazard

The lethal inhalation dose of cadmium oxide in humans is 2,500 mg/m3 for a 1 minute exposure. Lethal exposure has been established at 50 mg (cadmium)/m3 for 1 hour for cadmium oxide dust and 1/2 hour for the fume. These concentrations may be inhaled without sufficient discomfort to warn worker of exposure. Inhalation may cause acute tracheobronchitis, pneumonitis, and pulmonary edema. Exposure can cause kidney and lung damage. Acute exposure by inhalation may cause death by anoxia. The lowest human toxic inhalation concentration is 8.630 mg/m3/5 hours for the fume. Persons with respiratory disorders should be excluded from contact with this material. (EPA, 1998)

Reactivity Profile

CADMIUM OXIDE reacts violently with magnesium. (NTP, 1992)

Belongs to the Following Reactive Group(s)

- Salts, Basic

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase, in the downwind direction, as necessary, the isolation distance shown above.

FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

Firefighting

(Non-Specific -- Cadmium Compounds) Wear self-contained breathing apparatus and full protective clothing. Move container from fire if you can do so without risk.

(Non-Specific -- Cadmium Compounds) Extinguish with dry chemical, carbon dioxide, water fog, spray, or foam. (EPA, 1998)

Non-Fire Response

If dust is released in a hazardous concentration: (1) remove all ignition sources; (2) ventilate area of release; and (3) collect released material and place in sealed containers in secured sanitary landfill. (Non-Specific -- Cadmium Compounds) Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, keep out of low areas. If pollution of water occurs, notify proper authorities. Do not touch spilled material; stop leak if you can do so without risk. Absorb small spills with sand or other noncombustible absorbent material and place into containers for later disposal.

Small dry spills: with clean shovel place material into clean, dry container and cover; move container from spill area. Dike large spills far ahead for later disposal. (EPA, 1998)

Protective Clothing

Skin: No recommendation is made specifying the need for personal protective equipment for the body.

Eyes: No recommendation is made specifying the need for eye protection.

Wash skin: The worker should wash daily at the end of each work shift.

Remove: No recommendation is made specifying the need for removing clothing that becomes wet or contaminated.

Change: Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premise. (NIOSH, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Warning: Effects may be delayed for hours. Caution is advised.

Signs and Symptoms of Acute Cadmium Oxide Exposure: The following signs and symptoms may be noted following exposure to cadmium oxide: cough, dyspnea (shortness of breath), dry mouth or increased salivation, abdominal pain, nausea, vomiting, bronchitis, and chest pain. Pulmonary edema may develop. Vertigo (dizziness), fever, and profuse sweating are common. Victims may collapse.

Emergency Life-Support Procedures: Acute exposure to cadmium oxide may require decontamination and life support for the victims. Emergency personnel should wear protective clothing appropriate to the type and degree of contamination. Air-purifying or supplied-air respiratory equipment should also be worn, as necessary. Rescue vehicles should carry supplies such as plastic sheeting and disposable plastic bags to assist in preventing spread of contamination.

Inhalation Exposure:
1. Move victims to fresh air. Emergency personnel should avoid self-exposure to cadmium oxide.
2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.
3. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
4. Transport to a health care facility.

Dermal/Eye Exposure:
1. Remove victims from exposure. Emergency personnel should avoid self- exposure to cadmium oxide.
2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.
3. Remove contaminated clothing as soon as possible.
4. If eye exposure has occurred, eyes must be flushed with lukewarm water for at least 15 minutes.
5. Wash exposed skin areas THOROUGHLY with soap and water.
6. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
7. Transport to a health care facility.

Ingestion Exposure:
1. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.
2. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
3. Vomiting may be induced with syrup of Ipecac. If elapsed time since ingestion of cadmium oxide is unknown or suspected to be greater than 30 minutes, do not induce vomiting and proceed to Step

4.Ipecac should not be administered to children under 6 months of age.Warning: Ingestion of cadmium oxide may result in sudden loss of consciousness. Syrup of Ipecac should be administered only if victims are alert, have an active gag-reflex, and show no signs of impending seizure or coma. If ANY uncertainty exists, proceed to Step
4.The following dosages of Ipecac are recommended: children up to 1 year old, 10 mL (1/3 oz); children 1 to 12 years old, 15 mL (1/2 oz); adults, 30 mL (1 oz). Ambulate (walk) the victims and give large quantities of water. If vomiting has not occurred after 15 minutes, Ipecac may be readministered. Continue to ambulate and give water to the victims. If vomiting has not occurred within 15 minutes after second administration of Ipecac, administer activated charcoal.
4. Activated charcoal may be administered if victims are conscious and alert. Use 15 to 30 g (1/2 to 1 oz) for children, 50 to 100 g (1-3/4 to 3-1/2 oz) for adults, with 125 to 250 mL (1/2 to 1 cup) of water.
5. Promote excretion by administering a saline cathartic or sorbitol to conscious and alert victims. Children require 15 to 30 g (1/2 to 1 oz) of cathartic; 50 to 100 g (1-3/4 to 3-1/2 oz) is recommended for adults.
6. Transport to a health care facility. (EPA, 1998)

Physical Properties

Chemical Formula: CdO

Flash Point: data unavailable

Lower Explosive Limit (LEL): This material may burn but does not ignite readily. (EPA, 1998)

Upper Explosive Limit (UEL): This material may burn but does not ignite readily. (EPA, 1998)

Autoignition Temperature: data unavailable

Melting Point: Greater than 2732° F (EPA, 1998)

Vapor Pressure: 1 mm Hg at 1832 ° F (EPA, 1998)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 8.15 Crystalline form 6.95 Amorphous form (EPA, 1998)

Boiling Point: 2838 ° F at 760 mm Hg (sublimes) (NTP, 1992)

Molecular Weight: 128.4 (EPA, 1998)

Water Solubility: less than 1 mg/mL at 68° F (NTP, 1992)

Ionization Potential: data unavailable

IDLH: 9 mg/m3 (as Cd); A potential occupational carcinogen. (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Cadmium oxide (1306-19-0)	0.11 mg/m3	0.87 mg/m3	5.4 mg/m3

(DOE, 2016)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Cadmium Compounds	N078			&	313		
Cadmium oxide	1306-19-0	100/10000 pounds	100 pounds		313c		

"c" indicates that although not listed by name and CAS number, this chemical is reportable under one or more of the EPCRA section 313 chemical categories.

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- CADMIUM FUME

- CADMIUM MONOXIDE
- CADMIUM OXIDE
- CADMIUM OXIDE FUME
- CADMIUM(II) OXIDE
- CDO: CADMIUM MONOXIDE, CADMIUM OXIDE FUME
- NCI-C02551
- NCI-CO2551

CAMEO Chemicals

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Chemical Datasheet

CHROMIUM COMPOUNDS

Chemical Identifiers

CAS Number
none

UN/NA Number
none

DOT Hazard Label
data unavailable

USCG CHRIS Code
none

NIOSH Pocket Guide
none

International Chem Safety Card
none

NFPA 704
data unavailable

General Description
No information available.

Hazards

Reactivity Alerts
none

Air & Water Reactions
No rapid reaction with air. No rapid reaction with water.

Fire Hazard
No information available.

Health Hazard
No information available.

Reactivity Profile
No information available.

Belongs to the Following Reactive Group(s)

- Insufficient Information for Classification

Potentially Incompatible Absorbents
No information available.

Response Recommendations

Isolation and Evacuation
No information available.

Firefighting
No information available.

Non-Fire Response
No information available.

Protective Clothing

No information available.

DuPont Tychem® Suit Fabrics

No information available.

First Aid

No information available.

Physical Properties

Chemical Formula: data unavailable

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Potential: data unavailable

IDLH: data unavailable

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

No PAC information available.

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Chromium Compounds	N090			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- CHROMIUM COMPOUNDS

CAMEO Chemicals

Print

Chemical Datasheet

CHROMIUM

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7440-47-3	1759	Corrosive	none

NIOSH Pocket Guide
Chromium metal

International Chem Safety Card
CHROMIUM

NFPA 704

data unavailable

General Description

PHYSICAL DESCRIPTION: Very hard gray solid with a metallic luster. (NTP, 1992)

Hazards

Reactivity Alerts

- Pyrophoric

Air & Water Reactions

May be pyrophoric, as dust. Insoluble in water.

Fire Hazard

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.). Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. For electric vehicles or equipment, ERG Guide 147 (lithium ion batteries) or ERG Guide 138 (sodium batteries) should also be consulted. (ERG, 2016)

Health Hazard

Exposure Routes: inhalation, ingestion, skin and/or eye contact

Symptoms: Irritation eyes, skin; lung fibrosis (histologic)

Target Organs: Eyes, skin, respiratory system (NIOSH, 2016)

Reactivity Profile

CHROMIUM reacts violently with NH4NO3, N2O2, Li, NO, KClO3, SO2 (NTP, 1992). Metal dusts when suspended in atmospheres of carbon dioxide may ignite and explode.

Belongs to the Following Reactive Group(s)

- Metals, Elemental and Powder, Active

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase, in the downwind direction, as necessary, the isolation distance shown above.

FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

Firefighting

Excerpt from ERG Guide 154 [Substances - Toxic and/or Corrosive (Non-Combustible)]:

SMALL FIRE: Dry chemical, CO2 or water spray.

LARGE FIRE: Dry chemical, CO2, alcohol-resistant foam or water spray. Move containers from fire area if you can do it without risk. Dike fire-control water for later disposal; do not scatter the material.

FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. (ERG, 2016)

Non-Fire Response

SMALL SPILLS AND LEAKAGE: If you spill this chemical, dampen the solid spill material with 5% ammonium hydroxide, then transfer the dampened material to a suitable container. Use absorbent paper dampened with 5% ammonium hydroxide to pick up any remaining material. Your contaminated clothing and the absorbent paper should be sealed in a vapor-tight plastic bag for eventual disposal. Wash all contaminated surfaces with 5% ammonium hydroxide followed by washing with a strong soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.

STORAGE PRECAUTIONS: You should store this material in a refrigerator. (NTP, 1992)

Protective Clothing

Skin: No recommendation is made specifying the need for personal protective equipment for the body.

Eyes: No recommendation is made specifying the need for eye protection.

Wash skin: No recommendation is made specifying the need for washing the substance from the skin (either immediately or at the end of the work shift).

Remove: No recommendation is made specifying the need for removing clothing that becomes wet or contaminated.

Change: No recommendation is made specifying the need for the worker to change clothing after the work shift. (NIOSH, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital.

OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

Physical Properties

Chemical Formula: Cr

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 3452 ° F (NTP, 1992)

Vapor Pressure: 1 mm Hg at 2941 ° F (NTP, 1992)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 7.2 (NTP, 1992)

Boiling Point: 4788 ° F at 760 mm Hg (NTP, 1992)

Molecular Weight: 52 (NTP, 1992)

Water Solubility: Insoluble (NIOSH, 2016)

Ionization Potential: data unavailable

IDLH: 250 mg/m3 (as Cr) (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Chromium (7440-47-3)	1.5 mg/m3	17 mg/m3	99 mg/m3

(DOE, 2016)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Chromium	7440-47-3			5000 pounds	313		
Chromium Compounds	N090			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ALPASTE RRA 030
- ALPASTE RRA 050
- CHROME
- CHROMIUM
- CHROMIUM ELEMENT
- CHROMIUM FULLERIDE (CRC20)
- CHROMIUM METAL

CAMEO Chemicals

Print

Chemical Datasheet

COPPER COMPOUNDS

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
none	none	data unavailable	none

NIOSH Pocket Guide
Copper (dusts and mists, as Cu)

International Chem Safety Card
none

NFPA 704
data unavailable

General Description
No information available.

Hazards

Reactivity Alerts
none

Air & Water Reactions
No rapid reaction with air. No rapid reaction with water.

Fire Hazard
No information available.

Health Hazard
No information available.

Reactivity Profile
No information available.

Belongs to the Following Reactive Group(s)

- Insufficient Information for Classification

Potentially Incompatible Absorbents
No information available.

Response Recommendations

Isolation and Evacuation
No information available.

Firefighting
No information available.

Non-Fire Response
No information available.

Protective Clothing

No information available.

DuPont Tychem® Suit Fabrics

No information available.

First Aid

No information available.

Physical Properties

Chemical Formula: data unavailable

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Potential: data unavailable

IDLH: 100 mg/m3 (as Cu) (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

No PAC information available.

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Copper Compounds	N100			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- COPPER COMPOUNDS

CAMEO Chemicals

Print

Chemical Datasheet

COPPER

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7440-50-8	none	data unavailable	none

NIOSH Pocket Guide
Copper (dusts and mists, as Cu)

International Chem Safety Card
COPPER

NFPA 704

data unavailable

General Description

Reddish lustrous malleable odorless metallic solid.

Hazards

Reactivity Alerts

none

Air & Water Reactions

Solid pieces are very slowly oxidized by air to give a green basic carbonate. Solid pieces become covered by a black oxide when heated in air. Insoluble in water.

Fire Hazard

No information available.

Health Hazard

Exposure Routes: inhalation, ingestion, skin and/or eye contact

Symptoms: Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing; [potential occupational carcinogen]

Target Organs: Eyes, skin, respiratory system, liver, kidneys (increase(d) risk with Wilson's disease) (NIOSH, 2016)

Reactivity Profile

COPPER combines violently with chlorine trifluoride in the presence of carbon [Mellor 2, Supp. 1, 1956]. Is oxidized by sodium peroxide with incandescence [Mellor 2:490-93, 1946-1947]. Forms an unstable acetylide when acetylene is passed over samples that have been heated enough to form an oxide coating. Reacts more rapidly in powdered or granular form. Subject to explosive reaction then mixed in finely divided form with finely divided bromates chlorates and iodates of barium, calcium, magnesium, potassium, sodium, or zinc; these reactions are initiated by heat, percussion, and occasionally light friction [Mellor 2:310, 1946-1947]. A solution of sodium azide in copper pipe with lead joints formed copper azide and lead azide, both of these compounds can detonate [Klotz, 1973].

Belongs to the Following Reactive Group(s)

- Metals, Less Reactive

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

No information available.

Firefighting

No information available.

Non-Fire Response

No information available.

Protective Clothing

Skin: Wear appropriate personal protective clothing to prevent skin contact.

Eyes: Wear appropriate eye protection to prevent eye contact.

Wash skin: The worker should immediately wash the skin when it becomes contaminated.

Remove: Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premise. (NIOSH, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Eye: If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

Skin: If this chemical contacts the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly.

Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.

Swallow: If this chemical has been swallowed, get medical attention immediately. (NIOSH, 2016)

Physical Properties

Chemical Formula: Cu

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 1981 ° F (NIOSH, 2016)

Vapor Pressure: 0 mm Hg (approx) (NIOSH, 2016)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 8.94 (NIOSH, 2016)

Boiling Point: 4703 ° F at 760 mm Hg (NIOSH, 2016)

Molecular Weight: 63.5 (NIOSH, 2016)

Water Solubility: Insoluble (NIOSH, 2016)

Ionization Potential: data unavailable

IDLH: 100 mg/m3 (as Cu) (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Copper (7440-50-8)	3 mg/m3	33 mg/m3	200 mg/m3

(DOE, 2016)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Copper	7440-50-8			5000 pounds	313		
Copper Compounds	N100			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- COPPER
- COPPER METAL DUSTS
- COPPER METAL FUMES

CAMEO Chemicals

Print

Chemical Datasheet

LEAD COMPOUND, SOLUBLE, N.O.S.

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
none	2291	Poison	none

NIOSH Pocket Guide
none

International Chem Safety Card
none

NFPA 704
data unavailable

General Description

Lead compounds are single material, mixtures of two or more solids, or a liquid absorbed on a dry carrier. It has the property of being toxic by ingestion, inhalation (vapor, dust, etc), or skin absorption. If available, obtain the technical name from the shipping papers and contact CHEMTREC, 800-424-9300 for specific response information.

Hazards

Reactivity Alerts
none

Air & Water Reactions
No rapid reaction with air. No rapid reaction with water.

Fire Hazard
Excerpt from ERG Guide 151 [Substances - Toxic (Non-combustible)]:

Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Containers may explode when heated. Runoff may pollute waterways. (ERG, 2016)

Health Hazard
Excerpt from ERG Guide 151 [Substances - Toxic (Non-combustible)]:

Highly toxic, may be fatal if inhaled, swallowed or absorbed through skin. Avoid any skin contact. Effects of contact or inhalation may be delayed. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution. (ERG, 2016)

Reactivity Profile
This record includes many lead compounds, many of which are possibly toxic. These materials do not readily ignite.

Belongs to the Following Reactive Group(s)

- Insufficient Information for Classification

Potentially Incompatible Absorbents
No information available.

Response Recommendations

Isolation and Evacuation
Excerpt from ERG Guide 151 [Substances - Toxic (Non-combustible)]:

As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase, in the downwind direction, as necessary, the isolation distance shown above.

FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

Firefighting

Excerpt from ERG Guide 151 [Substances - Toxic (Non-combustible)]:

SMALL FIRE: Dry chemical, CO2 or water spray.

LARGE FIRE: Water spray, fog or regular foam. Move containers from fire area if you can do it without risk. Dike fire-control water for later disposal; do not scatter the material. Use water spray or fog; do not use straight streams.

FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2016)

Non-Fire Response

Excerpt from ERG Guide 151 [Substances - Toxic (Non-combustible)]:

Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. Cover with plastic sheet to prevent spreading. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. DO NOT GET WATER INSIDE CONTAINERS. (ERG, 2016)

Protective Clothing

Excerpt from GUIDE 151 [Substances - Toxic (Non-combustible)]:

Wear positive pressure self-contained breathing apparatus (SCBA). Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible. (ERG, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Excerpt from ERG Guide 151 [Substances - Toxic (Non-combustible)]:

Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. Move victim to fresh air. Call 911 or emergency medical service. Give artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. For minor skin contact, avoid spreading material on unaffected skin. Keep victim calm and warm. Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed. (ERG, 2016)

Physical Properties

Chemical Formula: data unavailable

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Potential: data unavailable

IDLH: data unavailable

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

No PAC information available.

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Lead Compounds	N420			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- LEAD COMPOUND, SOLUBLE, N.O.S.
- LEAD COMPOUNDS
- LEAD COMPOUNDS, [SOLUBLE]

CAMEO Chemicals

Print

Chemical Datasheet

LEAD

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7439-92-1	none	data unavailable	none

NIOSH Pocket Guide
Lead

International Chem Safety Card
LEAD

NFPA 704

data unavailable

General Description

PHYSICAL DESCRIPTION: Soft silver-bluish white to gray metal. (NTP, 1992)

Hazards

Reactivity Alerts

none

Air & Water Reactions

Insoluble in water.

Fire Hazard

Flash point data for this compound are not available, however, it is probably non-combustible. (NTP, 1992)

Health Hazard

Exposure Routes: inhalation, ingestion, skin and/or eye contact

Symptoms: Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension

Target Organs: Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue (NIOSH, 2016)

Reactivity Profile

In the presence of carbon, the combination of chlorine trifluoride with aluminum, copper, lead, magnesium, silver, tin, or zinc results in a violent reaction [Mellor 2, Supp. 1: 1956]. A solution of sodium azide in copper pipe with lead joints formed copper and lead azide, both are detonating compounds [Klotz 1973]. Sodium acetylide becomes pyrophoric when mixed with metals like lead. Mixtures of trioxane with 60% hydrogen peroxide in contact with metallic lead when heated detonated. Lead containing rubber ignited in a nitric acid atmosphere. Lead is incompatible with strong oxidants such as: ammonium nitrate, chlorine trifluoride, hydrogen peroxide, etc.

Belongs to the Following Reactive Group(s)

- Metals, Less Reactive

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

No information available.

Firefighting

Fires involving this material can be controlled with a dry chemical, carbon dioxide, foam, or Halon extinguisher. (NTP, 1992)

Non-Fire Response

STORAGE PRECAUTIONS: You should store this chemical under refrigerated temperatures, and keep it away from oxidizing materials. (NTP, 1992)

Protective Clothing

Skin: Wear appropriate personal protective clothing to prevent skin contact.

Eyes: Wear appropriate eye protection to prevent eye contact.

Wash skin: The worker should wash daily at the end of each work shift.

Remove: Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premise. (NIOSH, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital.

OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

Physical Properties

Chemical Formula: Pb

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 621.5 ° F (NTP, 1992)

Vapor Pressure: 1.77 mm Hg (NTP, 1992)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 11.3437 at 61 ° F (NTP, 1992)

Boiling Point: 3164 ° F at 760 mm Hg (NTP, 1992)

Molecular Weight: 207.19 (NTP, 1992)

Water Solubility: Insoluble (NTP, 1992)

Ionization Potential: data unavailable

IDLH: 100 mg/m3 (as Pb) (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Lead (7439-92-1)	0.15 mg/m3	120 mg/m3	700 mg/m3

(DOE, 2016)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Lead	7439-92-1			10 pounds	313		
Lead Compounds	N420			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- C.I. 77575
- C.I. PIGMENT METAL 4
- KS-4
- LEAD
- LEAD ELEMENT
- LEAD FLAKE
- LEAD METAL
- LEAD S 2
- LEAD SZ
- PB-S 100
- PLUMBUM
- SSO 1

CAMEO Chemicals

Print

Chemical Datasheet

NICKEL COMPOUNDS

Chemical Identifiers

CAS Number
none

UN/NA Number
none

DOT Hazard Label
data unavailable

USCG CHRIS Code
none

NIOSH Pocket Guide
Nickel metal and other compounds (as Ni)

International Chem Safety Card
none

NFPA 704
data unavailable

General Description
A category of chemicals with a wide variety of colors and appearances. Most are solids, but some are liquids. Properties depend on exact identity of the compound.

Hazards

Reactivity Alerts
none

Air & Water Reactions
No rapid reaction with air. No rapid reaction with water.

Fire Hazard
No information available.

Health Hazard
No information available.

Reactivity Profile
No information available.

Belongs to the Following Reactive Group(s)

- Insufficient Information for Classification

Potentially Incompatible Absorbents
No information available.

Response Recommendations

Isolation and Evacuation
No information available.

Firefighting
No information available.

Non-Fire Response
No information available.

Protective Clothing

No information available.

DuPont Tychem® Suit Fabrics

No information available.

First Aid

No information available.

Physical Properties

Chemical Formula: data unavailable

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Potential: data unavailable

IDLH: 10 mg/m3 (as Ni); A potential occupational carcinogen. (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

No PAC information available.

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Nickel Compounds	N495			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- NICKEL COMPOUNDS

Print

CAMEO Chemicals

Chemical Datasheet

NICKEL

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7440-02-0	none	data unavailable	none

NIOSH Pocket Guide
Nickel metal and other compounds (as Ni)

International Chem Safety Card
NICKEL

NFPA 704

Diamond	Hazard	Value	Description
4 2 1	Health	2	Can cause temporary incapacitation or residual injury.
	Flammability	4	Burns readily. Rapidly or completely vaporizes at atmospheric pressure and normal ambient temperature.
	Instability	1	Normally stable but can become unstable at elevated temperatures and pressures.
	Special		

(NFPA, 2010)

General Description

Lustrous, silvery, odorless metallic solid. Insoluble in water.

Hazards

Reactivity Alerts

- Strong Reducing Agent
- Known Catalytic Activity
- Pyrophoric

Air & Water Reactions

Insoluble in water.

Fire Hazard

No information available.

Health Hazard

Exposure Routes: inhalation, ingestion, skin and/or eye contact

Symptoms: Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]

Target Organs: Nasal cavities, lungs, skin (NIOSH, 2016)

Reactivity Profile

NICKEL METAL is not highly reactive in bulk. A reducing agent. Reacts with (is corroded by) acids to generate flammable hydrogen. Burns when heated in oxygen. Incompatible with oxidizing agents such as oxidizing acids, ammonium nitrate, chlorine, potassium perchlorate, nitryl fluoride. Powdered nickel is much more reactive; can ignite in air [Bretherick 1979 p. 170-171].

Belongs to the Following Reactive Group(s)

- Metals, Elemental and Powder, Active

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

No information available.

Firefighting

No information available.

Non-Fire Response

No information available.

Protective Clothing

Skin: Wear appropriate personal protective clothing to prevent skin contact.

Eyes: No recommendation is made specifying the need for eye protection.

Wash skin: The worker should immediately wash the skin when it becomes contaminated. The worker should wash daily at the end of each work shift.

Remove: Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: Workers whose clothing may have become contaminated should change into uncontaminated clothing before leaving the work premise. (NIOSH, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Skin: If this chemical contacts the skin, immediately flush the contaminated skin with water. If this chemical penetrates the clothing, immediately remove the clothing and flush the skin with water. Get medical attention promptly.

Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.

Swallow: If this chemical has been swallowed, get medical attention immediately. (NIOSH, 2016)

Physical Properties

Chemical Formula: Ni

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 2831 ° F (NIOSH, 2016)

Vapor Pressure: 0 mm Hg (approx) (NIOSH, 2016)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 8.9 (Metal) (NIOSH, 2016)

Boiling Point: 5139 ° F at 760 mm Hg (NIOSH, 2016)

Molecular Weight: 58.7 (NIOSH, 2016)

Water Solubility: Insoluble (NIOSH, 2016)

Ionization Potential: data unavailable

IDLH: 10 mg/m3 (as Ni); A potential occupational carcinogen. (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Nickel (7440-02-0)	4.5 mg/m3	50 mg/m3	99 mg/m3

(DOE, 2016)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Nickel	7440-02-0			100 pounds	313		
Nickel Compounds	N495			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- NICKEL
- NICKEL METAL
- NICKEL METAL: ELEMENTAL NICKEL

CAMEO Chemicals

Print

Chemical Datasheet

NICKEL OXIDE

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
1313-99-1	3288	Poison	none

NIOSH Pocket Guide
Nickel metal and other compounds (as Ni)

International Chem Safety Card
NICKEL(II)OXIDE

NFPA 704

data unavailable

General Description

PHYSICAL DESCRIPTION: Odorless green-black cubic crystals (yellow when hot) or green powder. (NTP, 1992)

Hazards

Reactivity Alerts

none

Air & Water Reactions

Flammable and toxic as dust or fume. Insoluble in water.

Fire Hazard

Flash point data for this chemical are not available. It is probably combustible. (NTP, 1992)

Health Hazard

SYMPTOMS: Exposure to this compound can result in "nickel itch", which includes skin sensitization and itching dermatitis. It may cause intestinal disorders. It may also cause irritation to the eyes, skin and upper respiratory tract. It may cause conjunctivitis. Other symptoms include asthma, epiphora and pulmonary fibrosis. Chronic exposure to this compound may result in lung and nasal cancer. It may also cause sinus and laryngeal cancer.

ACUTE/CHRONIC HAZARDS: This chemical is an irritant of the skin, eyes and upper respiratory tract. When heated to decomposition it may emit toxic fumes and metal oxides. (NTP, 1992)

Reactivity Profile

NICKEL OXIDE may be light-sensitive. It should be thermally stable at temperatures up to 644° F. This compound reacts violently with iodine, hydrogen sulfide and (BaO + air). It is incompatible with anilinium perchlorate and hydrogen peroxide. It incandesces in cold fluorine. (NTP, 1992).

Belongs to the Following Reactive Group(s)

- Salts, Basic

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 151 [Substances - Toxic (Non-combustible)]:

As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase, in the downwind direction, as necessary, the isolation distance shown above.

FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

Firefighting

Fires involving this material can be controlled with a dry chemical, carbon dioxide or Halon extinguisher. A water spray may also be used. (NTP, 1992)

Non-Fire Response

SMALL SPILLS AND LEAKAGE: If you spill this chemical, dampen the solid spill material with 5% ammonium hydroxide, then transfer the dampened material to a suitable container. Use absorbent paper dampened with 5% ammonium hydroxide to pick up any remaining material. Your contaminated clothing and the absorbent paper should be sealed in a vapor-tight plastic bag for eventual disposal. Wash all contaminated surfaces with 5% ammonium hydroxide followed by washing with a soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.

STORAGE PRECAUTIONS: You should protect this material from exposure to light, and store it under ambient temperatures. (NTP, 1992)

Protective Clothing

MINIMUM PROTECTIVE CLOTHING: If Tyvek-type disposable protective clothing is not worn during handling of this chemical, wear disposable Tyvek-type sleeves taped to your gloves.

RECOMMENDED RESPIRATOR: Where the neat test chemical is weighed and diluted, wear a NIOSH-approved half face respirator equipped with an organic vapor/acid gas cartridge (specific for organic vapors, HCl, acid gas and SO2) with a dust/mist filter. (NTP, 1992)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas.

INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital.

OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

Physical Properties

Chemical Formula: NiO

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 3603 ° F (NTP, 1992)

Vapor Pressure: 0 mm Hg at 68 ° F (NTP, 1992)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 6.67 (NTP, 1992)

Boiling Point: data unavailable

Molecular Weight: 74.71 (NTP, 1992)

Water Solubility: less than 1 mg/mL at 68° F (NTP, 1992)

Ionization Potential: data unavailable

IDLH: 10 mg/m3 (as Ni); A potential occupational carcinogen. (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Nickel oxide; (Nickel(II) oxide) (1313-99-1)	0.76 mg/m3	220 mg/m3	1300 mg/m3

(DOE, 2016)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Nickel Compounds	N495			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- BUNSENITE
- C.I. 77777
- GREEN NICKEL OXIDE
- MONONICKEL OXIDE
- NICKEL (T+) OXIDE
- NICKEL MONOOXIDE
- NICKEL MONOXIDE
- NICKEL OXIDE
- NICKEL OXIDE SINTER 75
- NICKEL PROTOXIDE
- NICKEL(2+) OXIDE
- NICKEL(II) OXIDE
- NICKEL(II) OXIDE (1:1)
- NICKEL(II) OXIDE, BLACK
- NICKELOUS OXIDE

CAMEO Chemicals

Print

Chemical Datasheet

ZINC COMPOUNDS

Chemical Identifiers

CAS Number
none

UN/NA Number
none

DOT Hazard Label
data unavailable

USCG CHRIS Code
none

NIOSH Pocket Guide
none

International Chem Safety Card
none

NFPA 704
data unavailable

General Description
No information available.

Hazards

Reactivity Alerts
none

Air & Water Reactions
No rapid reaction with air. No rapid reaction with water.

Fire Hazard
No information available.

Health Hazard
No information available.

Reactivity Profile
No information available.

Belongs to the Following Reactive Group(s)

- Insufficient Information for Classification

Potentially Incompatible Absorbents
No information available.

Response Recommendations

Isolation and Evacuation
No information available.

Firefighting
No information available.

Non-Fire Response
No information available.

Protective Clothing

No information available.

DuPont Tychem® Suit Fabrics

No information available.

First Aid

No information available.

Physical Properties

Chemical Formula: data unavailable

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Potential: data unavailable

IDLH: data unavailable

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

No PAC information available.

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Zinc Compounds	N982			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ZINC COMPOUNDS

Print

Chemical Datasheet

ZINC DUST

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
7440-66-6	1436	Dangerous When Wet Spontaneously Combustible	none

NIOSH Pocket Guide
none

International Chem Safety Card
ZINC POWDER

NFPA 704

data unavailable

General Description

A grayish powder. Insoluble in water. May produce toxic zinc oxide fumes when heated to very high temperatures or when burned. Used in paints, bleaches and to make other chemicals.

Hazards

Reactivity Alerts

- Strong Reducing Agent
- Known Catalytic Activity
- Water-Reactive
- Pyrophoric

Air & Water Reactions

Can evolve gaseous hydrogen in contact with water or damp air. The heat of the reaction may be sufficient to ignite the hydrogen produced [Haz. Chem. Data 1966. p. 171]. Flammable. May form an explosive mixture with air [Hawley].

Fire Hazard

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

Produce flammable gases on contact with water. May ignite on contact with water or moist air. Some react vigorously or explosively on contact with water. May be ignited by heat, sparks or flames. May re-ignite after fire is extinguished. Some are transported in highly flammable liquids. Runoff may create fire or explosion hazard. (ERG, 2016)

Health Hazard

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

Inhalation or contact with vapors, substance or decomposition products may cause severe injury or death. May produce corrosive solutions on contact with water. Fire will produce irritating, corrosive and/or toxic gases. Runoff from fire control may cause pollution. (ERG, 2016)

Reactivity Profile

ZINC METAL is a reducing agent. Reacts violently with oxidants causing fire and explosion hazards [Handling Chemicals Safely 1980. p. 966]. In the presence of carbon, the combination of chlorine trifluoride with zinc results in a violent reaction [Mellor 2, Supp. 1: 1956]. Sodium peroxide oxidizes zinc with incandescence [Mellor 2:490-93 1946-47]. Zinc powder or dust in contact with acids forms hydrogen. The heat generated by the reaction is sufficient to ignite the hydrogen evolved [Lab. Govt. Chemist 1965]. A mixture of powdered zinc and an oxidizing agent such as potassium chlorate or powdered sulfur can be exploded by percussion. Zinc burns in moist chlorine. A mixture of zinc and carbon disulfide reacts with incandescence. Zinc powder reacts explosively when heated with manganese chloride. The reaction between zinc and selenium or tellurium is accompanied by incandescence [Mellor 4:476-480 1946-47]. When zinc and ammonium nitrate are mixed and wetted with a minimum of water, a violent reaction occurs with evolution of steam and zinc oxide. When hydrazine mononitrate is heated in contact with zinc a flaming decomposition occurs at temperatures a little above its melting point. Hydroxylamine is reduced when heated with zinc dust, unpredictably it may either ignite and burn or explode [Mellor 8 1946-47].

Belongs to the Following Reactive Group(s)

- Metals, Elemental and Powder, Active

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase, in the downwind direction, as necessary, the isolation distance shown above.

FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

Firefighting

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

DO NOT USE WATER OR FOAM.

SMALL FIRE: Dry chemical, soda ash, lime or sand.

LARGE FIRE: DRY sand, dry chemical, soda ash or lime or withdraw from area and let fire burn. Move containers from fire area if you can do it without risk.

FIRE INVOLVING METALS OR POWDERS (ALUMINUM, LITHIUM, MAGNESIUM, ETC.): Use dry chemical, DRY sand, sodium chloride powder, graphite powder or Met-L-X® powder; in addition, for Lithium you may use Lith-X® powder or copper powder. Also, see ERG Guide 170.

FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. (ERG, 2016)

Non-Fire Response

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not touch or walk through spilled material. Stop leak if you can do it without risk. Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. DO NOT GET WATER on spilled substance or inside containers.

SMALL SPILL: Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain. Dike for later disposal; do not apply water unless directed to do so.

POWDER SPILL: Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry. DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. (ERG, 2016)

Protective Clothing

Excerpt from GUIDE 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

Wear positive pressure self-contained breathing apparatus (SCBA). Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible. (ERG, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Excerpt from ERG Guide 138 [Substances - Water-Reactive (Emitting Flammable Gases)]:

Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. Move victim to fresh air. Call 911 or emergency medical service. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Remove and isolate contaminated clothing and shoes. In case of contact with substance, wipe from skin immediately; flush skin or eyes with running water for at least 20 minutes. Keep victim calm and warm. (ERG, 2016)

Physical Properties

Chemical Formula: Zn

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: data unavailable

Vapor Pressure: data unavailable

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: data unavailable

Water Solubility: data unavailable

Ionization Potential: data unavailable

IDLH: data unavailable

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Zinc (7440-66-6)	6 mg/m3	21 mg/m3	120 mg/m3

(DOE, 2016)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Zinc	7440-66-6			1000 pounds			
Zinc (fume or dust)	7440-66-6			1000 pounds	313		
Zinc Compounds	N982			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ASARCO L 15
- BLUE POWDER
- ECKA 4
- F 1000
- F 1000 (METAL)
- F 2000
- F 2000 (METAL)
- LS 2
- LS 2 (ELEMENT)
- LS 4
- LS 5
- RHEINZINK
- UF

- UF (METAL)
- VM 4P16
- ZINC
- ZINC (FUME OR DUST)
- ZINC DUST
- ZINC METAL, [POWDER OR DUST]
- ZINC POWDER

CAMEO Chemicals

Print

Chemical Datasheet

ZINC OXIDE, CRUDE

Chemical Identifiers

CAS Number	UN/NA Number	DOT Hazard Label	USCG CHRIS Code
1314-13-2	3077	Class 9	none

NIOSH Pocket Guide
Zinc oxide

International Chem Safety Card
ZINC OXIDE

NFPA 704

data unavailable

General Description

Crude zinc oxide is a yellow-gray granular solid with no odor. It is insoluble in water. The primary hazard is the threat posed to the environment. Immediate steps should be taken to limit its spread to the environment. Prolonged inhalation of the dust may result in metal fume fever with symptoms of chills, fever, muscular pain, nausea and vomiting.

Hazards

Reactivity Alerts

none

Air & Water Reactions

Slowly decomposed (hydrolyzed) in water. Insoluble in water.

Fire Hazard

Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

Some may burn but none ignite readily. Containers may explode when heated. Some may be transported hot. For UN3508, be aware of possible short circuiting as this product is transported in a charged state. (ERG, 2016)

Health Hazard

Exposure Routes: inhalation

Symptoms: Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function

Target Organs: respiratory system (NIOSH, 2016)

Reactivity Profile

ZINC OXIDE is insoluble in water. What little solubility it has yields aqueous solutions that are neutral in pH. Intimate mixtures of zinc oxide and chlorinated rubber with or without hydrocarbons or chlorinated solvent react violently, even explosively upon heating [Chem. Trade J., 1962, 151, 672]. Slow addition of zinc oxide to cover the surface of linseed oil varnish caused generation of heat and ignition, [Chem. Trade J., 1933, 92, 278].

Belongs to the Following Reactive Group(s)

- Salts, Basic

Potentially Incompatible Absorbents

No information available.

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase, in the downwind direction, as necessary, the isolation distance shown above.

FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)

Firefighting

Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

SMALL FIRE: Dry chemical, CO2, water spray or regular foam.

LARGE FIRE: Water spray, fog or regular foam. Do not scatter spilled material with high-pressure water streams. Move containers from fire area if you can do it without risk. Dike fire-control water for later disposal.

FIRE INVOLVING TANKS: Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. (ERG, 2016)

Non-Fire Response

Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent dust cloud. Avoid inhalation of asbestos dust.

SMALL DRY SPILL: With clean shovel, place material into clean, dry container and cover loosely; move containers from spill area.

SMALL SPILL: Pick up with sand or other non-combustible absorbent material and place into containers for later disposal.

LARGE SPILL: Dike far ahead of liquid spill for later disposal. Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent entry into waterways, sewers, basements or confined areas. (ERG, 2016)

Protective Clothing

Skin: No recommendation is made specifying the need for personal protective equipment for the body.

Eyes: No recommendation is made specifying the need for eye protection.

Wash skin: No recommendation is made specifying the need for washing the substance from the skin (either immediately or at the end of the work shift).

Remove: No recommendation is made specifying the need for removing clothing that becomes wet or contaminated.

Change: No recommendation is made specifying the need for the worker to change clothing after the work shift. (NIOSH, 2016)

DuPont Tychem® Suit Fabrics

No information available.

First Aid

Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible. (NIOSH, 2016)

Physical Properties

Chemical Formula: OZn

Flash Point: data unavailable

Lower Explosive Limit (LEL): data unavailable

Upper Explosive Limit (UEL): data unavailable

Autoignition Temperature: data unavailable

Melting Point: 3587 ° F (NIOSH, 2016)

Vapor Pressure: 0 mm Hg (approx) (NIOSH, 2016)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: data unavailable

Boiling Point: data unavailable

Molecular Weight: 81.4 (NIOSH, 2016)

Water Solubility: 0.0004 % at 64° F (NIOSH, 2016)

Ionization Potential: data unavailable

IDLH: 500 mg/m3 (NIOSH, 2016)

AEGLs (Acute Exposure Guideline Levels)

No AEGL information available.

ERPGs (Emergency Response Planning Guidelines)

No ERPG information available.

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Zinc oxide (1314-13-2)	10 mg/m3	15 mg/m3	2500 mg/m3

(DOE, 2016)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Zinc Compounds	N982			&	313		

& indicates that no RQ is assigned to this generic or broad class, although the class is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985).

(EPA List of Lists, 2015)

DHS Chemical Facility Anti-Terrorism Standards (CFATS)

No regulatory information available.

OSHA Process Safety Management (PSM) Standard List

No regulatory information available.

Alternate Chemical Names

- ZINC OXIDE
- ZINC OXIDE, CRUDE
- ZINC PEROXIDE

Appendix F

Job Hazard Analysis Forms

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐ Office ☐ Construction	☒ New ☐ Revised	Date: 2/15/2022
Office: Tukwila Client: Bridge	Location: Former Maralco Aluminum Property, 7730 South 202nd Street, Kent, WA	
Work Type: Remedial Investigation	Work Activity: Site Inspection, Investigation, Sampling	

Personal Protective Equipment (PPE): Minimum PPE is Level D including: Hard hat, safety glasses or goggles, steel-toed boots, high visibility safety vest, hearing protection as needed, and gloves as needed (type dependent on job-specific requirements).

Additional PPE may be required in any site-specific Health & Safety Plan (HASP) available. Also refer to the HASP for air monitoring and emergency procedures.

Development Team	Position/Title	Reviewed By	Position/Title	Date
Rusty Jones	Project Geologist	Jamie Stevens	Senior Engineer	2/15/22

❶ Job Steps	❷ Potential Hazard	❸ Critical Actions
1. All Onsite Activities	Slips/Trips/Falls Heat/Cold Stress Biological Hazards	• Keep all areas free of excess materials and debris and clear all walking paths. • Monitor onsite workers for signs of heat/cold stress and ensure that necessary breaks are taken. • Use insect repellant and check areas for signs of snakes, spiders, poisonous plants, ticks and mosquitoes • Maintain a clear line of sight.
2. Utility Locate	Explosion, electrocution, injury, death or property damage	• Contact public utility locate and have utilities marked out around the site. • Oversee a private onsite utility locate. • Review locations against construction drawings and known utilities • If necessary, clear upper eight feet of intended drilling location with an air/knife/vacuum truck
3. Equipment Inspections	Leaks, defective or damaged parts, slip/trip/fall hazards, fuel/oil spills, fire hazards, pinch points	• Conduct thorough inspections of all equipment at the beginning of each day and throughout the day, as appropriate. • Check for leaking hoses or fittings, loose connections, functional controls, functional emergency shutoff and damaged equipment • Identify pinch points • Check that a spill kit is available for use on site in the event of a spill or that secondary containment is provided. • Clear working areas of all unnecessary equipment.

4. Equipment Set Up	Flying debris, pinch points	• Identify pinch points • Use a spotter to locate drill rig • Delineate work area with delineators or equivalent • Establish a support zone and set up sampling equipment outside of drill rig work zone • Use designated hand signals to approach drill crew • Engage outriggers • Lower drill rig derrick prior to moving the rig
5. Concrete Coring (if necessary)	Sharp objects, rotating parts, electric tools and power equipment, hot objects	• Buddy system lifting heavy objects (drill press). • Drill in marked, approved (utility and rebar cleared) areas only. • Anchor/bolt/clamp drill machine to ground or other secure objects to prevent movement while in use. • Keep hands and feet away from the rotating drill bit at all times. Avoid loose fitting clothes around powered machine. • Use water or non-toxic, approved coolant to cool drill bits, parts, and coring surface, vacuuming/recovering the coolant during and after use. • Wear hearing protection as needed in proximity to loud equipment.
6. Drilling Operation	Flying debris, pinch points, back strain, cross-contamination, struck by drill rig derrick, chemical exposure, clothing caught in rotating equipment, hearing loss	• Keep hands and feet away from the drill stem while in motion • Wear all appropriate PPE (incl. hearing protection) • Decontamination all equipment prior to use. • Avoid lifting heavy equipment and use the buddy system for heavy objects • Assure that the drill rig derrick is secured • Make sure all guards are in place while drilling operations are underway. • Do not wear loose fitting clothes or jewelry
7. Collecting Soil and/or Samples	Pinch points, back strain, knee strain, chemical exposure	• Identify pinch points • Wear all appropriate PPE • Place soil core samples on an elevated surface (portable table) to avoid bending. • Keep hands clear while core samples are removed from the drill stem • Sample containers may be glass and can break if handled roughly. Look into coolers before reaching into coolers in case broken glass. • Sample jars may contain acid preservatives. Wear nitrile gloves and safety glasses and check containers lids frequently.

8. Monitoring Well Construction	Back strain, pinch points, chemical exposure, hearing loss	• Identify pinch points • Wear all appropriate PPE • Use proper lifting technique and avoid lifting more than one bag of sand or bentonite at a time • Avoid bending while pouring sand pack or bentonite seal • Keep hands and feet clear as drill stem is raised out of the borehole
9. Well Box Construction	Back strain, knee strain, vehicle hazards	• Delineate work area with delineators or equivalent so you can be seen when vehicles or equipment are being moved. • Avoid lifting heavy objects without assistance • Avoid bending while laying the concrete • Wear knee pads when kneeling.
10. Backfilling Soil Borings	Back strain	• When soil borings are not completed as monitoring wells, borings must be backfilled with bentonite. • Avoid lifting more than one bag of bentonite at a time • Take breaks as necessary.
11. Equipment Decontamination	Cross-contamination, chemical exposure, back strain	• Use Alconox or Liquinox to decontaminate all equipment with potential to contact soil or groundwater • Ask for help when moving heavy or awkward equipment. • Wear all appropriate PPE
12. Debris and Waste Management	Spills, chemical exposure, regulatory infractions, back strain, pinch points	• Ensure that all soil cuttings, decontamination water and purge water are properly contained and labeled • Use a drum dolly or lift to move any drums onsite. • Clear a path before moving drums • Prepare a bill of lading for all waste to be moved from site.
13. Demobilization	Chemical exposure, back strain, pinch points	• Avoid lifting heavy or awkward objects without help. • Wear all appropriate PPE • Ensure that all equipment has been decontamination prior to repacking. • Ensure that all equipment is securely put away and tied down.