Soil, Groundwater, and Tier II Vapor Intrusion Assessment Report

Parcel 40
Port of Tacoma

Project Number: 013PT-006 TO3

Prepared for:
Port of Tacoma
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Tacoma, WA 98421

January 27, 2022

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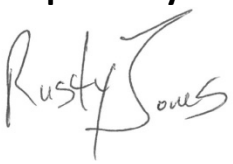

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1 Introduction

This document presents a Tier II vapor intrusion (VI) site assessment and the results of a soil and groundwater investigation performed by Crete Consulting Incorporated, PC (CRETE) on behalf of the Port of Tacoma (Port) at the Parcel 40 Maintenance Building (site)[1]. The Site is located at 1675 Lincoln Avenue, Tacoma, Washington 98421 (Figure 1). It is currently leased to SSA Terminals and operated as a maintenance facility for a marine cargo terminal. The property is listed (Facility Site ID 66987611) with the Washington State Department of Ecology (Ecology). This report documents investigation activities conducted during 2020 and incorporates data from multiple previous investigations and interim actions.

1.1 Property History

The Site appears to have been undeveloped until the 1920s (tacomaMAP 2021). The adjacent property[2] to the east was owned, developed, and operated as a railyard between 1905 and 1980 by Chicago, Milwaukee, St. Paul, and Pacific Railroad Company. The railyard was the company's primary west coast facility for train maintenance and repair (Ecology 1991). According to the 1940, 1950, and 1973 aerial imagery, rail lines associated with the railyard crossed onto the northern corner of the Site (tacomaMAP 2021).

In the 1930s, the True's Oil Company constructed a 1.25 million gallon above-ground fuel storage tank on the subject property. In 1942 Chicago, Milwaukee, St. Paul, and Pacific Railroad Company purchased the True's Oil Company facility (Appendix A, drawing 5A-531). Available aerial imagery and historical drawings from the 1940s show the tank surrounded by an earthen berm for secondary containment (tacomaMAP 2021, Appendix A). Several pipelines ran to and from the tank area; available drawings show pipes labeled "Diesel oil," "Oil & Steam," and "Steam (Ret.)" (Port of Tacoma 1983). Select historical documents are included in Appendix A. The timing of tank construction is consistent with the beginning of widespread use of diesel locomotives. Figure 2 illustrates the former location of the True's Oil tank and piping; historical fuel storage tank locations are pulled from historical documents (Appendix A). In 1979, the Port acquired the property from Union Pacific Railroad, successor to the Chicago, Milwaukee, St. Paul, and Pacific Railroad Company. The True's oil tank was removed in about 1981 and the associated piping located in the vicinity of Building 600 is believed to have been removed in about 1984 (Port of Tacoma 1983; Appendix A). The extent of underground piping removal in this area is not known.

The current Site infrastructure was constructed in the early 1980s during property redevelopment for Tacoma Terminals, Inc. (known later as Sealand, Maersk, and finally APMT), a marine terminal operator. The primary structure is a large service garage now known as Building 600 (McGranahan et al. 1984). The northeast end of Building 600 was built over the former footprint of the True's Oil tank (Figure 2). Construction included installation of a 3,000-gallon

[1] Tax parcel no. 8950000221 and 8950000231.
[2] Tax parcel no. 5000350690.

waste oil underground storage tank (UST) on the south side of Building 600 and the installation of a 20,000-gallon diesel UST and a 1,000-gallon gasoline UST at a fuel shed located about 70 to 120 east of the easternmost corner of Building 600. The 3,000 gallon waste oil UST was removed in 1998. The diesel and gasoline USTs are still in use by the current tenant, SSA Marine, to fuel hustlers and trucks[3].

The Site surface is currently paved with asphalt and concrete and is generally flat at an elevation of approximately 18 to 19 feet Mean Lower Low Water (MLLW). To the north is East 11th Street and further north is the marine terminal yard. To the east is a paved lot where terminal cargo is staged adjacent to Milwaukee Way and the South Intermodal Yard. To the south is Lincoln Avenue, where truck traffic enters/exits the Port terminals. To the west is the Puyallup River, which flows north to Commencement Bay.

1.2 Previous Cleanup Activities

In August 1983, a strong fuel odor was noted in a test pit completed to support property redevelopment. The test pit (TP-20) was located in the area where the 3,000-gallon waste oil tank was later installed (Hart Crowser 1983).

In the late 1990s, a lube oil line running between the fuel shed and Building 600 was discovered to be leaking by terminal personnel. The line was subsequently abandoned in place. The dates of release, the release volume, and abandonment methods are unknown (GCI 2000).

In December 1998, the 3,000-gallon waste oil UST was removed to meet new Ecology guidelines. During tank excavation a strong diesel odor was noted and free petroleum product was visible on the surface of the groundwater. The assessment report concluded that the release encountered in the excavation of the waste oil tank was from previous releases and was not due to a release from the waste oil tank (CETI 1999). A Phase 2 investigation including soil sampling and monitoring well installation with subsequent groundwater sampling was conducted in January 2000 (GCI 2000). The investigation found that the soil and groundwater contained diesel- and oil-range petroleum. Following that investigation, the Port reported the discovery of soil and groundwater containing diesel and oil at the Site to Ecology (Port of Tacoma 2000). Additional investigation work, led by the Port, culminated in a focused feasibility study that presented a preferred remedial action of monitored natural attenuation in conjunction with a passive free product recovery system (Geoengineers 2001, 2002).

Passive skimming activities to recover free product were conducted at the Site by Shaw Environmental from May 2002 through at least November 2003 (termination period undetermined). Skimming activities were conducted using a peristaltic pump and tubing extended into the free product at recovery wells ITC-RW-1 and ITC-RW-2. A total of 16 gallons of

[3] AMPT vacated the property in 2017, SSA Marine took occupancy shortly thereafter.

free product was recovered during this documented period (Shaw 2003). There are no records of free product recovery after December 2003. The last groundwater sampling event was conducted in November 2002.

In 2019, soil and groundwater sampling was conducted by Anchor QEA on behalf of the Port to support decommissioning of the remaining 20,000-gallon diesel UST and the 1,000-gallon gasoline UST. Decommissioning was being pursued by the Port due to the age of the two tanks. A UST assessment was completed in August 2019 (Anchor QEA 2020). During the same period, a round of groundwater samples was collected from the groundwater monitoring well network installed in early 2000s (Anchor QEA 2019). Soil and groundwater samples were analyzed for gasoline-range organics (TPH-GRO), diesel- and oil-range organics (TPH-DRO/ORO) and benzene, toluene, ethylbenzene, and xylenes (BTEX). The UST report suggested that the impacts near the USTs were likely associated with historical contamination related to petroleum storage tanks and pipelines. Benzene was detected above the vapor intrusion groundwater screening criteria at monitoring well GEI-MW-1 (Figure 2), located just outside the eastern wall of Building 600[4]. The report identified data gaps in the groundwater plume mapping and recommended performing a tidal study, sampling for natural attenuation indicators, and a vapor intrusion assessment at Building 600 due to the presence of elevated benzene at monitoring well GEI-MW-1 (Anchor QEA 2019).

1.3 Adjacent Properties

The eastern adjacent site is known as the Former Milwaukee Way Railyard[5] and was owned by Union Pacific Railroad until 1995. The property is currently owned by the Port of Tacoma and is listed as Cleanup Site 5002 and Facility ID 1251 with Ecology. The Former Milwaukee Railyard had historical petroleum hydrocarbon contamination with up to 3 separate plumes of free phase product, primarily diesel fuel. Contaminated soils have been excavated from the site and free product removal has been conducted by multiple methods. Additionally, wood preserving chemicals, such as pentachlorophenol, chromium, and arsenic have been reported in the soil and groundwater (Ecology 2021). Ecology has determined that NAPL remains in the groundwater at this site (Ecology 2011) and the remaining residual NAPL is not impacting groundwater (Shaw 2008).

A former 14,000-gallon diesel UST and associated loading racks on the Railyard were located approximately 200 feet to the northeast of Building 600 and an area of known contamination was documented in the Prospective Purchaser Consent Decree (Ecology 1995) as indicated on Figure 2. Documented contamination included a TPH soil concentration of 46,000 mg/kg at 7 feet

[4] Benzene results from GEI-MW-1 were 42.2 µg/L (sample collection on August 21, 2019), compared to the MTCA Method C Cancer vapor intrusion screening level of 24 µg/L.

[5] Also known as the Union Pacific Railroad site.

below ground surface (bgs) at AGI TP-40 (AGI 1990), located immediately north of the former diesel UST and free product located slightly further to the northeast.

1.4 Site Screening Levels

The site qualifies as an industrial property (WAC 173-340-745), therefore industrial screening levels are appropriate for the site. Site soil data are compared to Model Toxics Cleanup Act (MTCA) industrial screening levels and site groundwater data is compared to screening levels protective of surface water, vapor intrusion, and groundwater exposure.

Vapor data results are compared to MTCA screening levels and American Conference of Governmental Industrial Hygienists (ACGIH) screening levels for Total Petroleum Hydrocarbons (TPH) air-phase petroleum hydrocarbons. Screening levels are presented on the analytical data summary tables (Tables 1 through 5).

2 Investigation Activities and Results

Groundwater monitoring well redevelopment and sampling activities conducted in 2019 (AnchorQEA 2019) confirmed the presence petroleum contamination in soil and groundwater and also identified benzene in groundwater at GEI-MW-1 exceeding the vapor intrusion screening level. The investigation activities described herein were designed to define the extent of soil and groundwater contamination and assess vapor intrusion. All work was completed based on the *Direct Push Soil, Groundwater, and Tier II Vapor Intrusion Assessment Work Plan* (CRETE 2020). This section discusses the results of the vapor intrusion assessment (Section 2.1) and the soil and groundwater investigation (Section 2.2).

2.1 Vapor Intrusion Assessment

The vapor intrusion assessment followed *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action* (Ecology 2009). The guidance outlines a two-tiered approach; Tier I: compare shallow groundwater concentration data to generic groundwater screening levels (SLs) to evaluate the need for further VI assessment; and, Tier II: conduct indoor air sampling. CRETE conducted a Tier I and Tier II VI assessment. The Tier II assessment and the soil and groundwater sampling plan is documented in the *Direct Push Soil, Groundwater, and Tier II Vapor Intrusion Assessment Work Plan* (CRETE 2020).

The vapor intrusion pathway was assessed by collecting and analyzing groundwater samples for volatile organic compounds in and around the area of elevated benzene detected in monitoring well GEI-MW-1 in 2019 (Tier I) and by performing subsequent ambient and indoor air sampling in Building 600(Tier II). A site-specific TPH MTCA cleanup level was calculated for screening the indoor air results. Measured TPH concentrations (sum of APH ranges and VOCs) exceeded the site-specific TPH screening level in all five indoor air samples (Table 1). As a result, the consultant recommended that the Port plan for a proactive solution to minimize vapor intrusion (EMB 2020). The Port decided to install a sub-slab depressurization system (SSDS). The SSDS is designed to achieve lower sub-slab air pressure relative to indoor air pressure by using fans or a blower to draw air from beneath the slab. During design and permitting work for the SSDS, two sub-slab vapor samples were collected to evaluate the potential need for a Puget Sound Clear Air Agency (PSCAA) permit and emission controls. The data are provided in this report for reference. Design and permitting of the SSDS are discussed in a separate report (CRETE 2021).

2.1.1 Tier I: Volatile Organic Compound Groundwater Sampling

Based on the 2019 identification of benzene in groundwater at GEI-MW-1 that exceeded the vapor intrusion screening level, groundwater samples were collected from select monitoring wells to assess whether other volatile organic compounds could also present a vapor intrusion risk. In March 2020, low-flow groundwater samples were collected from 4 monitoring wells (GEI-MW-1, GEI-MW-5, GEI-MW-8, and GEI-MW-9) and one recovery well (ITC-RW-1) and submitted

to Friedman & Bruya (FBI) for analytical testing. ITC-RW-1 exhibited measurable free phase product (0.89-feet thickness) and was initially sampled in the field, but the sample was not submitted for analysis due to presence of free phase product. Samples were submitted for analysis of volatile organic constituents (VOCs) by EPA Method 8260 (conducted by FBI) and volatile petroleum hydrocarbons (VPH) by Method NWVPH (conducted by Freemont Analytical laboratories). Groundwater sample results from the well GEI-MW-1 indicated that benzene and volatile petroleum hydrocarbons (VPH) are present at concentrations above the MTCA groundwater screening level for protection of indoor air (24 micrograms per liter [µg/L] and 6.4 µg/L, respectively). Measured benzene concentrations in groundwater from GEI-MW-1 ranged between 35.7 µg/L (March 26, 2020) and 42.2 µg/L (August 21, 2019; AnchorQEA 2019). VPH (Aliphatic (C8-C10) + (C10-C12)) was detected at 2 site wells, GEI-MW-1 and GEI-MW-9 at concentrations of 268.2 µg/L and 201.3 µg/L, respectively. Well locations are shown on Figure 2. Based on these exceedances of the screening criteria, a Tier II assessment was performed.

2.1.2 Tier II: Indoor and Ambient Air Sampling

In July 2020, EMB Consulting, LLC performed indoor and ambient air sampling at Building 600. Sampling was conducted over a holiday weekend (July 4 and 5) when Building 600 was not in use. A brief summary of the results is presented below. The full report is provided in Appendix B. Sample locations are indicated on Figure 3 and analytical results are provided in Table 1.

Two ambient air samples were collected, one from the upwind side of Building 600 (east) and one downwind (west). The ambient air samples did not have detectable concentrations of VOCs, with the exception of naphthalene, which was detected in both samples.

Four indoor air samples were collected: one in each working bay (east and west), one in the central office area, and one in the parts room. VOCs were detected above laboratory reporting levels (RLs) in all indoor samples, but none were detected at concentrations above the MTCA Method C indoor air screening levels for industrial properties. VOCs commonly found in paint (toluene, ethylbenzene, and xylenes) were identified in higher concentrations in the West Bay of Building 600, which is close to the paint booth. Sample locations are shown in Figure 3.

Air-Phase Petroleum Hydrocarbon (APH) EC5-8 aliphatics and EC9-12 aliphatics were detected in all indoor air samples. APH EC9-10 aromatics were not identified in any indoor air sample above the RL. The default MTCA indoor air screening level for TPH compounds (or APH fractions) is 140 ug/m3. A site-specific TPH MTCA cleanup level of 310 µg/m^3 was calculated for screening the APH results. APH ranges and detectable VOCs exceeded the site-specific TPH screening level in all five indoor air samples (Table 1). The APH EC5-8 aliphatic concentrations are higher in the west portion of Building 600 than the east portion; APH EC9-12 aliphatics are higher in the east portion of the Building 600 than the west portion. The reason for this difference cannot be determined based on the available data. There were chemicals present in east and west building bays, but not in the central areas sampled (offices). Many of the chemical products onsite are petroleum based, but considering the types and volumes of products observed, these chemical

products are not likely to generate concentrations of APH aliphatics identified across the building space. Based on the results of the indoor air assessment, it appears likely that petroleum hydrocarbons in soil and groundwater beneath the building are impacting indoor air through vapor intrusion (EMB 2020).

2.1.3 Sub-Slab Vapor Sampling

In October 2020, two sub-slab samples were collected from below the concrete slab of Building 600. One sample was collected in the Parts Room (SSV-Parts) and one sample was collected in the East Bay (SSV-E Bay), as shown on Figure 3. These data are provided in Table 1 and Appendix B. APH EC5-8 aliphatics were detected beneath the East Bay while APH EC9-12 aliphatics were detected below the Parts Room. MTCA does not have final screening levels for sub-slab samples; draft values are included in the Guidance for Evaluating Soil Vapor Intrusion in Washington State (Ecology 2018a) and a generic TPH sub-slab screening level of 4,700 µg/m^3 was provided in Implementation Memorandum 18 (Ecology 2018b). The TPH results for the sub-slab samples were below this screening level. Sub-slab sample results were not detected above laboratory reporting limits for BTEX compounds and laboratory reporting limits were below sub-slab screening levels (Table 1). Although the sub-slab vapor samples were below screening levels, TPH was above the screening level in indoor air and benzene, TPH-GRO, and TPH-DRO were present above cleanup levels in soil and groundwater adjacent to and likely below the building, including the presence of free product. Additional sub-slab vapor sampling would likely encounter elevated concentrations since sub-slab and indoor air sample results can vary spatially and temporally depending on many factors (e.g. barometric pressure and trend, temperature, warehouse bay doors open/closed).

2.2 Soil and Groundwater Investigation

Soil and groundwater sampling were conducted from March 2020 through November 2020 in the following phases.

- March 26, 2020: Tier I VOC sampling, discussed in Section 2.1.1, included collection of groundwater samples from 5 site monitoring wells, GEI-MW-1, GEI-MW-5, GEI-MW-8, GEI-MW-9 and ITC-RW1; analytical results are summarized in Table 2.

- June 12 and August 5 through 6, 2020: Two days of direct push investigation were performed to collect soil and groundwater from borehole and temporary wells (Section 2.2.1) to refine the understanding of site conditions and the extent of subsurface contamination; analytical results are summarized in Tables 3 and 4.

- October 4, 2020: Two additional monitoring wells (MW-10 and MW-11) were installed to address data gaps (Section 2.2.2), and water level and light non-aqueous phase liquid (LNAPL) gauging was conducted on October 25, 2020 (Section 2.2.3).

- November 2020: A tidal study (November 2 through 6) and groundwater sampling (November 19 through 20) of the monitoring well network (ten wells) were conducted (Sections 2.2.4 and 2.2.5). Groundwater samples were collected from all site monitoring wells (GEI-MW-1, GEI-MW-2, GEI-MW-3, GEI-MW-4, GEI-MW-5, GEI-MW-6, GEI-MW-8, GEI-MW-9, MW-10 and MW-11). Table 5 summarizes analytical results and Table 6 summarizes field parameters.

Borehole logs are provided in Appendix C. Groundwater sampling forms are included in Appendix D. Laboratory reports for soil and groundwater data are provided in Appendix E.

2.2.1 Direct Push Investigation

The initial direct push mobilization on June 12, 2020 included five boreholes in the immediate vicinity of GEI-MW-1 along the northeast side of Building 600 to determine the extent of elevated benzene in groundwater (SB-1 through SB-5), and four locations around the remaining perimeter of the building to define the extent of the elevated TPH in groundwater (SB-6 through SB-9). The second mobilization on August 5 and 6, 2020 included eight borehole locations and was intended to fill in data gaps and step out from locations with known impacts (SB-10 through SB-16). ESN Northwest, a Washington licensed driller, used a direct push technology (DPT) soil coring rig to collect soil and groundwater samples. Soil borehole locations are shown on Figure 4.

Soil cores were collected on 5-foot intervals to a depth of 15 feet bgs at all locations. Four locations, SB-01D, SB-08D, SB-10D, and SB-12D were advanced to 25-feet bgs for investigation into the saturated zone.

Various hydrocarbon odors and/or sheens were noted at 5 to 15 feet bgs at SB-01, SB-03, SB-05, SB-06, at 4.5 to 15 feet bgs at SB-02, SB-04, at 10.9 to 15 feet bgs at SB-07, and at 6.5 to 15 feet bgs at SB-09, 7.7 to 15 feet bgs at SB-11, and 3.8 to 14 feet bgs at SB-13 (See borehole logs in Appendix C for specific observations). Based on PID-screening measurements and odor and visual observations, up to two soil samples were collected from each soil borehole. Where there was no indication of contamination, a soil sample was collected at the water table. Soil sample depths and results are provided in Table 3 and the laboratory reports are provided in Appendix E.

All soil samples from SB-01 through SB-05, and SB-09 were analyzed for diesel- and oil-range organics (TPH-DRO/ORO) by Method NWTPH-Dx, gasoline range organics (TPH-GRO) by Method NWTPH-Gx, and for BTEX by EPA Method 8021 in areas of suspected benzene impacts. Soil samples from SB-06, SB-07, and SB-08 were analyzed for TPH-DRO/ORO. Soil sample depths and results are provided on Table 3 and the laboratory report is provided in Appendix E.

Grab groundwater samples were collected from all soil borehole locations using a stainless steel screen lowered into the borehole. Dedicated HDPE tubing and a peristaltic pump were used to purge the temporary well for typically 5 to 10 minutes or until the purge water became generally less turbid, whichever occurred first. Temporary wells were screened from 11 to 15 feet bgs.

Deeper grab groundwater samples were collected at 21 to 25 feet bgs at SB-01D, SB-08D, SB-10D, and SB-12D. All grab groundwater samples were analyzed for TPH-DRO/ORO (with and without silica gel column [SGC]), TPH-GRO, and BTEX.

Results are summarized in Tables 3 and 4, sample locations are shown on Figure 4, and laboratory reports are provided in Appendix E.

2.2.1.1 June and August 2020 Direct Push Soil Analytical Results

Soil concentrations of TPH-DRO/ORO (combined diesel- and oil-range petroleum) exceeded the MTCA Method A screening level of 2,000 mg/kg at 9 borehole locations; concentrations ranged from 44,700 mg/kg (duplicate of location SB-03-10) to below the RL of 250 mg/kg. Soil concentrations of TPH-GRO exceeded the MTCA Method A screening level of 30 mg/kg at 8 borehole locations; concentrations ranged from 3,000 mg/kg (location SB-01-09) to below the RL of 5 mg/kg. A review of chromatograms suggests that the TPH-GRO concentrations are the result of a middle distillate rather than gasoline. These data are discussed further in Appendix F.

Benzene, ethylbenzene, and total xylenes exceeded screening levels from soil samples collected from borehole SB-03-10 (and the duplicate sample) and SB-04-08; ethylbenzene exceeded the screening level in a soil sample collected from SB-01-09. These three locations are co-located with the highest TPH-DRO/ORO and TPH-GRO exceedances.

2.2.1.2 June and August 2020 Direct Push Groundwater Analytical Results

Temporary groundwater grab samples were collected at 2 depths, approximately 12 feet bgs and 25 feet bgs. Deep groundwater grab samples were collected from soil borehole locations SB-01, SB-08, SB-10 and SB-12, these are noted with a "D" in the sample name shown on Table 4.

Shallow groundwater concentrations of TPH-DRO/ORO analyzed without silica gel cleanup exceeded the MTCA Method A groundwater screening level of 500 µg/L at 14 of 16 borehole locations. Detected concentrations of TPH-DRO/ORO ranged from 610 µg/L (location SB-8) to 62,000,000[6] µg/L (location SB-05). The sample from SB-05 was influenced by the presence of free phase hydrocarbons; the next highest TPH-DRO/ORO concentration was 1,700,000 µg/L (location SB-3). Groundwater samples were also analyzed with silica gel cleanup. Of the groundwater samples detected above screening levels without silica gel cleanup, only the groundwater sample from SB-8 was below screening levels with the silica gel cleanup.

Deep groundwater concentrations of TPH-DRO/ORO analyzed without silica gel cleanup exceeded the MTCA Method A groundwater screening level of 500 µg/L at 3 of the 4 borehole locations. Concentrations detected at SB-10D were below the screening level (detection of 400

[6] Groundwater concentration of 62,000,000 µg/L TPH-DRO/ORO indicative of free phase hydrocarbons present. Field notes for this groundwater sample (SB-05-0620) indicate moderate to strong hydrocarbon odor, hydrocarbon sheen, and "yellowish, oily water" on purged sample water.

µg/L). All deep groundwater samples were below screening levels (SB-01D, SB-8D, and SB-12D) when silica gel cleanup was used.

Shallow direct push groundwater sample concentrations of TPH-GRO exceeded the MTCA Method A groundwater screening level of 800 µg/L at 7 locations as shown on Table 4. Detected concentrations of TPH-GRO ranged from 7,500 µg/L (at location SB-05) to 280 µg/L (at location SB-13). Direct push groundwater sample concentrations of benzene exceeded the screening level of 1.6 µg/L at 3 locations (SB-01, SB-05, and SB-09); concentrations ranged from 22 µg/L (SB-01) to non-detect. A review of chromatograms suggests that the TPH-GRO concentrations are the result of a middle distillate rather than gasoline. These data are discussed further in Appendix F.

Deep direct push groundwater sample concentrations of TPH-GRO and BTEX compounds were below the MTCA Method A groundwater screening levels.

2.2.2 Monitoring Well Installation

Following the results of the direct push investigation, two additional groundwater monitoring wells were installed to better define the downgradient extent of the groundwater impacts toward the Puyallup River. MW-10 was installed along the western end of Building 600, downgradient of impacted areas and near borehole location SB-08. MW-11 was installed to the south of soil boreholes SB-11 and SB-12. TPH-DRO/ORO concentrations in groundwater were near the CUL in SB-8 and were elevated at SB-11 and SB-12. Well locations are shown on Figure 4.

On October 4, 2020, CRETE and Holocene Drilling, a Washington licensed driller, installed the monitoring wells using hollow stem auger drilling methods. A 1.5 feet length split-spoon core sample was collected every 2.5 feet in depth starting at 2.5 feet bgs for limited logging and sampling purposes.

Soils were logged and PID-screened for organic vapor impacts. Monitoring well logs for MW-10 and MW-11 can be found in Appendix C. Well depths and screened intervals are provided in Table 6. One soil sample was collected from the MW-11 borehole at the vadose/saturated zone interface. The sample was analyzed for TPH-DRO/ORO, TPH-GRO, and BTEX. Soil sample results are provided on Table 3 and the laboratory report is provided in Appendix E. Results from the one soil sample collected at MW-11 were non-detect for all analytes.

2.2.3 October Site-Wide Gauging

On October 25, 2020 CRETE conducted site-wide gaging of static groundwater elevations at all ten monitoring wells and two recovery wells. LNAPL was observed at 3 wells, monitoring well GEI-MW-9 (0.02 feet thickness) and recovery wells ITC-RW-1 (0.82 feet thickness) and ITC-RW-2 (2.29 feet thickness).

2.2.4 Tidal Study

Between November 2 and November 6, 2020, CRETE conducted a tidal study at Parcel 40 using the existing monitoring well network (GEI-MW-1, GEI-MW-2, GEI-MW-3, GEI-MW-4, GEI-MW-5, GEI-MW-6, GEI-MW-8, GEI-MW-9, MW-10 and MW-11). Monitoring well locations used in the tidal study and the net groundwater flow path are shown on Figure 5. The tidal study was conducted to evaluate the extent of tidal influence across the Site and to develop appropriate tidal lag times for sampling of tidally influenced monitoring wells. Methods and results of this tidal study are provided in Appendix G. Results are summarized in Section 3.2.

2.2.5 November 2020 Monitoring Well Groundwater Sampling

On November 18 through November 20, 2020, CRETE collected groundwater samples from all ten monitoring wells (GEI-MW-1 through GEI-MW-6, GEI-MW-8, GEI-MW-9, MW-10, and MW-11)[7] using low-flow sampling methods. Groundwater samples were collected between 2 and 4.5 hours after low-tide based on the tidal study efficiency and lag times in conjunction with tides measured at the NOAA station 9446484 in Tacoma, WA during the November 18 to 20 sample period. All groundwater samples were analyzed for TPH-DRO/ORO (with and without SGC), TPH-GRO, and BTEX. Groundwater monitoring results are presented in Table 5 and monitoring well field parameters are presented in Table 6. Groundwater sampling forms are included in Appendix D.

Detected concentrations of TPH-DRO/ORO in groundwater samples without SGC ranged from 370 µg/L (GEI-MW-4/5) to 30,600 µg/L (GEI-MW-1) and exceeded the screening criteria at 7 monitoring wells. Groundwater concentrations exceeded the TPH-GRO MTCA Method A screening level at 1 monitoring well at a concentration of 1,700 µg/L (GEI-MW-1). Concentrations of TPH-DRO/ORO with SGC ranged up to 8,500 µg/L (GEI-MW-1) and exceeded the MTCA Method A screening level at 3 monitoring wells.

At GEI-MW-1, the concentration of benzene, 46 µg/L, exceeded the screening level. Concentrations of toluene, ethylbenzene, and total xylenes were detected above the RLs at GEI-MW-1 but below screening levels. There were no other monitoring wells with BTEX concentrations above the laboratory RLs (Table 5).

LNAPL was observed at ITC-RW-1, ITC-RW-2, and GEI-MW-9 on October 25, 2020 (Table 6). ITC-RW-1 and ITC-RW-2 were not sampled during November 2020 due to product thickness. GEI-MW-9 did not exhibit LNAPL on November 20, 2020 and was sampled with the other wells.

[7] Monitoring well identification GEI-MW-7 is not used at the site.

2.2.6 Investigation-Derived Waste

Throughout the 2020 investigations, all decontamination wash and rinse waters, soil core cuttings, well installation cuttings, and purged groundwater was captured and containerized in 15-gallon and 55-gallon drums, labelled, and temporarily staged at the Site. On November 23, 2020, DH Environmental collected the containers of waste, transported them to Lafarge North America at 5400 West Marginal Way in Seattle for disposal.

3 Site Conditions

This section presents site geological and hydrogeological conditions and overall groundwater flow patterns.

3.1 Geology

The Site was originally a tidal marsh within the Puyallup River delta. Typical reference documents regarding filling activities in the tide flats, such as the Geology of the Port of Tacoma, do not provide documentation for this area (Hart Crowser 1974). A review of available historical aerial photography suggests that some filling, and construction of True's Oil tank, was completed sometime between 1931 and 1940 (tacomaMAP 2021).

The remainder of the Site area appears to have been filled in the early 1980s associated with marine terminal site redevelopment and construction of the current structures. In the immediate vicinity of Building 600, the upper 3 to 5 feet of fill consist of Building 600 preload material that was reused as structural fill (Appendix A; Port of Tacoma 1983).

The former tidal marsh surface was not distinguishable from the above fill material in most boreholes advanced at the site. At monitoring well location MW-11 a distinct clayey silt unit was identified at 10 feet bgs, likely representing the former tidal marsh surface. In some boreholes, a thin silt unit about 1 foot thick was identified between 7 and 10 feet below grade. In other boreholes, the silt content increased at about 7.5 to 11.5 feet below grade and the lithology was described as a sandy silt or silty sand. Decomposed wood or root matter was observed at 13.8 feet below grade at SB-08 and at 14.3 feet below grade at SB-10, suggesting organic plant material, likely from the marsh.

The soil unit above the former tidal marsh surface consists predominantly of gravelly sand to sand, consistent with structural fill placement, with some construction debris. The soil unit below the former tidal marsh consists of fine- to coarse-grained sand and silty sand. These units will be referred to as the "Upper Sand" and "Lower Sand".

3.2 Hydrogeology

Groundwater occurs in the Upper Sand under unconfined conditions and in the Lower Sand under confined or semi-confined conditions, due to the intermittent clayey-silt units. Groundwater at the site appears to flow toward the Puyallup River to the west/southwest and to the north towards East 11th Street, with an apparent groundwater divide to the east-northeast of Building 600. The northward component of groundwater flow is consistent with the groundwater flow direction report for the Milwaukee Railyard (Shaw 2008). Net groundwater elevation contours are presented in Figure 5.

3.2.1 Site Groundwater Levels

Depth to groundwater at the Site is generally in the range of 8 to 12 feet bgs. Based on transducer data from the tidal study, groundwater elevations appear to fluctuate as much as about 3 feet through a tidal cycle, with the largest rate of change seen at MW-10, the well closest to the Puyallup River. Water level depths and elevations for the November groundwater sampling event are presented in Table 6. Tidal study procedures, results, and data analysis are documented in Appendix G.

3.2.2 Groundwater Flow

To determine the Site groundwater flow direction(s), data from the tidal study (Appendix G) was used calculate net groundwater flow. The water elevation data recorded from 5:06 PM on November 2 through 9:24AM on November 6 was averaged at each well where the data was recorded and the data were contoured to map the average water elevations. Figure 5 depicts the net groundwater flow determined from this tidal study. Groundwater flow on the western half of the site flows west/southwest towards the Puyallup River. Groundwater flow to the east and northeast of Building 600 generally flows north with a groundwater high, or mound, at the very east end of Building 600.

4 Conceptual Site Model

This section summarizes the nature and extent of contamination, suspected sources, and identifies potential human and environmental risk exposure pathways present on the Site. The purpose of the conceptual site model (CSM) is to synthesize the findings of the site investigation so that the CSM can be used as a tool to identify data gaps and to develop and evaluate cleanup approaches.

4.1 Nature and Extent of Contamination

The Site has been impacted by releases from historical petroleum operations at the property resulting in elevated concentrations of TPH-DRO/ORO, TPH-GRO, and benzene in soil and groundwater, and air-phase TPH contributions to indoor air at Building 600.

4.1.1 Groundwater

This discussion of the nature and extent of groundwater contamination incorporates data from samples collected from direct push boreholes in June and August 2020 and samples from monitoring wells collected in March and November 2020.

Groundwater concentrations exceed the MTCA Method A TPH-DRO/ORO screening level in 17 of the 20 direct push groundwater samples when SGC was not used. Groundwater concentrations of TPH-DRO/ORO were below the MTCA Method A screening level at SB-10, SB-10D, and SB-16, the locations closest to the Puyallup River. When SGC was used, concentrations of TPH-DRO/ORO at SB-01D, SB-08, SB-08D, and SB-12D fell below the MTCA Method A screening level.

The existing monitoring well network generally bounds the extent of TPH-DRO/ORO and TPH-GRO contamination with two exceptions. Based on TPH-DRO/ORO with silica gel cleanup, GEI-MW-8 exceeds screening criteria to the north and GEI-MW-9 exceeds screening criteria to the south. Figures 6 and 7 illustrate the TPH-DRO/ORO groundwater plume both without and with silica gel cleanup, respectively.

Groundwater concentrations of TPH-GRO exceed the MTCA Method A screening level in 7 of 20 direct push groundwater samples. TPH-GRO groundwater exceedances were focused around the eastern half of Building 600 with one notable exception at SB-14, shown on Figure 8. Benzene in groundwater was detected above the screening criteria at three locations (SB-01, SB-04, and SB-09), shown on Figure 9. For the temporary groundwater samples collected during this investigation, concentrations of benzene ranged up to 22 µg/L, toluene up to 10 µg/L, ethylbenzene up to 27 µg/L, and total xylenes up to 38 µg/L. Toluene, ethylbenzene and total xylenes were not detected above screening levels from groundwater samples collected from the direct push boreholes.

Benzene was detected in groundwater samples collected from GEI-MW-1 in March 2020 (28 µg/L) and November 2020 (46 µg/L); results exceeded the MTCA Method A and marine surface

water screening criteria. GEI-MW-1 was the only monitoring well to exhibit detections of BTEX above laboratory reporting limits in March or November 2020.

4.1.2 Soil

Soil concentrations from the 2020 investigation exceed MTCA Method A screening levels for TPH-GRO and TPH-DRO/ORO (Table 3 and Figure 10). The highest TPH-GRO results (3,000 mg/kg, SB-01) and TPH-DRO results (44,700 mg/kg, duplicate of SB-03) are generally associated with the eastern half of Building 600 with a few exceptions. SB-13, located northeast of Building 600 and near the Former Milwaukee Railyard also had elevated concentration of both TPH-GRO (1,400 mg/kg) and TPH-DRO/ORO (12,000 mg/kg). There are data points with reported TPH-DRO concentrations below MTCA Method A industrial SLs (GEI-MW-2, GEI-MW-6, P40-UST-01, P40-UST-02) that separate SB-13 from the Building 600 contamination suggesting that the impacts at the site may be from a two separate releases.

Soil concentrations along the northwestern and western areas of the site are not impacted with hydrocarbons or BTEX and reported values are SB-07, SB-08, SB-10, and SB-16 in this area are below laboratory RLs. Soil concentrations of TPH-DRO (8,000 mg/kg; duplicate concentration of 9,400 mg/kg) and TPH-GRO (1,500 mg/kg) at SB-11 in the southwest area of the Building 600 exceed screening criteria.

In the soil samples collected during the 2020 investigation, concentrations of benzene ranged up to 14 mg/kg, toluene up to 5 mg/kg, ethylbenzene up to 20 mg/kg, and total xylenes up to 24 mg/kg. Concentrations of BTEX compounds in soil exceed MTCA Method A screening levels at SB-01, SB-03, and SB-04; no other locations exceed MTCA screening levels. No BTEX soil exceedances were observed or noted in the active UST pad area investigation conducted by Anchor QEA in August 2019 (Anchor QEA 2020).

4.1.3 Vapor

Vapors samples collected at the site, discussed in Section 2.1, included indoor air and sub-slab vapor. All indoor air samples contained APHs in the range of C5 through C8 (APH EC5-8 aliphatics) and C9 through C12 (APH EC9-12 aliphatics) above the site-specific TPH MTCA Method C cleanup level of 310 µg/m^3 (Table 1, Figure 3). Though Building 600 is used for equipment maintenance and it is known that products used during routine operations in the building contain TPH, the levels detected in the indoor air samples are not thought to be from these products only (EMB 2020).

Sub-slab samples were collected from two locations in the building; one sample was collected in the Parts Room (SSV-Parts) and one sample was collected in the East Bay (SSV-E Bay) as shown on Figure 3 and Table 1. APH EC5-8 aliphatics were detected beneath the East Bay while APH EC9-12 aliphatics were detected below the Parts Room. These APH results were below the Ecology TPH screening level. Sub-slab sample results were not detected above laboratory reporting limits for BTEX compounds and laboratory reporting limits were below sub-slab screening levels (Table 1). Although the sub-slab vapor samples were below screening levels, TPH was above the

screening level in indoor air and benzene, TPH-GRO, and TPH-DRO were present above cleanup levels in soil and groundwater adjacent to and likely below the building, including the presence of free product. Sub-slab and indoor air sample results can vary spatially and temporally depending on many factors (e.g. barometric pressure and trend, wind, temperature). Due to this uncertainty in air concentration measurements and the presence of significant soil and groundwater contamination, it is reasonable to expect that sub-slab vapor contamination is present and contributing to indoor air.

Groundwater data from GEI-MW-1 indicates that benzene exceeds the vapor intrusion groundwater screening level (GEI-MW-1; Figure 1).

4.1.4 Contaminants of Concern

Contaminants that have been detected above screening levels at Parcel 40 are benzene, ethylbenzene, xylenes, TPH-GRO, and TPH-DRO/ORO. Benzene exceeded screening levels in soil and groundwater while ethylbenzene and xylenes only exceeded screening levels in soil. TPH-GRO and TPH-DRO/ORO exceeded screenings levels in soil and groundwater plus TPH exceeded screening levels in indoor air. As discussed in Appendix F, although TPH-GRO exceeded screening levels in soil and groundwater, there is no known historical use of gasoline at the property and a closer look at the TPH-DRO/ORO results indicates that the TPH-GRO response may have been due to high concentrations of a middle distillate, such as diesel.

4.1.5 Sources

Historical petroleum operations at the site include a number of potential sources (Figure 2):

- The 1.25 million gallon True's Oil above-ground diesel storage tank; including the pump area and associated "oil" and diesel pipelines
- The former 14,000-gallon diesel UST and loading rack located at the former Milwaukee Railyard
- Several "oil" and "oil and steam" pipelines that may have carried heavier-end petroleum products such as Bunker C for fueling locomotives prior to diesel use
- The former lube oil line and documented leak
- The former 3,000-gallon waste oil tank associated with Building 600
- The existing 20,000-gallon diesel and 1,000-gallon gasoline USTs and fueling area

The primary source of contamination in the Building 600 area appears to be historical operation of the True's Oil diesel tank. Operation of the True's Oil tank included smaller tanks within the secondary containment berm, various fuel lines, the pump house, and septic tank. The highest soil and groundwater concentrations are centered at the former tank and generally decrease with distance from the tank. The True's Oil tank also appears to have supplied diesel fuel to the nearby 14,000-gallon diesel UST and tank car loading rack on the former Milwaukee Railyard to the east (Figure 2). Petroleum contamination and a free product plume were previously identified on the Milwaukee Railyard in the vicinity of this fueling area. Although this area was not a focus

of the Building 600 investigation, evidence of contamination associated with the former Milwaukee Railyard was identified at SB-13. Reports prepared for the former Milwaukee Railyard indicate free phase product remains at the site and remediation activities have ceased (Ecology 2011, Hart Crowser 2015). Testing indicated that NAPL at the former Milwaukee Railyard site has been depleted of water-soluble hazardous constituents (Shaw 2008).

Several "oil" and "oil and steam" notations are present on historical drawings in reference to pipelines. These notations suggest that heavier-end TPH, such as Bunker C fuel, were present. This would be consistent with locomotive fueling prior to the advent of the diesel locomotive. Other than the lube oil line, discussed below, TPH impacts discovered in the area appear consistent with diesel. As a result, it does not appear that these pipelines contributed to petroleum contamination of soil and groundwater.

The lube oil line leak noted in the late 1990s (GCI 2000) is also a known source of petroleum contamination. Soil impacted with TPH-ORO likely associated with this leak is located in a small area along the south side of Building 600 as identified on Figure 10.

The former waste oil tank and the existing diesel and gasoline USTs do not appear to be sources of petroleum contamination. During removal of the waste oil UST, it was noted that the tank was in good condition with minimal evidence of scaling, pitting, or rusting (CETI 1999). A contaminated soil sample from the tank excavation was tested and found to contain diesel. A sample of sludge from the waste oil tank contained primarily TPH-ORO, consistent with the anticipated contents. These analytical data indicate that soil contamination outside the tank is not consistent with the contents of the waste oil tank.

The existing diesel and gasoline fiberglass USTs are tested annually in accordance with the current regulations, most recently in May and June 2021. The tanks, lines, spill bucket, overfill prevention system, and leak detection system were all determined to be operating properly.

The shallow groundwater table is encountered from 8 to 12 feet bgs. Groundwater flow at the site appears to be toward the Puyallup River to the west/southwest and to the north towards East 11th Street. The dissolved groundwater plume appears to be primarily in the Upper Sand unit and has migrated in the direction of groundwater flow.

4.2 Exposure Assessment

This section identifies potential human and ecological exposures to contaminated media at the site. Consistent with WAC 173-340-350(1), exposure scenarios are identified that assist in the selection of a cleanup action that will "protect human health and the environment (including, as appropriate, aquatic and terrestrial ecological receptors)" (WAC 173-340-350(8)(c)(i)(A)). To evaluate cleanup actions, applicable cleanup standards must be determined. As outlined in WAC 173-340-700(5), to select the appropriate cleanup standards for cleanup actions, the following criteria must be evaluated:

- Nature of the contamination
- Potentially contaminated media

- Current and potential land and resource uses
- Current and potential receptors
- Current and potential pathways of exposure.

The nature of contamination and impacted media were described in Section 2.3. This section describes current and potential receptors and pathways of exposure, based on current and potential land and resource uses.

4.2.1 Current and Potential Land and Resource Uses

Cleanup levels must derive from reasonable maximum exposures, defined as the "highest exposure that is reasonably expected to occur at a site under current and potential future site use" (WAC 173-340-708(3)(b)). This section identifies the current and future potential uses of resources where contaminated media are known or suspected to be present. The resources under consideration are land, groundwater, and surface water.

4.2.2 Groundwater

Protection of drinking water is not applicable to this Site because the shallow groundwater is not potable. It is expected to remain non-potable in the future under the Model Toxics Control Act (MTCA) and local regulations because:

- Neither the Site nor groundwater in its vicinity is a current source of drinking water.
- Under Washington Administrative Code (WAC) 173-340-720(2)(b), neither the Site nor groundwater in its vicinity is a potential future source of drinking water because groundwater contains natural background levels of specific conductivity above the state and local secondary maximum contaminant level of 0.7 mS/cm (WAC 246-290-310(3)(a) and Tacoma-Pierce County Health Department Environmental Health Code Chapter 3 Drinking Water).
- Site groundwater will not migrate into groundwater that is a current or potential source of drinking water.
- A domestic supply well would not be placed in the vicinity of Parcel 40 (WAC-173-340-720(2)(d)). State and local codes prohibit the construction of drinking water wells in the vicinity of the Parcel 40 via WAC 246-290-130(1) which requires drinking water supplies to come from the highest quality source (which at the Site is the municipal water supply system) and via WAC 290-135(2)(b) which specifies a minimum 100-foot drinking water well setback from surface water, roads, utilities, and buildings.

Protection of marine surface water is an applicable pathway because shallow groundwater at the Site flows toward and discharges into the brackish waters of the Puyallup River and the marine waters of Commencement Bay. The marine surface water quality pathway will incorporate criteria for both the protection of aquatic organisms and humans consuming aquatic organisms.

The groundwater to industrial indoor air pathway is relevant because the Parcel 40 is zoned Port Maritime Industrial by the City of Tacoma and is likely to remain industrial for the foreseeable

future. Additionally, the Site's current and future land uses include occupied industrial/commercial buildings. Vapor intrusion is discussed further in Section 4.2.4.

4.2.3 Soil

Parcel 40 is currently zoned Port Maritime Industrial and future land use plans are for industrial use, therefore, cleanup levels for industrial land use are applicable. Soil must also not leach to groundwater at concentrations that would cause groundwater to exceed acceptable levels. Parcel 40 is excluded from a terrestrial ecological evaluation per WAC 173-340-7491 (1)(b) since all contaminated soil is covered by buildings or pavement. Based on this exclusion, a simplified terrestrial ecological evaluation has not been performed but an institutional control will be required.

Soil direct contact risk is mitigated across much of the Parcel 40 area by complete asphalt or concrete coverage. Soil direct contact could still occur during subsurface excavations for utility work or construction. Existing paving is protective of industrial workers.

4.2.4 Vapor

Vapor intrusion risk is a concern where soil or groundwater is impacted with VOCs above SLs adjacent to enclosed breathing spaces. Benzene is present above SLs in the vicinity of Building 600. Based on the results of the indoor air assessment, it appears likely that petroleum hydrocarbons in soil and groundwater beneath the building are impacting indoor air through vapor intrusion (see Section 2.1). The Port has installed a sub-slab depressurization system (SSDS) to mitigate the potential vapor intrusion risk.

4.2.5 Potential Receptors and Exposure Pathways

The exposure pathways at the Site for human health or the environment are:

- Direct contact with soil by industrial maintenance, utility, or construction workers
- Soil leaching to groundwater
- Groundwater discharge to surface water and exposure to aquatic organisms and humans consuming aquatic organisms (through bioaccumulation)
- Inhalation of indoor air containing contaminants volatilized from groundwater and soil (VI) by onsite office workers and industrial maintenance workers.

Inhalation of indoor air containing contaminants is a relevant exposure pathway but one that was addressed by installation of the SSDS (CRETE 2021).

4.3 Cleanup Standards

MTCA provides the framework for evaluating and selecting cleanup actions. Within this framework are threshold requirements that must be met by all cleanup actions. The threshold requirements for cleanup actions, as defined in WAC 173-340-360(2)(a), are to:

1. Protect human health and the environment
2. Comply with cleanup standards (WAC 173-340-700 through 173-340-760)
3. Comply with applicable state and federal laws (WAC 173-340-710)
4. Provide for compliance monitoring (WAC 173-340-410 and 173-340-720 through 173-340-760)

This section develops appropriate cleanup standards to be protective of human health and the environment, and the locations at which to apply these cleanup standards (the points of compliance) (#1-2 above). The third requirement, comply with applicable or relevant and appropriate requirements (ARARs), is not discussed in this document, but would need to be evaluated during site cleanup and or development. The fourth requirement to provide for compliance monitoring, is discussed in Section 5.

4.3.1 Cleanup Levels

Cleanup levels for affected media at the Site were evaluated in accordance with MTCA and take into consideration exposure pathways and receptors based on current and likely future uses of the Site. Because the Site is located in a developed commercial/industrial setting with buildings, paved parking lots, and roads, the Site qualifies for a TEE exclusion under WAC 173-340-7491(1)(b).

The exposure scenarios that are relevant to the development of cleanup standards to protect human health and the environmental at Parcel 40 are:

- Direct contact with soil by industrial maintenance, utility, or construction workers
- Soil leaching to groundwater
- Groundwater discharge to surface water and exposure by aquatic organisms and humans consuming organisms
- Inhalation of indoor air containing contaminants volatilized from groundwater and soil (VI) by onsite office workers and industrial maintenance workers.

MTCA (WAC 173-340-360(c)(ii)(A)) states that groundwater sources shall be treated or removed, including removal of free product consisting of petroleum and other light nonaqueous phase liquid (LNAPL) from the groundwater using normally accepted engineering practices. MTCA defines free product as “a nonaqueous phase liquid that is present in the soil, bedrock, ground water or surface water as a distinct (sic) separate layer” (WAC 173-340-200). Free product has been measured in ITC-RW-1 and ITC-RW-2 and intermittently in GEI-MW-9. Sorbent socks were placed in wells ITC-RW-1, ITC-RW-2, and GEI-MW-9 on December 29, 2020 to remove accumulated free product.

4.4 Point of Compliance

A point of compliance is that point or location on a property where the CULs must be attained in each medium of concern. Preliminary points of compliance for the Site were established in accordance with WAC 173-340-740(6) for soil and WAC 173-340-720(8) for groundwater.

The point of compliance for soil cleanup levels based on direct contact is throughout the Property to 15 feet bgs. The point of compliance for soil cleanup levels based on protection of groundwater is throughout the property.

Shallow groundwater at Parcel 40 discharges either to the Puyallup River or Commencement Bay. For properties near, but not abutting, surface water, a conditional point of compliance may be "located as close as practicable to the source, not to exceed the point or points where ground water flows into the surface water" (WAC 173-340-720(8)(d)(ii)). For Parcel 40, groundwater compliance will be assessed at wells located within the property boundary or closer to the source.

5 Recommendations

Recommended cleanup and monitoring activities are:

- Install a sub-slab depressurization system at Building 600 to address any potential vapor intrusion. Installation occurred in the Summer and Fall of 2021. System startup is anticipated in February 2022.
- Install an additional groundwater monitoring well in the vicinity of SB-11 to fill dissolved plume data gap between GEI-MW-10 and GEI-MW-11.
- Routine groundwater monitoring sampling of the well network.

To the north of Building 600, TPH-DRO/ORO at SB-13, SB-14, and GEI-MW-8 may be attributable to former Milwaukee Railyard activities. Additional investigation may be warranted to better define boundary or overlap between the two petroleum releases sites.

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Tables

Table 1 Summary of Indoor Air, Ambient Air, and Sub-Slab Vapor Sample Results
Port of Tacoma - Parcel 40

				Sample Location / Sample ID / Sample Duration									
	MTCA Screening Level (indoor air) Method C	DOSH PEL (8hr TWA)[a]	ACGIH GGVs for Hydrocarbons	Ambient West AW040720 09:54 to 09:54 7/4 - 7/5/2020	Ambient East AE040720 10:04 to 10:04 7/4 - 7/5/2020	Indoor - West Bay 13 IWB13040720 10:13 to 10:13 7/4 - 7/5/2020	Indoor - Parts Office IPO040720 10:23 to 10:23 7/4 - 7/5/2020	Indoor - NW Office INWOFF040720 10:31 to 10:31 7/4 - 7/5/2020	Indoor - East IE040720 10:37 to 10:37 7/4 - 7/5/2020	Indoor - East (duplicate) IE100040720 10:37 to 10:38 7/4 - 7/5/2020	Subslab Vapor Parts Room SSV-Parts 16:48 to 16:53 10/27/2020	Subslab Vapor East Bay SSV-E Bay 17:17 to 17:22 10/27/2020	MTCA Sub-Slab Soil Gas Screening level Method B
Analytes	*all values in units of µg/m³*												
Analysis for Volatile Compounds By EPA Method TO-15													
Benzene	3.20	3,190	NV	<0.32	<0.38	0.58	0.74	0.51	0.79	0.78	<1	<2.6	11
Toluene	5000	376,810	NV	<19	<23	39	<23	<19	<19	<19	<60	<150	76,000
Ethylbenzene	1000	434,190	NV	<0.43	<0.52	14	6.3	5.1	1.3	1.3	<1.4	<3.6	15,000
m,p-Xylene	100	434,190	NV	<0.87	<1	63	30	25	5.5	5.3	<2.8	<7.1	1,500
o-Xylene	100	434,190	NV	<0.43	<0.52	19	9.8	8.3	2.1	1.7	<1.4	<3.6	1,500
Naphthalene	0.74	52,430	NV	0.16	0.12	0.39	0.36	0.34	0.32	0.36	<0.84	<2.1	2.5
Analysis For Volatile Compounds By Method MA-APH													
APH EC5-8 aliphatics	*NV*	*NV*		<30	<36	240	160	110	130	130	<130	1,900	NV
ACGIH C5-8 aliphatics	*NV*	*NV*	1,500,000										
APH EC9-12 aliphatics	*NV*	*NV*		<35	<42	1,500[c]	1,200[c]	1,100[c]	2,600[c]	2,700[c]	230	<410	NV
ACGIH C9-15 aliphatics	*NV*	*NV*	1,200,000										
APH EC9-10 aromatics	*NV*	*NV*		<25	<30	<25	<30	<25	<25	<25	<80	<200	NV
ACGIH C9-15 aromatics	*NV*	*NV*	1,200,000										
TPH[d]	310			111	130	**1,901**	**1,460**	**1,293**	**2,784**	**2,883**	507	2,679	4,700

Notes:

NV = No Value

MTCA = Model Toxics Control Act

DOSH = Washington State Division of Occupational Safety and Health

PEL = Permissible Exposure Limit

EPA = Environmental Protection Agency

APH = Air-Phase Petroleum Hydrocarbons

8hr TWA = 8 hour Time-Weighted Average

ACGIH = American Conference of Governmental Industrial Hygienists

GGVs - Group Guidance Values

µg/m³ = micrograms per cubic meter

TPH = Total Petroleum Hydrocarbons

MA-APH = Massachusetts Department of Environmental Protection Method for the Determination of Air-Phase Petroleum Hydrocarbons

[a] DOSH PELs are cited in units of parts per million for the analytes listed. The PELs have been converted to units of µg/m³ for the purpose of this report.

[b] The GGVs listed in Table 1 are reproduced from Column B of the ACGIH Table 1 Group Guidance Values found in Appendix H of the ACGIH publication, 2019 Threshold Limit Values and Biological Exposure Indices.

[c] The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

[d] TPH is based on Petroleum Vapor Intrusion (PVI): Updated Screening Levels, Cleanup Levels, and Assessing PVI Threats to Future Buildings Implementation Memorandum No. 18, dated January 10, 2018. The indoor air TPH screening level assumes compounds not detected are present at the full reporting limit. The sub-slab screening level is based on the Method B indoor air screening level of 140 ug/m3 and the standard attenuation factor of 0.03.

Table 2 Monitoring Well Groundwater Analytical Results - March 2020
Port of Tacoma - Parcel 40

Parameter	MTCA Groundwater Screening Level Method C	Marine Surface Water Screening Level	Source of Marine Surface Water Screening Level	GEI-MW1 (See Note 5)	Duplicate GEI-MW-1 (GEI-MW39-0320)	GEI-MW5	GEI-MW8	GEI-MW9	ITC-RW1-0320 (See Note 4)
				03-26-20	03-26-20	03-26-20	03-26-20	03-26-20	03-26-20
	ug/L	ug/L		ug/L	ug/L	ug/L	ug/L	ug/L	mg/kg
Volatile Organic Constituents (VOCs; EPA Method 8260)									
1,2,4-Trimethylbenzene	180	NV	---	**3.1**	**3.1**	1.0 U	1.0 U	1.0 U	10 U
1,2-Dichlorobenzene	1,600	800	See Note 1	**1.2**	**1.3**	1.0 U	1.0 U	1.0 U	10 U
1,3-Dichlorobenzene	NV	2	See Note 1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**21**
1,4-Dichlorobenzene	81	22	See Note 2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**19**
Benzene	8	1.6	See Note 3	**28/35.7**	**28**	0.35 U	0.35 U	0.35 U/20 U	6 U
Chlorobenzene	350	200	See Note 1	**4.1**	**4.2**	1.0 U	1.0 U	**2.6**	**14**
Ethylbenzene	1,800	31	See Note 1	**5.6/20 U**	**5.5**	1.0 U	1.0 U	1.0 U	10 U
Isopropylbenzene (Cumene)	NV	NV	---	**2.9**	**2.8**	1.0 U	1.0 U	**1.8**	10 U
Naphthalene	350	4,900	See Note 2	**1.2/20 U**	**1.1**	1.0 U	1.0 U	1.0 U	10 U
n-Propylbenzene	NV	NV	---	**2.9**	**2.9**	1.0 U	1.0 U	**1.5**	**10**
o-Xylene	3,500	NV	---	**5.4/20 U**	**5.2**	1.0 U	1.0 U	1.0 U	10 U
p-Isopropyltoluene	NV	NV	---	**1.6**	**1.5**	1.0 U	1.0 U	1.0 U	**49**
sec-Butylbenzene	NV	NV	---	1.0 U	1.0 U	1.0 U	1.0 U	**2.2**	**16**
Toluene	1,400	130	See Note 1	**2.8/20 U**	**2.9**	1.0 U	1.0 U	1.0 U	10 U
Fuel Additives									
1,2-dibromoethane (EDB)	2.7	NV	---	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
1,2-dichloroethane (EDC)	42	NV	---	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
Methyl tert-butyl ether (MTBE)	240	NV	---	1.0 U/20 U	1.0 U	1.0 U	1.0 U	1.0 U/20 U	10 U
Volatile Petroleum Hydrocarbons (VPH)									
Aliphatic Hydrocarbon (C5-C6)	NV	NV	---	40 U	NA	NA	NA	40 U	NA
Aliphatic Hydrocarbon (C6-C8)	NV	NV	---	**87.9**	NA	NA	NA	20 U	NA
Aliphatic Hydrocarbon (C8-C10)	NV	NV	---	**37.2**	NA	NA	NA	**29.3**	NA
Aliphatic Hydrocarbon(C10-C12)	NV	NV	---	**231**	NA	NA	NA	**172**	NA
Aromatic Hydrocarbon (C8-C10)	NV	NV	---	**138**	NA	NA	NA	50 U	NA
Aromatic Hydrocarbon (C10-C12)	NV	NV	---	**505**	NA	NA	NA	**343**	NA
Aromatic Hydrocarbon (C12-C13)	NV	NV	---	**896**	NA	NA	NA	**461**	NA

Notes:

Yellow = Shading denotes values above ONE MTCA Screening level
Orange = Shading denotes values above BOTH MTCA Screening levels
Bold = detections
ug/L = micrograms per liter
mg/kg = milligram per kilogram
U = laboratory reporting limit
NV = no value
NA = not analyzed
Note 1 - MTCA Surface Water Human Health Marine Waters 40 CFR 131.45 Screening Level
Note 2 - MTCA Surface Water Method B Cancer Screening Level
Note 3 - MTCA Surface Water Human Health Marine Waters 173-201A WAC Screening Level
Note 4 - ITC-RW1 had 0.89-ft thickness of free product on sample date of 3/26/2020.
Note 5 - Split samples to two labs (Friedman & Bruya value/Fremont Analytical value)

Table 3 Soil Analytical Results - 2020
Port of Tacoma - Parcel 40

				Parameter							
Sample ID	**Date Sampled**	**Sample Depth (ft bgs)**	**Units**	**Diesel Range Organics (DRO)**	**Lube Range Oil (ORO)**	**DRO/ORO (Diesel + Lube Oil)**	**Gasoline Range Organics (GRO)**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Total Xylenes**
MTCA Method A Screening Level			mg/kg	see total	see total	2,000	30	0.03	7	6	9
SB-01-09	6/12/20	9 to 10	mg/kg	**23,000**	**1600 x**	**23,000**	**3,000**	0.2 U	0.2 U	**7**	**24**
SB-02-09.5	6/12/20	9.5 to 10	mg/kg	**3,800**	**390 x**	**3,800**	**600**	0.2 U	0.2 U	**1.6**	**2.3**
SB-03-10	6/12/20	10 to 11	mg/kg	**27,000**	**3100 x**	**27,000**	**2,400**	**14**	**3.8**	**20**	**20**
Dup (SB-03-10)	6/12/20	10 to 11	mg/kg	**40,000**	**4,700**	**44,700**	**2,000**	**1.3**	**5**	**13**	**17**
SB-04-08	6/12/20	8 to 9	mg/kg	**15,000**	**1100 x**	**15,000**	**2,800**	0.2 U	0.2 U	**7.9**	**20**
SB-05-09.5	6/12/20	9.5 to 10	mg/kg	**9,500**	**750 x**	**9,500**	**600**	0.1 U	0.1 U	**1.7**	**2.1**
SB-06-09	6/12/20	9 to 10	mg/kg	**15,000**	**490 x**	**15,000**	NA	NA	NA	NA	NA
SB-07-07.5	6/12/20	7.5 to 8.5	mg/kg	50 U	250 U	250 U	NA	NA	NA	NA	NA
SB-08-09	6/12/20	9 to 10	mg/kg	50 U	250 U	250 U	NA	NA	NA	NA	NA
SB-09-07.5	6/12/20	7.5 to 10	mg/kg	**18,000**	**610**	**18,610**	NA	NA	NA	NA	NA
SB-10-05	8/5/20	5 to 6	mg/kg	50 U	250 U	250 U	5 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-11-09	8/5/20	9 to 10	mg/kg	**8,000**	**550 x**	**8,000**	**1,500**	0.02 Uj	0.1 U	**3.3**	**2.6**
Dup (SB-11-09)	8/5/20	9 to 10	mg/kg	**9,400**	**640 x**	**9,400**	**1,500**	0.02 Uj	0.1 U	**2.9**	**2.3**
SB-12-10	8/5/20	10 to 11	mg/kg	**150**	250 U	**150**	**36**	0.02 U	0.02 U	0.02 U	0.06 U
SB-13-09	8/5/20	9 to 10	mg/kg	**12,000**	**860 x**	**12,000**	**1,400**	0.02 Uj	0.1 U	**2.0**	**1.7**
SB-14-09	8/5/20	9 to 10	mg/kg	50 U	250 U	250 U	5 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-15-08	8/5/20	8 to 8.5	mg/kg	50 U	250 U	250 U	5 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-16-05	8/5/20	5 to 6	mg/kg	50 U	250 U	250 U	5 U	0.02 U	0.02 U	0.02 U	0.06 U
MW-11-10-11.5	10/4/20	10 to 11.5	mg/kg	50 U	250 U	250 U	5 U	0.02 U	0.02 U	0.02 U	0.06 U

Notes:

Yellow = Shading denotes values above the MTCA Screening level
MTCA Method A industrial/protection of groundwater vadose (default)
Bold = detections
mg/kg = milligram per kilogram
U = laboratory reporting limit
NV = no value
NA = not analyzed
x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation

Table 4 Direct Push Groundwater Analytical Results - 2020
Port of Tacoma - Parcel 40

			Parameter										
Sample ID	**Date Sampled**	**Units**	**Diesel Range Organics (DRO)**	**Lube Range Oil (ORO)**	**DRO/ORO (Diesel + Lube Oil)**	**DRO - SGC**	**ORO - SGC**	**DRO/ORO - SGC (Diesel + Lube Oil)**	**Gasoline Range Organics (GRO)**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Total Xylenes**
MTCA Method A/C Industrial Groundwater Screening Level		ug/L	see total	see total	500	see total	see total	500	800	8	1,400	1,800	3,500
MTCA Method B Marine Surface Water Screening Level		ug/L	NV	NV	NV	NV	NV	NV	NV	1.6	130	31	NV
SB-01-0620	6/12/20	ug/L	**690,000**	25000 U	**690,000**	**620,000**	25000 U	**620,000**	**4,100**	**22**	10 U	**25**	30 U
SB-01D-0620	6/12/20	ug/L	**880**	250 U	**880**	**470**	250 U	**470**	100 U	1 U	1 U	1 U	3 U
SB-02-0620	6/12/20	ug/L	**78,000**	25000 U	**78,000**	**77,000**	25000 U	**77,000**	**1,800**	1 U	1 U	**1**	**4.2**
Dup (SB-02)	6/12/20	ug/L	**94,000**	25000 U	**94,000**	**97,000**	25000 U	**97,000**	**830**	1 U	**1.1**	1 U	**4.0**
SB-03-0620	6/12/20	ug/L	**1,700,000**	**64,000 x**	**1,700,000**	**1,700,000**	**72,000 x**	**1,700,000**	**4,100**	1 U	**10**	**27**	3 U
SB-04-0620	6/12/20	ug/L	**25,000**	**3,100 x**	**25,000**	**12,000**	2500 U	**12,000**	**1,600**	**81**	**4.6**	**19**	**14**
SB-05-0620 (see note1)	6/12/20	ug/L	**62,000,000**	**1,500,000 x**	**62,000,000**	**71,000,000**	**2,000,000 x**	**71,000,000**	**7,500**	**1.1**	**3.4**	1 U	**38**
SB-06-0620	6/12/20	ug/L	**18,000**	2500 U	**18,000**	**15,000**	2500 U	**15,000**	**750**	1 U	1 U	**1.5**	3 U
SB-07-0620	6/12/20	ug/L	**1,100**	250 U	**1,100**	**550**	250 U	**550**	100 U	1 U	1 U	1 U	3 U
SB-08-0620	6/12/20	ug/L	**280**	**330**	**610**	**55 x**	**290**	**290**	100 U	1 U	1 U	1 U	3 U
SB-08D-0620	6/12/20	ug/L	**640**	250 U	**640**	**310**	250 U	**310**	100 U	1 U	1 U	1 U	3 U
SB-09-0620	6/12/20	ug/L	**54,000**	2500 U	**54,000**	**61,000**	2500 U	**61,000**	**3,500**	**3.2**	1 U	11	**9.3**
SB-10-0820	8/5/20	ug/L	50 U	250 U	250 U	50 U	250 U	250 U	100 U	1 U	1 U	1 U	3 U
SB-10D-0820	8/6/20	ug/L	**400 x**	250 U	**400 x**	50 U	250 U	250 U	100 U	1 U	1 U	1 U	3 U
SB-11-0820	8/5/20	ug/L	**7,200**	250 U	**7,200**	**5,900**	250 U	**5,900**	**430**	1 U	1 U	1 U	3 U
SB-12-0820	8/5/20	ug/L	**3,600**	**1,300**	**4,900**	**2,600**	**1300**	**3,900**	100 U	1 U	1 U	1 U	3 U
SB-12D-0820	8/6/20	ug/L	**1700 x**	**380 x**	**2,080**	50 U	250 U	250 U	100 U	1 U	1 U	1 U	3 U
SB-13-0820	8/5/20	ug/L	**12,000**	**1,400 x**	**12,000**	**9,000**	**960 x**	**9,000**	**280**	1 U	1 U	1 U	3 U
Dup (SB-13)	8/6/20	ug/L	**16,000**	**1,900 x**	**16,000**	**12,000**	**1400 x**	**12,000**	**320**	1 U	1 U	1 U	3 U
SB-14-0820	8/5/20	ug/L	**150,000**	**6200 x**	**150,000**	**130,000**	**5,600 x**	**130,000**	**1,200**	1 U	1 U	3.0	3 U
SB-15-0820	8/5/20	ug/L	**2,900**	**410 x**	**2,900**	**2,900**	**330 x**	**2,900**	100 U	1 U	1 U	1 U	3 U
SB-16-0820	8/5/20	ug/L	50 U	250 U	250 U	50 U	250 U	250 U	100 U	1 U	1 U	1 U	3 U

Notes:
MTCA Screening Level Method A for TPH and Method C for BTEX
Yellow = Shading denotes values above surface water MTCA screening level
Orange = Shading denotes values above groundwater MTCA screening levels
Bold = detections
ug/L = micrograms per liter
U = laboratory reporting limit
NV = no value
x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.
Note 1 - Sample SB-05-0620 is likely influenced by the presence of free phase hydrocarbons present. Field notes for this groundwater sample indicate moderate to strong hydrocarbon odor, hydrocarbon sheen and "yellowish, oily water" on purged sample water.

Table 5 Monitoring Well Groundwater Analytical Results - November 2020
Port of Tacoma - Parcel 40

			Parameter										
Monitoring Well ID	**Date Sampled**	**Units**	**Diesel Range Organics (DRO)**	**Lube Range Oil (ORO)**	**DRO/ORO (Diesel + Lube Oil)**	**DRO - SGC**	**ORO - SGC**	**DRO/ORO - SGC (Diesel + Lube Oil)**	**Gasoline Range Organics (GRO)**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Total Xylenes**
MTCA Method A/C Industrial Groundwater Screening Level		ug/L	see total	see total	500	see total	see total	500	800	8	1,400	1,800	3,500
MTCA Method B Marine Surface Water Screening Level		ug/L	NV	NV	NV	NV	NV	NV	NV	1.6	130	31	NV
GEI-MW-1	11/19/20	ug/L	**25,000**	**5600**	**30,600**	**8,500**	**320 x**	**8,500**	**1700**	**46**	**6.7**	**22**	**14**
GEI-MW-2	11/20/20	ug/L	**1500 x**	**330 x**	**1,830**	50 U	250 U	250 U	**360**	1 U	1 U	1 U	3 U
GEI-MW-3	11/19/20	ug/L	**430 x**	**540 x**	**970**	50 U	250 U	250 U	100 U	1 U	1 U	1 U	3 U
GEI-MW-4	11/20/20	ug/L	**370 x**	250 U	**370**	50 U	250 U	250 U	100 U	1 U	1 U	1 U	3 U
GEI-MW-5	11/19/20	ug/L	**370 x**	250 U	**370**	50 U	250 U	250 U	100 U	1 U	1 U	1 U	3 U
GEI-MW-6	11/19/20	ug/L	**270 x**	**440 x**	**710**	50 U	250 U	250 U	100 U	1 U	1 U	1 U	3 U
GEI-MW-8	11/19/20	ug/L	**2400 x**	**820 x**	**3,220**	**550**	250 U	**550**	**130**	1 U	1 U	1 U	3 U
GEI-MW-9	11/20/20	ug/L	**2,900**	250 U	**2,900**	**920**	250 U	**920**	**360**	1 U	1 U	1 U	3 U
MW-10	11/19/20	ug/L	**720 x**	**430 x**	**1,150**	50 U	250 U	250 U	100 U	1 U	1 U	1 U	3 U
DUP-1120 (MW-10)	11/19/20	ug/L	**730 x**	**400 x**	**1,130**	50 U	250 U	250 U	100 U	1 U	1 U	1 U	3 U
MW-11	11/19/20	ug/L	**150x**	250 U	**150**	50 U	250 U	250 U	100 U	1 U	1 U	1 U	3 U

Notes:
MTCA Screening Level Method A for TPH and Method C for BTEX
Yellow = Shading denotes values above ONE MTCA Screening level
Orange = Shading denotes values above BOTH MTCA Screening levels
Bold = detections
ug/L = micrograms per liter
U = laboratory reporting limit
NV = no value
x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation

Table 6 Monitoring Well Construction and Field Parameters - November 2020
Port of Tacoma - Parcel 40

Well ID	Date	Initial Depth to Water (feet BTOC)	Final Depth to Water (feet BTOC)	Depth to LNAPL (feet BTOC)	Measured Total Depth (feet BTOC)	Well Screen Interval (feet bgs)	Temperature (degrees C)	Specific Conductance (uS/cm)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen (mg/L)	pH (S.U.)	Turbidity [a] (NTU)	Total Dissolved Solids (mg/L)	Sampling Purge Rate (mL/min)
GEI-MW-1	11/19/2020	10.00	11.21	NP	15.28	4-14	13.6	2,697	-86.8	0.21	6.62	407 Clear	1753	<=150
GEI-MW-2	11/20/2020	9.10	9.53	NP	14.90	5-15	16.8	905	-95.1	0.25	7.65	307 Clear	588	<=200
GEI-MW-3	11/18/2020	8.61	NM	NP	8.66	4-14	15.0	2630	-121.8	0.19	7.00	522 Clear	1704	>=200
GEI-MW-4	11/20/2020	9.75	10.49	NP	15.08	4-14	14.3	2225	-114.9	0.26	7.37	617 Clear	1446	<=175
GEI-MW-5	11/19/2020	9.60	14.79	NP	9.81	4-14	15.7	2458	-78.2	0.25	6.91	596 Clear	1594	150
GEI-MW-6	11/19/2020	9.26	9.44	NP	15.40	6-16	15.2	1924	-80.4	0.18	6.72	638 Clear	1252	<=175
GEI-MW-8	11/19/2020	8.85	8.90	NP	15.05	5-15	16.0	1473	-84.6	0.09	6.65	547 Clear	962	<=250
GEI-MW-9	11/20/2020	10.44	10.73	NP	15.42	4-14	17.9	1,263	-100.0	0.23	7.36	198 Clear	820	<=175
MW-10	11/19/2020	10.58	10.66	NP	NM	7-17	16.1	2,583	-134.8	0.20	7.15	793 Clear	1678	175
MW-11	11/18/2020	10.28	11.15	NP	NM	5-15	14.7	2,235	210.0	0.31	6.51	228 Clear	1454	100
ITC-RW-1[b]	10/25/2020	10.47	NM	9.65	NM	5-15	NM	NM	NM	NM	NM	NM	NM	NM
ITC-RW-2[b]	10/25/2020	12.14	NM	9.85	NM	5-15	NM	NM	NM	NM	NM	NM	NM	NM

Notes:

a. Turbidity measurements through flow cell and water quality meter do not appear accurate and qualitative description provided.

b. Well not gauged during November 2020. Gauging data from 10/25/2020.

NM - Not measured

NP - Not present

BTOC - Below top of casing (designated measuring point/mark or north side of casing)

bgs - below ground surface

C - Celsius

uS/cm - micro-Siemens per centimeter

mg/L - milligrams per Liter

S.U. - Standard Units

mV - millivolts

NTU - Nephelometric Turbidity Units

mL/min - milliliters per minute

All water quality parameters are final instrument readings after low-flow sampling stabilization and immediately prior to sampling.

Figures

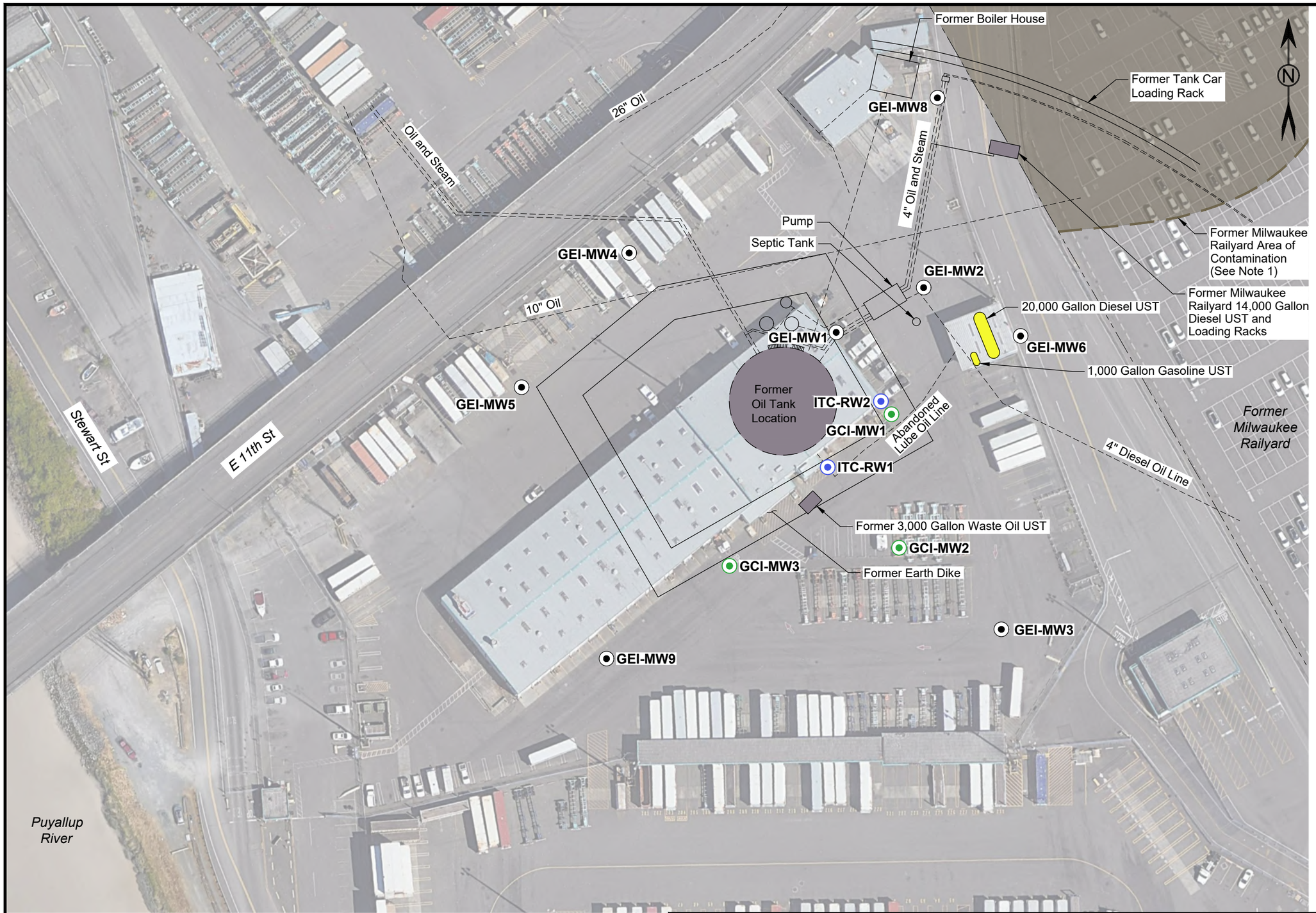
N

0 2,500 5,000
SCALE IN FEET

CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40
Tacoma, Washington
July 9, 2021

Figure 1
Vicinity Map



LEGEND

- Historical Fuel Storage
- Active UST
- Existing Monitoring Well
- Abandoned or Damaged Monitoring Well (Not Sampled)
- Existing Monitoring Well (Not Sampled)
- Approximate Site Boundaries

NOTES

1. Area of contamination approximated from Prospective Purchaser Consent Decree Re: Milwaukee Railyard Site, Attachment C, Figure 1. No. 95-2-02280-0 (Ecology 1995). Figure 1 identifies this area as free product but it is suspected that the figure legend is incorrect. Area of contamination is the approximate extent of soil with total petroleum hydrocarbon concentrations exceeding 1,000 mg/kg.
2. Historical petroleum infrastructure includes former True's Oil and Milwaukee Railyard facilities identified and located based on drawing numbers SA-531, SA-552, EP-3863-23, and EP-3865-23-C3 provided in Appendix A.

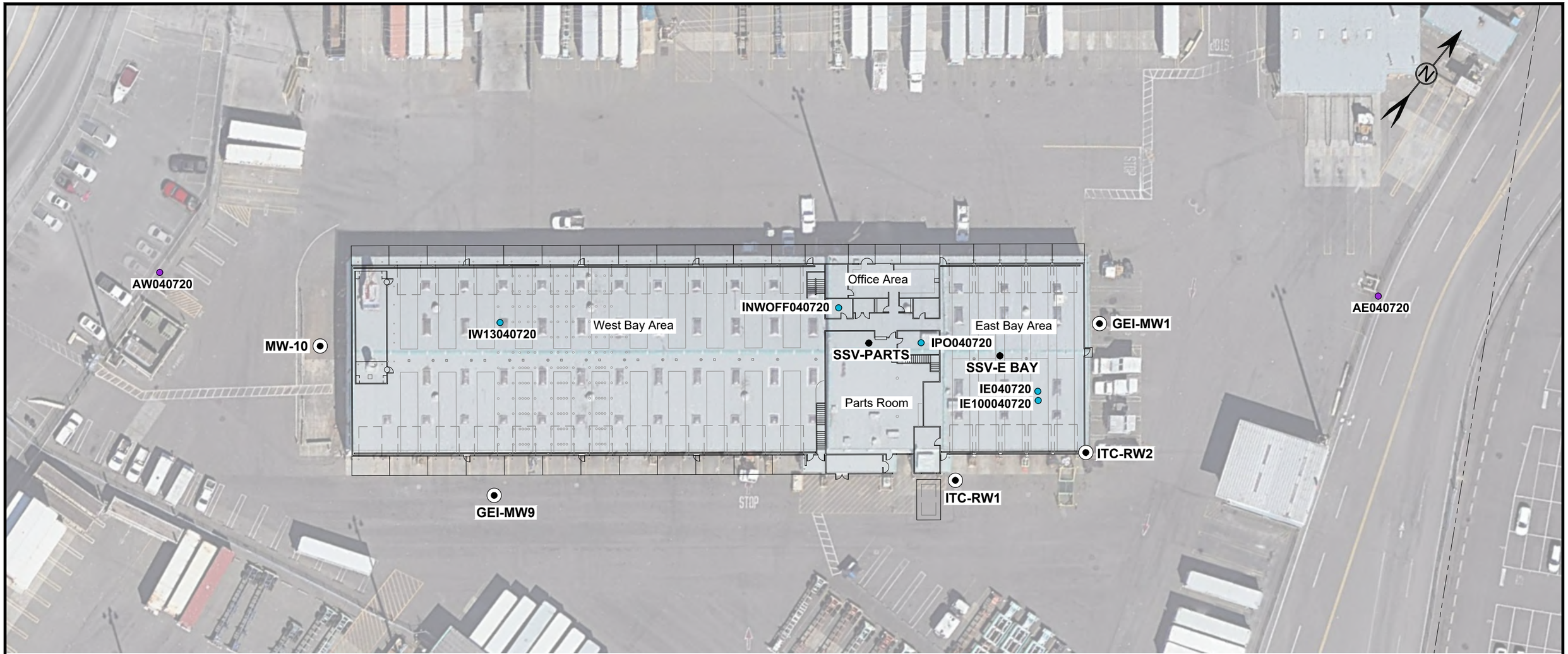
0 80 160

SCALE IN FEET

CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40
Tacoma, Washington
July 9, 2021

Figure 2
Historical Petroleum Infrastructure



LEGEND

- Subslab Vapor Sample
- Ambient Air Sample
- Indoor Air Sample
- Existing Monitoring Well

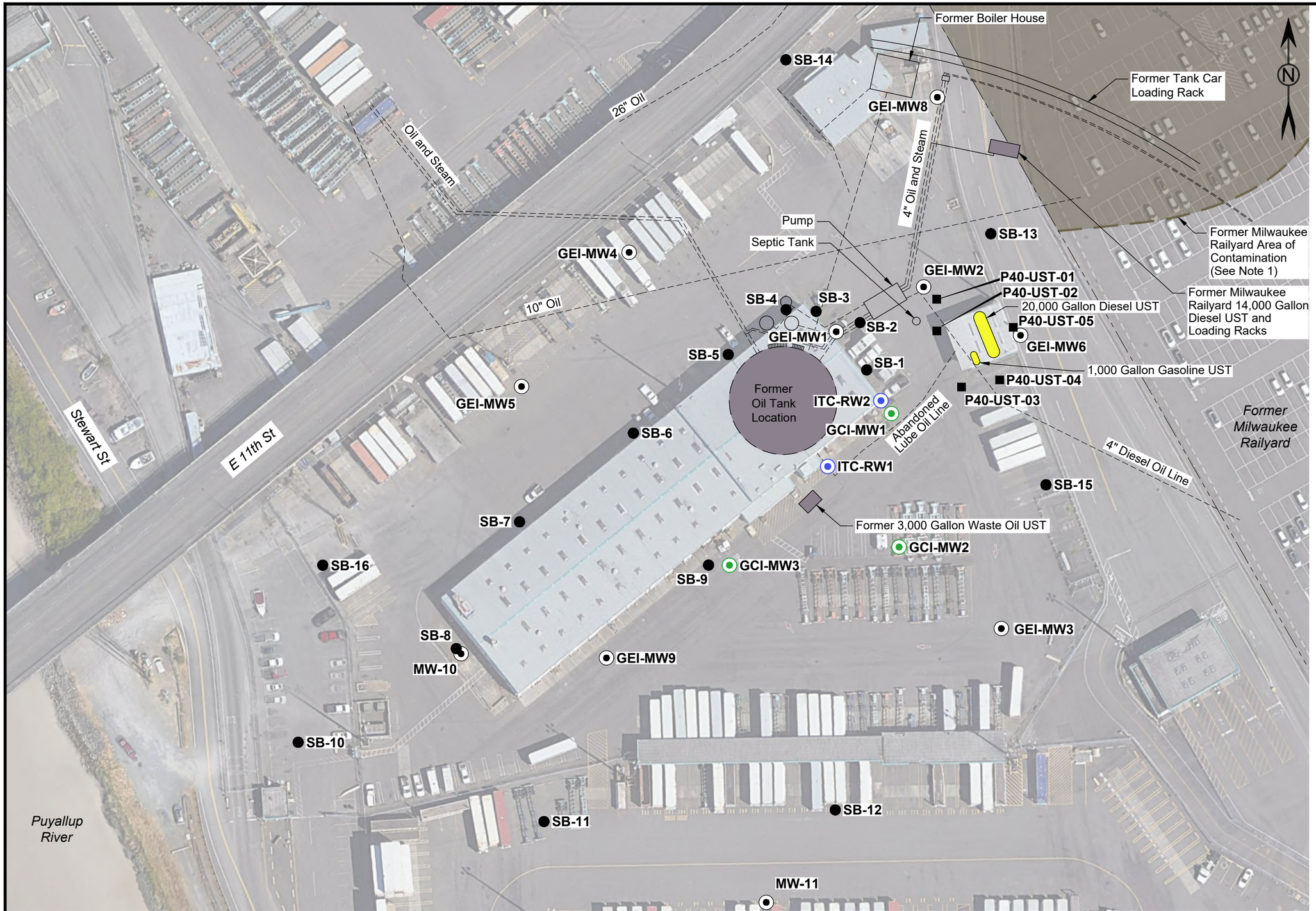
0 50 100

SCALE IN FEET

CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40
Tacoma, Washington
July 9, 2021

Figure 3
Building 600
Air and Subslab Vapor Sample Locations



LEGEND

- Historical Fuel Storage
- Active UST
- Existing Monitoring Well
- Existing Boring
- Existing Soil and Groundwater Sample
- Abandoned or Damaged Monitoring Well (Not Sampled)
- Existing Monitoring Well (Not Sampled)
- Approximate Site Boundaries

NOTES

1. Area of contamination approximated from Prospective Purchaser Consent Decree Re: Milwaukee Railyard Site, Attachment C, Figure 1. No. 95-2-02280-0 (Ecology 1995). Figure 1 identifies this area as free product but it is suspected that the figure legend is incorrect. Area of contamination is the approximate extent of soil with total petroleum hydrocarbon concentrations exceeding 1,000 mg/kg.

2. Historical petroleum infrastructure includes former True's Oil and Milwaukee Railyard facilities identified and located based on drawing numbers SA-531, SA-552, EP-3863-23, and EP-3865-23-C3 provided in Appendix A.

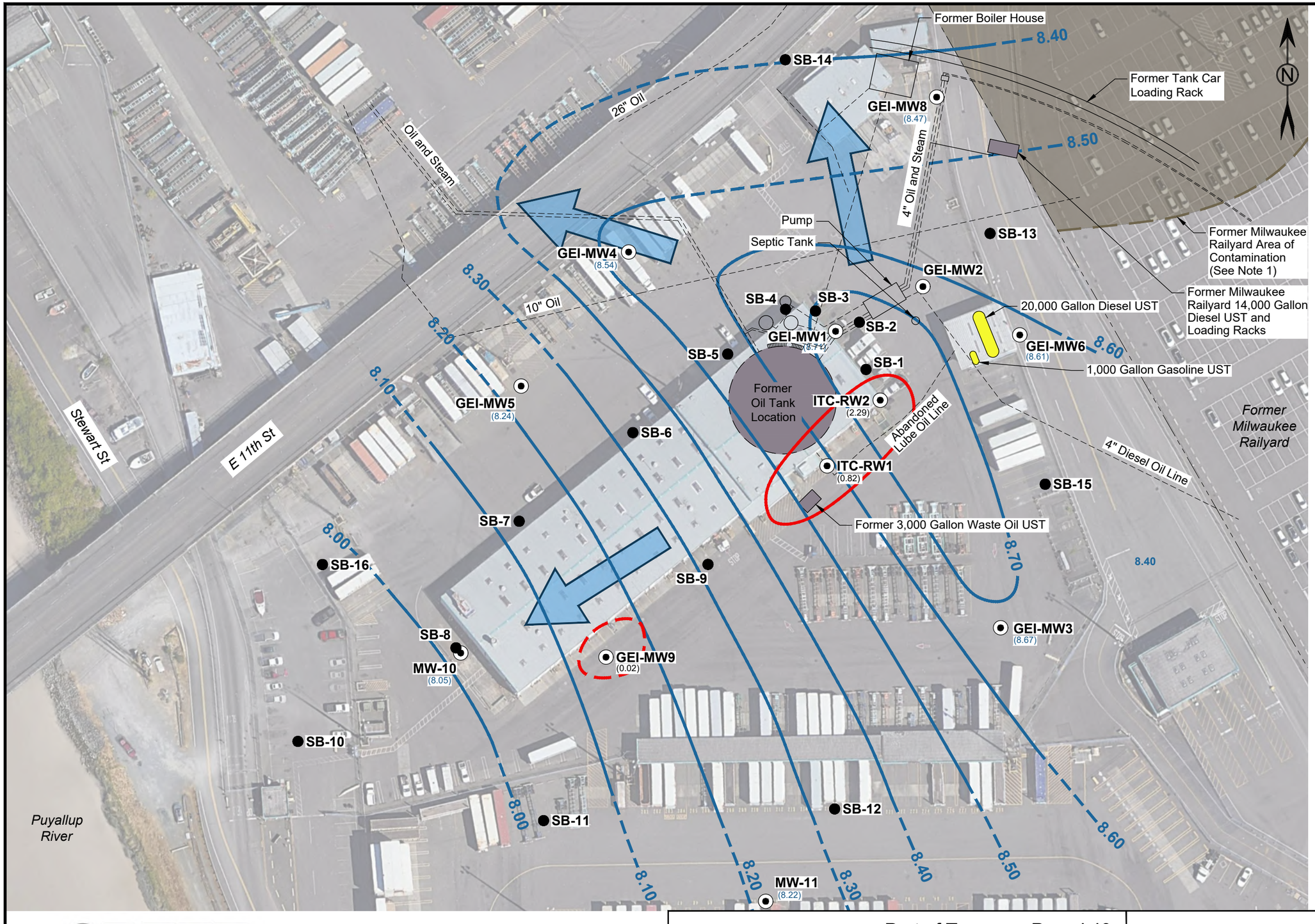
0 80 160

SCALE IN FEET

CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40
Tacoma, Washington
July 9, 2021

Figure 4
Soil and Groundwater Investigation Locations



LEGEND

- Historical Fuel Storage
- Active UST
- Existing Monitoring Well
- Investigation Soil Boring
- Groundwater Contour (Dashed where Inferred)
- (8.61) Averaged Groundwater Elevation at Monitoring Well over Tidal Study Period (feet MLLW)
- Groundwater Flow Direction
- LNAPL Plume
- Intermittent LNAPL
- (0.82) LNAPL Thickness
- Approximate Site Boundaries

NOTES

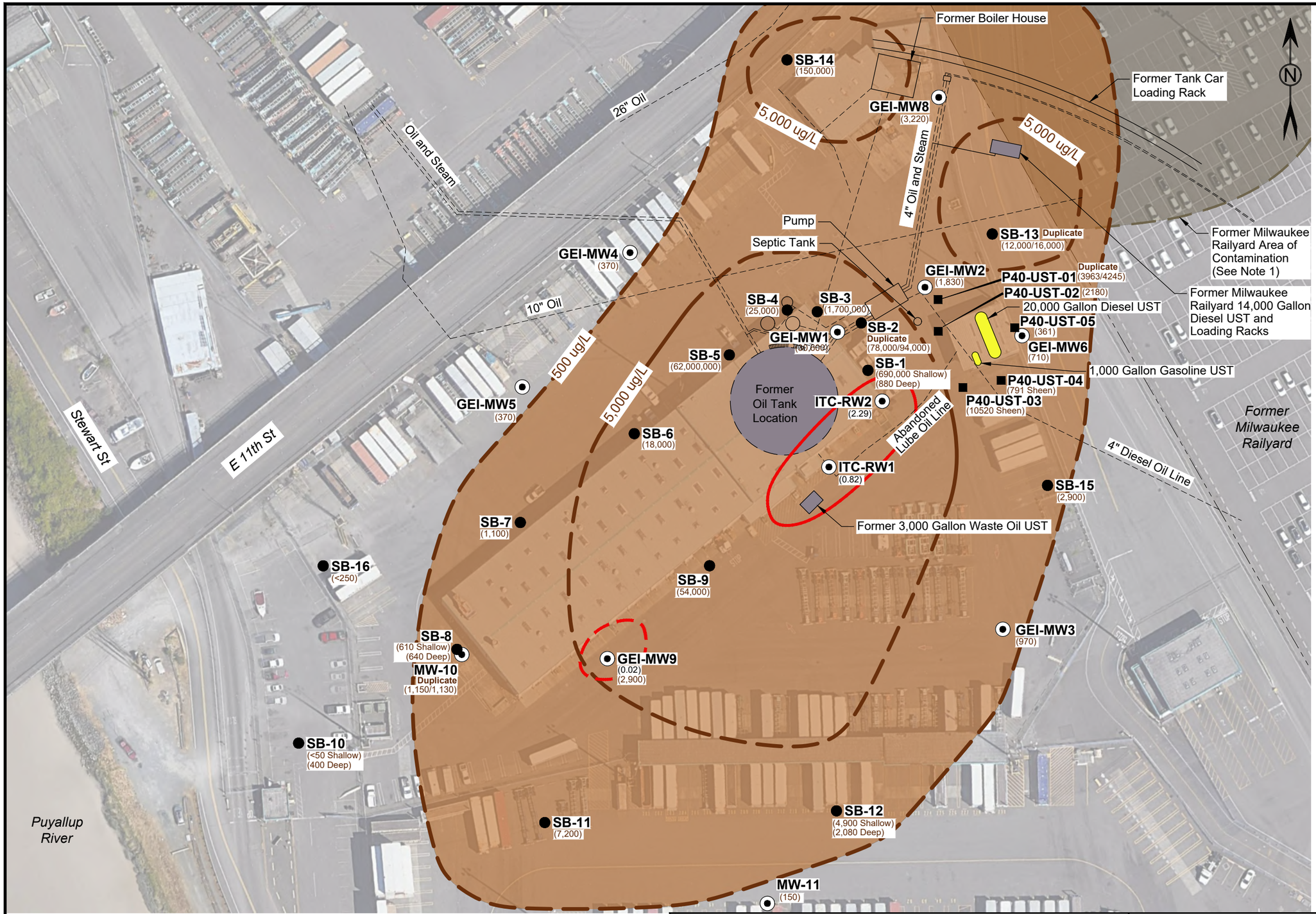
1. Area of contamination approximated from Prospective Purchaser Consent Decree Re: Milwaukee Railyard Site, Attachment C, Figure 1. No. 95-2-02280-0 (Ecology 1995). Figure 1 identifies this area as free product but it is suspected that the figure legend is incorrect. Area of contamination is the approximate extent of soil with total petroleum hydrocarbon concentrations exceeding 1,000 mg/kg.
2. Historical petroleum infrastructure includes former True's Oil and Milwaukee Railyard facilities identified and located based on drawing numbers SA-531, SA-552, EP-3863-23, and EP-3865-23-C3 provided in Appendix A.
3. Groundwater elevations averaged over time period ranging from 11/2/2020 at 5:06pm to 11/6/2020 at 9:24am. 0.02-ft LNAPL observed at GEI-MW9 on 10/25/2020 but no LNAPL observed on 11/19/2020. ITC-RW1 and ITC-RW2 LNAPL observations dated 10/25/2020.

0 80 160
SCALE IN FEET

CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40
Tacoma, Washington
July 9, 2021

Figure 5
Net Groundwater Flow



LEGEND

- Historical Fuel Storage
- Active UST
- Existing Monitoring Well
- Existing Boring
- Previous Soil and Groundwater Sample
- DRO/ORO Concentration in Groundwater Monitoring Wells (Dashed where Inferred)
- (920) Concentration of DRO/ORO in Groundwater (micrograms per liter) without use of Silica Gel Column for Cleanup
- Groundwater DRO/ORO Concentrations Exceeding MTCA Method A
- LNAPL Plume
- Intermittent LNAPL
- (0.82) LNAPL Thickness
- Approximate Site Boundaries

NOTES

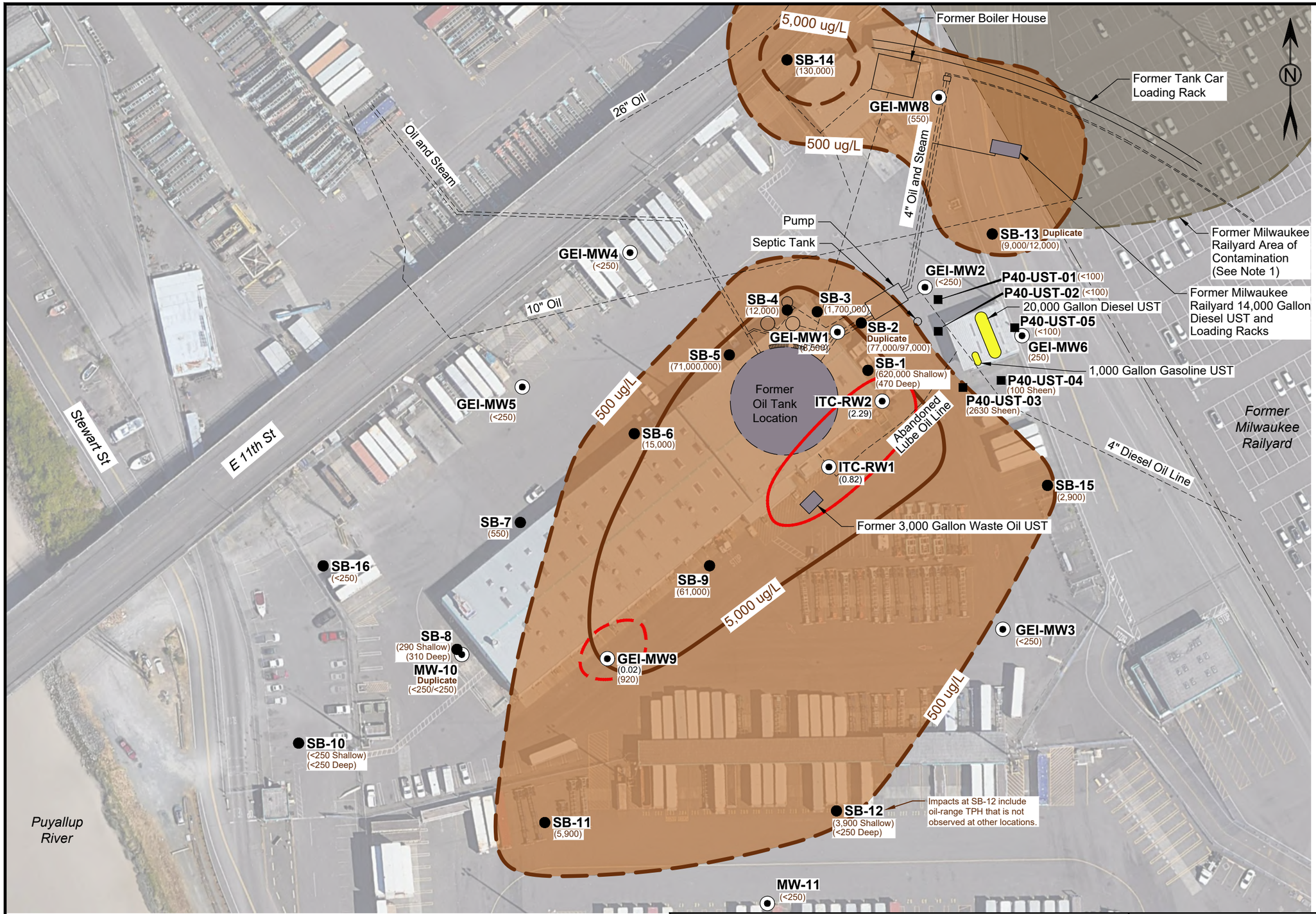
1. Area of contamination approximated from Prospective Purchaser Consent Decree Re: Milwaukee Railyard Site, Attachment C, Figure 1. No. 95-2-02280-0 (Ecology 1995). Figure 1 identifies this area as free product but it is suspected that the figure legend is incorrect. Area of contamination is the approximate extent of soil with total petroleum hydrocarbon concentrations exceeding 1,000 mg/kg.
2. Historical petroleum infrastructure includes former True's Oil and Milwaukee Railyard facilities identified and located based on drawing numbers SA-531, SA-552, EP-3863-23, and EP-3865-23-C3 provided in Appendix A.
3. Monitoring well groundwater sampled November 18-20, 2020.
   P40-UST sample locations sampled on August 30, 2019.
   SB-01 through SB-09 sample locations collected on June 12, 2020.
   SB-10 through SB-16 sample locations sampled on August 5, 2020.

0 80 160
SCALE IN FEET

CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40
Tacoma, Washington
July 9, 2021

Figure 6
TPH-DRO/ORO Groundwater Plume Map



LEGEND

- Historical Fuel Storage
- Active UST
- Existing Monitoring Well
- Existing Boring
- Previous Soil and Groundwater Sample
- DRO/ORO Concentration in Groundwater Monitoring Wells (Dashed where Inferred)
- (920) Concentration of DRO/ORO in Groundwater (micrograms per liter) with use of Silica Gel Column for Cleanup
- Groundwater DRO/ORO Concentrations Exceeding MTCA Method A
- LNAPL Plume
- Intermittent LNAPL
- (0.82) LNAPL Thickness
- Approximate Site Boundaries

NOTES

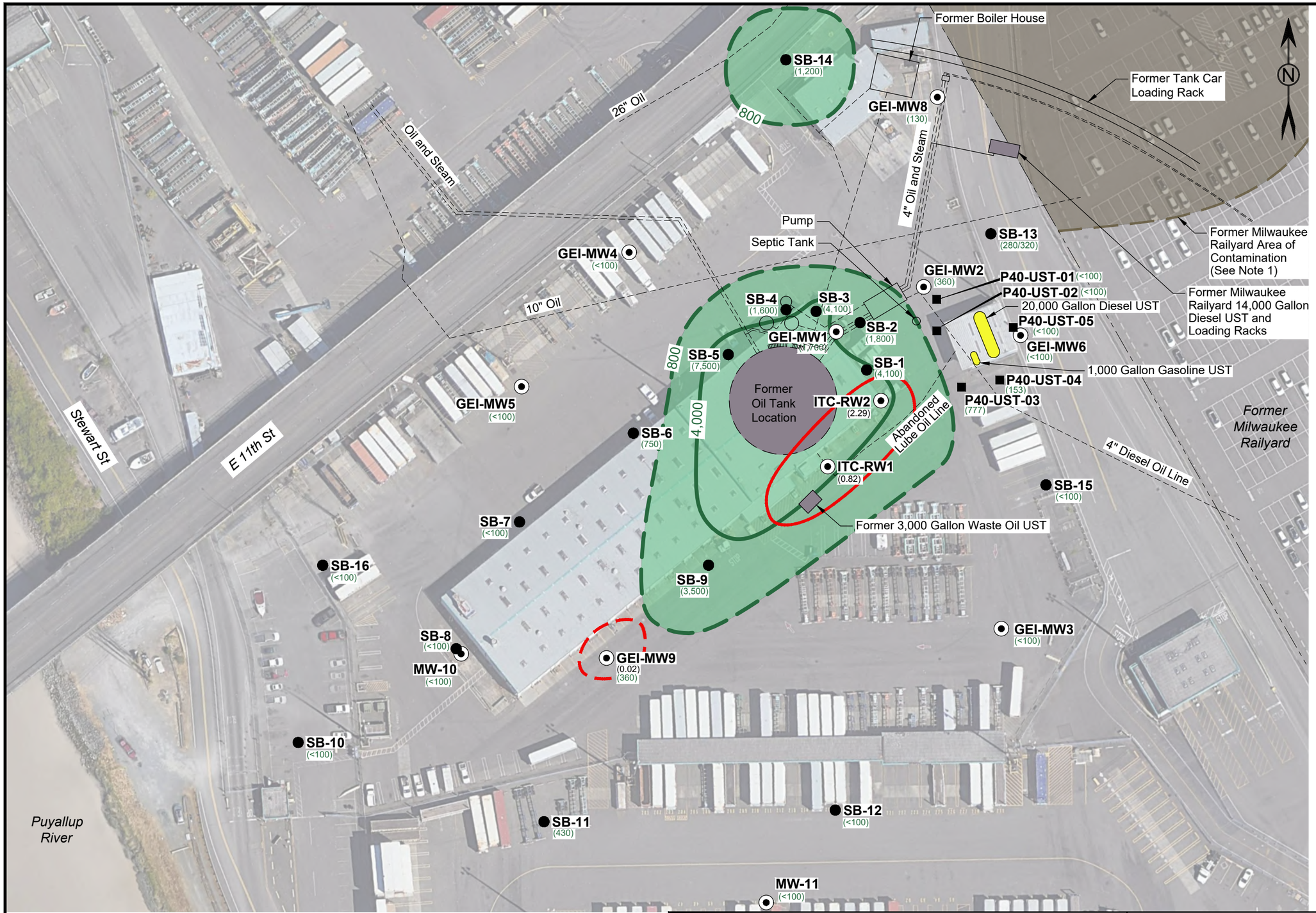
1. Area of contamination approximated from Prospective Purchaser Consent Decree Re: Milwaukee Railyard Site, Attachment C, Figure 1. No. 95-2-02280-0 (Ecology 1995). Figure 1 identifies this area as free product but it is suspected that the figure legend is incorrect. Area of contamination is the approximate extent of soil with total petroleum hydrocarbon concentrations exceeding 1,000 mg/kg.
2. Historical petroleum infrastructure includes former True's Oil and Milwaukee Railyard facilities identified and located based on drawing numbers SA-531, SA-552, EP-3863-23, and EP-3865-23-C3 provided in Appendix A.
3. Monitoring well groundwater sampled November 18-20, 2020.
   P40-UST sample locations sampled on August 30, 2019.
   SB-01 through SB-09 sample locations collected on June 12, 2020.
   SB-10 through SB-16 sample locations sampled on August 5, 2020.

0 80 160
SCALE IN FEET

CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40
Tacoma, Washington
July 9, 2021

Figure 7
TPH-DRO/ORO with Silica Gel Cleanup
Groundwater Plume Map



LEGEND

- Historical Fuel Storage
- Active UST
- Existing Monitoring Well
- Existing Boring
- Previous Soil and Groundwater Sample
- GRO Concentration in Groundwater Monitoring Wells (Dashed where Inferred)
- (920) Concentration of GRO in Groundwater (micrograms per liter)
- GRO Concentrations Exceeding MTCA Method A
- LNAPL Plume
- Intermittent LNAPL
- (0.82) LNAPL Thickness
- Approximate Site Boundaries

NOTES

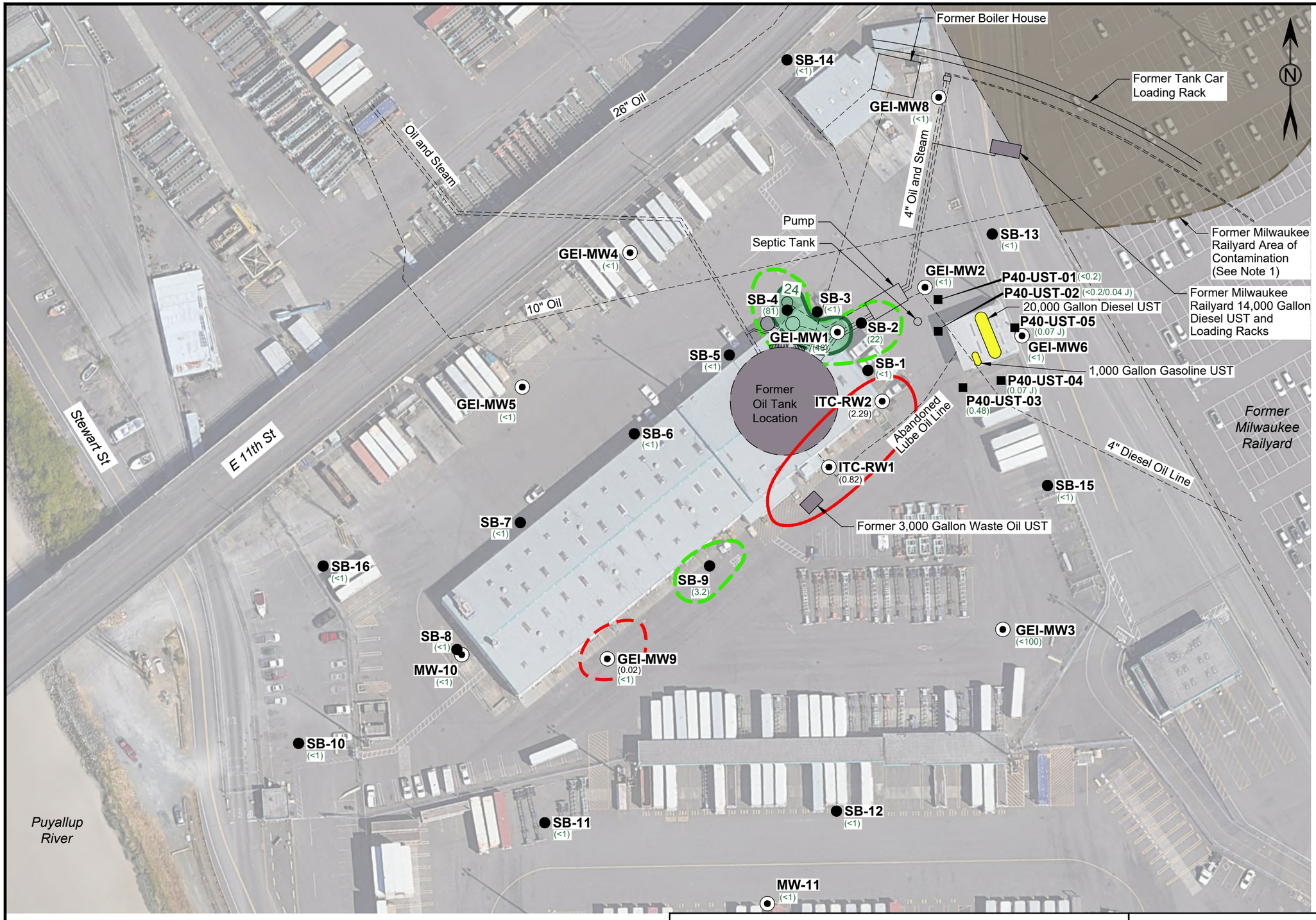
1. Area of contamination approximated from Prospective Purchaser Consent Decree Re: Milwaukee Railyard Site, Attachment C, Figure 1. No. 95-2-02280-0 (Ecology 1995). Figure 1 identifies this area as free product but it is suspected that the figure legend is incorrect. Area of contamination is the approximate extent of soil with total petroleum hydrocarbon concentrations exceeding 1,000 mg/kg.
2. Historical petroleum infrastructure includes former True's Oil and Milwaukee Railyard facilities identified and located based on drawing numbers SA-531, SA-552, EP-3863-23, and EP-3865-23-C3 provided in Appendix A.
3. Monitoring well groundwater sampled November 18-20, 2020.
   P40-UST sample locations sampled on August 30, 2019.
   SB-01 through SB-09 sample locations collected on June 12, 2020.
   SB-10 through SB-16 sample locations sampled on August 5, 2020.

0 80 160
SCALE IN FEET

CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40
Tacoma, Washington
July 9, 2021

Figure 8
TPH-GRO Groundwater Plume Map



LEGEND

- Historical Fuel Storage
- Active UST
- Existing Monitoring Well
- Existing Boring
- Previous Soil and Groundwater Sample
- (920) Concentration of Benzene in Groundwater (micrograms per liter)
- Benzene Concentrations Exceeding MTCA Method C Vapor Intrusion Screening Level
- Benzene Concentration Exceeds Surface Water Quality Criteria
- LNAPL Plume
- Intermittent LNAPL
- (0.82) LNAPL Thickness
- Approximate Site Boundaries

NOTES

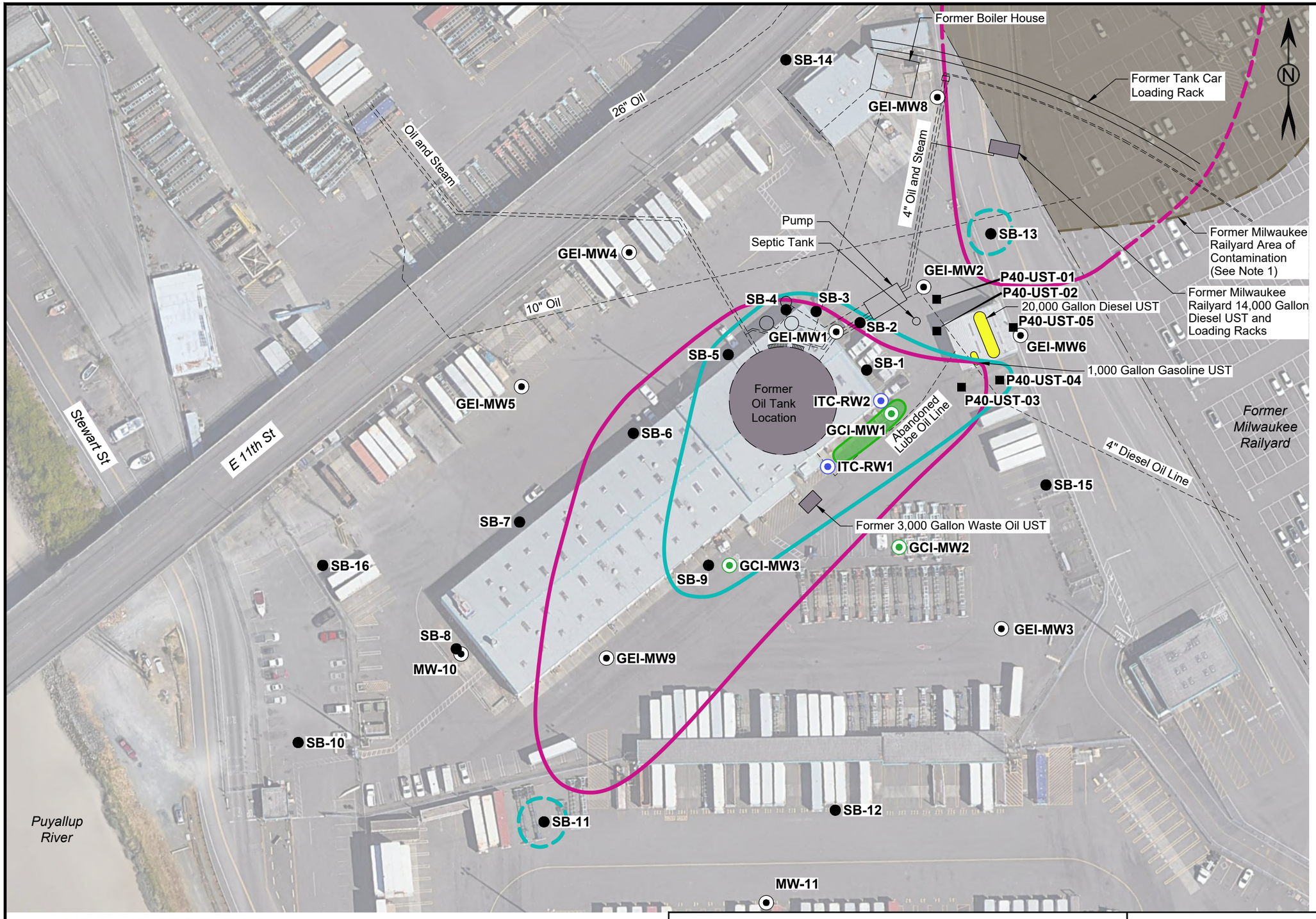
1. Area of contamination approximated from Prospective Purchaser Consent Decree Re: Milwaukee Railyard Site, Attachment C, Figure 1. No. 95-2-02280-0 (Ecology 1995). Figure 1 identifies this area as free product but it is suspected that the figure legend is incorrect. Area of contamination is the approximate extent of soil with total petroleum hydrocarbon concentrations exceeding 1,000 mg/kg.
2. Historical petroleum infrastructure includes former True's Oil and Milwaukee Railyard facilities identified and located based on drawing numbers SA-531, SA-552, EP-3863-23, and EP-3865-23-C3 provided in Appendix A.
3. Monitoring well groundwater sampled November 18-20, 2020.
   P40-UST sample locations sampled on August 30, 2019.
   SB-01 through SB-09 sample locations collected on June 12, 2020.
   SB-10 through SB-16 sample locations sampled on August 5, 2020.

0 80 160
SCALE IN FEET

CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40
Tacoma, Washington
July 9, 2021

Figure 9
Benzene Groundwater Plume Map



LEGEND

- Historical Fuel Storage
- Active UST
- Existing Monitoring Well
- Existing Boring
- Previous Soil and Groundwater Sample
- Abandoned or Damaged Monitoring Well (Not Sampled)
- Existing Monitoring Well (Not Sampled)
- Lube Oil Release (ORO > 10,000 mg/kg)
- DRO > 10,000 mg/kg (Dashed where Inferred)
- GRO > 500 mg/kg (Dashed where Inferred)
- Approximate Site Boundaries

NOTES

1. Area of contamination approximated from Prospective Purchaser Consent Decree Re: Milwaukee Railyard Site, Attachment C, Figure 1. No. 95-2-02280-0 (Ecology 1995). Figure 1 identifies this area as free product but it is suspected that the figure legend is incorrect. Area of contamination is the approximate extent of soil with total petroleum hydrocarbon concentrations exceeding 1,000 mg/kg.
2. Historical petroleum infrastructure includes former True's Oil and Milwaukee Railyard facilities identified and located based on drawing numbers SA-531, SA-552, EP-3863-23, and EP-3865-23-C3 provided in Appendix A.

0 80 160
SCALE IN FEET

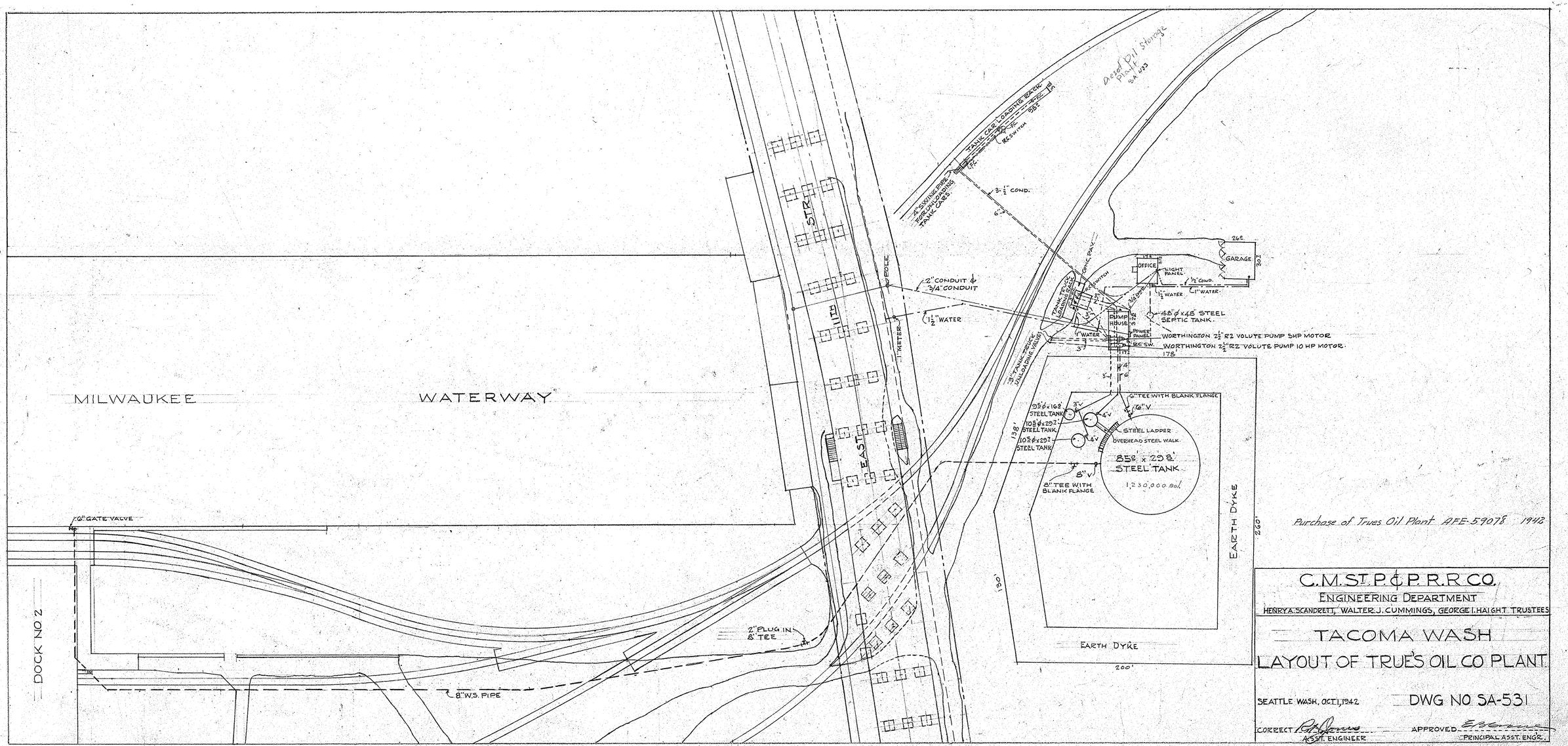
CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40
Tacoma, Washington
July 9, 2021

Figure 10
Petroleum Impacted Soil Areas

Appendix A

Select Historical Documents



Purchase of Trues Oil Plant AFE-59078 1942

C.M.St.P.&P.R.R.CO.

ENGINEERING DEPARTMENT

HENRY A. SCANDRETT, WALTER J. CUMMINGS, GEORGE I. HAIGHT TRUSTEES

TACOMA WASH

LAYOUT OF TRUES OIL CO PLANT

SEATTLE WASH. OCT 1, 1942 DWG NO SA-531

CORRECT _____ ASST. ENGINEER

APPROVED _____ PRINCIPAL ASST. ENGR.

File 429-6.12

MILWAUKEE WATERWAY

EAST 11TH ST.

Place 1" steam riser with 1" valve at each unloader

NEW 1½" 231 LF. STEAM HEATING LINE - ENCLOSE IN CREOSOTED WOOD BOX WITH OIL LINE SEE SECT. C-C

EXTEND 6" OIL LINE & INSTALL 8-6' TANK CAR UNLOADING CONNECTIONS @ 40 ft. C. to C.

Note:- 3-6" UNLOADING CONNECTIONS OUT OF EXISTING 6" LINE, BALANCE OF CONNECTIONS OUT OF 6" LINE EXTENDED.

EXISTING TANK CAR LOADING COLUMNS TO BE LEAVE IN PLACE

STEAM & OIL CONNECTIONS IN CREOSOTED WOOD BOX WITH 30'-0" LEAD TO PORTABLE PUMP

14,000 GAL. DIESEL OIL TANK A.S.E. 59660

4" VALVE

58 L.F. 4" Pipe

34 L.F. SECT.

EXISTING 6" OIL LINE
NEW 1½ OIL LINE, 118
NEW 1½" STEAM LINE 118

ENCLOSE IN CREOSOTED WOOD BOX.

2'-6"x2'-6" TIM. BLOWOFF BOX.

223 LF 4" NEW 4" STEAM LINE INSULATED, IN CREOSOTED WOOD BOX

50 LIN. FT. SECT. D-D

NEW 30'-32' BOILER HOUSE & 120 H.P. BOILER

24'-SECT. FF

GARAGE

OFFICE

31 LIN. FT. SECT. OC.

60 L.F. NEW 1¼ WATER LINE.

EXISTING 1½ WATER LINE

EXISTING 1" WATER METER.

45 L.F. SECT. GG.

TANK TRUCK UNLOADING VALVES

Run 1½" steam & 1½" oil pipes around pump house (50 LF SECT. C-C)

STEAM HEATING COILS IN PUMP HOUSE, 130 L.F. 1¼" PIPE.

PUMPHOUSE, 2-2½" CENTRIFUGAL PUMPS

4'-0"x3'-0"x2'-6" TIM. BOX.

DISCONNECT

142'-3" Pipe

62 L.F. SECT. EE

STEAM & OIL CONNECTIONS IN CREOSOTED WOOD BOX FOR DRAINING 6" OIL LINE WITH PORTABLE PUMP

59 LF SECT. F-F

30 LF SECT. E-E

3'-0"x4'-0"x2'-0" TIM. BOX.

REMOVE 4" PIPE.

DISCONNECT THESE TANKS FROM PUMP MANIFOLD

15 LF NEW 4" OIL LINE

1" 20'-0" LONG TIM. BOX

NEW 1½ OIL LINE

STEAM TO TANK COILS

For details of heating coils see Dr. SA-570

50 LF SECT. H-H

858'x298' STEEL TANK.

SWING JOINT

NEW 6" SWING PIPE.

1,250,000 Gal. Capacity

NEW SUMP

1½"x1' Ell and 1" Globe valve at end of 1½" steam line

NEW 1½" STEAM LINE

Bend in 8" pipe

8" Toe now in place to be turn toe to face in the right direction

5'-2"x4'-6"x5'-0" TIMBER BOX

87.7 LF SECT. M-N

50 LF SECTION B-B.

74 LF SECT. A-A

55 LF SECT. A-A

20 LF SECT. B-B

A

B

EARTH DYKE.

DOCK NO 2

EXISTING 8" OIL LINE. , NEW LGTH. 1084'
NEW 1½" STEAM LINE , 1084'
NEW 1¼" OIL LINE FOR, 1084' PUMPING OIL FROM 8" LINE TO SHIP OR STORAGE TANK

EXISTING 6" VALVE

NEW 1½" GATE VALVE
NEW 1¼" GATE VALVE

20 LIN. FT. SECTION B-B. CONSTRUCT NEW 8" LINE 80 L.F.

40 LIN. FT. SECT. B-B

170 L.F. SECT. K-M.

1/2" STEAM VALVE
1/2" OIL VALVE
1/2" OIC VALVE

6'-6"x6'-9" TIM. BOX

STEAM & OIL CONNECTIONS IN CREOSOTED WOOD BOX FOR DRAINING 8" OIL LINE WITH PORTABLE PUMP

PLACE VALVE SO THAT STEAM LINE WILL DRAIN

254 L.F. SECT. A-A

ENCLOSE THESE 3 PIPES IN CREOSOTED WOOD BOX

8" pipe has screwed couplings, but flanged fittings.

OLSEN BOAT CO.

EXISTING 8" OIL LINE 1076 L.F.

RETIRE 81 L.F. 8" PIPE UNDER BLDG.

134 L.F. SECT. A-A

Bend in 8" pipe

PLAN OF OIL PLANT.
UNLESS OTHERWISE NOTED ALL FACILITIES SHOWN ARE NOW IN PLACE.
Scale 1" = 40'

3" TO TRUCKS

6" SUCTION & DISCHARGE TO TANK CARS

3" DISCHARGE MANIFOLD.

3" FROM TRUCKS

MOVE 3" GATE V.

3" GATE VALVES FROM PIPING REMOVED

WORTHINGTON 2½ R VOLUTE CENTRIFUGAL PUMP NO 841434 5 HP 220 V 3ϕ 60 CY MOTOR 1750 RPM.

4" SUCTION MANIFOLD

NEW 4" GATE V.

MOVE 4" GATE V.

4" DISCHARGE MANIFOLD.

WORTHINGTON 2½ R VOLUTE CENTRIFUGAL PUMP NO. 841821 10 HP 220 V 3ϕ 60 CY MOTOR 1750 RPM.

6" SUCTION MANIFOLD

4" DISCHARGE TO 8" LINE TO DOCK NO 2

6" SUCTION & DISCHARGE, STORAGE TANK.

DIAGRAM OF PIPING IN PUMP HOUSE
PUMPS & PIPING NOW IN PLACE.
PIPING SHOWN THUS ----- TO BE DISCONNECTED OR REMOVED.

1'-6" Roofing 4"x12"x1'-6" 2-⅜"x9" Boat spikes 2 each end 4"x14" 4"x10" 4"x14" 1'-6" 4"x12"x2'-6" @ 4' C. to C.

SECT. G-G, Under track and road

1'-2" Roofing 2"x12"x1'-2" 4" Oil 1½ 2"x10" 2"x10" 1'-0"

SECT. H-H

1'-8" Roofing 4"x12"x1'-8" 2-⅜"x9" boat spikes each end 6" Oil 1½ 1½ 4"x14" 4"x14" 1'-6" ⅜"x9" Boat spikes, 6" ctrs. 4"x12" 4"x12"x3'-0" @ 4' C. to C.

SECT. D-D Under track and roadway scale 1"=1'-0"

3'-4" Roofing 2"x12"x2'-4" 6" Oil 1½ 4" Oil 1½ 2"x14" 2"x14" 1'-4" 2"x12" 2"x12" 3"x6"x3'-0" @ 6'-0" C. to C.

SECT. E-E

1'-6" 2" 1'-2" 2" #55 Prepared Roofing 2"x12"x1'-6" 2"x14" 8" Oil line 1¼" Oil line 1½" Steam line 1"x6" @ 6'-0" ctrs. 2"x14" 1'-4" 12" 3" 2" 3" 3"x6"x1'-9" sleepers, 6'-0" C. to C.

SECTION A-A
BOX FOR 8" OIL LINE ~ Scale 1½"=1'-0"

1'-4" 2" 12" 2" #55 Prepared Roofing 2"x12"x1'-4" 2"x12" 6" Oil line 1¼" Oil line 1½" Steam line 1"x6" @ 6' ctrs 2"x12" 1'-2" 10" 2" 3" 3"x6"x1'-6" Sleepers, 6'-0" ctrs.

SECTION C-C
BOX FOR 6" OIL LINE ~ Scale 1½"=1'-0"

1'-2" 2" 10" 2" 12" Strips roofing from Sect. CC 2"x12"x1'-2" 2"x12" 4" Std. 1½" Asbestos Insulation 4" steam pipe 2"x12" 2"x10" 1'-2" 10" Pipe Roller:- 1½" pipe over ⅜" pipe abt. 18" C. to C. Thin washer ⅜" Pipe cap 2" 2" 3"

SECTION F-F
BOX FOR 4" STEAM LINE

2'-0" Prepared Roofing 5"x12"x2'-0" 8" Oil 1½ 1½ 5"x12" 5"x12" 1'-10" ⅜"x9" Boat spikes 2 ea. end 1"x6"x1'-1" 5"x12"x2'-0"

SECT. B-B Under Track and Roadways scale 1½"=1'-0"

AFE-59564 AS BUILT.

C. M. ST. P & P. R. R. CO.
ENGINEERING DEPARTMENT
HENRY A. SCANDRETT, WALTER J. CUMMINGS, GEORGE I. HAIGHT-TRUSTEES

TACOMA WASH.
IMPROVEMENTS TO TRUE'S OIL PLANT.

SEATTLE, WASH.
APRIL 12 1943

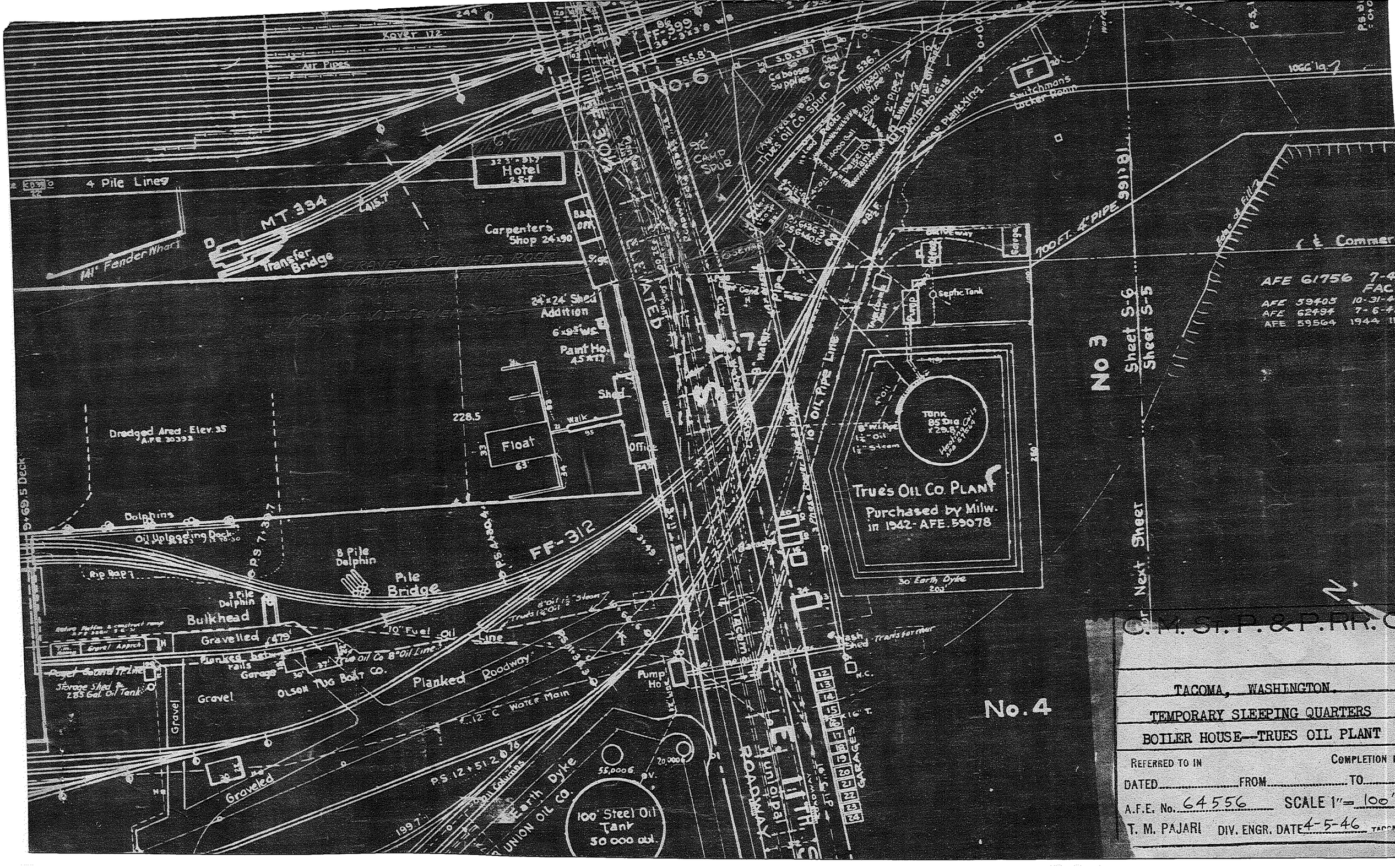
DWG. NO. SA-552

CORRECT:- [signature] ASST. ENGR

APPROVED:- [signature] PRIN. ASST. ENGINEER

REV. AS BUILT 7-24-43 LGW. Rev. Sect. F-F 11-20-43 WRN Rev. Pipe sizes 10-15-43 WRN Rev. 10-9-43 WRN

File 429-6.42


No. 6
No. 7
No. 4
No 3
Sheet S-6
Sheet S-5
Hotel 25'
Carpenter's Shop 24'x90'
MT 334
Transfer Bridge
4 Pile Lines
141' Fender Wharf
24'x24' Shed Addition
Paint Ho. 45'x17'
Float 63'
Dredged Area - Elev. 35 A.F.E. 30393
Dolphins
Oil Unloading Dock
Rip Rap
8 Pile Dolphin
3 Pile Dolphin
Bulkhead
Pile Bridge
FF-312
Gravelled 479'
10" Fuel Oil Line
Planked Roadway
Gravel
OLSON TUG BOAT CO.
Storage Shed & 285 Gal. Oil Tank
Graveled
12" C. Water Main
Earth Dyke
UNION OIL CO.
100' Steel Oil Tank 50 000 gal.
55,000 G.
20,000
Pump House
Office
Walk
Shed
Gravel
Planked Walk
Planked Roadway
Camp Spur
Caboose Supplies
Switchman's Locker Room
Switch Stand
Derail
Unloading Pipe
Dike
Pump No. 618
Plank Xing
Trues Oil Co. Spur
Trues oil Co. 8" Oil Line
Trucks 8"Oil 1½"Steam
Tank 10,000 gal.
Tank 5,000 gal.
Tank 2,000 gal.
Tank 1,000 gal.
Tank 500 gal.
Tank 285 gal.
Tank 85 Dia. 29.8 High
Septic Tank
Pump
Drive Way
Garage
Wash Shed
Transformer
N.C.
700 FT. 4" PIPE
10" OIL PIPE LINE
Edge of Fill
Edge of Water
Center Line
Track
Switch
Turnout
Derail
Unloading Pipe
Dike
Pump No. 618
Plank Xing
Switchman's Locker Room
Caboose Supplies
Trues Oil Co. Spur
Camp Spur
Hotel 25'
Carpenter's Shop 24'x90'
MT 334
Transfer Bridge
4 Pile Lines
141' Fender Wharf
24'x24' Shed Addition
Paint Ho. 45'x17'
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3 Pile Dolphin
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Storage Shed & 285 Gal. Oil Tank
Graveled
12" C. Water Main
Earth Dyke
UNION OIL CO.
100' Steel Oil Tank 50 000 gal.
55,000 G.
20,000
Pump House
Office
Walk
Shed
Gravel
Planked Walk
Planked Roadway
Camp Spur
Caboose Supplies
Switchman's Locker Room
Switch Stand
Derail
Unloading Pipe
Dike
Pump No. 618
Plank Xing
Trues Oil Co. Spur
Trues oil Co. 8" Oil Line
Trucks 8"Oil 1½"Steam
Tank 10,000 gal.
Tank 5,000 gal.
Tank 2,000 gal.
Tank 1,000 gal.
Tank 500 gal.
Tank 285 gal.
Tank 85 Dia. 29.8 High
Septic Tank
Pump
Drive Way
Garage
Wash Shed
Transformer
N.C.
700 FT. 4" PIPE
10" OIL PIPE LINE
Edge of Fill
Edge of Water
Center Line
Track
Switch
Turnout
Derail
True's Oil Co. Plant
Purchased by Milw. in 1942 - AFE. 59078
30 Earth Dyke
AFE 61756
AFE 59403
AFE 62494
AFE 59504
Sheet Next Sheet
C. M. St. P. & P. R. R. Co.
TACOMA, WASHINGTON.
TEMPORARY SLEEPING QUARTERS
BOILER HOUSE—TRUES OIL PLANT
REFERRED TO IN
DATED FROM TO
A.F.E. No. 64556 SCALE 1" = 100'
T. M. PAJARI DIV. ENGR. DATE 4-5-46

PORT OF TACOMA

SITE FACILITIES FOR
TACOMA TERMINALS INC.
CONTAINER TERMINAL
CONTRACT NO. 550

PORT COMMISSION:

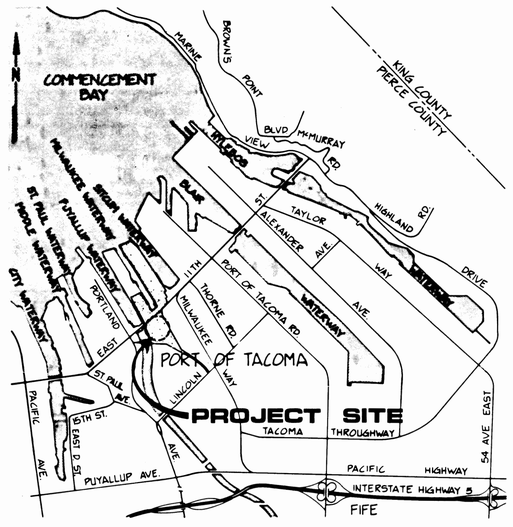
ROBERT G. EARLEY
JACK A. FABULICH
JOE E. FAKER
JOHN A. McCARTHY
PATRICK O'MALLEY

PORT STAFF:

RICHARD DALE SMITH
EXECUTIVE DIRECTOR

JOHN J. TERPSTRA, P.E.
PROJECT MANAGER

ROBERT L. MacLEOD, P.E.
CHIEF ENGINEER



VICINITY MAP N.T.S.

INDEX OF DRAWINGS:

DRAWING NO.	SHEET NO.	SHEET TITLE
EP-3865-23	1	Cover Sheet
EP-3865-23-G1	2	Site Plan & General Notes
EP-3865-23-C1	3	Plan
EP-3865-23-C2	4	Plan
EP-3865-23-C3	5	Plan
EP-3865-23-C4	6	Plan
EP-3865-23-C5	7	Plan
EP-3865-23-C6	8	Typical Sections
EP-3865-23-C7	9	Typical Sections & Details
EP-3863-23		Reference Drawing

CIVIL & ELECTRICAL CONSULTANTS:
WHITACRE ENGINEERS, INC.
2124 SOUTH "K" STREET
TACOMA, WASHINGTON

GEOTECHNICAL CONSULTANTS:
HART-CROWSER & ASSOC., INC.
SEATTLE, WASHINGTON

PORT of TACOMA U.S.A.

JOHN A. PETERSON — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION 4-5-84

Whitacre Engineers, Inc.
Consulting Engineering & Land Planning
2124 SO. 'K' STREET P.O. BOX 5677
TACOMA, WASHINGTON 98405 (206) 272-5144

MARK	REVISION	BY	APP.	DATE
	ISSUE FOR CONSTRUCTION	JJP	JJP	4-5-84

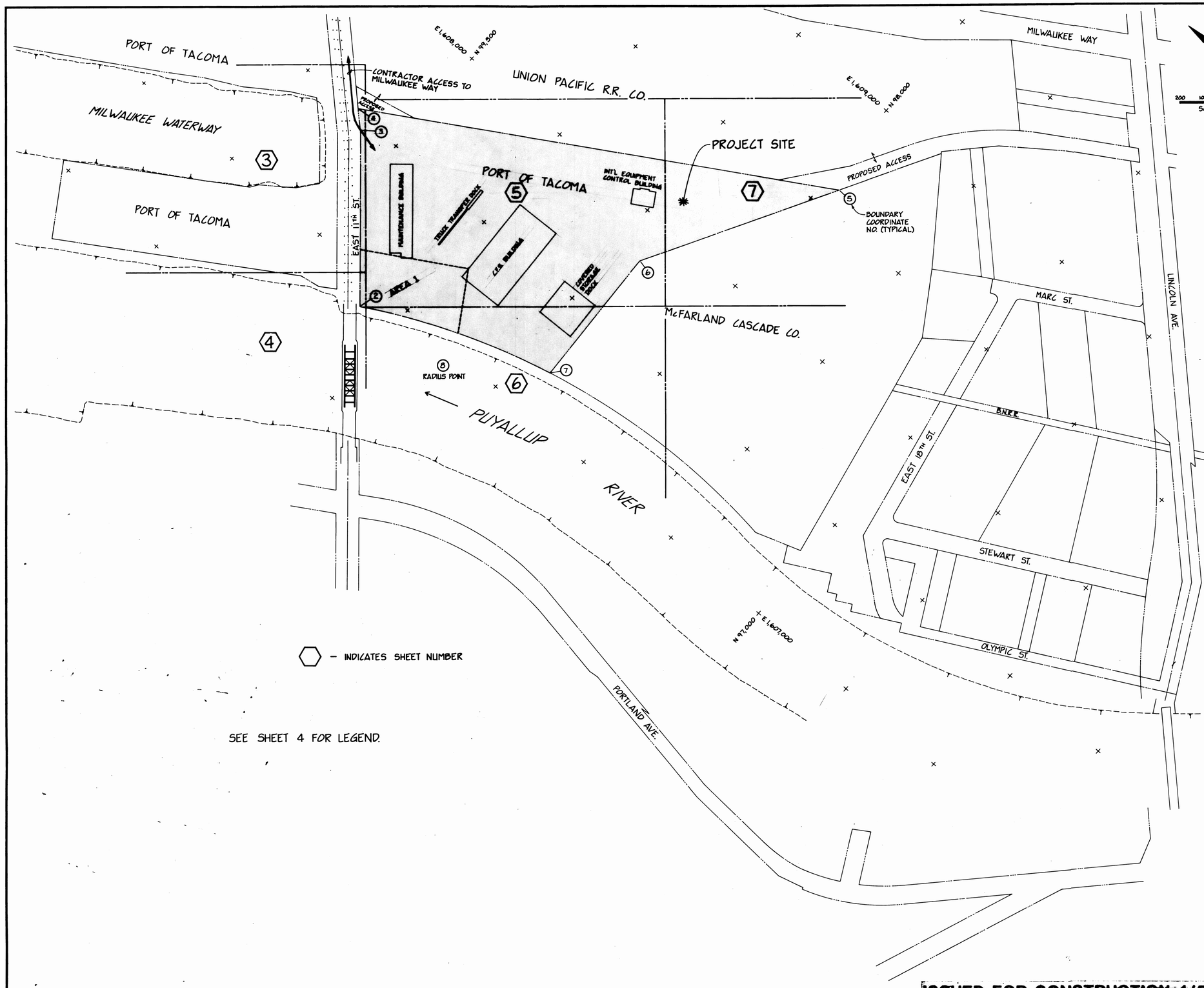
DRAWN RHT DATE 12-27-83
CHECKED JJP DATE 12-27-83
CHECKED JJP DATE 12/27/83
CONT. NO. 550

PORT OF TACOMA
TACOMA TERMINALS, INC.
C.F.S. AREA EARTHWORK
COVER SHEET

FIELD BOOK (S) _____ SCALE _____

APPROVED _____ PROJECT MANAGER 12/29/83 DATE
R. Dale Smith CHIEF ENGINEER 12/29/83 DATE

DRAWING NO. EP-3865-23
SHEET 1 OF 9



⬡ – INDICATES SHEET NUMBER

SEE SHEET 4 FOR LEGEND.

GENERAL NOTES

1. Vertical datum for this project is Mean Lower Low Water (M.L.L.W.) as established by the Port of Tacoma.

2. Existing ground elevations shown on these drawings were obtained from the following:

   a. Field topographic surveys prepared by the Port of Tacoma.

   b. Aerial topographic surveys prepared by Aerial Mapping Co., Boise Idaho, for Whitacre Engineers in July 1983.

   c. Miscellaneous field topographic surveys to augment (a) and (b) above by Whitacre Engineers in November 1983.

3. The locations of underground utilities shown within the limits of this project are approximate and were obtained from available records. The actual existence of these utilities is unknown. Depths are unknown.

4. The general sequence of construction activities is as follows:

   a. Perform required clearing, grubbing, stripping, excavation, etc.

   b. Place structural fill material to a minmimum elevation of 15 feet (M.L.L.W.), as specified. The westerly portion of the existing Maintenance Building preload may be utilized.

   c. Place structural and preload fill to specified lines and grades for C.F.S. Building.

   d. Perform Item (c) above for all other buildings to be preloaded.

   e. Allow for settlement of filled areas to occur until the Engineer authorizes removal of preload fill material. During this time, other activities may take place:

      1. Demolition and removal of buried utilities, slabs, etc.

      2. Spread easterly portion of the existing Maintenance building preload into Area 1 and other areas as required.

      3. Additional importing and placement of structural fill material outside of the building areas may occur if the contractor anticipates that this additional material will be required to complete site grading after the preload fill material is re-spread as structural fill.

   f. Remove preload fill material and re-spread onsite as structural fill to complete site subgrade preparation for C.F.S. Building and 50 feet outside thereof.

   g. Perform Item (f) above for all other preloaded building areas.

   h. Complete all other site grading as specified.

5. The boundary of the project site, and the limits of work (excluding easements for slopes, ditches, etc.) are defined by the following coordinates:

Coordinate No.	Northing	Easting
2	99,148.74	1,606,877.52
3	99,633.87	1,607,445.11
4	99,789.38	1,607,517.69
5	97,917.31	1,608,603.85
6	98,371.71	1,607,810.86
7	98,345.87	1,607,196.95
8	97,608.74	1,604,175.57

6. Prior to commencement of construction, the Contractor shall provide the Engineer a plan for site access (haul routes, etc.) for review and approval. Consideration must be made in this plan for protection of utilities, structures, neighboring properties, waterways, and public right-of-ways.

7. If the Contractor chooses a water route for fill importation, the Milwaukee Waterway will be the designated delivery point. The Contractor is advised that cargo handling in this area is under the jurisdiction of I.L.W.U. Local No. 23 and should contact the business agent.

ISSUED FOR CONSTRUCTION 4/5/84

JOHN A. PETTER — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

Whitacre Engineers, Inc.
Consulting Engineering & Land Planning
2124 NO. "K" STREET P.O. BOX 9977
TACOMA, WASHINGTON 98409 (206) 272-2944

MARK	REVISION	BY	APP.	DATE
	ISSUE FOR CONSTRUCTION	J.T.P.	JP	4-5-84

DRAWN RHT DATE 12-27-83
CHECKED J.T.P. DATE 12-27-83
CHECKED JP DATE 12/29/83
CONT. NO. 550
FIELD BOOK (S) ____

PORT OF TACOMA
TACOMA TERMINALS, INC.
C.F.S. AREA EARTHWORK
SITE PLAN & GENERAL NOTES

SCALE: NOTED
APPROVED: PORT MANAGER 12/29/83 DATE; ENGINEER 12/29/83 DATE
DRAWING NO. EP-3865-23-61
SHEET 2 OF 9

MILWAUKEE WATERWAY

PUYALLUP WATERWAY

N100,750 E1,606,750

PROJECT GRID — S 9+16.24 E 10+00.00
N 99,709.30 E 1,607,317.69

CAUTION:
THE CONTRACTOR SHALL ERECT BARRIERS, FLAGGING, ETC., AS REQUIRED TO PROTECT ALL TELEPHONE MANHOLES.

N43°55'39"E 184.60'

BRIDGE PEDESTAL (TYP.)

STRUCTURAL CROSS BRACING (TYP.)

EAST 11TH STREET

N49°28'45"E 744.67'

LIMIT OF PROJECT

AREA 1

MATCH LINE - SEE SHT. 5

MATCH LINE - SEE SHT. 4

N99,500 E1,607,000

E10+00
E9+00
E8+00
E7+00
E6+00
E5+00
E4+00
S9+00

SCALE IN FEET

ISSUED FOR CONSTRUCTION 4/5/84

JOHN A. PETTER — REGISTERED PROFESSIONAL ENGINEER

Whitacre Engineers, Inc.
Consulting Engineering & Land Planning
2124 SO. 'K' STREET P.O. BOX 5677
TACOMA, WASHINGTON 98405 (206) 272-5144

MARK	REVISION	BY	APP.	DATE
	ISSUE FOR CONSTRUCTION	J.T.P.		4-5-84
1	REVISED GRADES	J.T.P.		4-5-84

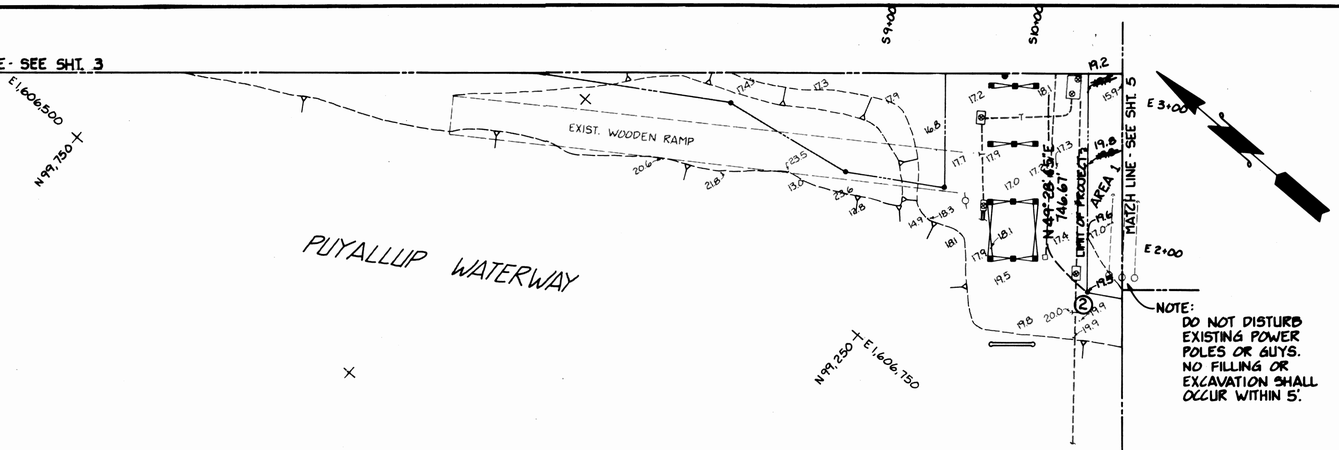
DRAWN RHT DATE 12-27-83
CHECKED J.T.P. DATE 12-27-83
CHECKED DATE 12/29/83
CONT. NO. 850
FIELD BOOK (S)

PORT OF TACOMA

TACOMA TERMINALS, INC.
C.F.S. AREA EARTHWORK
PLAN

SCALE NOTED
DRAWING NO. EP-3865-23-C1
APPROVED 12/29/83
PROJECT MANAGER DATE
CHIEF ENGINEER 12/29/83 DATE
SHEET 3 OF 9

MATCH LINE - SEE SHT. 3

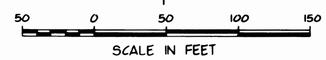


LEGEND

	EXISTING	PROPOSED
WATER	----W----	
STORM DRAIN	----SD----	
TELEPHONE	----T----	
HYDRANT		
MANHOLE		
TELEPHONE MANHOLE		
POWER POLE & GUY		
DITCH FLOW LINE		
ROAD		
FENCE		
VEGETATION		
CONTOUR LINE	20	
GROUND ELEVATION	11.4	12.3
SLOPE		
PRELOAD FILL		
PROJECT BOUNDARY		

SITE COORDINATE DATA

Coordinate No.	Northing	Easting
2	99,148.74	1,606,877.52
3	99,633.87	1,607,445.11
4	99,709.30	1,607,517.69
5	97,917.31	1,608,603.85
6	98,371.71	1,607,810.86
7	98,345.87	1,607,196.95
8	97,608.74	1,606,175.57
478	98,459.75 60.53	1,608,087.76 29.03
479	98,506.48 178.73	1,608,184.31 108.56
480	98,568.37 163.15	1,607,968.56 196.83
481	98,609.08 611.35	1,608,048.63 46.36
482	99,070.46 277.10	1,607,898.38 296.80
483	99,091.91 2782.80	1,607,618.30 647.59
484	98,716.49 .20	1,607,684.09 .28
485	98,698.94 .40	1,607,868.18 261.45
486	98,921.41 920.08	1,607,853.86 252.12
487	98,999.16 937.88	1,607,674.69 .95
488	98,381.48 .46	1,607,566.78 566.78
489	98,373.48 .44	1,607,376.88 376.45
490	98,569.26 542.78	1,607,367.96 368.48
491	98,571.25 572.79	1,607,557.78 558.81



ISSUED FOR CONSTRUCTION 4/5/84

MARK	REVISION	BY	APP.	DATE
	ISSUE FOR CONSTRUCTION	J.T.O		4-5-84
1	REVISED GRADES; CHANGE COORDS.	J.T.P		4-5-84

Whitacre Engineers, Inc.
Consulting Engineering & Land Planning
2124 SO. 'K' STREET P.O. BOX 5677
TACOMA, WASHINGTON 98405 (206) 272-5144

DRAWN RHT DATE 12-27-83
CHECKED J.T.P. DATE 12-27-83
CHECKED DATE 12/29/83
CONT. NO. 550
FIELD BOOK (S)
APPROVED

PORT OF TACOMA

TACOMA TERMINALS, INC.
C.F.S. AREA EARTHWORK
PLAN

SCALE NOTED
DRAWING NO. EP-3865-23-C2
SHEET 4 OF 9

NOTE:
REFER TO PORT OF TACOMA DWG. NO. EP 3863-23, SHEET 1 OF 1, REGARDING RECENT MODIFICATION TO PRELOAD FILL MATERIAL AND REMOVAL OF BURIED UTILITIES.

UNION PACIFIC R.R. CO.

FINISH SUBGRADE ELEVATION (TYP.)

S 31° 13' 15" E ~ 2095.47'

PROJECT BASELINE

NOTE:
See Detail, Sheet 9, regarding grading near property lines.

N 90,750
E 1,608,250

APPROX. LIMITS OF UNSUITABLE DEBRIS FILL MATERIAL

INT'L EQUIPMENT CONTROL BUILDING
TOP OF PRELOAD FILL EL. 23.0

FORMER OIL TANK LOCATION

MAINTENANCE BUILDING

AREA 1

TRUCK TRANSFER DOCK
TOP OF PRELOAD FILL EL. 22.4

C.F.S. BUILDING
TOP OF PRELOAD FILL EL. 33.2

COVERED STORAGE DOCK
TOP OF PRELOAD FILL EL. 28.6

SETTLEMENT PLATE (TYP.)

FORMER R.R. EMBANKMENT

McFARLAND CASCADE CO.

N 60° 11' 10" W ~ 913.96'

S 67° 35' 23" W ~ 644.45'

MATCH LINE - SEE SHT. 3

MATCH LINE - SEE SHEET 4

MATCH LINE - SEE SHT. 6

MATCH LINE - SEE SHT. 7

NOTE:
DO NOT DISTURB EXISTING POWER POLES OR GUYS. NO FILLING OR EXCAVATION SHALL OCCUR WITHIN 5'.

SCALE IN FEET
50 0 50 100 150

ISSUED FOR CONSTRUCTION 4/5/84

DRAWN	KHT
DATE	12-27-83
CHECKED	J.T.P.
DATE	12-27-83
CHECKED	
DATE	
CONT. NO.	880
FIELD BOOK (S)	
APPROVED	

PORT OF TACOMA
TACOMA TERMINALS, INC.
C.F.S. AREA EARTHWORK
PLAN

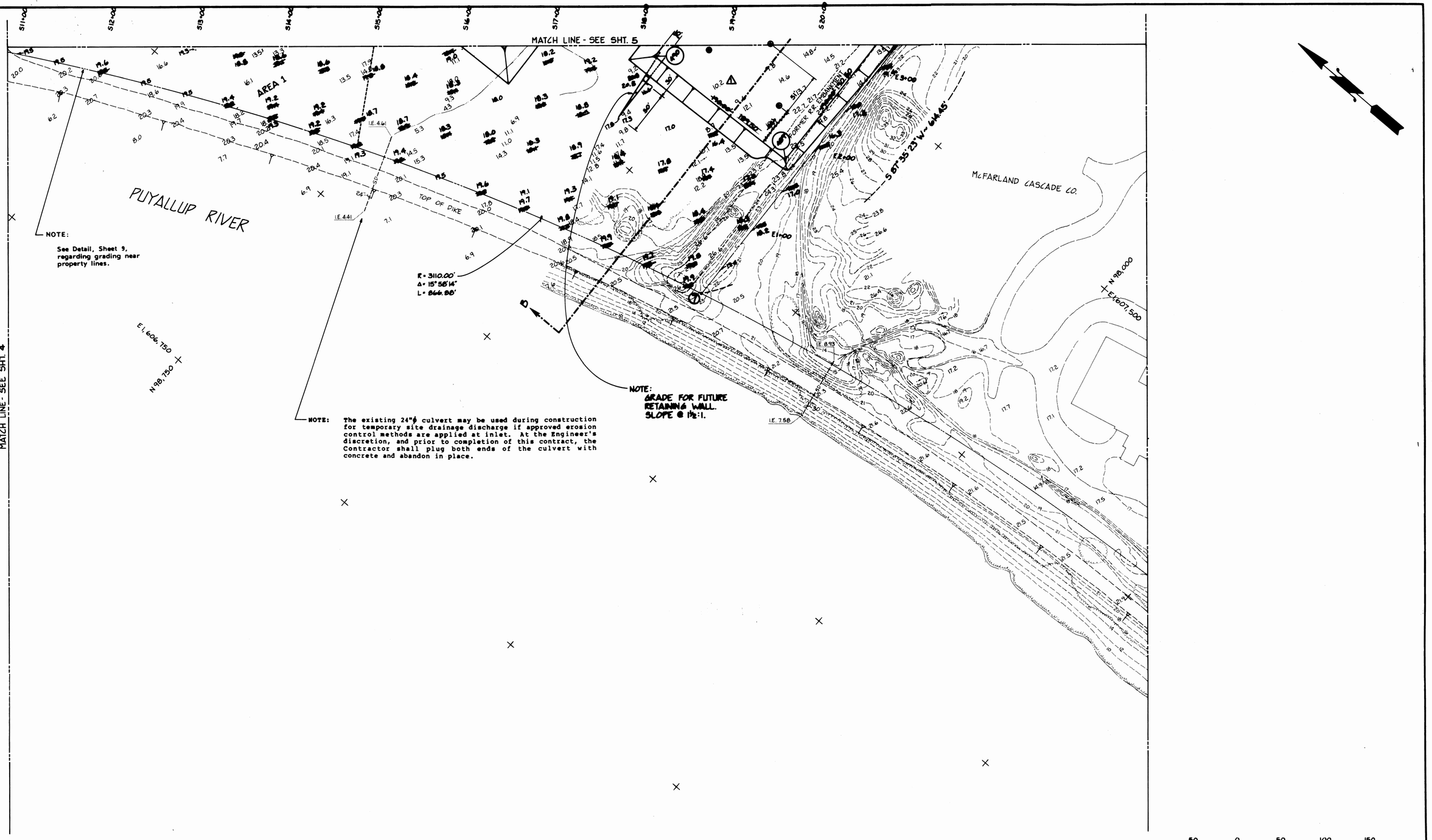
SCALE: NOTED
DRAWING NO. EP-3865-23-C3
SHEET 5 OF 9

12/29/83
DATE

JOHN A. PETTEY — STATE OF WASHINGTON — REGISTERED CIVIL ENGINEER

Whitacre Engineers, Inc.
Consulting Engineering & Land Planning
2124 SO. "K" STREET P.O. BOX 5677
TACOMA, WASHINGTON 98405 (206) 272-5144

MARK	REVISION	BY	APP.	DATE
	ISSUE FOR CONSTRUCTION	KHT		4-5-84
1	REVISED GRADES; PRELOAD PPL	KHT		4-5-84



ISSUED FOR CONSTRUCTION 4/5/84

Whitacre Engineers, Inc.
Consulting Engineering & Land Planning
2124 SO. 'K' STREET P.O. BOX 5677
TACOMA, WASHINGTON 98405 (206) 272-5144

MARK	REVISION	BY	APP.	DATE
	ISSUE FOR CONSTRUCTION	J.T.P.		4-5-84
1	REVISED GRADES; PRELOAD DIM.	J.T.P.		5-8-84

DRAWN RBH DATE 12-27-83
CHECKED J.T.P. DATE 12-27-83
CHECKED DATE 12/29/83
CONT. NO. 560
FIELD BOOK (S)
APPROVED 12/29/83 DATE

PORT OF TACOMA

TACOMA TERMINALS, INC.
C.F.S. AREA EARTHWORK
PLAN

SCALE NOTED
DRAWING NO. EP-3865-23-C4
SHEET 6 OF 9

E1,609,500
N98,500

UNION PACIFIC R.R. CO.

S31°13'15"E ~ 2095.47'

4" DIESEL OIL LINE

FORMER R.R. EMBANKMENT

WEIR ASSEMBLY

MATCH LINE - SEE SHT. 5

E10+00

E9+00

E8+00

E7+00

S23+00.02

S24+00.64

S25+00

S26+00.66

S27+00.59

S28+00.59

S29+00

S30+00

FUTURE ACCESS ROAD (NOT IN CONTRACT)

N60°11'10"W ~ 913.96'

NOTE:
See Detail, Sheet 9, regarding grading near property lines.

S30+11.71
E10+00.00
PROJECT GRID

N97917.31
E1,608,603.86

N97,500
E1,608,750

McFARLAND CASCADE CO.

50 0 50 100 150
SCALE IN FEET

ISSUED FOR CONSTRUCTION 4/5/84

JOHN A. PETERSON — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

Whitacre Engineers, Inc.
Consulting Engineering & Land Planning
2124 SO. 'K' STREET P.O. BOX 5677
TACOMA, WASHINGTON 98405 (206) 272-3144

MARK	REVISION	BY	APP.	DATE
	ISSUE FOR CONSTRUCTION	JTP		4-5-84
1	REVISED GRADES; CHANGE LOCKED	JTP		4-5-84

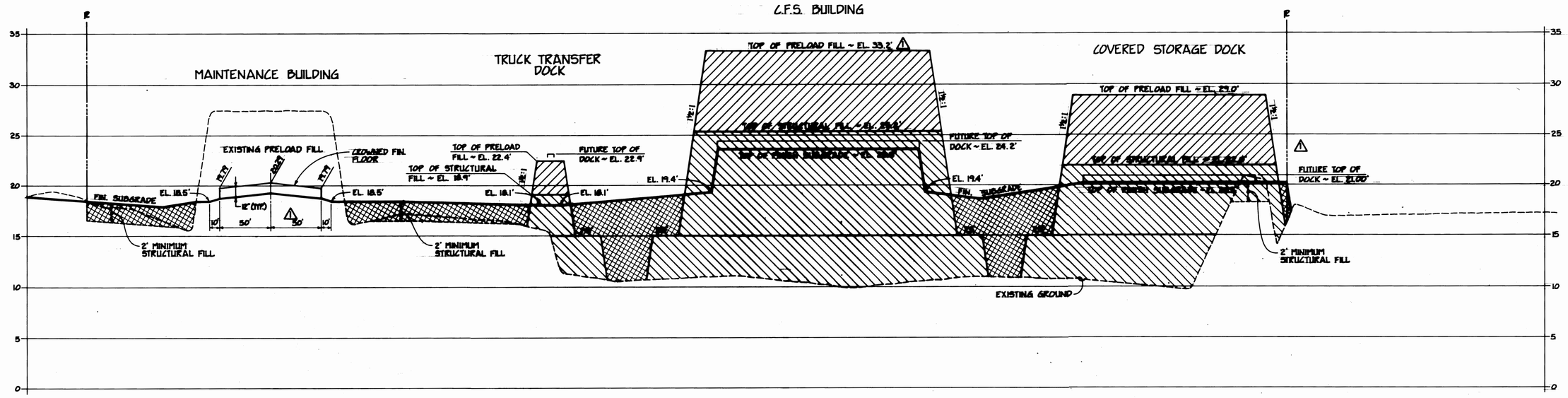
DRAWN PMT DATE 12-27-83
CHECKED JTP DATE 12-27-83
CHECKED DATE 12-27-83
CONT. NO. 550
FIELD BOOK NO.
APPROVED Public Works Director 12/29/83 DATE

PORT OF TACOMA

TACOMA TERMINALS, INC.
C.F.S. AREA EARTHWORK
PLAN

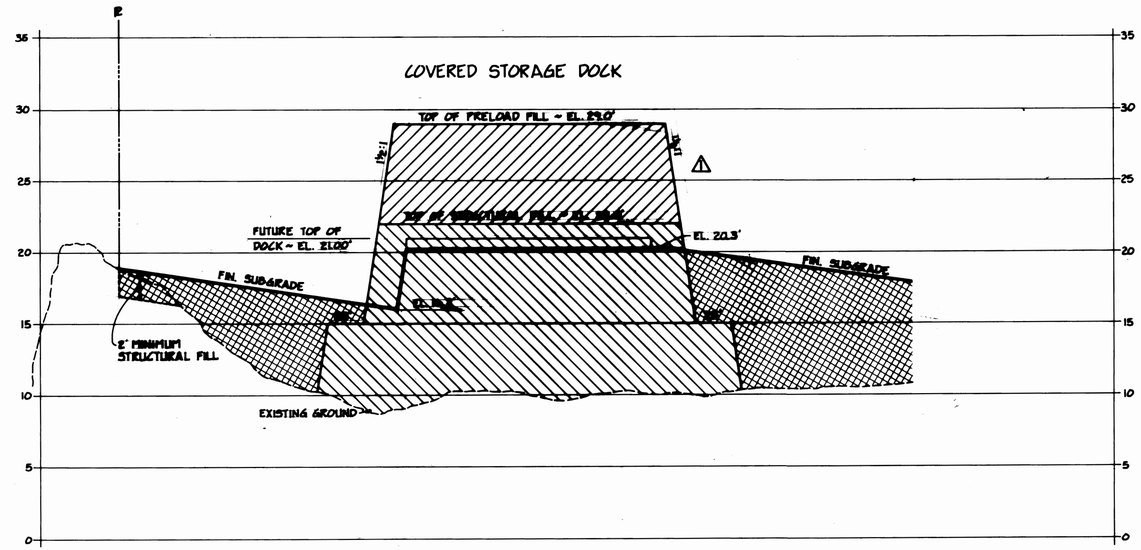
SCALE NOTED
DRAWING NO. EP-3865-23-C5
SHEET 7 OF 9

⚠ NOTE:
ACTUAL TOP OF PRELOAD ELEVATIONS SHALL BE ADJUSTED BASED UPON DENSITY OF PRELOAD MATERIAL AND SHALL FIRST BE APPROVED BY THE ENGINEER.



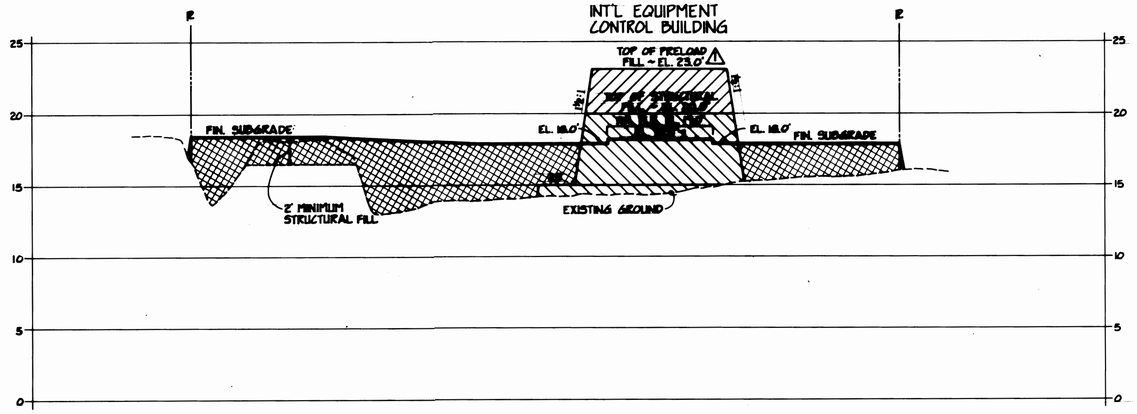
SECTION A-A

HORIZ. SCALE - 1" = 50'
VERT. SCALE - 1" = 5'



SECTION B-B

HORIZ. SCALE - 1" = 50'
VERT. SCALE - 1" = 5'



SECTION C-C

HORIZ. SCALE - 1" = 50'
VERT. SCALE - 1" = 5'

STRUCTURAL FILL
PRELOAD FILL
PRELOAD FILL RE-SPREAD AS STRUCTURAL FILL AND/OR ADDITIONAL IMPORTED STRUCTURAL FILL

JOHN A. PETTER — STATE OF WASHINGTON — PROFESSIONAL ENGINEER

Whitacre Engineers, Inc.
Consulting Engineering & Land Planning
2401 So. "E" STREET P.O. BOX 1827
TACOMA, WASHINGTON 98401 (206) 272-2044

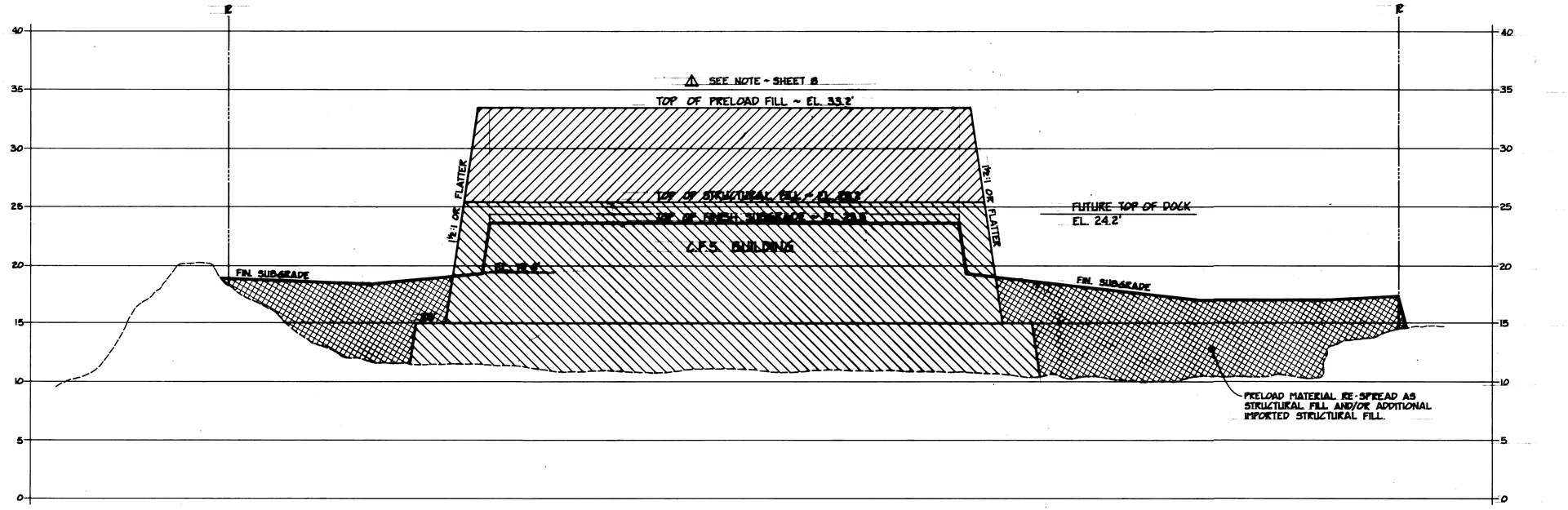
MARK	REVISION	BY	APP.	DATE
	ISSUE FOR CONSTRUCTION	J.T.P.		4-5-84
⚠	REVISED GRADES	J.T.P.		4-5-84

DRAWN RHT DATE 12-27-83
CHECKED J.T.P. DATE 12-27-83
CHECKED DATE 4/27/84
CONT. NO. 550
FIELD BOOK (S)
APPROVED 12/29/83 DATE

PORT OF TACOMA
TACOMA TERMINALS, INC.
C.F.S. AREA EARTHWORK
TYPICAL SECTIONS

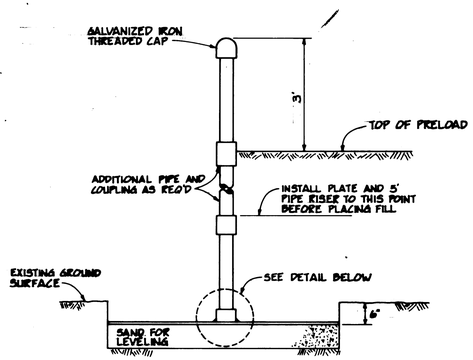
SCALE NOTED
DRAWING NO. EP-3865-23-06
SHEET 8 OF 9

ISSUED FOR CONSTRUCTION 4/5/84

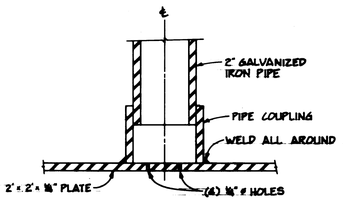


SECTION D-D

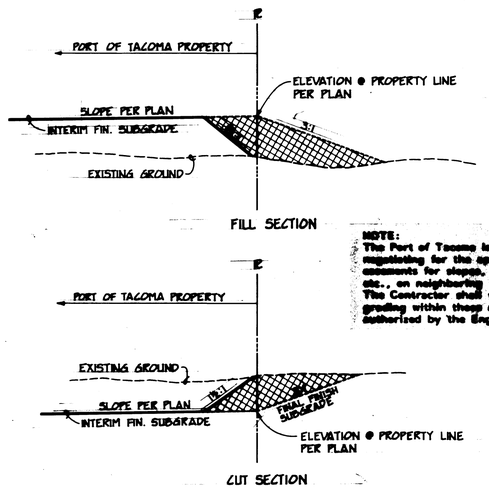
HORIZ. SCALE - 1" = 50'
VERT. SCALE - 1" = 5'



NOTE:
SETTLEMENT PLATES TO BE PROVIDED BY CONTRACTOR.



SETTLEMENT PLATE INSTALLATION
N.T.S.



NOTE:
The Port of Tacoma is currently negotiating for the appropriate easements for slopes, drainage, etc., on neighboring properties. The Contractor shall withhold grading within these areas until authorized by the Engineer.

This authorization will be provided no later than (90+t) days following the date of award of this contract, or the work shall be deleted from the contract by modification (refer to the Supplementary/Special Conditions for a definition of "t").

DETAIL ~ INTERIM GRADING NEAR PROPERTY LINES
N.T.S.

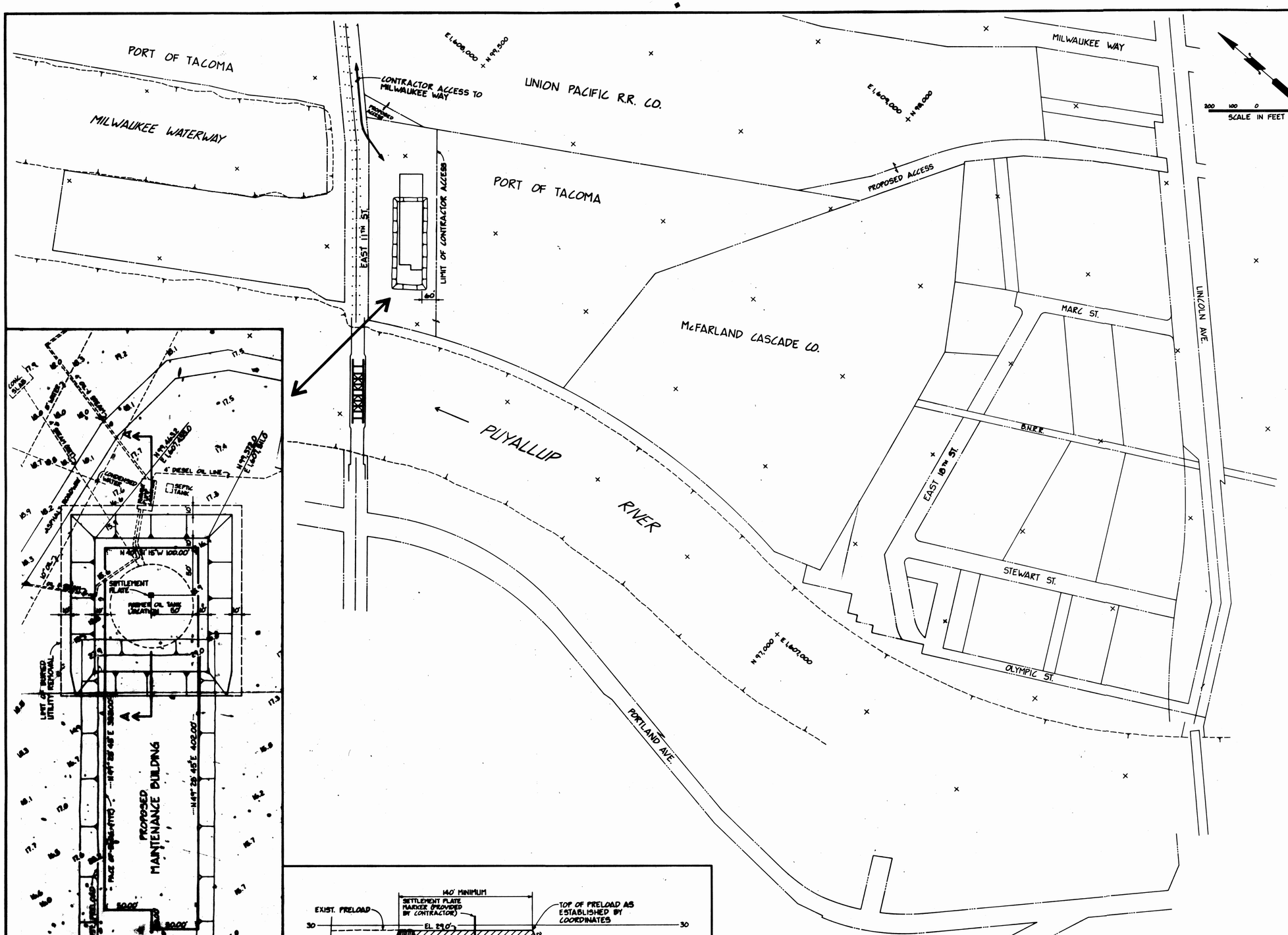
JOHN A. PITTS — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

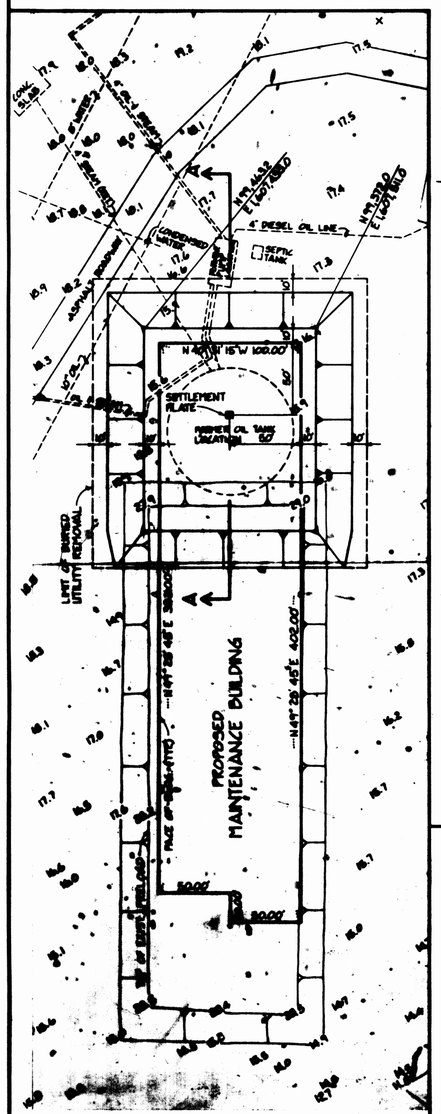
ISSUED FOR CONSTRUCTION 4/5/84

Whitacre Engineers, Inc.
Consulting Engineers & Land Planners
[illegible]

MARK	REVISION	BY	APP.	DATE
	ISSUE FOR CONSTRUCTION	J.T.P.		4-5-84
⚠	REVISED GRADES	J.T.P.		4-5-84

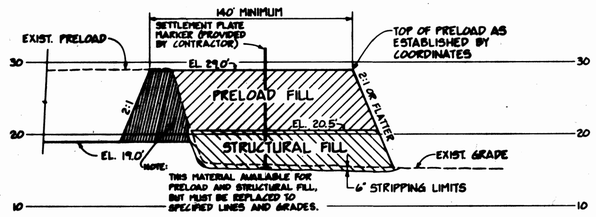
DRAWN RHT DATE 12-27-83	**PORT OF TACOMA**
CHECKED J.T.P. DATE 12-27-83	TACOMA TERMINALS, INC.
CHECKED [illegible] DATE 4/5/84	C.F.S. AREA EARTHWORK
CONT. NO. 550	TYPICAL SECTIONS & DETAILS
FIELD BOOK NO.	SCALE NOTED
APPROVED [illegible]	DRAWING NO. EP-3865-23-C7
	SHEET 9 OF 9





DETAIL

1" = 50'



NOTE:
ELEVATION DATUM IS M.L.L.W.

SECTION A-A

1" = 50'H = 1" = 10'V

GENERAL NOTES & SPECIFICATIONS

1. All materials and methods for site work shall be as specified in the APWA Standard Specifications for Municipal Construction, 1981 edition.

2. Material for structural fill and for preload shall consist of the existing preload material shown on the drawing.

3. The locations of underground utilities shown on the drawing are approximate and were obtained from available records. The actual existence of these utilities is unknown. Depths are unknown. The construction sequence for buried utility removal is as follows:

   a. Thoroughly probe the area within the limit of buried utility removal and notify the Port Engineer of any utilities found. If any utilities are found to be "live", the Port shall determine the required course of action.
   b. Remove any buried pipe and appurtenances as directed by the Port. This material shall become the contractor's property and removed from Port of Tacoma land.
   c. The remaining portions of any buried utilities shall be capped.

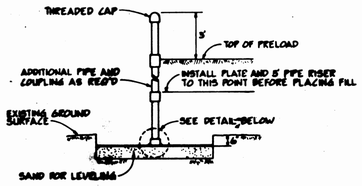
   The contractor shall use extra care and caution on oil lines so as to prevent contamination of soil.

4. Construction Sequence for Earthwork:

   a. Perform any clearing and grubbing and strip surface area to receive preload of all vegetation and sod to a depth of 6 inches. All organic material shall be wasted off-site.
   b. Any accumulations of organic-rich material or debris fill encountered on that portion of land to be preloaded shall be overexcavated to a minimum of 3 feet, removed, wasted off-site, and replaced with compacted structural fill.
   c. Preroll the exposed soils to a dense, non-yielding condition with a large, self-propelled vibratory roller or similar equipment.
   d. Structural fill shall be placed in loose lifts not exceeding 10 inches in thickness and thoroughly compacted to at least 95% of the laboratory maximum density as determined by A.S.T.M. D-1557-70 to an elevation of 20.5 feet. (MLLW=0.00 datum). The structural fill shall be from that portion of the existing preload material that is visibly more granular in nature.
   e. One settlement plate shall be installed beneath the preload fill as shown on the drawing so as to accurately allow monitoring of settlement.
   f. Preload fill above elevation 20.5 feet shall be placed in loose layers not exceeding 12 inches and compacted to at least 90% of the laboratory maximum density as determined by A.S.T.M. D-1557-70 to an elevation of 29.0 feet.
   g. The top of the preload fill shall extend beyond the perimeter of the building line a minimum of 10 feet as shown on the drawing. The top of the preload is to be essentially flat.
   h. The side slopes of the fill should be no steeper than 2 horizontal to 1 vertical. The contractor shall leave all slopes straight and uniform.

5. Construction staking, inspection, compaction testing, and monitoring of settlement shall be provided by the Port of Tacoma.

6. The existing ground elevations shown were obtained from a survey prepared by the Port of Tacoma entitled "Milwaukee Property - Parcel 5", drawing no. TERM L-109, dated January 1982. The elevations shown on the existing preload material were obtained by Whitacre Engineers, Inc., on November 29, 1983.



SETTLEMENT PLATE INSTALLATION

N.T.S.

NOT IN CONTRACT
FOR REFERENCE ONLY

JOHN A. PETTEY — STATE OF WASHINGTON — PROFESSIONAL ENGINEER

Whitacre Engineers, Inc.
Consulting Engineering & Land Planning
2001 SO. "I" STREET P.O. BOX 5977
TACOMA, WASHINGTON 98405 (206) 272-2944

MARK	REVISION	BY	APP.	DATE

DRAWN RMT DATE 12-7-83	PORT OF TACOMA
CHECKED J.T.P. DATE 12-7-83	TACOMA TERMINALS, INC.
CHECKED DATE 12/9/83	MAINTENANCE BUILDING PRELOAD MODIFICATION
CONT. NO. 294	
FIELD BOOK (S)	SCALE NOTED
APPROVED DATE 12/29/83	DRAWING NO. EP 3863-23
APPROVED DATE 12/29/83	SHEET 1 OF 1

Appendix B

Indoor and Ambient Air Sampling Report and Sub-Slab Vapor Analytical Data

INDOOR AND AMBIENT AIR SAMPLING

PORT OF TACOMA
PARCEL 40
MAINTENANCE GARAGE
TACOMA, WASHINGTON

Project Number: 013-006 TO3

August 26, 2020

Prepared for:

Crete Consulting Incorporated, PC
and
The Port of Tacoma

Prepared by:

EMB Consulting, LLC

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Project Title:	Indoor and Ambient Air Sampling Port of Tacoma Parcel 40 Maintenance Building Tacoma, Washington
Prepared For:	Crete Consulting Incorporated, PC 108 South Washington Street, Suite 300 Seattle, Washington 98104
EMB Consulting Project Number:	1563

Elisabeth Black, CIH
Certified Industrial Hygienist
EMB Consulting LLC

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ACRONYMS

µg/m^3	micrograms per cubic meter
ACGIH	American Conference of Governmental Industrial Hygienists
APH	Air-Phase Petroleum Hydrocarbons
Building	Parcel 40 Maintenance Garage
CLARC	Cleanup Levels and Risk Calculations
COCs	contaminants of concern
Crete	Crete Consulting Incorporated, PC
CUL	Cleanup Level
DOSH	Washington State Division of Occupational Safety and Health
Ecology	Washington State Department of Ecology
EMB	EMB Consulting LLC
EPA	Environmental Protection Agency
FBI	Friedman & Bruya, Inc.
GC/MS	Gas Chromatography/Mass Spectrophotometry
GVVs	Group Guidance Values
HVAC	Heating Ventilation and Air Conditioning
SDSs	Safety Data Sheets
MTCA	Model Toxics Control Act
OEL	Occupational Exposure Limit
PEL	Permissible Exposure Limit
Port	Port of Tacoma
RL	Reporting Limit
TPH	Total Petroleum Hydrocarbons
VOCs	Volatile Organic Compounds

1.0 Introduction

This document presents the results of indoor and ambient air sampling conducted in July 2020 for the Port of Tacoma (Port) Parcel 40 Warehouse Building (Building). The sampling was conducted based on the recent discovery by Crete Consulting Incorporated, PC (Crete) of petroleum hydrocarbons in soil and groundwater beneath the Building. The objective of the indoor and ambient air sampling was to determine if potential vapor intrusion from contaminants beneath the Building could impact indoor air for the Building.

The following sections of this report describe Building background, sampling methods, results, conclusions, and recommendations. Attachments to this report include summary tables of air monitoring data, figures of Parcel 40 and the Building with sample locations, and the laboratory analytical report. Data on ambient weather during sampling is also included.

2.0 Background

2.1 Site Description

Parcel 40 consists of an asphalt-paved lot with a 38,000 square foot maintenance garage. The Building foundation is slab on grade with a steel frame structure and sheet metal walls and roof. The Building has single-level open bays on its east and west ends, with a two-level office/storage area between. The Building is currently occupied by SSA Marine and is used for marine terminal equipment maintenance.

The maintenance garage contains chemical products typically used for vehicle and heavy equipment maintenance, to include oils, greases, adhesives, solvents, and degreasers. In addition, there is a paint booth on the west end of the Building, which appears to be in use.

A fueling shed is located on the east side of Parcel 40, approximately 70 feet from the east end of the Building. Otherwise, the maintenance garage is surrounded by paved road and parking areas. The 11th Street bridge borders the north side of Parcel 40.

2.2 Site Environmental Data

Benzene was initially identified as exceeding the vapor intrusion groundwater screening level in a sample from monitoring well GEI-MW-1 collected in August 2019. Follow-up monitoring well sampling in March 2020 confirmed the August 2019 benzene result, confirmed elevated groundwater TPH results, and indicated that no additional VOCs were present in groundwater above the vapor intrusion screening levels (Crete 2020).

Additional soil and groundwater testing was performed in June 2020 around the perimeter of the Building. Benzene exceeded the vapor intrusion screening level in one other location toward the northeast corner of the Building. Elevated gasoline and diesel range organics were also identified in soil and groundwater around the majority of the perimeter of the Building with the exception of the west side and about the western 150 feet of the north side.

3.0 Methods

This section provides a summary of the scope of work required to perform the indoor and ambient air sampling for the Building.

Prior to mobilizing to the Building for sampling, EMB Consulting, LLC (EMB) reviewed Safety Data Sheets (SDSs) provided by SSA Marine to determine if chemical products resemble those being assessed for vapor intrusion.

Based on the Crete environmental sampling data, the Air-Phase Petroleum Hydrocarbon (APH) analysis and Environmental Protection Agency (EPA) Method TO-15 were selected as the sampling and analytical method to evaluate indoor and ambient air. The APH method is applied for evaluation of gasoline and the volatile fraction of diesel fuel oil. The TO-15 method is applied for volatile organic compounds (VOCs). The APH method provides concentration data in air for the following contaminants of concern (COCs).

- volatile aliphatic hydrocarbons in the range of C5 through C8 (APH EC5-8 aliphatics); aliphatic hydrocarbons in the range of C9 through C12 (APH EC9-12 aliphatics); and aromatic hydrocarbons in the range of C9 through C10 (APH C9-10 aromatics).

The TO-15 method provides concentration data in air for the following COCs.

- Volatile organic compounds (VOCs) benzene, toluene, ethylbenzene, xylenes, naphthalene; and

Samples were collected in accordance with EPA Method TO-15 for volatile organic compounds (VOCs) and the APH Method using six-liter summa-type evacuated cylinders with regulators calibrated to collect samples over 24 hours. Sample collection methods are explained in greater detail in the work plan (Crete 2020). The APH/TO-15 method uses evacuated cylinders to draw an air sample over a specified period of time to be analyzed in a laboratory by gas chromatography/mass spectrometry (GC/MS). The analytical laboratory selected for this project is Friedman & Bruya, Inc (FBI).

The field sampling program was carried out during a 24-hour period, over two consecutive days to account for fluctuations in temperature, ambient pressure, surrounding traffic and Port activities, and other environmental conditions. Changes in these conditions can affect the flow of soil gas into the indoor space.

Weather data for the Tacoma area for July 4 through 5, 2020 are provided with this report in Attachment B and summarized in the Results section.

Beginning on the morning of Saturday July 4, 2020, EMB initiated five samples inside the Building. At the same time, EMB collected two ambient outdoor air samples on Parcel 40. The outdoor samples were collected from presumed upwind and downwind locations to provide data on background levels of the COCs in the project area. Figure 1 shows the location of the two ambient samples. Figure 2 shows the location of the indoor samples on the east side of the warehouse. Figure 3 provided with this report shows the location of the indoor samples on the west side of the warehouse.

The samples collected are described below. In addition, shop equipment or chemicals identified nearby that could impact results are also described. The Building was vacant during periods when samples were placed on July 4, 2020 and when picked up on July 5, 2020. It is not known if SSA employees entered the Building between those two periods. Exterior and interior doors, including garage doors, were closed for the duration of sampling. There is no central ventilation system in the building.

- **Sample AW040720** is an ambient outdoor air sample attached to the fence on the west side of Parcel 40.

- **Sample AE040720** is an ambient outdoor air sample attached to the fence on the east side of Parcel 40.

- **Sample IWB13040720** is an indoor sample collected from the west side of the Maintenance Building. The sampling equipment was located on portable stairs in Bay 13 at approximately 4.5 feet above the floor. There was a hydraulic lift located within 10 feet of the sample, but SSA Marine reported that the lift does not contain hydraulic fluid. In addition, the paint booth is located on the west end of the warehouse, approximately 80 feet west of the sample location.

- **Sample IPO040720** is an indoor sample collected from the Parts Office in the central area of the Maintenance Building on the ground floor. The sampling equipment was located on a stool at approximately three feet above the floor. The door to the Parts Office was closed during sampling. There were no chemical products observed in the Parts Office.

- **Sample INWOFF040720** is an indoor sample collected from the northwest office in the central area of the Maintenance Building on the ground floor. The sampling equipment was located on a ladder at approximately four feet above the floor. The door to the room was closed during sampling. There were no chemical products observed in the northwest office.

- **Sample IE040720** is an indoor sample collected from the east side of the Maintenance Building. The sampling equipment was located on a work

bench at approximately four feet above the floor. There was a solvent degreaser located near the sample, approximately 20 feet away. In addition, workbench chemicals in small quantity containers were located throughout the area. These included spray paint, caulks and adhesives, and lubrication oils.

- **Sample IE100040720** is a duplicate sample collocated with Sample IE040720**.**

At the completion of sampling on July 5, 2020, the seven samples were retrieved. On Monday July 6, 2020 the samples were hand delivered to FBI in Seattle, Washington for analysis.

The analytical results are summarized in Table 1 attached to this report. Each of the individual VOCs and hydrocarbon ranges identified by the APH/TO-15 analysis were compared with Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Cleanup Levels and Risk Calculations (CLARC) Method C cleanup levels (CULs) for indoor air on industrial properties. A Total TPH CUL was calculated using the method demonstrated in Table 2 attached to this report. Outdoor ambient air values are considered background for comparison with indoor air samples.

The Washington State Division of Occupational Safety and Health (DOSH) Permissible Exposure Limits (PELs) are also listed in Table 1 for comparison with the MTCA CULs. These levels are three to five times higher than MTCA CULs. The PELs are applicable to the potential chemical exposure created by the work conducted by SSA Marine activities or by chemical products stored by SSA Marine at the site. They do not apply to any contribution to workplace VOCs resulting from contamination beneath the building.

Finally, the American Conference of Governmental Industrial Hygienists (ACGIH) has developed Group Guidance Values (GGVs) for certain refined hydrocarbon solvent mixtures. There are GGVs for specific petroleum compound groups similar to the ranges reported in the APH Method. The ACGIH has developed the GGVs based on similar chemical and toxicological characteristics. GGVs may be used as occupational exposure limits (OELs) when the mixture does not contain a compound for which specific OELs have been established. The ACGIH GGVs for Hydrocarbon Solvent Vapor Mixtures are included in Table 1. The GGVs are applicable to the potential chemical exposure created by the work conducted by SSA Marine activities or by chemical products stored by SSA Marine at the site. They do not apply to any contribution to workplace VOCs resulting from contamination beneath the building.

4.0 Results

The results of sampling for indoor air and ambient outdoor air at the Parcel 40 on July 4 and 5, 2020 are described below. Analytical results for indoor air and

outdoor ambient air are summarized in Table 1 attached to this report. The FBI laboratory report is provided in Attachment A.

4.1 Indoor Air and Outdoor Ambient Air

The ambient air sample results from the east and west sides of Parcel 40 did not have detectable concentrations of the VOCs, with the exception of naphthalene, which was detected in both samples. Naphthalene was detected at 0.12 micrograms per cubic meter of air (µg/m^3) in the east sample (AE040720). The western ambient sample (AW040720) result was reported at 0.16 µg/m^3. The analytes represented by the three APH ranges were not detected at or above laboratory reporting limits (RLs) in either ambient sample. The TPH CUL was derived assuming compounds not detected are present at the full reporting limit.

For the indoor air samples, the VOCs were detected above laboratory RLs in all indoor samples, but none were detected in concentrations above the MTCA Method C CUL. VOCs commonly found in paint (toluene, ethylbenzene, and xylenes) are identified in higher concentrations in the West Bay sample (IWB13040720), which is close to the paint booth. This appears to demonstrate impacts to indoor air for the COCs from SSA Marine operations.

APH EC9-10 aromatics were not identified in any indoor air sample above the laboratory RL. APH EC5-8 aliphatic and APH EC9-12 had detectable levels in all indoor samples. The APH EC5-8 aliphatic concentrations are higher in the west portion of the warehouse than the east portion; APH EC9-12 aliphatics are higher in the east portion of the warehouse than the west portion. The reason for this difference cannot be determined based on the available data.

It appears likely that the APH EC9-12 aliphatics are at least partially associated with soil and groundwater contamination beneath the Building. The Total APH concentrations are higher in the areas where a subsurface source has been identified (Indoor-East) and chemical product use in that area does not differ substantially from the use on the other side of the building (Indoor-West Bay 13). The addition of the APH ranges plus detectable VOCs exceed the regulatory criteria for total petroleum hydrocarbons (TPH) for this project of 310 µg/m^3 in all five indoor samples.

All COCs detected in indoor sample results were well below DOSH PELs, where they exist.

All hydrocarbon ranges detected in indoor sample results were well below ACGIH GVVs, where they exist.

4.2 Atmospheric Conditions

The influence of barometric pressure and ambient conditions on the potential release of soil vapor to ambient and indoor air was also evaluated in this

assessment. Changes in atmospheric pressure may create a “piston-like” force on soil vapor, possibly causing a cyclic up and down flow of contaminant vapors into and out of the building. Soil vapor compression and expansion in response to barometric pressure fluctuations may alternately enhance or inhibit vapor intrusion. Vapor intrusion into buildings is typically higher during periods of low barometric pressure.

The barometric pressure readings were consistent during the sampling event conducted between July 4 and July 5, 2020. There was a high pressure system in place during sampling with minor fluctuation between 30.08 to 30.13 inches of mercury. Temperature fluctuated between 57 and 68 degrees Fahrenheit. Wind was from the north-northwest for most of the sampling duration. Weather data for the two days on which sampling occurred are included with this report in Attachment B.

4.3 Building Conditions

According to Building drawings, there is a Heating, Ventilation, Air Conditioning (HVAC) system in the building. The system was not operating during this sampling event. SSA has characterized the system as “shop exhaust fans”, noting that they are not used for HVAC or as vehicle exhaust extraction systems. SSA noted that they run continuously in the winter, but not during warmer months.

The paint booth may create an east-to-west draw during operation, but it was not in operation during sampling.

There were chemicals present in the east and west building bays, but not in the central areas sampled (Parts Office, Northwest Office). Many of the chemical products on site are petroleum based, but considering the types and volume of products observed, these chemical products are not likely to generate the concentrations of APH aliphatics identified across the Building space.

5.0 Conclusions and Recommendations

Based on the results of this assessment, it appears likely that petroleum hydrocarbons in soil and groundwater beneath the building are impacting indoor air through vapor intrusion. In the short term, the Port should encourage the tenant to continuously run the shop exhaust fans and keep bay doors open to dilute indoor air with fresh air as much as possible. Portable fans may also be used to increase circulation between indoor and outdoor spaces. The Port should plan for a more proactive solution to minimize vapor intrusion, such as a subslab vapor extraction system or interior ventilation system to dilute indoor air.

6.0 References

ACGIH. 2019 Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices - Appendix H.

Crete Consulting, Inc. Direct Push Soil, Groundwater and Tier II Vapor Intrusion Assessment Work Plan, Port of Tacoma's Parcel 40 Maintenance Building Project Number: 013PT-006 TO3. June 10, 2020.

Tables

Table 1 - Summary of Indoor and Ambient Air Sample Results
Port of Tacoma
Parcel 40 Warehouse Building
July 4 to July 5, 2020

				Sample Location Sample ID Sample Duration						
	MTCA Screening Level (indoor air) Method C	**DOSH PEL (8hr TWA)[a]**	**ACGIH GGVs for Hydrocarbons**	**Ambient West**	**Ambient East**	**Indoor - West Bay 13**	**Indoor - Parts Office**	**Indoor - NW Office**	**Indoor - East**	**Indoor - East (duplicate)**
				AW040720 09:54 to 09:54	**AE040720 10:04 to 10:04**	**IWB13040720 10:13 to 10:13**	**IPO040720 10:23 to 10:23**	**INWOFF040720 10:31 to 10:31**	**IE040720 10:37 to 10:37**	**IE100040720 10:37 to 10:38**
Analytes				*all values in units of µg/m^3*						
Analysis for Volatile Compounds By EPA Method TO-15										
Benzene	**3.20**	**3,190**		<0.32	<0.38	0.58	0.74	0.51	0.79	0.78
Toluene	**5000**	**376,810**		<19	<23	39	<23	<19	<19	<19
Ethylbenzene	**1000**	**434,190**		<0.43	<0.52	14	6.3	5.1	1.3	1.3
m,p-Xylene	**100**	**434,190**		<0.87	<1	63	30	25	5.5	5.3
o-Xylene	**100**	**434,190**		<0.43	<0.52	19	9.8	8.3	2.1	1.7
Naphthalene	**0.74**	**52,430**		0.16	0.12	0.39	0.36	0.34	0.32	0.36
Analysis For Volatile Compounds By Method MA-APH										
APH EC5-8 aliphatics				<30	<36	240	160	110	130	130
ACGIH C5-8 aliphatics			**1,500,000**							
APH EC9-12 aliphatics				<35	<42	1,500[c]	1,200[c]	1,100[c]	2,600[c]	2,700[c]
ACGIH C9-15 aliphatics			**1,200,000**							
APH EC9-10 aromatics				<25	<30	<25	<30	<25	<25	<25
ACGIH C9-15 aromatics			**1,200,000**							
TPH[d]	**310.00**			111.21	129.54	**1,900.97**	**1,460.20**	**1,293.25**	**2,784.01**	**2,883.44**

Table 1 - Summary of Indoor and Ambient Air Sample Results
Port of Tacoma
Parcel 40 Warehouse Building
July 4 to July 5, 2020

MTCA = Model Toxics Control Act

DOSH = Washington State Division of Occupational Safety and Health

PEL = Permissible Exposure Limit

8hr TWA = 8 hour Time-Weighted Average

ACGIH = American Conference of Governmental Industrial Hygienists

GGVs - Group Guidance Values

$\mu g/m^3$ = micrograms per cubic meter

EPA = Environmental Protection Agency

MA-APH = Massachusetts Department of Environmental Protection Method for the Determination of Air-Phase Petroleum Hydrocarbons

APH = Air-Phase Petroleum Hydrocarbons

TPH = Total Petroleum Hydrocarbons

[a] DOSH PELs are cited in units of parts per million for the analytes listed. The PELs have been converted to units of $\mu g/m^3$ for the purpose of this report.

[b] The GGVs listed in Table 1 are reproduced from Column B of the ACGIH Table 1 Group Guidance Values found in Appendix H of the ACGIH publication, 2019 Threshold Limit Values and Biological Exposure Indices.

[c] The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

[d] TPH is based on Petroleum Vapor Intrusion (PVI): Updated Screening Levels, Cleanup Levels, and Assessing PVI Threats to Future Buildings Implementation Memorandum No. 18, dated January 10, 2018. This TPH limit assumes compounds not detected are present at the full reporting limit.

Table 2 - Derivation of Total TPH Cleanup Level for Indoor Air
Port of Tacoma
Parcel 40 Warehouse Building

The Total TPH Cleanup Level for indoor air for the Parcel 40 Building was derived by the following method.

Step 1. Determine which Cleanup method criteria are appropriate for the project. Industrial standards were selected for this project - MTCA Method C.
Step 2. Select air samples with high TPH concentrations for fractionation. For these data, the derivation was conducted for Indoor-West Bay 13 and Indoor-East.
Step 3. Use the fractionated results in the equation below to calculate a Method C air CUL.
Step 4. Compare the TPH concentrations in compliance air samples with the Method C air CUL.

Individual petroleum component: $CUL_i = \frac{RfDi_i \; x \; ABW \; x \; UCF \; x \; HQ \; x \; AT}{BR \; x \; ABS_i \; x \; ED \; x \; EF}$

(WAC 173-340-750, Equation 750-1)

TPH cleanup level: $CUL_{TPH} = \frac{1}{\sum_{i=1}^{i=n} \frac{F_i}{CUL_i}}$

source: https://fortress.wa.gov/ecy/publications/documents/1709043.pdf

Indoor - West Bay 13

Petroleum Fraction or Compound	Measured Concentration ($\mu g/m^3$)	Fraction of Total Concentration (Fi)	METHOD C Total TPH Non-Carcinogenic CULi ($\mu g/m^3$)	Fi / CULi
Aliphatics EC>5-8	240	0.126	5.95E+03	2.12E-05
Aliphatics EC>9-12	1,500	0.789	2.98E+02	2.65E-03
Aromatics EC>9-10	25	0.013	3.98E+02	3.30E-05
Benzene	0.58	0.000	3.00E+01	1.02E-05
Toluene	39	0.021	4.90E+03	4.19E-06
Ethylbenzene	14	0.007	1.00E+03	7.35E-06
Xylenes	82	0.043	1.02E+02	4.25E-04
Naphthalene	0.39	0.000	3.02E+00	6.80E-05
Total TPH	***1900.97***	1		***310.44***

The Total TPH Non-carcinogenic CUL = 1 / Σ (Fi / CULi)

Total TPH limit assumes compounds not detected are present at the full reporting limit.

Indoor - East

Petroleum Fraction or Compound	Measured Concentration Site-Specific Sample ($\mu g/m^3$)	Fraction of Total Concentration (Fi)	METHOD C Total TPH Non-carcinogenic CULi ($\mu g/m^3$)	Fi / CULi
Aliphatics EC>5-8	130	0.047	5.95E+03	7.85E-06
Aliphatics EC>9-12	2,600	0.934	2.98E+02	3.14E-03
Aromatics EC>9-10	25	0.000	3.98E+02	0.00E+00
Benzene	0.79	0.000	3.00E+01	9.47E-06
Toluene	19	0.000	4.90E+03	0.00E+00
Ethylbenzene	1.3	0.000	1.00E+03	4.66E-07
Xylenes	7.6	0.003	1.02E+02	2.69E-05
Naphthalene	0.32	0.000	3.02E+00	3.81E-05
Total TPH	***2784.01***	0.984195459		***310.37***

The Total TPH Non-carcinogenic CUL = 1 / Σ (Fi / CULi)

Total TPH limit assumes compounds not detected are present at the full reporting limit.

Figures


Figure 1
Port of Tacoma
Parcel 40
Ambient Sample Location Plan
July 4 to July 5, 2020
AE040720
AW040720
STOP
STOP
© 2020 Google

Figure 2
Port of Tacoma
Parcel 40 Building - East
Indoor Sample Location Plan
July 4 to July 5, 2020

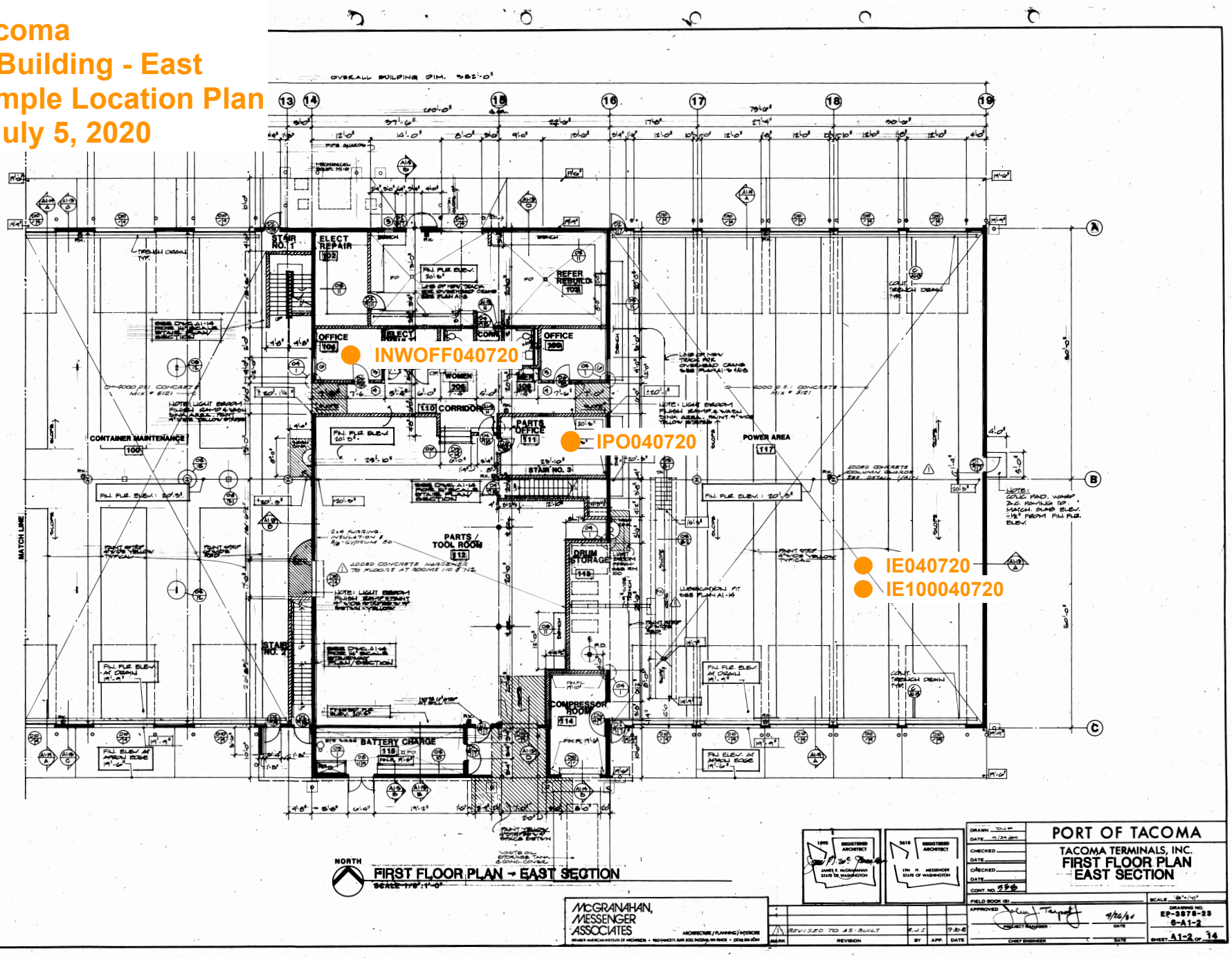
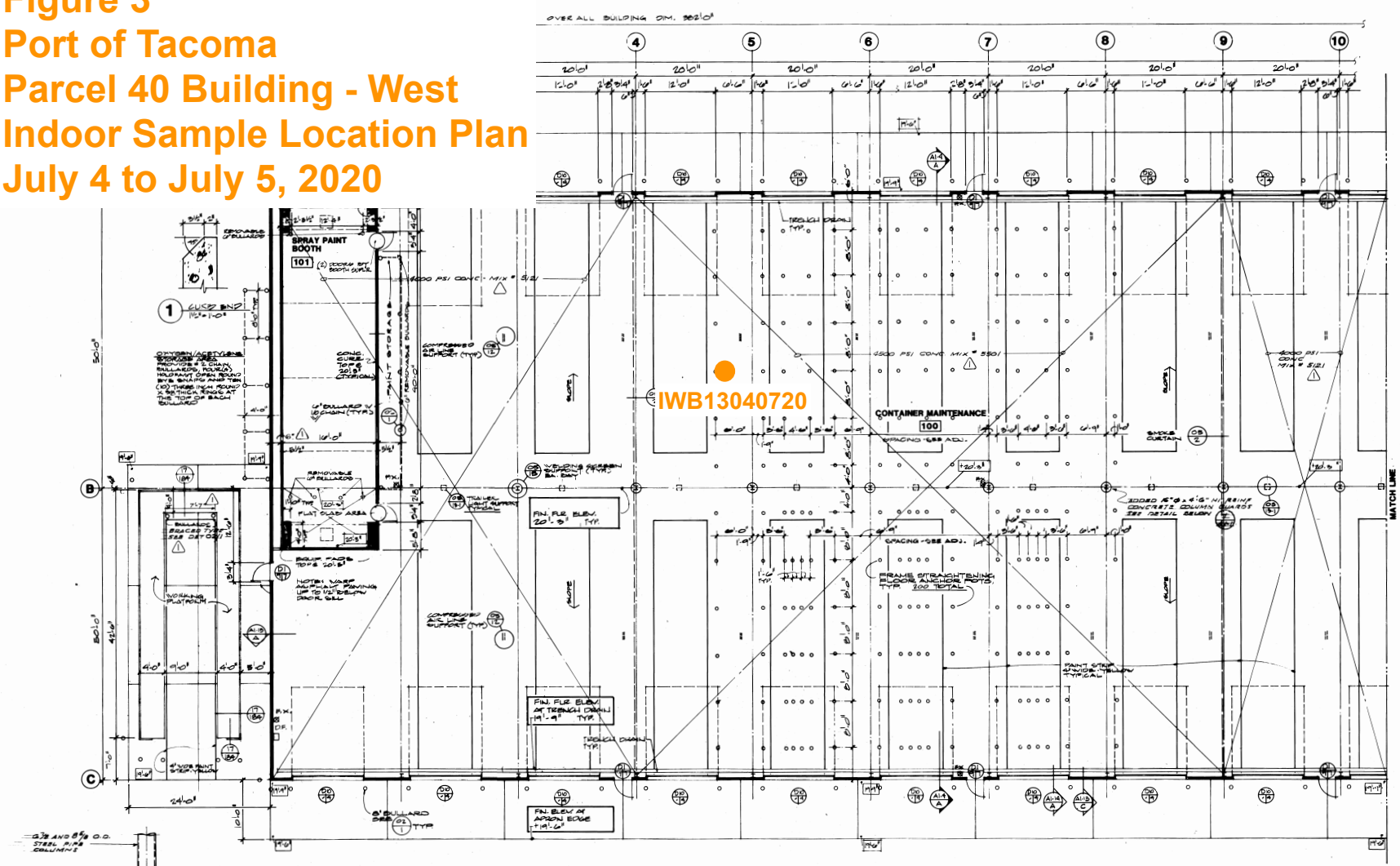


Figure 3
Port of Tacoma
Parcel 40 Building - West
Indoor Sample Location Plan
July 4 to July 5, 2020



ATTACHMENT A
Friedman & Bruya, Inc.
Laboratory Analytical Reports

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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July 10, 2020

Elisabeth Black
EMB Consulting, LLC
22725 44th Ave W
Mountlake Terrace, WA 98043

Dear Ms Black:

Included are the results from the testing of material submitted on July 6, 2020 from the Parcel 40, F&BI 007054 project. There are 20 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: Jamie Stevens, Grant Hainsworth
NAA0710R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on July 6, 2020 by Friedman & Bruya, Inc. from the EMB Consulting, LLC Parcel 40, F&BI 007054 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	EMB Consulting, LLC
007054 -01	AW040720
007054 -02	AE040720
007054 -03	IWB13-040720
007054 -04	IPO040720
007054 -05	INWOFF040720
007054 -06	IE040720
007054 -07	IE100040720

Non-petroleum compounds identified in the air phase hydrocarbon (APH) ranges were subtracted per the MA-APH method.

The APH EC9-12 aliphatics concentration in several samples exceeded the calibration range of the instrument. The data were flagged accordingly.

All other quality control requirements were acceptable.

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	AW040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-01
Date Analyzed:	07/07/20	Data File:	070711.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	90	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	<30
APH EC9-12 aliphatics	<35
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	AE040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-02 1/1.2
Date Analyzed:	07/07/20	Data File:	070712.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	99	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	<36
APH EC9-12 aliphatics	<42
APH EC9-10 aromatics	<30

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	IWB13-040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-03
Date Analyzed:	07/07/20	Data File:	070713.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	87	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	240
APH EC9-12 aliphatics	1,500 ve
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	IPO040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-04 1/1.2
Date Analyzed:	07/08/20	Data File:	070714.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	91	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	160
APH EC9-12 aliphatics	1,200 ve
APH EC9-10 aromatics	<30

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	INWOFF040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-05
Date Analyzed:	07/08/20	Data File:	070715.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	108	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	110
APH EC9-12 aliphatics	1,100 ve
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	IE040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-06
Date Analyzed:	07/08/20	Data File:	070716.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	101	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	130
APH EC9-12 aliphatics	2,600 ve
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	IE100040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/20	Lab ID:	007054-07
Date Analyzed:	07/08/20	Data File:	070717.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	101	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	130
APH EC9-12 aliphatics	2,700 ve
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	Method Blank	Client:	EMB Consulting, LLC
Date Received:	Not Applicable	Project:	Parcel 40, F&BI 007054
Date Collected:	Not Applicable	Lab ID:	00-1504 mb
Date Analyzed:	07/07/20	Data File:	070710.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	90	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	<30
APH EC9-12 aliphatics	<35
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AW040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-01
Date Analyzed:	07/07/20	Data File:	070711.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	91	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	<0.32	<0.1
Toluene	<19	<5
Ethylbenzene	<0.43	<0.1
m,p-Xylene	<0.87	<0.2
o-Xylene	<0.43	<0.1
Naphthalene	0.16	0.031

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AE040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-02 1/1.2
Date Analyzed:	07/07/20	Data File:	070712.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	101	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	<0.38	<0.12
Toluene	<23	<6
Ethylbenzene	<0.52	<0.12
m,p-Xylene	<1	<0.24
o-Xylene	<0.52	<0.12
Naphthalene	0.12 j	0.023 j

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IWB13-040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-03
Date Analyzed:	07/07/20	Data File:	070713.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	88	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	0.58	0.18
Toluene	39	10
Ethylbenzene	14	3.3
m,p-Xylene	63	14
o-Xylene	19	4.3
Naphthalene	0.39	0.074

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IPO040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-04 1/1.2
Date Analyzed:	07/08/20	Data File:	070714.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	92	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	0.74	0.23
Toluene	<23	<6
Ethylbenzene	6.3	1.4
m,p-Xylene	30	6.9
o-Xylene	9.8	2.3
Naphthalene	0.36	0.068

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	INWOFF040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-05
Date Analyzed:	07/08/20	Data File:	070715.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	109	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	0.51	0.16
Toluene	<19	<5
Ethylbenzene	5.1	1.2
m,p-Xylene	25	5.7
o-Xylene	8.3	1.9
Naphthalene	0.34	0.064

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IE040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-06
Date Analyzed:	07/08/20	Data File:	070716.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	102	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	0.79	0.25
Toluene	<19	<5
Ethylbenzene	1.3	0.30
m,p-Xylene	5.5	1.3
o-Xylene	2.1	0.47
Naphthalene	0.32	0.061

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IE100040720	Client:	EMB Consulting, LLC
Date Received:	07/06/20	Project:	Parcel 40, F&BI 007054
Date Collected:	07/04/25	Lab ID:	007054-07
Date Analyzed:	07/08/20	Data File:	070717.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	102	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	0.78	0.24
Toluene	<19	<5
Ethylbenzene	1.3	0.29
m,p-Xylene	5.3	1.2
o-Xylene	1.7	0.39
Naphthalene	0.36	0.068

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	EMB Consulting, LLC
Date Received:	Not Applicable	Project:	Parcel 40, F&BI 007054
Date Collected:	Not Applicable	Lab ID:	00-1504 mb
Date Analyzed:	07/07/20	Data File:	070710.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS/BAT

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	91	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	<0.32	<0.1
Toluene	<19	<5
Ethylbenzene	<0.43	<0.1
m,p-Xylene	<0.87	<0.2
o-Xylene	<0.43	<0.1
Naphthalene	<0.057 j	<0.011 j

Date of Report: 07/10/20
Date Received: 07/06/20
Project: Parcel 40, F&BI 007054

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD MA-APH

Laboratory Code: 007060-02 1/8.3 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
APH EC5-8 aliphatics	ug/m3	<250	<250	nm
APH EC9-12 aliphatics	ug/m3	380	350	8
APH EC9-10 aromatics	ug/m3	<210	<210	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
APH EC5-8 aliphatics	ug/m3	67	81	70-130
APH EC9-12 aliphatics	ug/m3	67	109	70-130
APH EC9-10 aromatics	ug/m3	67	107	70-130

Date of Report: 07/10/20
Date Received: 07/06/20
Project: Parcel 40, F&BI 007054

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: 007060-02 1/8.3 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
Benzene	ug/m3	<2.7	<2.7	nm
Toluene	ug/m3	<160	<160	nm
Ethylbenzene	ug/m3	<3.6	<3.6	nm
m,p-Xylene	ug/m3	<7.2	<7.2	nm
o-Xylene	ug/m3	<3.6	<3.6	nm
Naphthalene	ug/m3	<2.2	<2.2	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/m3	43	87	70-130
Toluene	ug/m3	51	96	70-130
Ethylbenzene	ug/m3	59	86	70-130
m,p-Xylene	ug/m3	120	92	70-130
o-Xylene	ug/m3	59	89	70-130
Naphthalene	ug/m3	71	83	70-130

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.

SAMPLE CHAIN OF CUSTODY

007054 ME 07/06/20

Page # 1 of 1

Report To Elisabeth Black
Company EMB Consulting, LLC
Address 22725 - 44th Ave W
City, State, ZIP Mountlake Terrace, WA
Phone 206-915-2395 Email emblackconsult@gmail.

SAMPLERS (signature) E. Black

PROJECT NAME & ADDRESS: Parcel 40

PO #:

NOTES: cc: Jamie Stevens

INVOICE TO: Crete

TURNAROUND TIME
☑ Standard
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Default: Clean after 3 days
☐ Archive (Fee may apply)

SAMPLE INFORMATION / ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Cont. ID	Reporting Level: IA=Indoor Air SG=Soil Gas (Circle One)	Date Sampled	Initial Vac. ("Hg)	Field Initial Time	Final Vac. ("Hg)	Field Final Time	TO15 Full Scan	TO15 BTEXN	TO15 cVOCs	APH	Helium		Notes
AW040720	01	20545	05349	(IA) / SG	7/4.5	29.75	9:54	8.5	9:54		X		X			X-per EB/GH
AE 040720	02	18561	05348	(IA) / SG	7/4.5	>30.0	10:04	10.0	10:04		X		X			7/6/20 ME
IWB13-040720	03	35331	05347	(IA) / SG	7/4.5	>30.0	10:13	9.75	10:13		X		X			
IP0 040720	04	20549	05335	(IA) / SG	7/4.5	>30.0	10:23	10.75	10:23		X		X			
INWOFF040720	05	21442	07846	(IA) / SG	7/4.5	>30.0	10:31	8.00	10:31		X		X			
IE 04072D	06	18577	06602	(IA) / SG	7/4.5	29.75	10:37	8.5	10:37		X		X			
IE10040720	07	35338	05350	(IA) / SG	7/4.5	28	10:37	7.75	10:38		X		X			
				IA / SG												

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FORMS\COC\COCTO-15.DOC

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: E. Black	Elisabeth Black	EMB Consulting	07/06/20	11:35
Received by: Michael E. Hall	Michael E. Hall	FB	7/6/20	↓
Relinquished by:				
Received by:		Samples received at 21 °C		

ATTACHMENT B
Weather Data
Tacoma, Washington
July 4 to 5, 2020

Weather History for KWATACOM280

Previous | Daily Mode | July | 4 | 2020 | View | Next

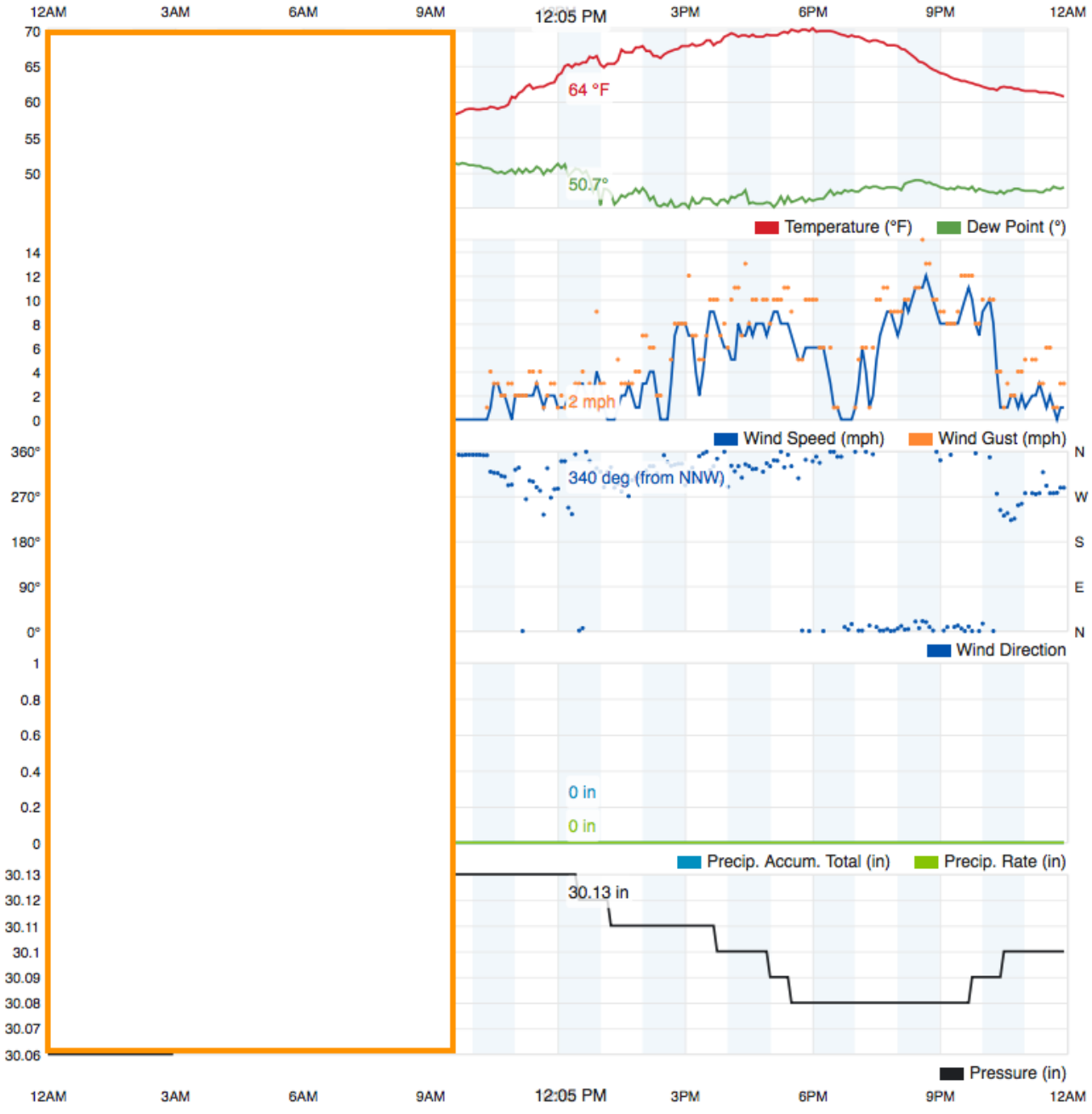
Summary
July 4, 2020

	High	Low	Average
Temperature	70.3 °F	53.8 °F	61.5 °F
Dew Point	51.8 °F	45.1 °F	49.0 °F
Humidity	89 %	41 %	66 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	12.0 mph	0.0 mph	2.7 mph
Wind Gust	15.0 mph	--	3.8 mph
Wind Direction	--	--	NNW
Pressure	30.13 in	30.06 in	--

Graph | Table

July 4, 2020



Weather History for KWATACOM280

Previous | Daily Mode | July | 5 | 2020 | View | Next

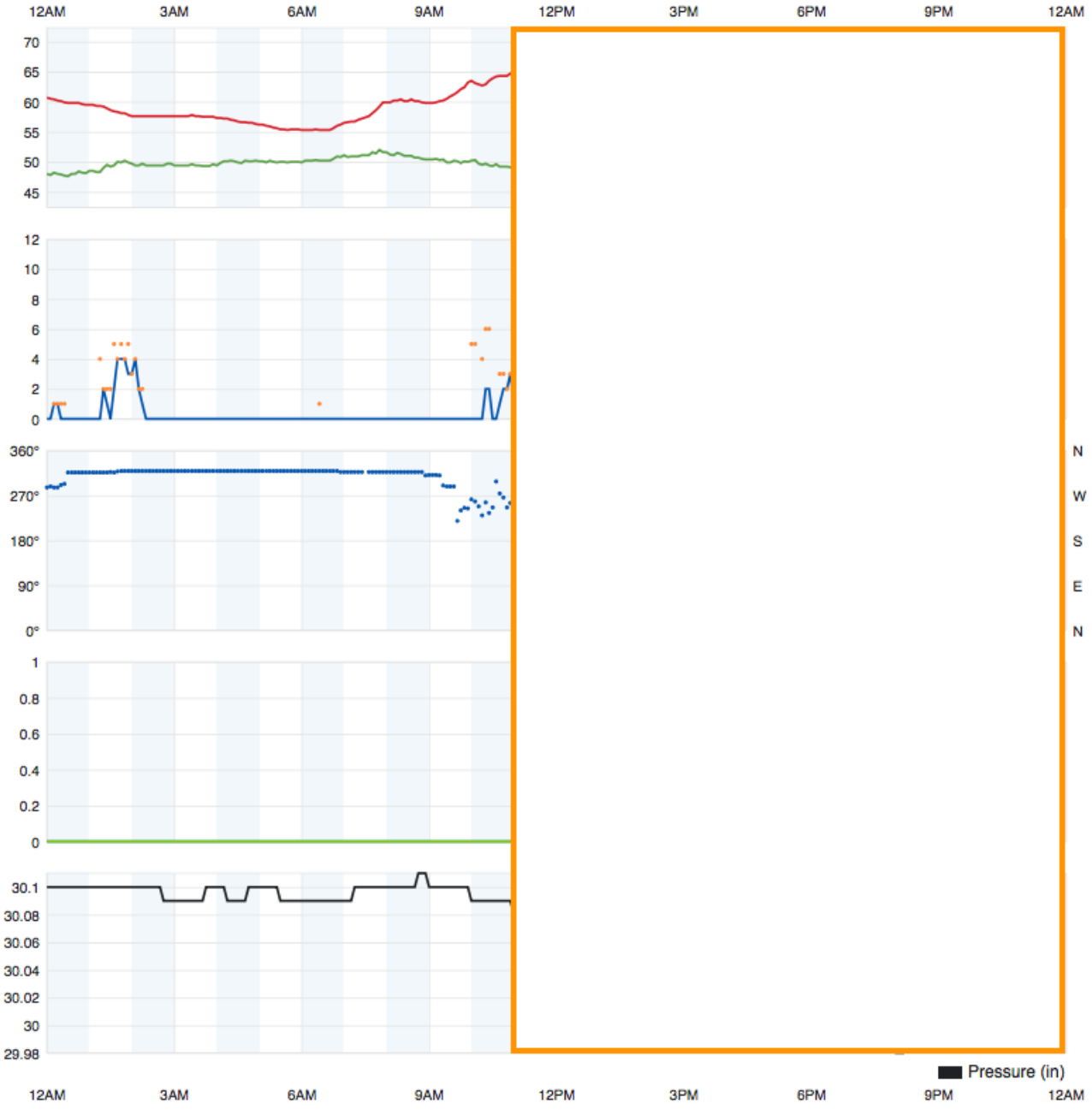
Summary
July 5, 2020

	High	Low	Average
Temperature	72.3 °F	55.3 °F	64.1 °F
Dew Point	52.0 °F	42.4 °F	48.3 °F
Humidity	83 %	37 %	58 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	11.0 mph	0.0 mph	2.6 mph
Wind Gust	12.0 mph	--	3.5 mph
Wind Direction	--	--	NW
Pressure	30.11 in	29.98 in	--

Graph | Table

July 5, 2020



Sub-Slab Vapor Analytical Data

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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www.friedmanandbruya.com

November 4, 2020

Grant Hainsworth, Project Manager
Crete Consulting
108 S. Washington St., Suite 300
Seattle, WA 98104

Dear Mr Hainsworth:

Included are the results from the testing of material submitted on October 28, 2020 from the Port of Tacoma Parcel 40, F&BI 010494 project. There are 10 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: Jamie Stevens
CTC1104R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on October 28, 2020 by Friedman & Bruya, Inc. from the Crete Consulting Port of Tacoma Parcel 40, F&BI 010494 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
010494 -01	SSV-Parts
010494 -02	SSV-E Bay

All quality control requirements were acceptable.

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	SSV-Parts	Client:	Crete Consulting
Date Received:	10/28/20	Project:	Port of Tacoma Parcel 40
Date Collected:	10/27/20	Lab ID:	010494-01 1/3.2
Date Analyzed:	10/30/20	Data File:	102927.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	104	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	<130
APH EC9-12 aliphatics	230
APH EC9-10 aromatics	<80

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	SSV-E Bay	Client:	Crete Consulting
Date Received:	10/28/20	Project:	Port of Tacoma Parcel 40
Date Collected:	10/27/20	Lab ID:	010494-02 1/8.2
Date Analyzed:	10/30/20	Data File:	102929.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	86	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	1,900
APH EC9-12 aliphatics	<410
APH EC9-10 aromatics	<200

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Port of Tacoma Parcel 40
Date Collected:	Not Applicable	Lab ID:	00-2642 MB
Date Analyzed:	10/29/20	Data File:	102911.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	97	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	<40
APH EC9-12 aliphatics	<50
APH EC9-10 aromatics	<25

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SSV-Parts	Client:	Crete Consulting
Date Received:	10/28/20	Project:	Port of Tacoma Parcel 40
Date Collected:	10/27/20	Lab ID:	010494-01 1/3.2
Date Analyzed:	10/30/20	Data File:	102927.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	106	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	<1	<0.32
Toluene	<60	<16
Ethylbenzene	<1.4	<0.32
m,p-Xylene	<2.8	<0.64
o-Xylene	<1.4	<0.32
Naphthalene	<0.84	<0.16

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SSV-E Bay	Client:	Crete Consulting
Date Received:	10/28/20	Project:	Port of Tacoma Parcel 40
Date Collected:	10/27/20	Lab ID:	010494-02 1/8.2
Date Analyzed:	10/30/20	Data File:	102929.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	88	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	<2.6	<0.82
Toluene	<150	<41
Ethylbenzene	<3.6	<0.82
m,p-Xylene	<7.1	<1.6
o-Xylene	<3.6	<0.82
Naphthalene	<2.1	<0.41

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	Port of Tacoma Parcel 40
Date Collected:	Not Applicable	Lab ID:	00-2642 MB
Date Analyzed:	10/29/20	Data File:	102911.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	99	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	<0.32	<0.1
Toluene	<19	<5
Ethylbenzene	<0.43	<0.1
m,p-Xylene	<0.87	<0.2
o-Xylene	<0.43	<0.1
Naphthalene	<0.26	<0.05

Date of Report: 11/04/20
Date Received: 10/28/20
Project: Port of Tacoma Parcel 40, F&BI 010494

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD MA-APH

Laboratory Code: 010494-01 1/3.2 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
APH EC5-8 aliphatics	ug/m3	<130	<130	nm
APH EC9-12 aliphatics	ug/m3	230	230	0
APH EC9-10 aromatics	ug/m3	<80	<80	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
APH EC5-8 aliphatics	ug/m3	67	72	70-130
APH EC9-12 aliphatics	ug/m3	67	91	70-130
APH EC9-10 aromatics	ug/m3	67	104	70-130

Date of Report: 11/04/20
Date Received: 10/28/20
Project: Port of Tacoma Parcel 40, F&BI 010494

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: 010494-01 1/3.2 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
Benzene	ug/m3	<1	<1	nm
Toluene	ug/m3	<60	<60	nm
Ethylbenzene	ug/m3	<1.4	<1.4	nm
m,p-Xylene	ug/m3	<2.8	<2.8	nm
o-Xylene	ug/m3	<1.4	<1.4	nm
Naphthalene	ug/m3	<0.84	<0.84	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/m3	43	94	70-130
Toluene	ug/m3	51	107	70-130
Ethylbenzene	ug/m3	59	107	70-130
m,p-Xylene	ug/m3	120	103	70-130
o-Xylene	ug/m3	59	101	70-130
Naphthalene	ug/m3	71	98	70-130

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.

0104944

SAMPLE CHAIN OF CUSTODY MG 10-28-20

Page # 1 of 1

Report To Grant Hainsworth (& Jamie)
Company CRETE
Address 108 S. Washington St., #300
City, State, ZIP Seattle, WA 98104
Phone 253-797-6322 Email grant.hainsworth@crete consulting.com

SAMPLERS (signature) Grant Hainsworth

PROJECT NAME & ADDRESS: Port of Tacoma Parcel 40

PO #

NOTES:

INVOICE TO

TURNAROUND TIME
☒ Standard
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Default: Clean after 3 days
☐ Archive (Fee may apply)

SAMPLE INFORMATION										ANALYSIS REQUESTED						
Sample Name	Lab ID	Canister ID	Flow Cont. ID	Reporting Level: IA=Indoor Air SG=Soil Gas (Circle One)	Date Sampled	Initial Vac. ("Hg)	Field Initial Time	Final Vac. ("Hg)	Field Final Time	TO15 Full Scan	TO15 BTEXN	TO15 cVOCs	APH	Helium		Notes
SSV-Parts	01	3312	255	IA / (SG)	10/27/20	30+	1648	4	1653		X		X			
SSV-E Bay	02	2435	256	IA / (SG)	10/27/20	30	1717	5	1722		X		X			
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FORMS\COC\COCTO-15.DOC

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Grant Hainsworth	Grant Hainsworth	CRETE	10/28/20	823
Received by: Ann Wessbecher	Ann Wessbecher Bruya	FLB	10/28	823
Relinquished by:				
Received by:		Samples received at 9 °C		

Appendix C

Borehole Logs and Survey Data

CRETE Consulting, Inc.

16300 Christensen Road, Suite 214
Seattle, WA 98188

WELL LOG

BORING/WELL ID: **MW-10**

INSTALLED DEPTH: **20-ft bgs**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Parcel 40**	DRILLING CO.:	**Holocene Drilling/Eric Swanson**
SITE LOCATION:	**1675 Lincoln Avenue**	DRILLING METHOD:	**Hollow Stem Auger**
	Tacoma, WA	EQUIPMENT TYPE:	**Diedrich D-50 Turbo**
LOGGED BY:	**Rusty Jones**	SAMPLING METHOD:	**4.25" ID Hollow Stem Auger**
PROJECT MANAGER:	**G. Hainsworth**		**With 1.5-ft Split-Spoons**
DATES DRILLED/INSTALLED:	**10/4/2020**	DRILLED DEPTH:	**20-ft bgs, Cored to 21.5-ft bgs**
LATITUDE:	**48.9257° N**	INITIAL WATER DEPTH:	**12.5-ft bgs**
LONGITUDE:	**122.8127° W**	SCREENED INTERVAL:	**7 to 17 ft bgs**

DEPTH	SOIL LOG	USCS	DESCRIPTION	SAMPLE ID	SAMPLE DEPTH (ft bgs)	PID (ppm)	WELL CONSTRUCT.	WELL DESC.
0		SW	GRAVELLY SAND, fine to coarse-grained, poorly-sorted, subangular to subround, up to 1.5-inch gravel, slightly moist ot moist.	Split-Spoon	0 - 1.5 ft		Flush-mount Wellhead Cover	0
							Cement Collar	
				Split-Spoon	2.5 - 4 ft	4.8	2-inch PVC Riser	
5								5
				Split-Spoon	5 - 6.5 ft	6.4	Bentonite Seal	
		SM	SILTY SAND, fine to coarse-grained, black. At 7.5-ft bgs: Abundant GRAVEL, slightly moist.					
				Split-Spoon	7.5 - 9 ft	7.1		
		SP	SAND, fine to medium-grained, well-sorted, slightly moist, dark brown.					
10		ML	SILT, firm, moist to wet, dark brown to black, very faint hydrocarbon odor. At 12.5-ft bgs: Wet to saturated	Split-Spoon	10 - 11.5 ft	6.9		10
				Split-Spoon	12.5 - 14 ft	7.0	Filter Pack 12/20 Silica Sand	
15			At 15-ft bgs: Some seams of black fine to medium-grained SAND, black, little to no hydrocarbon odor.	Split-Spoon	15 - 16.5 ft	5.3	2-inch PVC Screen 0.010-Slotted	15
		SP	SAND, minor SILT, fine to medium-grained, loose to medium consistency, wet, black, little to no hydrocarbon odor.	Split-Spoon	17.5 - 19 ft	5.9		
20				Split-Spoon	20 - 21.5 ft			20

NOTES: Installed adjacent to SB-08
Lithology logged from split spoon core samples.

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Seattle, WA 98188

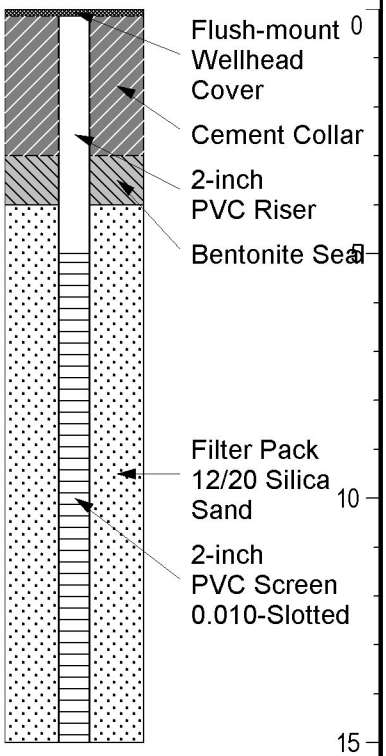
WELL LOG

BORING/WELL ID: **MW-11**

INSTALLED DEPTH: **20-ft bgs**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Parcel 40**	DRILLING CO.:	**Holocene Drilling/Eric Swanson**
SITE LOCATION:	**1675 Lincoln Avenue**	DRILLING METHOD:	**Hollow Stem Auger**
	Tacoma, WA	EQUIPMENT TYPE:	**Diedrich D-50 Turbo**
LOGGED BY:	**Rusty Jones**	SAMPLING METHOD:	**4.25" ID Hollow Stem Auger**
PROJECT MANAGER:	**G. Hainsworth**		**With 1.5-ft Split-Spoons**
DATES DRILLED/INSTALLED:	**10/4/2020**	DRILLED DEPTH:	**20-ft bgs, Cored to 21.5-ft bgs**
LATITUDE:	**48.9252° N**	INITIAL WATER DEPTH:	**12.5-ft bgs**
LONGITUDE:	**122.8117° W**	SCREENED INTERVAL:	**5 to 15 ft bgs**

DEPTH	SOIL LOG	USCS	DESCRIPTION	SAMPLE ID	SAMPLE DEPTH (ft bgs)	PID (ppm)
0		GW	GRAVELLY SAND, medium to coarse-grained, poorly-sorted, subangular, slightly moist ot moist, dark brown.	Split-Spoon	0 - 1.5 ft	
				Split-Spoon	2.5 - 4 ft	NM
5				Split-Spoon	5 - 6.5 ft	0.9
				Split-Spoon	7.5 - 9 ft	2.6
10		SM	CLAYEY SILT, native seams varying from dark brown to dark grays, moist to wet. At 12.5 ft bgs: SILT, decreasing CLAY fines, minor fine to medium-grained SAND pockets, wet, black. At 15 ft bgs: SILT with fine-grained SAND, wet, dark gray to black.	Split-Spoon	10 - 11.5 ft	2.6
				Split-Spoon	12.5 - 14 ft	2.6
15		SP	SAND, medium to coarse-grained, subangular to subround, black, wet.	Split-Spoon	15 - 16.5 ft	3.0
				Split-Spoon	17.5 - 19 ft	2.7
20				Split-Spoon	20 - 21.5 ft	2.8



NOTES: Installed adjacent to Matson warehouse.
Lithology logged from split spoon core samples.

CRETE CONSULTING, INC.

Crete Consulting, Inc.
16300 Christensen Road
Suite 214
Tukwila, WA 98188

Boring Log

LOCATION/BORING ID: **SB-01**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**6/12/2020**
START TIME: **08:55**	END TIME: **10:00**

REMARKS: **East end of Building 600.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Casey Newman**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**25 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9264	**122.8114**

INITIAL WATER LEVEL: **13.71 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		SW	FILL: GRAVELLY SAND, poorly-sorted, fine to coarse-grained, subround to round gravel, dark tan to brown, slightly moist.		0.8-2	0.9	
			At 3 ft bgs: Mostly gray.		3-4	2.0	
5		SP	SAND, fine to medium-grained, dark gray to black, slightly moist.		4.5-5	65.0	
		SP	SAND, fine to coarse -grained, dark gray to black, slightly moist to moist, moderate to strong hydrocarbon odors.		5.5-6.5	162.5	
					7.5-8.5	187.7	
10			At 9.5 ft bgs: Moist to wet.	SB-01-09	9-10	189.3	
			At 11-11.5 ft bgs: GRAVELLY SAND layer.		10-11	131.1	
		SM	SILTY SAND, fine to medium-grained, dark gray to black, wet, moderate to strong hydrocarbon.	SB-01-0620	12-13	95.6	Temporary well screen installed (11-15 ft bgs).
15			Lithology not logged after 15 ft bgs.		14-15	70.1	
20				SB-01D-0620			Temporary well screen installed (21-25 ft bgs).
25							

These logs should not be used separately from original report

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Suite 214
Tukwila, WA 98188

Boring Log

LOCATION/BORING ID: **SB-02**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**6/12/2020**
START TIME: **10:05**	END TIME: **10:55**

REMARKS: **East end of Building 600 near GEI-MW1.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Casey Newman**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**15 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9265	**122.8114**

INITIAL WATER LEVEL: **9.97 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT and GRAVEL, some medium to coarse-grained SAND, mostly dry.				
		SW	FILL: GRAVELLY SAND, poorly-sorted, fine to coarse-grained, brown to gray, slightly moist.		1-2	6.0	
			SAND, medium-grained, minor coarse-grained,subround to round, trace round GRAVEL (<1-inch observed), dark gray to black, slightly moist to moist.				
					3.5-5	33.8	
5		SP	At 4.5 ft bgs: Faint hydrocarbon odor. At 5 ft bgs: Minor SILT, some brown SAND, moist.				
					6-7	17.1	
					7.5-8.5	83.5	
			SILTY SAND, fine to medium-grained, dark gray to black, moist to wet. Increasing SILT with depth. At 9.5 ft bgs: Wet, hydrocarbon sheen.				
10	∇			SB-02-09.5	9.5-10	144.7	
			At 11 ft bgs: Wet to saturated, hydrocarbon sheen, strong hydrocarbon odors.		10.5-11	68.8	
		SM					
					12-13	19.0	
				SB-02-0620			
15					14-15	10.8	

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Tukwila, WA 98188

Boring Log

LOCATION/BORING ID: **SB-03**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**6/12/2020**
START TIME: **11:00**	END TIME: **11:50**

REMARKS: **Northeast corner of Building 600.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Casey Newman**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**15 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9265	**122.8116**

INITIAL WATER LEVEL: **12.28 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		SW	FILL: GRAVELLY SAND, poorly-sorted, fine to coarse-grained, subround to round gravel (<1.5-inch observed), tan to brown, slightly moist to moist.		0.5-1	2.4	
					2.5-3.5	1.9	
5		SP	SAND, medium to coarse-grained, black, moist. Faint hydrocarbon odor. At 5 ft bgs: Dark brown to black, slightly moist to moist, moderate to strong hydrocarbon.		4.5-5	78.8	
					5.5-6.5	175.0	
					7.5-8.5	235.2	
10			At 10 ft bgs: Some decomposed ROOTS, dark gray to black, moist to wet, very strong hydrocarbon odor.		9.5-10	167.7	
				SB-03-10	10-10.5	879.8	
		SM	SILTY SAND, fine to medium-grained, wet to saturated. Strong hydrocarbon odor.	SB-03-0620 SB-0310-10	11.5-12.5	198.0	
15					14.5-15	24.5	

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Suite 214
Tukwila, WA 98188

Boring Log

LOCATION/BORING ID: **SB-04**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**6/12/2020**
START TIME: **12:40**	END TIME: **13:28**

REMARKS: **Northeast corner of Building 600.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Casey Newman**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**15 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9265	**122.8117**

INITIAL WATER LEVEL: **11.60 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		SW	GRAVELLY SAND, minor SILT, poorly-sorted, fine to coarse-grained, tan to brown, slightly moist to moist.		1-2.5	2.1	
5		SP	SAND, medium to coarse-grained, greenish dark gray, very faint hydrocarbon odor. At 5 ft bgs: Fine to medium-grained, dark gray to black, faint to moderate hydrocarbon odor.		4-5	18.4	
					6-7	37.6	
				SB-04-08	8-9	242.4	
10			CLAYEY SANDY SILT , soft, trace decomposed ROOTS, moist to wet, moderate to strong hydrocarbon odors. At 10 ft bgs: Variable SAND and SILT content, very fine to fine-grained, dark gray to black, wet to saturated, strong hydrocarbon odor.				
					10-11	215.4	
		ML					
					12-13	51.3	
				SB-04-0620			
15					14-15	10.9	

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Suite 214
Tukwila, WA 98188

Boring Log

LOCATION/BORING ID: **SB-05**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**6/12/2020**
START TIME: **13:30**	END TIME: **14:20**

REMARKS: **North side of Building 600.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Casey Newman**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**15 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9264	**122.8119**

INITIAL WATER LEVEL: **12.57 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		SW	SAND with GRAVEL, poorly-sorted, very fine to coarse-grained, subround to round sand and gravel, tan to brown, slightly moist.		1-2.5	3.2	
			At 2 to 2.5 ft bgs: Perched coarse SAND layer, wet.				
5			At 5 ft bgs: Medium to coarse-grained, SAND, tan, wet, faint hydrocarbon odor.		4-5	2.7	
					5.5-6.5	3.0	
		SP	SAND, minor to some SILT, fine to medium-grained, dark gray, moist, moderate to strong hydrocarbon odor.		7-8	81.3	
10		ML	SANDY SILT, very fine to fine-grained sand, subround, dark brown to dark gray, strong hydrocarbon odor.	SB-05-09.5	9.5-10	134.3	
			At 10 ft bgs: Wet to saturated, strong hydrocarbon odor, hydrocarbon sheen.		10.5-11.5	125.6	
			At 10.5-11.5 ft bgs: Fine-grained SANDY layer.	SB-05-0620	12.5-13.5	93.4	
15					14.5-15	30.4	

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Boring Log

LOCATION/BORING ID: **SB-06**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**6/12/2020**
START TIME: **14:30**	END TIME: **15:10**

REMARKS: **North side of Building 600.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Casey Newman**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**15 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9262	**122.8122**

INITIAL WATER LEVEL: **10.30 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		SW	GRAVELLY SAND, poorly-sorted, fine to coarse-grained, mostly subround, gravel up to 1.5-inch observed, tan to brown, slightly moist.		1-2	2.5	
5		SP	SAND, fine to medium-grained, dark brown to dark gray, slightly moist to moist. At 5 ft bgs: Moderate to strong hydrocarbon odor. At 5.5 to 6.5 ft bgs: Coarse-grained SAND.		4-5	5.0	
					5-6	11.0	
					7-8	98.9	
10	▽	SM	SILTY SAND, dark gray to black, wet, moderate to strong hydrocarbon odor.	SB-06-09	9-10	229.1	
					10.5-11.5	145.3	
				SB-06-0620	12.5-13.5	79.4	
15					14-15	89.4	

CRETE CONSULTING, INC.

Crete Consulting, Inc.
16300 Christensen Road
Suite 214
Tukwila, WA 98188

Boring Log

LOCATION/BORING ID: **SB-07**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**6/12/2020**
START TIME: **15:18**	END TIME: **16:08**

REMARKS: **North side of Building 600.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Casey Newman**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**15 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.926	**122.8126**

INITIAL WATER LEVEL: **10.11 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		SW	SAND and GRAVEL, poorly-sorted, fine to coarse-grained, subround gravel up to 1.5-inch, tan to brown, slightly moist to moist.		1-2.5	2.0	
5		SP	SAND, medium-grained, loose to medium consistency, brown to dark gray, slightly moist to moist, no appreciable hydrocarbon odors.		4-5	4.9	
					5.5-6.5	3.4	
				SB-07-07.5	7.5-8.5	4.2	
10	▽		At 10.5 ft bgs: GRAVELLY SAND, coarse-grained, brown, moist to wet.		9-10	3.7	
		SM	SILTY SAND, very fine to fine-grained, black, wet to saturated, faint hydrocarbon odors.	SB-07-0620	10.5-11.5	2.6	
					13-14	2.5	
15					14-15	2.3	

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Crete Consulting, Inc.
16300 Christensen Road
Suite 214
Tukwila, WA 98188

Boring Log

LOCATION/BORING ID: **SB-08**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**6/12/2020**
START TIME: **16:18**	END TIME: **18:00**

REMARKS: **West end of Building 600 Area. At GEI-MW10 location.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Casey Newman**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**25 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9257	**122.8128**

INITIAL WATER LEVEL: **10.35**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		GW	GRAVEL and SAND, slightly moist to moist.				
			GRAVELLY SAND, fine to coarse-grained, mostly medium to coarse-grained, moist.		1.5-2.5	2.7	
		SW					
5			At 5 ft bgs: Wet. At 5.5 to 5.8 ft bgs: GRAVEL.		4-5	1.8	
			SAND, poorly-sorted, medium to coarse-grained, subround, black, moist.		6-7	2.7	
		SW					
10			At 10.8 ft bgs: Very coarse-grained SAND, subangular to subround, tan to brown, wet to saturated.	SB-08-09	9-10	2.8	
			SILTY SAND, well-sorted, very fine to fine-grained, black, saturated.		11-12	2.5	Temporary well screen installed 11-15 ft bgs.
		SM		SB-08-0620			
			At 13.8 ft bgs: Decomposing WOOD.		14-15	2.4	
15			SAND, mostly medium to coarse-grained, coarsening downward sequence, black with some white and red grains, saturated, very faint indistinct odor.		16-17	2.2	
					18.5-20	2.1	
20		SP	At 20 ft bgs: Reducing odors.				Temporary well screen installed 21-25 ft bgs. Water level at 11.03 ft bgs.
			At 22.5 ft bgs: Minor to some SILT, minor reducing odors.		21-22	1.8	
				SB-08D-0620			
25					24-25	1.8	

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Boring Log

LOCATION/BORING ID: **SB-09**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**6/12/2020**
START TIME: **18:05**	END TIME: **18:45**

REMARKS: **Southside of Building 600, near former GCI-MW3.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Casey Newman**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**15 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9259	**122.8119**

INITIAL WATER LEVEL: **10.46 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		SW	SAND and GRAVEL, poorly-sorted, fine to coarse-grained, tan/brown to gray, moist.		1-5	3.0	
5					5-7.5	8.5	
		SP	SAND, fine to medium-grained, subround, dark gray to black, moist, mild to moderate hydrocarbon odor. Increasing SILT with depth.	SB-09-07.5	7.5-10	295.3	
10			At 10 ft bgs: Coarsening downward sequence, dark brown to black, wet. At 10.5 ft bgs: Coarse-grained, gray, wet.				
		SM	SILTY SAND, very fine to fine-grained, dark brown to black, saturated.		10.5-11.5	228.1	
			At 12 ft bgs: Hydrocarbon sheen.	SB-09-0620	12-13	225.5	
15					14.5-15	197.1	

These logs should not be used separately from original report

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Boring Log

LOCATION/BORING ID: **SB-10**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**8/5/2020**
START TIME: **07:30**	END TIME: **09:15**

REMARKS: **West of Building 600, near Stewart Street.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Don Harden**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**25 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9255	**122.8133**

INITIAL WATER LEVEL: **8.85 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		SW	GRAVELLY SAND, poorly-sorted, fine to coarse-grained, subround, tan, slightly moist. At 1.8 ft bgs: Decreasing GRAVEL, subround to round, moist.		0.5-1.5	20.3	
		SP	SAND, trace GRAVEL, medium-grained, round to subround, tan, moist.		3-4	20.7	
5				SB-10-05	5-6	21.9	
		SM	SILTY SAND, fine-grained, subround, dark brown to black, moist.		7-8	17.2	
			At 10 ft bgs: Moist to wet. At 10.7 ft bgs: Fine to medium-grained, dark brown, wet.		9-10	17.7	
10					10.5-11	18.4	Temporary well screen installed 11-15 ft bgs.
			At 14.3 ft bgs: Decomposed WOOD.	SB-10-0820	12-13	15.0	
					14-14.5	14.9	
15		SP	SAND, minor SILT, mostly medium-grained, subangular to subround, dark brown, wet to saturated.		15-16	13.2	
					18-19	15.6	
20			At 20 ft bgs: Fine to coarse-grained, coarsening downward, trace SHELL fragments, wet to saturated.		20-22	14.2	Temporary well screen installed 21-25 ft bgs.
		SM	SILTY SAND, semi-cohesive, fine to medium-grained, dark brown to dark gray, wet.	SB-10D-0820	22-23.8	17.2	
25							

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Boring Log

LOCATION/BORING ID: **SB-11**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**8/5/2020**
START TIME: **09:36**	END TIME: **10:25**

REMARKS: **Southwest of Building 600.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Don Harden**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**15 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9254	**122.8124**

INITIAL WATER LEVEL: **9.6 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		GW	FILL: SANDY GRAVEL, poorly-sorted, fine to very coarse-grained, dry.				
		SW	SAND, mostly medium to coarse-grained, trace to minor small GRAVEL, subround, greenish gray, slightly moist.		2-3	18.5	
					4-5	17.0	
5			At 5 ft bgs: Moist, faint hydrocarbon odor.		5.5-6.5	20.5	
					7.5-8.5	71.8	
				SB-11-09	9-10	486.8	
10		SM	SILTY SAND, fine to medium-grained, well-sorted, dark tan to brown, moist, very faint hydrocarbon odor.		11-12	366.6	
				SB-11-0820	14-15	591.0	
15							

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Boring Log

LOCATION/BORING ID: **SB-12**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**8/5/2020**
START TIME: **10:33**	END TIME: **12:40**

REMARKS: **South of Building 600.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Don Harden**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**25 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9254	**122.8114**

INITIAL WATER LEVEL: **9.4 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		SW	FILL: GRAVELLY SAND, poorly-sorted, fine to coarse-grained, subround, tan to brown, dry.		1-2	19.8	
			SAND with minor GRAVEL, medium to very coarse-grained, dark gray, slightly moist.				
					3.5-4	21.8	
5		SW	At 5 ft bgs: SAND, medium-grained, trace small GRAVEL, dark gray, slightly moist to moist.		4.5-5	23.2	
					6-7	25.8	
					8-9	9.8	
			SANDY SILT, very fine-grained, dark brown to gray, moist to wet.				
10			At 10 ft bgs: SILTY SAND, coarsening downward sequence.	SB-12-10	10-11	56.4	
		SM		SB-12-0820	12-13	21.9	Temporary well screen installed 11-15 ft bgs.
			At 13.5 ft bgs: Fine to very fine-grained, dark brown, wet.		14-15	20.3	
15			SAND, medium to coarse-grained, dark brown, wet.		16-17	14.2	
		SP			19-20	16.3	
			At 19 ft bgs: Trace SHELL fragments.				
20			SILTY SAND, medium-grained, subround to round, very dark brown, wet.		20-22.5	18.8	Temporary well screen installed 21-25 ft bgs.
		SP	At 24-25 ft bgs: Minor brittle SHELL fragments.	SB-12D-0820	24-25	20.9	
25							

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Boring Log

LOCATION/BORING ID: **SB-13**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**8/5/2020**
START TIME: **12:55**	END TIME: **13:43**

REMARKS: **East of Building 600. In exit lane to Gate 2.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Don Harden**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**15 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9267	**122.811**

INITIAL WATER LEVEL: **10.1 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		GW	FILL: GRAVEL and SAND, well-graded, fine to coarse-grained, subround, gray to tan.				
			SAND, medium to coarse-grained, subround, minor to small GRAVEL, gray, slightly moist.		1-2	12.8	
					3-4	417.4	
			At 3.8 ft bgs: Minor coarse-grained, undistubed layering seams, brown to gray, slightly moist, mild hydrocarbon odors.				
5		SW			5-6	594	
					7-8	668.7	
			At 9 ft bgs: Moist.	SB-13-09	9-10	642.5	
10			SILTY SAND, very fine to medium-grained, SILT content increasing with depth, moderate hydrocarbon odor.				
			At 10-11 ft bgs: Oil sheen.		11-12	184.3	
		SM	At 13-15 ft bgs: Black, medium-grained, hydrocarbon odor taper off by 14 ft bgs.	SB-13-0820 SB-130-0820			
					13-14	31.9	
15							

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Boring Log

LOCATION/BORING ID: **SB-14**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**8/5/2020**
START TIME: **13:48**	END TIME: **14:33**

REMARKS: **North of Building 600. Under 11th Street bypass.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Don Harden**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**15 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9271	**122.8117**

INITIAL WATER LEVEL: **10.1 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		SW	FILL: GRAVELLY SAND, poorly-sorted, mostly coarse-grained, tan, dry.				
		SP	SAND, fine to medium-grained sand, trace coarse-grained, brown, slightly moist to moist, no appreciable odors.		2-3	1.4	
					4-5	1.4	
5					5-6	1.0	
					7-8	0.7	
				SB-14-09	9-10	0.7	
10	▽						
					10.5-11.5	0.7	
		SM	SILTY SAND, fine to medium-grained, dark brown, moist to wet, no appreciable odors.				
				SB-14-0820	13-13.5	1.0	
15					14-15	0.5	

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Boring Log

LOCATION/BORING ID: **SB-15**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**8/5/2020**
START TIME: **14:40**	END TIME: **15:28**

REMARKS: **Southeast of Building 600.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Don Harden**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**15 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

LATITUDE	LONGITUDE
48.9262	**122.8108**

INITIAL WATER LEVEL: **9.7 ft bgs**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		SW	GRAVELLY SAND, poorly-sorted, fine to very coarse-grained, subround, gray to tan, dry.		1-2	1.8	
			At 2.3 ft bgs: Tan to brown.				
5		SP	SAND, decreasing GRAVEL, mostly medium-grained, dry.		4-5	1.9	
			At 5 ft bgs: Medium to coarse-grained, little to no GRAVEL, dry to slightly moist.				
					6-7	2.3	
			At 7.5 ft bgs: SAND, medium-grained, subangular to subround, brown, moist.				
				SB-15-08	8-8.5	1.7	
			At 8.5 ft bgs: fine to medium-grained, some to abundant SILT, brown, wet.				
					9-10	1.3	
10		SM	SILTY SAND, mostly fine-grained, brown to dark brown, wet.		10.5-11.5	1.4	
				SB-15-0820	12-13	0.9	
15					14-15	1.5	

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Boring Log

LOCATION/BORING ID: **SB-16**

PROJECT INFORMATION

PROJECT:	**Port of Tacoma**
SITE NAME:	**Parcel 40** **1675 Lincoln Avenue**
SITE LOCATION:	**Tacoma, WA**
JOB NUMBER:	
PROJECT MANAGER:	**G. Hainsworth, P.E.**
LOGGED BY:	**R. Jones**
DATE(S) DRILLED:	**8/5/2020**
START TIME: **15:30**	END TIME: **16:10**

REMARKS: **Northwest of Building 600.**

DRILLING INFORMATION

DRILLING COMPANY:	**ESN Northwest/Don Harden**
DRILLING METHOD:	**Direct Push Technology**
BORING DEPTH:	**15 ft bgs**
BORING DIAMETER:	**2.25-inch**
SOIL SCREENING:	**MiniRAE PID**
PLUGGING METHOD:	**Bentonite chips**
GROUND ELEV:	**NM**
ELEV. METHOD:	**NM**
COOR. METHOD:	**Lat./Long.**

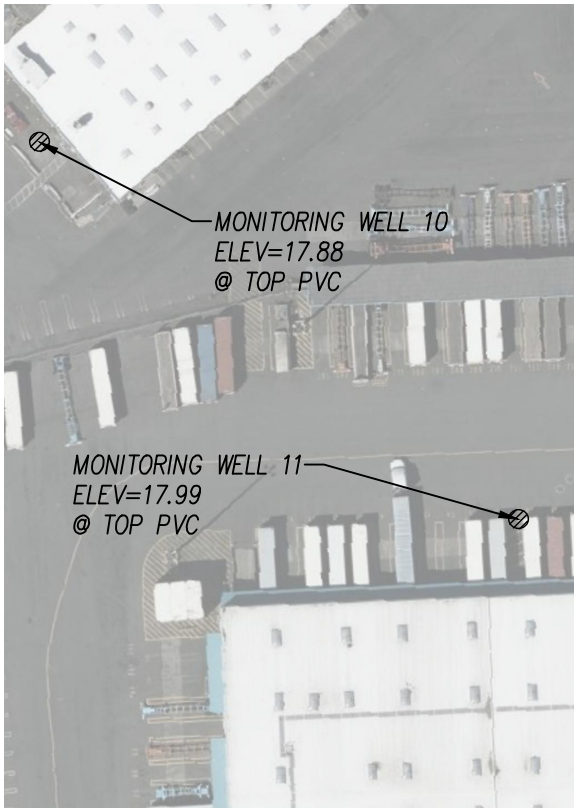
LATITUDE	LONGITUDE
48.9259	**122.8132**

INITIAL WATER LEVEL: **11.7 ft bgs**

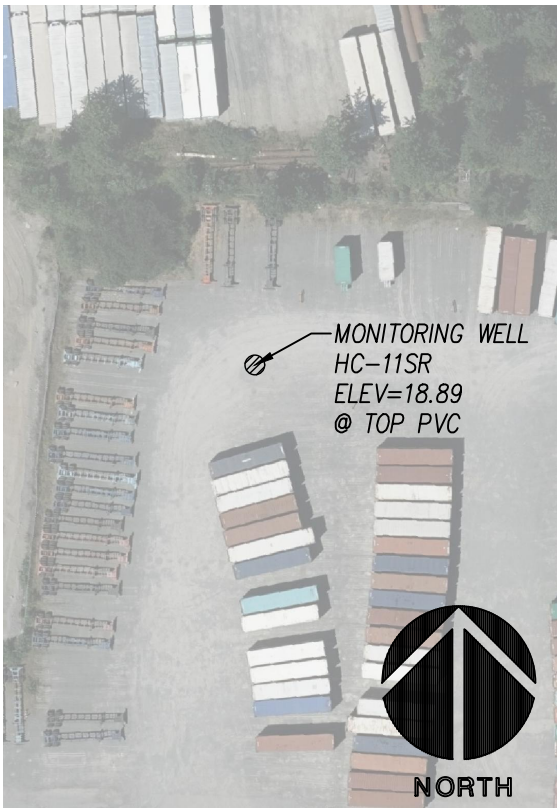
DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	DEPTH (ft bgs)	PID (ppm)	COMMENTS
0			ASPHALT				
		SW	FILL: SAND and GRAVEL, well-graded, dry to slightly moist.		1-2	0.5	
			SAND, fine to medium-grained, little to no GRAVEL, brown to dark brown, moist.				
					3.5-4.5	0.5	
5			At 5 ft bgs: Medium-grained with trace coarse-grained, subround, trace subround to round GRAVEL (1-cm), moist.	SB-16-05	5-6	3.4	
		SP					
					7-8	1.3	
					9-10	1.0	
10			At 10 ft bgs: Moist to wet.				
			SILTY SAND, fine-grained, slightly cohesive, dark brown to dark gray, wet to saturated.		11-12	1.0	
		SM		SB-16-0820	13-14	0.2	
15							

These logs should not be used separately from original report

1675 LINCOLN AVE. SITE (1675)



3002 TAYLOR WAY SITE (3002)



			MLLW (EPOCH 83-2001)			MLLW (EPOCH 1960-1978)		
WELL#	NORTHING	EASTING	TOP PVC	RIM	GROUND	TOP PVC	RIM	GROUND
MW-10	708,604.13	1,164,562.79	17.88	18.45	18.41	18.09	18.66	18.62
MW-11	708,407.63	1,164,812.06	17.99	18.38	18.32	18.20	18.59	18.53
HC-11SR	709,796.44	1,174,596.39	18.89	19.15	19.14	19.10	19.36	19.35
EXIST. MW-9 (1675)			17.96			18.17		
EXIST. MW-2*(1675)			17.25			17.46		
EXIST. HC-12S(3002)			18.61			18.82		

HORIZONTAL DATUM

WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE,
NAD 83/2011
(PER PORT OF TACOMA CONTROL MAP 2016)

VERTICAL DATUM

MLLW (PER PORT OF TACOMA 2016 SURVEY CONTROL MAP)

TIDE 22 1933 BENCHMARK: LOCATED AT NE CORNER OF 11TH ST. BRIDGE AT THE INTERSECTION OF E. 11TH ST. AND MILWAUKEE WAY
ELEVATION = 19.18
(BASED ON 1983-2001 TIDAL EPOCH)

PORT OF TACOMA MONITORING WELLS
–
PROJECT NO. 19045

SITTS & HILL ENGINEERS, INC.
CIVIL ■ STRUCTURAL ■ SURVEYING
4815 CENTER STREET TACOMA, WA. 98409
(253) 474-9449

CRETE CONSULTING INC.
108 SOUTH WASHINGTON STREET
SEATTLE, WA 98104

Appendix D

Groundwater Sampling Forms and Field Notes

CRETE CONSULTING, INC.

Low Flow Groundwater Sample Collection Record

Date: 3.26.20	**Well ID:** GEI-MW-1
Project Name: PDOT - PARCEL 40	**Location:**
Project Number:	**Collector(s):** PB
Start Time:	**End Time:**

Water Level Data

Total Well Depth:	15.28' TOC	Water Table Depth:	9.77' TOC
Screen Interval:		Tubing Placement Depth:	12' BGS
Well Volume		**Well Volume (gallons) = 0.041xH(D^2)** D= is in the inside diameter of the well casing, in inches H = Height of the water column (in feet)	
Purge Method:		Purge Rate:	

Water Quality Parameters

Time (24 hr)	Vol. Purged (L)	Temp (C)	pH	Spec. Cond (uS/cm)	DO (mg/L)	ORP (mv)	Turbidity (NTU)	Flow Rate (ml/min)	DTW	Color/ Odor
11:05	100	11.15	8.94	0.990	0.00	-69	0	100	9.98	cl
11:10	600	11.59	7.76	0.980	0.00	-99	0	100	10.06	cl
11:15	1100	11.52	7.37	0.985	0.00	-103	0	100	10.10	cl
11:20	1600	11.41	7.20	0.983	0.00	-106	0	100	10.13	cl
11:25	2100	11.30	7.09	0.976	0.00	-107	0	100	10.14	cl
11:30	2600	11.27	7.04	0.969	0.00	-108	0	100	10.14	cl
		SAMPLE TIME = 11:40								
			3 VOAs							

Acceptance Criteria defined:									
Temp	3%	pH	+/- 1.0 unit	Spec. Cond	3%	DO	10%		
Turbidity	<5 NTU*	ORP	+/- 10 MV	Drawdown	<0.3'*				
Sample Collection:							Duplicate Details:	GEI-MW39 12:02 2 VOAs	

*Achievement of turbidity levels of less than 5 NTU, and stable drawdowns of less than 0.3 feet, while desirable, are not mandatory. If after 2 hours of purging indicator field parameters have not stabilized, discontinue purging, collect samples and provide full explanation of attempts to achieve stabilization.

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Low Flow Groundwater Sample Collection Record

Date: 3.26.20	**Well ID:** GEI-MW-5
Project Name: POT - PARCEL 40	**Location:**
Project Number:	**Collector(s):** PB
Start Time:	**End Time:**

Water Level Data

Total Well Depth:	14.80' TOC	Water Table Depth:	9.43' TOC
Screen Interval:		Tubing Placement Depth:	12' BGS
Well Volume		**Well Volume (gallons) = 0.041xH(D^2)** D= is in the inside diameter of the well casing, in inches H = Height of the water column (in feet)	
Purge Method:		Purge Rate:	

Water Quality Parameters

Time (24 hr)	Vol. Purged (L)	Temp (C)	pH	Spec. Cond (uS/cm)	DO (mg/L)	ORP (mv)	Turbidity (NTU)	Flow Rate (ml/min)	DTW	Color/ Odor
13:22	100	12.24	6.23	0.000	11.96	10	256	100	9.55	CL
13:27	600	12.55	6.83	0.500	0.00	-13	90.6	100	9.55	CL
13:32	1100	12.82	6.72	0.500	0.00	-18	44.1	100	9.55	CL
13:37	1600	12.90	6.67	0.501	0.00	-21	20.8	100	9.55	CL
13:42	2100	12.97	6.66	0.502	0.00	-23	12.1	100	9.55	CL
13:47	2600	13.01	6.66	0.502	0.00	-24	9.8	100	9.55	CL
		SAMPLE TIME = 14:00								
			3 VOAs							

Acceptance Criteria defined:

Temp	3%	pH	+/- 1.0 unit	Spec. Cond	3%	DO	10%		
Turbidity	<5 NTU*	ORP	+/- 10 MV	Drawdown	<0.3'*				
Sample Collection:							Duplicate Details:		

*Achievement of turbidity levels of less than 5 NTU, and stable drawdowns of less than 0.3 feet, while desirable, are not mandatory. If after 2 hours of purging indicator field parameters have not stabilized, discontinue purging, collect samples and provide full explanation of attempts to achieve stabilization.

CRETE CONSULTING, INC.

Low Flow Groundwater Sample Collection Record

Date: 3.26.20	**Well ID:** GEI-MW-8
Project Name: POT- Parcel 40	**Location:**
Project Number:	**Collector(s):** PB
Start Time:	**End Time:**

Water Level Data

Total Well Depth:	15.02' TOC	Water Table Depth:	8.43' TOC
Screen Interval:		Tubing Placement Depth:	12' BGS
Well Volume		**Well Volume (gallons) = 0.041xH(D^2)** D= is in the inside diameter of the well casing, in inches H = Height of the water column (in feet)	
Purge Method:		Purge Rate:	

Water Quality Parameters

Time (24 hr)	Vol. Purged (L)	Temp (C)	pH	Spec. Cond (uS/cm)	DO (mg/L)	ORP (mv)	Turbidity (NTU)	Flow Rate (ml/min)	DTW	Color/ Odor
12:21	100	11.05	6.49	0.000	12.90	-4	223	100	8.45	CL
12:26	600	11.38	7.16	0.373	0.00	-10	185	100	8.45	CL
12:31	1100	11.55	6.93	0.370	0.00	-7	184	100	8.45	CL
12:36	1600	11.73	6.80	0.365	0.00	-6	180	100	8.45	CL
12:41	2100	11.90	6.73	0.361	0.00	-7	176	100	8.45	CL
12:46	2600	11.97	6.68	0.363	0.00	-7	168	100	8.45	CL
		SAMPLE TIME = 13:00								
				3 VOAs						

Acceptance Criteria defined:									
Temp	3%	pH	+/- 1.0 unit	Spec. Cond	3%	DO	10%		
Turbidity	<5 NTU*	ORP	+/- 10 MV	Drawdown	<0.3'*				
Sample Collection:							Duplicate Details:		

*Achievement of turbidity levels of less than 5 NTU, and stable drawdowns of less than 0.3 feet, while desirable, are not mandatory. If after 2 hours of purging indicator field parameters have not stabilized, discontinue purging, collect samples and provide full explanation of attempts to achieve stabilization.

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Low Flow Groundwater Sample Collection Record

Date:	**Well ID:** GEI-MW-9
Project Name:	**Location:**
Project Number:	**Collector(s):**
Start Time:	**End Time:**

Water Level Data

Total Well Depth:	15.41' TOC	Water Table Depth:	9.13' TOC
Screen Interval:		Tubing Placement Depth:	~~12~~ ' BGS
Well Volume		**Well Volume (gallons) = 0.041xH(D^2)** D= is in the inside diameter of the well casing, in inches H = Height of the water column (in feet)	
Purge Method:	LF	Purge Rate:	100 ml/min

Water Quality Parameters

Time (24 hr)	Vol. Purged (L) mL	Temp (C)	pH	Spec. Cond (uS/cm)	DO (mg/L)	ORP (mv)	Turbidity (NTU)	Flow Rate (ml/min)	DTW	Color/ Odor
9:03	100	8.21	7.87	0.001	14.62	299	383	100	9.19	CL NO
9:08	600	8.28	8.10	0.001	13.57	290	329	100	9.19	CL NO
9:13	1100	8.38	8.14	0.001	12.39	295	295	100	9.19	CL NO
9:18	1600	8.48	8.06	0.001	11.83	282	293	100	9.19	CL NO
9:23	2100	8.61	7.95	0.001	11.41	~~279~~ 277	291	100	9.19	CL NO
9:28	2600	8.78	7.78	0.000	11.28	273	288	100	9.19	CL NO
9:33	3100	8.84	7.71	0.000	11.12	273	291	100	9.19	CL NO
		SAMPLE TIME =			9:40					
			5 VOAs							

Acceptance Criteria defined:

Temp	3%	pH	+/- 1.0 unit	Spec. Cond	3%	DO	10%		
Turbidity	<5 NTU*	ORP	+/- 10 MV	Drawdown	<0.3'*				
Sample Collection:							Duplicate Details:		

*Achievement of turbidity levels of less than 5 NTU, and stable drawdowns of less than 0.3 feet, while desirable, are not mandatory. If after 2 hours of purging indicator field parameters have not stabilized, discontinue purging, collect samples and provide full explanation of attempts to achieve stabilization:

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Low Flow Groundwater Sample Collection Record

Date: 3.26.20	**Well ID:** ITC-RW1
Project Name: Pre POT-Parcel 40	**Location:**
Project Number:	**Collector(s):** PB
Start Time:	**End Time:**

Water Level Data

Total Well Depth:		Water Table Depth:	FP = 8.70' W = 9.59' TOC
Screen Interval:		Tubing Placement Depth:	12' BGS
Well Volume		**Well Volume (gallons) = 0.041xH(D^2)** D= is in the inside diameter of the well casing, in inches H = Height of the water column (in feet)	
Purge Method:		Purge Rate:	

Water Quality Parameters

Time (24 hr)	Vol. Purged (L)	Temp (C)	pH	Spec. Cond (uS/cm)	DO (mg/L)	ORP (mv)	Turbidity (NTU)	Flow Rate (ml/min)	DTW	Color/ Odor
		DID NOT PURGE								
		SAMPLE TIME = 14:30								
		5 VOAs								

Acceptance Criteria defined:

Temp	3%	pH	+/- 1.0 unit	Spec. Cond	3%	DO	10%		
Turbidity	<5 NTU*	ORP	+/- 10 MV	Drawdown	<0.3'*				
Sample Collection:							Duplicate Details:		

*Achievement of turbidity levels of less than 5 NTU, and stable drawdowns of less than 0.3 feet, while desirable, are not mandatory. If after 2 hours of purging indicator field parameters have not stabilized, discontinue purging, collect samples and provide full explanation of attempts to achieve stabilization.

SITE ID: Port of Tacoma **WELL ID:** MW-1

Groundwater Sampling Field Data Sheet

Project Number: Parcel 40 Investigation Date: 11.19.2020

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
2		< 125 mL/min
Total Depth of Well (ft BTOC)	**Purge Equipment**	**Sample Equipment**
15.28	GeoPump (peristaltic)	LDPE + Silicone tubing
Initial Static Water from (ft BTOC)	**Depth of Sample Intake ~~(ft BTOC)~~ RJ**	**Analytical Equipment**
10.00	~2 ft from bottom	AquaRead AP-2000 WQM
Product Level from (ft BTOC)	**Total Time Purged**	**Additional Details**
— Not Present —	23+ min	*Turbidity measurements not reflective of visual observations
Length of Water Column (ft)	**Pump Setting**	
5.28		
1 Well Volume (gal)		

Time	Depth to Water (ft BTOC)	Flow Rate (mL/min)	Temp (°C)	SpC ~~(mS/cm)~~ RJ uS/cm	ORP (mV)	DO (mg/L)	pH (S.U.)	*Turbidity (NTU)	TDS (mg/L)
0539	10.01	Begin micropurge. Filling flow cell.							
0542	~~10.38~~ RJ	~125	11.48	2796	-1.0	1.56	4.30	CLEAR 486	1755
0546	10.44	~125-150	13.13	2697	-79.4	0.45	6.39	CLEAR 444	1760
0550	10.69	↓	13.30	2722	-83.0	0.33	6.56	CLEAR 436	1769
0554	10.88	≤150	13.40	2692	-85.2	0.28	6.61	CLEAR 428	1753
0558	11.08	↓	13.58	2692	-86.2	0.23	6.61	CLEAR 411	1756
0602	11.21	↓	13.60	2697	-86.8	0.21	6.62	CLEAR 407	1753
	More drawdown than ideal for low-flow.								

Sample ID: GEI-MW1-1120	Sample Date: 11.19.2020	Sample Time: 0606
Observations:		
Analytical Parameters: NWTPH-Dx, -Gx, BTEX		
Disposition of Purged Water: CLEAR, yellowish tint, HC odor	Sampler Name & Date: R. Jones 11.19.2020	

SITE ID: Port of Tacoma **WELL ID:** MW-2

Groundwater Sampling Field Data Sheet

Project Number: Parcel 40 Investigation Date: 11.20.2020

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
2		~ 200 mL/min
Total Depth of Well (ft BTOC)	**Purge Equipment**	**Sample Equipment**
14.90	GeoPump (peristaltic)	LDPE + Silicone tubing
Initial Static Water from (ft BTOC)	**Depth of Sample Intake ~~(ft BTOC)~~**	**Analytical Equipment**
9.10	~2 ft from bottom	AquaRead AP-2000 WQM
Product Level from (ft BTOC)	**Total Time Purged** ~> 20+ minutes	**Additional Details**
Not Present	Started @ 0511	*Turbidity measurements not reflective of visual observations.*
Length of Water Column (ft)	**Pump Setting**	
5.80		
1 Well Volume (gal)		

Time	Depth to Water (ft BTOC)	Flow Rate (mL/min)	Temp (°C)	SpC ~~(ms/cm)~~ µS/cm	ORP (mV)	DO (mg/L)	pH (S.U.)	*Turbidity (NTU)	TDS (mg/L)
~~0513~~ ~~0511~~	~~9.10~~ 9.32	Flow cell filled	15.33	912	-63.7	0.95	7.62	CLEAR 352	592
~~0517~~ ~~0518~~	9.41	~200	16.60	899	-78.6	0.38	7.64	CLEAR 340	585
0521	9.47	↓	16.80	909	-83.6	0.32	7.62	CLEAR 325	590
0525	9.52	↓	16.88	904	-89.9	0.27	7.65	CLEAR 313	587
0529	9.51	≤200	16.80	898	-93.3	0.25	7.66	CLEAR 310	585
0533	9.53	↓	16.80	905	-95.1	0.25	7.65	CLEAR 307	588

Sample ID: GEI-MW2-1120	Sample Date: 11.20.2020	Sample Time: 0537
Observations:		
Analytical Parameters: NWTPH-Dx, -Gx, BTEX		
Disposition of Purged Water: Clear	Sampler Name & Date: R. Jones 11.20.2020	

SITE ID: Port of Tacoma **WELL ID:** MW-3

Groundwater Sampling Field Data Sheet

Project Number: Parcel 40 Investigation Date: 11/18/2020

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
2		>200 mL/min
Total Depth of Well (ft BTOC)	**Purge Equipment**	**Sample Equipment**
	GeoPump (peristaltic)	LDPE + Silicone tubing
Initial Static Water from (ft BTOC)	**Depth of Sample Intake ~~(ft BTOC)~~**	**Analytical Equipment**
8.61	~1-2-ft from bottom	Aquaread WQM
Product Level from (ft BTOC)	**Total Time Purged**	**Additional Details**
NL	30 min	* Turbidity measurements are not accurate. Final purge water clear.
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)~~ µS/cm	ORP (mV)	DO (mg/L)	pH (S.U.)	* Turbidity (NTU)	TDS (mg/L)
0417	8.61	Begin micropurge, Filling flow cell.							
0421	8.63	≤150	13.45	2627	+102.3	0.88	5.73	~~OVER~~ 475	1705
0425	8.65	↑	14.30	2651	-109.7	0.35	6.80	CLEAR 384	1725
0429	8.65	≤200	15.10	2641	-117.0	0.29	6.96	CLEAR 463	1718
0433	8.66	↓	~~15.10~~ 15.00	2625	-120.6	0.22	7.00	CLEAR 507	1709
0437	8.66	≥200	15.00	2630	-121.8	0.19	7.00	CLEAR 522	1704

Sample ID: GEI-MW3-1120	Sample Date: 11.18.2020	Sample Time: 0441
Observations:		
Analytical Parameters: NWTPH-D, -G, BTEX		
Disposition of Purged Water: Clear	Sampler Name & Date: R. Jones 11/18/2020	

SITE ID: Port of Tacoma **WELL ID:** MW-4

Groundwater Sampling Field Data Sheet

Project Number: Parcel 40 Investigation Date: 11.20.20

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
2		< 150 mL/min
Total Depth of Well (ft BTOC)	**Purge Equipment**	**Sample Equipment**
15.08	GeoPump (peristaltic)	LDPE + Silicone tubing
Initial Static Water from (ft BTOC)	**Depth of Sample Intake ~~(ft BTOC)~~**	**Analytical Equipment**
9.75	~2-ft from bottom	AquaRead AP-2000 WQM
Product Level from (ft BTOC)	**Total Time Purged**	**Additional Details**
— Not Present —	19+ minutes	* Turbidity measurements not reflective of visual observations. *
Length of Water Column (ft)	**Pump Setting**	
5.33		
1 Well Volume (gal)		

Time	Depth to Water (ft BTOC)	Flow Rate (mL/min)	Temp (°C)	SpC ~~(ms/cm) RF~~ µS/cm	ORP (mV)	DO (mg/L)	pH (S.U.)	*Turbidity (NTU)	TDS (mg/L)
0424	9.75	Begin micropurge. Filling flow cell.							
0427	10.03	~150-175	13.03	2244	+133.1	1.01	2.96	CLEAR 635	1458
0431	—	↓	14.30	2213	-87.8	0.42	7.00	CLEAR 642	1439
0435	10.37	↓	14.38	2220	-112.5	0.33	7.42	CLEAR 632	1443
0439	10.49	↓	14.30	2219	-111.2	0.29	7.38	CLEAR 617	1441
0443		↓	14.30	2225	-114.9	0.26	7.37	CLEAR 617	1446
~~04~~			RS						

Sample ID: GEI-MW4-1120	Sample Date: 11.20.2020	Sample Time: 0447
Observations:		
Analytical Parameters: NWTPH-Dx, -Gx, BTEX		
Disposition of Purged Water: Clear	Sampler Name & Date: R. Jones 11.20.20	

SITE ID: Port of Tacoma **WELL ID:** MW-5

Groundwater Sampling Field Data Sheet

Project Number: Parcel 40 Investigation Date: 11.19.2020

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
2		≥150 mL/min
Total Depth of Well (ft BTOC)	**Purge Equipment**	**Sample Equipment**
14.79	GeoPump (peristaltic)	LDPE + Silicone tubing
Initial Static Water from (ft BTOC)	**Depth of Sample Intake ~~(ft BTOC)~~**	**Analytical Equipment**
9.60	~2 ft from bottom	AquaRead AP-2000 WQM
Product Level from (ft BTOC)	**Total Time Purged**	**Additional Details**
Not Present	19+ min	*Turbidity measurements not reflective of visual observations.*
Length of Water Column (ft)	**Pump Setting**	
5.19		
1 Well Volume (gal)		

Time	Depth to Water (ft BTOC)	Flow Rate (mL/min)	Temp (°C)	SpC ~~(ms/cm)~~ µS/cm	ORP (mV)	DO (mg/L)	pH (S.U.)	*Turbidity (NTU)	TDS (mg/L)
0332	Begin micropurge.		Filling flow cell.						
0335	~~9.62~~ 9.75		12.20	2569	-84.1	1.06	6.20	CLEAR 635	1663
0339	9.79		14.80	2486	-72.3	0.39	6.97	CLEAR 604	1615
0343	9.78	↑	15.10	2475	-71.6	0.32	6.91	CLEAR 605	1609
0347	9.80	~150	15.70	2476	-75.7	0.28	6.92	CLEAR 602	1608
0351	9.81	↓	15.70	2458	-78.2	0.25	6.91	CLEAR 596	1594

Sample ID:	Sample Date:	Sample Time:
GEI-MW5-1120	11.19.2020	0355

Observations:

Analytical Parameters: NWTPH-Dx, -Gx, BTEX

Disposition of Purged Water:	Sampler Name & Date
Clear	K. Jones 11.19.2020

SITE ID: Port of Tacoma **WELL ID:** MW-6

Groundwater Sampling Field Data Sheet

Project Number: Parcel 40 Investigation Date: 11.19.2020

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
		≤ 175 mL/min
Total Depth of Well (ft BTOC)	Purge Equipment	Sample Equipment
15.40	GeoPump (peristaltic)	LDPE + Silicone tubing
Initial Static Water from (ft BTOC)	Depth of Sample Intake ~~(ft BTOC)~~	Analytical Equipment
9.26	~2 ft from bottom	AquaRead AP-2000 WQM
Product Level from (ft BTOC)	Total Time Purged	Additional Details
– Not Present –	19+ min	*Turbidity measurements not reflective of visual observations.*
Length of Water Column (ft)	Pump Setting	
5.84		
1 Well Volume (gal)		

Time	Depth to Water (ft BTOC)	Flow Rate (mL/min)	Temp (°C)	SpC ~~(ms/cm)~~ µS/cm	ORP (mV)	DO (mg/L)	pH (S.U.)	*Turbidity (NTU)	TDS (mg/L)
0454	9.27	Begin micropurge. Filling flow cell.							
0457	↓	~150	13.58	1906	-24.2	1.24	3.46	CLEAR 684	1237
0501	9.40	↓	15.00	1924	-65.2	0.36	6.50	CLEAR 668	1253
0505	9.44	↓	15.20	1924	-74.2	0.26	6.67	CLEAR 658	1250
0509	9.44	~150-175	15.30	1924	-79.0	0.22	6.71	CLEAR 645	1246
0513	9.44	↓	15.20	1924	-80.4	0.18	6.72	CLEAR 638	1252

Sample ID: GEI-MW6-1120	Sample Date: 11.19.20	Sample Time: 0517
Observations:		
Analytical Parameters: NWTPH-Dx, -Gx, BTEX		
Disposition of Purged Water: Clear	Sampler Name & Date: R. Jones 11.19.20	

SITE ID: Port of Tacoma **WELL ID:** MW-8

Groundwater Sampling Field Data Sheet

Project Number: Parcel 40 Investigation Date: 11.19.2020

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
2		~250 mL/min
Total Depth of Well (ft BTOC)	**Purge Equipment**	**Sample Equipment**
15.05	GeoPump (peristaltic)	LDPE + Silicone tubing
Initial Static Water from (ft BTOC)	**Depth of Sample Intake ~~(ft BTOC)~~**	**Analytical Equipment**
8.85	~2-ft from bottom	AquaRead AP-2000WQM
Product Level from (ft BTOC)	**Total Time Purged**	**Additional Details**
— Not Present —	22+ min	*Turbidity measurements not reflective of visual observations.*
Length of Water Column (ft)	**Pump Setting**	
6.20		
1 Well Volume (gal)		

Time	Depth to Water (ft BTOC)	Flow Rate (mL/min)	Temp (°C)	SpC ~~(ms/cm)~~ µS/cm	ORP (mV)	DO (mg/L)	pH (S.U.)	*Turbidity (NTU)	TDS (mg/L)
0414	8.85	Begin micro-purge - Filling flow cell.							
0416	8.88	Increasing	12.98	1607	-63.9	1.67	5.59	Very clear 728	1052
0420	8.89	~250	15.80	1626	-80.3	0.30	6.65	CLEAR 663	1058
0424	8.91	↓	15.90	1626	-84.7	0.19	6.68	CLEAR 641	1056
0428	8.90		15.90	1492	-85.1	0.13	6.66	CLEAR 580	976
0432	8.90		16.10	1481	-85.8	0.11	6.66	CLEAR 558	963
0436	8.90	↓	16.00	1473	-84.6	0.09	6.65	CLEAR 547	962

Sample ID: GEI-MW8-1120	Sample Date: 11.19.2020	Sample Time: 0440
Observations:		
Analytical Parameters: NWTPH-Dx, -Gx, BTEX		
Disposition of Purged Water: Clear to very clear	Sampler Name & Date: R. Jones 11.19.20	

SITE ID: Port of Tacoma **WELL ID:** MW-9

Groundwater Sampling Field Data Sheet

Project Number: Parcel 40 Investigation Date: 11.20.2020

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
2		≤175 mL/min
Total Depth of Well (ft BTOC)	**Purge Equipment**	**Sample Equipment**
15.47	GeoPump (peristaltic)	LDPE + Silicone tubing
Initial Static Water from (ft BTOC)	**Depth of Sample Intake ~~(ft BTOC)~~**	**Analytical Equipment**
10.44	~2-ft from bottom	AquaRead AP-2000 WQM
Product Level from (ft BTOC)	**Total Time Purged**	**Additional Details**
Not Present	18+ min	*Turbidity measurements not reflective of visual observations.*
Length of Water Column (ft)	**Pump Setting**	
4.98		
1 Well Volume (gal)		

Time	Depth to Water (ft BTOC)	Flow Rate (mL/min)	Temp (°C)	SpC ~~(ms/cm)~~ µS/cm	ORP (mV)	DO (mg/L)	pH (S.U.)	*Turbidity (NTU)	TDS (mg/L)
0347	10.45	Begin micropurge. Filling flow cell.							
0349	10.60	Decreasing	15.63	1211	-77.8	0.53	7.34	CLEAR 207	787
0353	10.67	~150-175	17.38	1201	-92.9	0.33	7.37	CLEAR 199	780
0357	10.70	sl. Increase ~150-175	17.70	1254	-96.1	0.27	7.37	CLEAR 189	815
0401	10.73	↓	17.90	1251	-98.3	0.24	7.35	CLEAR 196	813
0405	10.73	↓	17.90	1263	-100.0	0.23	7.36	CLEAR 198	820

Sample ID: GEI-MW9-1120	Sample Date: 11.20.2020	Sample Time: 0409
Observations:		
Analytical Parameters: NWTPH-Dx, -Gx, BTEX		
Disposition of Purged Water: Clear, mild-mod. HC odor	Sampler Name & Date: K. Jones 11.20.2020	

SITE ID: Port of Tacoma **WELL ID:** MW-10

Groundwater Sampling Field Data Sheet

Project Number: Parcel 40 Investigation Date: 11.19.2020

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
2		7175 mL/min
Total Depth of Well (ft BTOC)	Purge Equipment	Sample Equipment
	GeoPump (peristaltic)	LDPE + Silicone tubing
Initial Static Water from (ft BTOC)	Depth of Sample Intake ~~(ft BTOC)~~	Analytical Equipment
10.58	~3 ft from bottom	AquaRead WQM
Product Level from (ft BTOC)	Total Time Purged	Additional Details
— Not Present —	20+ minutes	* Turbidity measurements not reflective of visual observations.*
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)~~ µS/cm	ORP (mV)	DO (mg/L)	pH (S.U.)	* Turbidity (NTU)	TDS (mg/L)
0246	10.59	Begin micro-purge → Filling flow cell.							
0250	10.62	Increasing	13.88	2615	-125.5	0.81	7.24	CLEAR 831	1697
0254	10.64	~175	15.60	2589	-131.6	0.32	7.18	CLEAR 0821	1686
0258	10.64	↓	16.00	2580	-134.4	0.26	7.17	CLEAR 0809	1678
0302	10.65	↓	16.20	2575	-134.4	0.23	7.16	CLEAR 0805	1673
0306	10.66		16.10	2583	-134.8	0.20	7.15	CLEAR 0793	1678

Sample ID: GEI-MW10-1120	Sample Date: 11.19.2020	Sample Time: 0310
Observations: Collecting "DUP-1120" @ 0600 for same sample suite		
Analytical Parameters: NWTPH-Dx, -Gx, BTEX		
Disposition of Purged Water: Clear to very clear	Sampler Name & Date: R. Jones 11.19.20	

SITE ID: Port of Tacoma **WELL ID:** MW-11

Groundwater Sampling Field Data Sheet

Project Number: Parcel 40 Investigation Date: 11/18/20

Casing Diameter (in)	Screened Interval (ft BGS)	Recommended Flow Rate for Well
2		< 100 mL/min
Total Depth of Well (ft BTOC)	Purge Equipment: Geopump peristaltic pump	Sample Equipment: LDPE + Silicone tubing
Initial Static Water from (ft BTOC): 10.28	Depth of Sample Intake (ft BTOC): ~1-ft from bottom	Analytical Equipment: Aquaread WQM
Product Level from (ft BTOC): — NL —	Total Time Purged: 22+ min.	Additional Details: *Turbidity measurements likely not accurate. Purge water was clear to very clear.
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)~~ µS/cm	ORP (mV)	DO (mg/L)	pH (S.U.)	*Turbidity (NTU)	TDS (mg/L)
0333	~10.28	Begin micro-purge. Filling flow cell.							
0335	—	<150	14.30	2244	212.7	0.34 ~~3.~~ RJ	4.27	CLEAR 247	
0339	10.68	Decrease.	14.80	2238	211.5	0.35	4.22	CLEAR 246	1456
0343	11.01	≤125 ↓	14.80	2239	211.3	0.34		CLEAR 0241	
0347	11.05	↓	14.80	2225	0210.9	0.32		0243	
0351	11.12	~100	14.70	2238	210.4	0.32		0230	1456
0355	11.15	↓	14.70	2235	210.0	0.31	0.51	228	1454

Sample ID: GEI-MW11-1120	Sample Date: 11/18/20	Sample Time: 0359
Observations:		
Analytical Parameters: NWTPH-D, -G, BTEX		
Disposition of Purged Water: Very Clear	Sampler Name & Date: R. Jones 11/18/2020	

Port of Tacoma (POT) – Parcel 40

6.12.2020 Bldg. 600 Supplemental Investigation

0610 Obtain ice for sample coolers.

0701 R. Jones arrive on-site @ Guard Shack.

0705 APS (utility locator) on-site at entrance.

~0706 R. Jones, G. Hainsworth (Crete), Andrew Ainsworth (APS) heading to site.

0713 Begin locating/marking boring locations with Grant & APS. RJ

~0715 Sarah Weeks w/ Port of Tacoma on-site.

0716-0735 Crete and POT continue marking boring locations.

~0745-0800 ESN (drillers) on-site @ Gate 2. Grant to escort driller to site (Maintenance Building). RJ

0810-0825 Tailgate H&S Meeting (Crete, ESN, POT). *See separate Tailgate Form with HASP.* RJ

~0830 S. Weeks (POT) heading off-site.

0830 Walk locations with Casey Newman (ESN)

~0838 Set up at first boring location.

Equipment:

MiniRAE 3000 SN 592-912332

0843 *Zero w/ site air → Reads 0.0-ppm

0845 *Cal. w/ 100 ppm Isobutylene span-gas PN 17-21-0100, Lot # 17-6008

*Calibrated w/ moisture filter on. Reads 100.2 ppm w/ span-gas post-calibration.

POT – Parcel 40

Building 600 Soil & GW Investigation 6.12.2020

0908 Quick safety w/ rig run-down (E-stops, hydraulic shutoffs, etc.)

0910 DPT pushing at SB-1

0911 G. Hainsworth (CRETE) and A. Ainsworth (APS) departing Bldg. 600 and heading off-site.

See separate Boring Log Forms for all SB-# boring locations.

Soil & GW sample depths, times, etc. scribed on separate Boring Logs.

~0945-0950 J. Stevenson (CRETE) called for status update. RJ

~1020 G. Hainsworth called. Informed us of gutter drains.

1132 Notified G. Hainsworth by phone that free-phase LNAPL observed at SB-03. (water & LNAPL in purged liquids). Highest PID measurement thus far too.

1155 ESN re-setup at SB-01 and push to 25' bgs (screen 21-25' bgs) for deeper GW sample.

ESN and Crete worked through lunch.

~1555-1610 S. Weeks (POT) on-site to get a quick status update. →

Setting MacroCore Screen shallow (~11-15' BGS), for shallow GW sample, then coring 15-25' bgs and setting screen again deeper (21-25' bgs) is time-intensive and slow process. RJ

4

Port of Tacoma (PoT) - Parcel 40
Soil & GW Supplemental Investigation 6.12.2020

1845 Finish DPT soil and GW sampling. Conducting final decon (drill equipment), pack up, clean site, check samples, consolidate IDW.
* Added minor (<3-gal.) purge water, and decon water to existing 15-gal. drum on-site (DRUM#1). Full *
Started DRUM-2, soil cuttings, full at end of day. 15-gal. drum.*
1845 Sample time (composite) of DRUM-1, combined soil IDW for today's drilling.
~1900 Both R. Jones (CRETE) and C. Newman (ESN) departing site and PoT. Lab (F&B) closed. *Made arrangements to drop off samples w/ F&B over weekend.*

R. Jones 06.12.2020

Port of Tacoma - Parcel 40 R. Jones 5
Soil & GW Investigation, Bldg. 600 8/5/2020

~0550 R. Jones arrive at CRETE office, gather supplies and equipment, mobilize. RJ
~0610 Depart ~~Site~~ RJ for site, obtain ice for sample coolers in route to site. RJ
~0646 Arrive at greater quad shack area @ Gate 2, Port of Tacoma (PoT), RJ
0646 APS Locate (Scott N.) arrives at same time.
0653 G. Hainsworth (CRETE) arrives at Gate 2.
0656 Grant takes APS to employee parking lot to mark and clear soil boring in that area.
0705 ESN arrives at Gate 2. CRETE and ESN brief about SOW.
0708 R. Jones takes ESN to B. 600 employee parking lot for first location. RJ
~0730 APS Locate cleared SB-10.
Grant working w/ APS to mark and clear locations. R. Jones work w/ ESN to start DPT coring @ assigned locations
SB-10 0-15' DPT push, collect grab GW 11-15', then DPT push 15-25', collect grab GW 21-25'
0915 Finishing up @ SB-10
See separate Soil Boring Logs for all SB locations for today.
RJ

6 Port of Tacoma, Parcel 40, Bldg. 600 — R. Jones
Soil and GW Investigation — 8/5/2020

0930 Accessing Matson area. — RJ
0936 Setting up at SB-11. — RJ
1025 De-mobilize from SB-11. — RJ
1033 Begin DPT push @ SB-12. — RJ
1145 Poor recharge w/ tooling & peristaltic pump @ SB-12 @ 21-25' for GW sample. Silt and sand must have heared into tooling. — RJ
ESN decided to pull tooling out, de-congest screen, and try again. — RJ
1255 Locate and set up @ SB-13. — RJ
1348 Locate and set up @ SB-14. — RJ
1433 Finished up @ SB-14. — RJ
1440 Setup @ SB-15. — RJ
1530 Set up @ SB-16. — RJ
1557 De-brief w/ Sarah Weeks (PoT). — RJ
1604 De-brief w/ G. Hainsworth (CRETE). — RJ
1610 ESN finishing up @ SB-16. — RJ
1630 IDW (decon + purge water, soil cuttings) consolidated in 2 new drums adjacent to drums from last time (water drum ~2/3 full, soil drum ~3/4 full)
1635 CRETE and ESN offsite through side-gate near employee parking lot.
1649 R. Jones departing PoT to Seattle. — RJ

Port of Tacoma, Parcel 40, Bldg. 600 — 10/4/2020 — 7
Soil and GW Investigation — 8/5/2020 — RS

0550 R. Jones (Crete) @ Crete office. Gather supplies and equipment.
0615 Depart office for Port of Tacoma. — RJ
0654 Crete arrive at Matson security gate. Holocene Drilling already on-site @ gate. Minor mix-up with Matson security gaurd, resolved within minutes. — RJ
0705 At Matson building with APS Locates, mark MW location, let APS utility locator begin clearing/marking the area of utilities. — RJ
0712 G. Hainsworth (Crete) on-site to work with APS Locates to clear all utilities RS boring locations this morning. — RJ
0710-0723 Tailgate Health & Safety Meeting with Crete and Holocene. Discuss:
- Site background/history, COCs
IDW mgmt, well construct. design, logging needs, general rig safety, hospital location, fire exting./first aid kit locations, restroom facilities
0724 Holocene, Crete, APS walk site with RJ to discuss known utilities
0725+ Holocene unload drill rig and set up Diedrich D-50 Turbo, track-mounted

Port of Tacoma, Parcel 40 — R. Jones
MW Installations — 10/4/2020

0733 Holocene begin augering through asphalt @ Matson area location

See separate well log for lithology, well construction information, etc. ——— RJ

Will field screen logged soils with PID and ziplocks.

MiniRAE 3000 SN 592-908331
Field # 469845X
10.6 eV Lamp
*Calibrated by Field Instruments (separate cal. sheet) ——— RJ

0746 Begin split spooning @ MW-11. ——— RJ

0825 Reached TD of 21.5' BGS w/ split-spoon.
Heaving sands, should have added water to HSAs to minimize heaving sands. ——— RJ

0830-0845 Holocene trying to mitigate heaving sand and set well @ 5-15' BGS screen.

0846 Holocene pulled PVC to clean out borehole, HSAs, etc of heaved sands and reset well PVC at desired depth 5-15' BGS

Barometer 30.10" Hg

~0950 ~1000RT to 1025 Develop MW-11 some while finishing flushmount surface completion at MW-11

Used 2-stage 12-volt submersible Protective pump (dried MW-11 quickly)

* Only purged ~3 gallons *

Port of Tacoma, Parcel 40 — R. Jones
MW Installations — 10/4/2020

1025-1035 Head to Building 600 through alternate security gate, TWIC badges checked.

1035 Setting equipment up at MW-10

See separate logs for lithology and well construction details. ——— RJ

~1040 Begin augering through asphalt @ MW-10

~1120 Reached 20' w/ HSAs, 21.5' BGS w/ splitspoon @ MW-10

1127 Holocene begin well installation per Cete specs.

~1200 De-mobilizing rig from MW-10.
Working on surface completions. RJ ——— RJ

~1258 Finished up developing MW-10
(Surge and purge with 12-volt, 2-stage submersible pump).
→ yields water adequately for same day development.
Purged 50-60 gallons from MW-10 alone
Combined purge water from MW-11 (~3gal.), MW-10 (>50 gal.) and decon water is ≤1.5 drum volume
Will probably need to do additional development on MW-11 prior to any GW sampling from it. ——— RJ

1309 Consulting 1 DW drums with other already onsite IDW drums - 1 soil for each MW, and 1-5 total water drums today.

10 Port of Tacoma, Parcel 40 — R. Jones 10.4.2020
MW Installations

1319 Departing facility and Port of Tacoma.
Mobilize CRETE and HOLOCENE to
Blair Backup Properties.

R. Jones 10/4/2020

~0645-0800 Download Win-Situ, ~~connected~~ RJ to transducer, download existing data and free up memory space, sync-times with current ~~time~~, check transducer status

~0830 Departing Seattle for Tacoma

~0930 Swung by 1 Steam Way to see if LNAPL probe has been delivered. Nope.

0950 At Building 600, prep equipment, locate wells.

Equipment:
- Hand Tools, watch, Camera, Map
- Geotech Water Level (Field # U92852X, Serial # 6789)

1024 Begin data-logging @ MW-4. Using In-Situ Rugged Troll 100 Serial # 703984
Reference DTW 9.38, Transducer in well @ ~1025. Attached to bolt hole on manhole.

1041 Begin data-logging @ MW-5. Using InSitu Rugged Troll 100, Serial # 704098
Reference DTW 8.67, transducer in well by 1044 (DTW 8.66). Attached to bolt hole

1058 Begin data-logging @ MW-10. Using InSitu Rugged Troll 100, Serial # 703652
Reference DTW 9.03, transducer in well by 1059 (DTW ~9.02), strung to bottom of expansion plug. Sealed. RJ

~1117 Begin data-logging at MW-1. Using InSitu Rugged Troll 100, Serial # 366117
Reference DTW 10.22 transducer in well by 1120 (DTW 10.20), strung to bottom of plug.
Strong HC odor on WL probe after MW-1. Deconned WL meter thoroughly

1137 Begin data-logging @ MW-8. Using InSitu Rugged Troll 100 (DTW) Serial # 703994
Reference DTW 8.75, transducer in well by 1141 (8.73). Tied to manhole bolt hole.

~1155 Begin data-logging @ MW-6. Using InSitu Rugged Troll 100, Serial # 705999,
Reference DTW 9.12, transducer in well by 1157 (DTW 9.10). Tied to manhole bolt.

~1212-125 Began data-logging @ MW-3. Using InSitu Rugged Troll 100, Serial # 366121
Reference DTW 8.40, transducer in well by 1217 (DTW 8.39). Tied to manhole bolt.

1230 Began data-logging @ MW-11. Using InSitu Rugged Troll 100, Serial # 706001
Reference DTW 9.35, transducer in well by 1232 (DTW 9.30). Tied to bottom of exp. plug.

≤1249 BaroTroll began data-logging, by 1251 (undisturbed) BaroTroll hung and taped in place ~7 ft AGS on power power on NW corner of site. RJ

1322 Packed up, deconned, cleaned up garbage, departing Building 600 area and Tacoma, WA. RJ

R. Jones 10/21/2020

Used marked (Sharpie style marking) on all TOCs as measuring point for DTW.
All DTW, TD measurements are ft BTOC. RJ

BY R. Jones DATE 10.21.2020 Sheet No 1 of 1

PROJECT Port of Tacoma, Parcel 40, Tidal Study PROJECT NUMBER _____

CRETE CONSULTING, INC.

Port of Tacoma, Parcel 40 — 10/25/2020
Building 600 Area Tidal Study — R. Jones

0615 R. Jones (Crete) at Crete Consulting office.
Gather supplies and equipment. — RJ
~0700 Departing Seattle for Tacoma, WA. — RJ
0745 Arrive at security gate near Sitcum Way. — RJ
0754 Arrive at Building 600.
Using Heron H10IL (SN 01-6288)
0802 Open MW-10 wellhead to pull transducer.
DTW 11.48' BTOC — RJ
Transducer seems to have been on well bottom.
~0840 Have transducer @ MW-5 re-programmed
New reference DTW 10.40' BTOC
Transducers @ MW-10 and MW-5 programmed to record @ 10/25 – 11/22 0900-0900 unless otherwise modified.
0904 Meet w/ Sitts & Hill Engineers, Inc. (Surveyors) at Matson gate. Escort to MW-11, discuss needs. — RJ
0915 Reprogram MW-11 transducer to record
10/25 @ 0930 to 11/22 @ 0900
New reference DTW 11.01' BTOC
0930 Reprogram MW-3 transducer to record
10/25 @ 0935 to 11/22 @ 0900
New reference DTW 9.53' BTOC
~0945-0950 Arrive back on PoT-B. 600 Area (SSA).
Get surveyor started on MW-10. — RJ
(will use MW-9, etc. as reference points)
1001 MW-9 DTW 11.22 DTP 11.20' BTOC
1005 Inspected GCI-MW-2. 1" well inside a 2" well?
Filled with bentonite. Previously abandoned. — RJ
1015 Briefed with G. Hainsworth (Crete). — RJ
1025 R. Jones (Crete) and surveyors departing B.600/PoT for the Blair Backup Properties site. — RJ
1210 R. Jones (Crete) return to PoT-Parcel 40 area. — RJ
(surveyors completed off-site.) — RJ
1223 Reprogrammed MW-8 transducer to record
10/25 @ 1230 to 11/22 @ 0900
New Reference DTW 9.47' BTOC
1232 Re-program Re-programmed MW-6 transducer to record
10/25 @ 1240 to 11/22 @ 0900 RJ 2100
New reference DTW 9.89' BTOC

Port of Tacoma, Parcel 40 — 10/25/2020
Building 600 Area Tidal Study — R. Jones

~1242/43 Re-programmed MW-1 transducer to record
10/25 @ 1250 to 11/22 @ 0900'
New reference DTW 10.64, DTP 10.63' BTOC
1258/59 Re-programmed MW-4 transducer to record
10/25 @ 1310 to 11/22 @ 0900 ~~BTOC~~ RJ
New reference DTW 9.93' BTOC
1306 MW-2 DTW 9.48' BTOC
DTP No LNAPL
1314 RW-1 DTP 9.65' BTOC
DTW 10.47' BTOC
4" well cap was not sealed.
1322 RW-2 DTP 9.85' BTOC
DTW 12.14' BTOC
4" well, cap was secure/sealed
1400 BaroTROLL reprogramed to record 10/25@1405 to 11/22@0900.
Positioned in same place ~7 ft AGS on utility pole.
*All pressure transducers (8 in MWs, 1 BaroTROLL) programmed to record every 3-minutes)
~~1418~~ RJ 1417 MW-10 DTW 10.14
1420-1425 Travel from Building 600 to Matson property to work on developing MW-11. — RJ
1427-1429 Set up to surge and purge MW-11 with Proactive Waterspout pump (12 volt submersible)
1429-1430 After surging limited water column,
Purged 4.5 Liters H_2O in ~1-minute
Well pulsed dry 2-3 times
Initial DTW pre-development DTW 10.31' BTOC
Initial TD pre-development TD 13.65' BTOC
1430+ Let well recharge before surging and purging available water column.
1500 After ~30-minutes OFF & ON pumping → 12-liters purged
1530 Cease surge and purge development at MW-11.
Very poor recharge in given time to develop well.
DTW 12.70' BTOC TD 13.75' BTOC
During 2nd 30-minute ON/OFF pump period → 7.25 Liters
See separate notes for initial well development conducted during day MW-11 drilled and installed.
~1538-1540 Re-programmed MW-11 transducer to record 10/25@1545 to 11/22@0900. New reference DTW 11.75' BTOC

Port of Tacoma, Parcel 40 — 10/25/2020
Building 600 Tidal Study — R. Jones

1554 Finished up with limited development @ MW-11.
Heading back to Building 600 on SSA side of fence.
1615 Finished consolidated MW-11 purge water IDW at
temporary ~~MW-11~~ Building 600 drum storage area.
Clean up and pack up equipment, consolidate garbage.
1630 Departing Port of Tacoma. Heading back to Seattle, WA.

R. Jones 10/25/2020

Port of Tacoma, Parcel 40 11/6/2020
Tidal Study, Transducers
1258 Arrive at Port of Tacoma, enter through Sitcum Gate (Lincoln Ave Gate very busy).
1301 At Building 600 Area, prepare for gaging wells and removing transducers

Equipment:
Geotech Water Level Meter
SN 6789, Field # U92852X

1310 MW-8 DTW 8.32' BTOC (before & after trans.)
1310 Transducer #703994 pulled
1320 MW-4 DTW 8.92' BTOC (before trans. pull)
DTW 8.98' BTOC (after trans. pull)
1320 Transducer # 703984 pulled
1329 MW-5 DTW 8.24' BTOC (before trans. pull)
DTW 8.31' BTOC (after trans. pull)
(may have allowed trace-minor water in when pulling cap to access MW/trans.)
1330 Pulled Transducer SN 704098
1338 MW-10 DTW 8.89' BTOC (before & after trans pull)
1338 Transducer SN 703652 pulled
1348 MW-9 DTW 9.03" BTOC
1351 MW-1 DTW 9.82' BTOC (before trans. pulled)
9.88' BTOC (after trans. pulled)
1351 Transducer #366117 pulled
Moderate to strong HC odor

12 Port of Tacoma, Parcel 40 11/6/2020
Tidal Study, Transducers R. Jones

1358-1359 Pulled BaroTROLL (Serial # 701404) from staging area, but still recording. RJ

1409 MW-6 DTW 8.70' BTOC (before trans. pull)
DTW 8.75' BTOC (after trans. pull)

1409-1410 Pulled Tranducer SN 705999

1420-1423 Depart SSA area for Matson area for access to MW-3 and MW-11

1428-1429 MW-3 DTW 8.02' BTOC (before & after trans. pull)

1429-1430 Transducer SN 366121 pulled

1435-1436 MW-11 DTW 9.10' BTOC (before trans. pulled)
DTW 9.20' BTOC (after trans. pulled)
(Transducer SN 706001 pulled → may have been on MW-11 well bottom). RJ

1440-1505 Decon equipment, pack up, discard garbage, prepare to end field day at Parcel 40 area.

1507 Departing POT and head to Seattle, WA.

1550-1605 At Clete office to unload equipment and supplies. Stow samples and iced sample coolers at office over weekend.

R. Jones 11/6/2020

Port of Tacoma, Parcel 40 11/18/20 13
Groundwater Sampling R. Jones

0100 Truck loaded up, finish checking supplies.

0125 Departing Seattle for Tacoma, WA.

0208 Stuck waiting on train near Sitcum Gate

0215-0320 *Driving around Port of Tacoma trying to access (get on site) Parcel 40. Gates largely blocked by trains, multiple trains, and only two gates accessible were closed with no guards to open.

~0322 Finally able to get onto Matson area to access two wells (MW-11, MW-3)

Equipment RT Equipment List:
- HDPE tubing, silicone tubing
- Heron H.OIL Oil/Water Interface Meter (SN: 01-07584, Field # U933114X) (Field# U597209)
- GeoPump peristaltic pump w/ 12-volt battery
- Water Quality Meter: Aquahead AP-2000 (Field# U917764X)
- hand tools, buckets
- sample containers from F&B (lab)

0510 Finishing up at Matson area. Past lag time window to access other Parcel 40 wells, departing Port of Tacoma

~0600-0610 Returned to Seattle, WA, congested traffic

See separate GW sampling field forms with additional info for each low-flow sampled MW

Port of Tacoma, Parcel 40 — 11/19/20
Groundwater Sampling — R. Jones

~0130 R. Jones (Crete) departing Seattle, WA. — RJ
Truck loaded day/night prior (supplies, equip.)
~0211 Arriving at Port of Tacoma
~0220 Enter Port through Gate @ 1002 Milwaukee Way
~0230 Setting up at MW-10 to micro-purge & sample.
— *Same Equipment List as on Page 13.* —
See separate GW sampling forms for additional details at each MW/micro-purge location
~0230-0610 Low-flow sampling at
MW-10, MW-5, MW-8, MW-6, MW-1
0610 Clean up site, decon equipment, pack up
0628 MW-9 DTP None
DTW 10.06' BTOC
Was intending to install a sock absorbent at MW-9 but no NAPL measure at present and sock does not fit in well. — RJ
0645 Off-site of Parcel 40 (Building 600 area)
0645 Head to PoT - Time Oil Site — RJ
(See separate field notes).

R. Jones 11/19/20

Port of Tacoma, Parcel 40 — 11/20/2020
Groundwater Sampling — R. Jones

~0130 R. Jones (Crete) departing Seattle, WA. — RJ
~0213 Arrive @ Port of Tacoma. — RJ
~0216-0320 Groundwater sampling @ Time Oil site.
(see separate field notes for these details).
Same equipment list as on page 13. — RJ
0235 Calibrate WQM:

Parameter	Standard	Post-Calibration Reading
SpC	1409 µS/cm	1409 µS/cm
pH	7.0 S.U.	7.00 S.U.
temp.	FACTORY CALIBRATED	
DO	Not Field-Calibrated	

*1-point pH calibration device only allowed 1-pt cal. due to "low battery" warning — RJ
~0330 On-site @ Parcel 40.
Setting up @ MW-9
Low-flow sample remaining site MW's.
See separate Groundwater Sampling Form for additional details. — EF
~0600 Decomned equipment, site cleaned, IDW (purge H2O) consolidated, packed, departing site and PoT
~0700 Returned to Seattle WA
1311 Signed over and delivered samples to Friedman & Bruya (F&B) lab. — RJ

R. Jones 11/20/20

Appendix E

Soil and Groundwater Laboratory Reports

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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April 9, 2020

Jamie Stevens, Project Manager
Crete Consulting
108 S. Washington St., Suite 300
Seattle, WA 98104

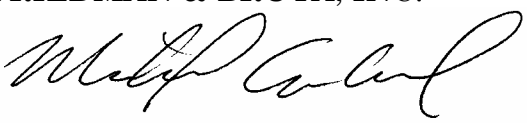
Dear Ms Stevens:

Included are the results from the testing of material submitted on March 27, 2020 from the POT - Parcel 40, F&BI 003444 project. There are 14 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
CTC0409R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on March 27, 2020 by Friedman & Bruya, Inc. from the Crete Consulting POT - Parcel 40, F&BI 003444 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
003444 -01	GEI-MW1-0320
003444 -02	GEI-MW5-0320
003444 -03	GEI-MW8-0320
003444 -04	GEI-MW9-0320
003444 -05	GEI-RW1-0320
003444 -06	GEI-MW39-0320

Samples GEI-MW1-0320 and GEI-MW9-0320 were sent to Fremont Analytical for VPH analysis. The report is enclosed.

All quality control requirements were acceptable.

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	GEI-MW1-0320	Client:	Crete Consulting
Date Received:	03/27/20	Project:	POT - Parcel 40, F&BI 003444
Date Extracted:	03/30/20	Lab ID:	003444-01
Date Analyzed:	03/30/20	Data File:	033043.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	94	50	150
Toluene-d8	108	50	150
4-Bromofluorobenzene	92	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	4.1
Trichlorofluoromethane	<1	Ethylbenzene	5.6
Acetone	<50	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<1	o-Xylene	5.4
Methylene chloride	<5	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	2.9
trans-1,2-Dichloroethene	<1	Bromoform	<1
1,1-Dichloroethane	<1	n-Propylbenzene	2.9
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<1
2-Butanone (MEK)	<10	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<1	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<0.56	1,2,4-Trimethylbenzene	3.1
Benzene	28	sec-Butylbenzene	<1
Trichloroethene	<1	p-Isopropyltoluene	1.6
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<1	1,4-Dichlorobenzene	<1
Dibromomethane	<0.27	1,2-Dichlorobenzene	1.2
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<1	1,2,4-Trichlorobenzene	<1
Toluene	2.8	Hexachlorobutadiene	<0.8
trans-1,3-Dichloropropene	<1	Naphthalene	1.2
1,1,2-Trichloroethane	<1	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	GEI-MW5-0320	Client:	Crete Consulting
Date Received:	03/27/20	Project:	POT - Parcel 40, F&BI 003444
Date Extracted:	03/30/20	Lab ID:	003444-02
Date Analyzed:	03/30/20	Data File:	033042.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	96	50	150
Toluene-d8	109	50	150
4-Bromofluorobenzene	96	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<50	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<1	o-Xylene	<1
Methylene chloride	<5	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	<1
trans-1,2-Dichloroethene	<1	Bromoform	<1
1,1-Dichloroethane	<1	n-Propylbenzene	<1
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<1
2-Butanone (MEK)	<10	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<1	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<0.56	1,2,4-Trimethylbenzene	<1
Benzene	<0.35	sec-Butylbenzene	<1
Trichloroethene	<1	p-Isopropyltoluene	<1
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<1	1,4-Dichlorobenzene	<1
Dibromomethane	<0.27	1,2-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<1	1,2,4-Trichlorobenzene	<1
Toluene	<1	Hexachlorobutadiene	<0.8
trans-1,3-Dichloropropene	<1	Naphthalene	<1
1,1,2-Trichloroethane	<1	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	GEI-MW8-0320	Client:	Crete Consulting
Date Received:	03/27/20	Project:	POT - Parcel 40, F&BI 003444
Date Extracted:	03/31/20	Lab ID:	003444-03
Date Analyzed:	04/01/20	Data File:	040120.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	105	57	121
Toluene-d8	103	63	127
4-Bromofluorobenzene	88	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<50	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<1	o-Xylene	<1
Methylene chloride	<5	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	<1
trans-1,2-Dichloroethene	<1	Bromoform	<1
1,1-Dichloroethane	<1	n-Propylbenzene	<1
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<1
2-Butanone (MEK)	<10	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<1	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<0.56	1,2,4-Trimethylbenzene	<1
Benzene	<0.35	sec-Butylbenzene	<1
Trichloroethene	<1	p-Isopropyltoluene	<1
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<1	1,4-Dichlorobenzene	<1
Dibromomethane	<0.27 j	1,2-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<1	1,2,4-Trichlorobenzene	<1
Toluene	<1	Hexachlorobutadiene	<0.8
trans-1,3-Dichloropropene	<1	Naphthalene	<1
1,1,2-Trichloroethane	<1	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	GEI-MW9-0320	Client:	Crete Consulting
Date Received:	03/27/20	Project:	POT - Parcel 40, F&BI 003444
Date Extracted:	03/31/20	Lab ID:	003444-04
Date Analyzed:	04/01/20	Data File:	040121.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	105	57	121
Toluene-d8	107	63	127
4-Bromofluorobenzene	93	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	2.6
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<50	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<1	o-Xylene	<1
Methylene chloride	<5	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	1.8
trans-1,2-Dichloroethene	<1	Bromoform	<1
1,1-Dichloroethane	<1	n-Propylbenzene	1.5
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<1
2-Butanone (MEK)	<10	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<1	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<0.56	1,2,4-Trimethylbenzene	<1
Benzene	<0.35	sec-Butylbenzene	2.2
Trichloroethene	<1	p-Isopropyltoluene	<1
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<1	1,4-Dichlorobenzene	<1
Dibromomethane	<0.27 j	1,2-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<1	1,2,4-Trichlorobenzene	<1
Toluene	<1	Hexachlorobutadiene	<0.8
trans-1,3-Dichloropropene	<1	Naphthalene	<1
1,1,2-Trichloroethane	<1	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	GEI-MW39-0320	Client:	Crete Consulting
Date Received:	03/27/20	Project:	POT - Parcel 40, F&BI 003444
Date Extracted:	03/30/20	Lab ID:	003444-06
Date Analyzed:	03/30/20	Data File:	033041.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	97	50	150
Toluene-d8	107	50	150
4-Bromofluorobenzene	95	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	4.2
Trichlorofluoromethane	<1	Ethylbenzene	5.5
Acetone	<50	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<1	o-Xylene	5.2
Methylene chloride	<5	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	2.8
trans-1,2-Dichloroethene	<1	Bromoform	<1
1,1-Dichloroethane	<1	n-Propylbenzene	2.9
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<1
2-Butanone (MEK)	<10	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<1	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<0.56	1,2,4-Trimethylbenzene	3.1
Benzene	28	sec-Butylbenzene	<1
Trichloroethene	<1	p-Isopropyltoluene	1.5
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<1	1,4-Dichlorobenzene	<1
Dibromomethane	<0.27	1,2-Dichlorobenzene	1.3
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<1	1,2,4-Trichlorobenzene	<1
Toluene	2.9	Hexachlorobutadiene	<0.8
trans-1,3-Dichloropropene	<1	Naphthalene	1.1
1,1,2-Trichloroethane	<1	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	POT - Parcel 40, F&BI 003444
Date Extracted:	03/30/20	Lab ID:	00-757 mb
Date Analyzed:	03/30/20	Data File:	033011.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	50	150
Toluene-d8	103	50	150
4-Bromofluorobenzene	93	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<50	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<1	o-Xylene	<1
Methylene chloride	<5	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	<1
trans-1,2-Dichloroethene	<1	Bromoform	<1
1,1-Dichloroethane	<1	n-Propylbenzene	<1
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<1
2-Butanone (MEK)	<10	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<1	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<0.56	1,2,4-Trimethylbenzene	<1
Benzene	<0.35	sec-Butylbenzene	<1
Trichloroethene	<1	p-Isopropyltoluene	<1
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<1	1,4-Dichlorobenzene	<1
Dibromomethane	<0.27	1,2-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<1	1,2,4-Trichlorobenzene	<1
Toluene	<1	Hexachlorobutadiene	<0.8
trans-1,3-Dichloropropene	<1	Naphthalene	<1
1,1,2-Trichloroethane	<1	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	GEI-RW1-0320	Client:	Crete Consulting
Date Received:	03/27/20	Project:	POT - Parcel 40, F&BI 003444
Date Extracted:	03/31/20	Lab ID:	003444-05 1/200
Date Analyzed:	04/01/20	Data File:	040116.D
Matrix:	Soil/Product	Instrument:	GCMS4
Units:	mg/kg (ppm)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	108	57	121
Toluene-d8	105	63	127
4-Bromofluorobenzene	94	60	133

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
Dichlorodifluoromethane	<100	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<5
Vinyl chloride	<10	Dibromochloromethane	<10
Bromomethane	<100	1,2-Dibromoethane (EDB)	<10
Chloroethane	<100	Chlorobenzene	14
Trichlorofluoromethane	<100	Ethylbenzene	<10
Acetone	<100	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<50	o-Xylene	<10
Methylene chloride	<100	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<6	sec-Butylbenzene	16
Trichloroethene	<4	p-Isopropyltoluene	49
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	21
Bromodichloromethane	<10	1,4-Dichlorobenzene	19
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<50
Toluene	<10	Hexachlorobutadiene	<50
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<50
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Crete Consulting
Date Received:	Not Applicable	Project:	POT - Parcel 40, F&BI 003444
Date Extracted:	03/31/20	Lab ID:	00-762 mb
Date Analyzed:	03/31/20	Data File:	033109.D
Matrix:	Soil/Product	Instrument:	GCMS4
Units:	mg/kg (ppm)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	105	62	145
Toluene-d8	106	55	145
4-Bromofluorobenzene	94	65	139

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
Dichlorodifluoromethane	<0.5	1,3-Dichloropropane	<0.05
Chloromethane	<0.5	Tetrachloroethene	<0.025
Vinyl chloride	<0.05	Dibromochloromethane	<0.05
Bromomethane	<0.5	1,2-Dibromoethane (EDB)	<0.05
Chloroethane	<0.5	Chlorobenzene	<0.05
Trichlorofluoromethane	<0.5	Ethylbenzene	<0.05
Acetone	<0.5	1,1,1,2-Tetrachloroethane	<0.05
1,1-Dichloroethene	<0.05	m,p-Xylene	<0.1
Hexane	<0.25	o-Xylene	<0.05
Methylene chloride	<0.5	Styrene	<0.05
Methyl t-butyl ether (MTBE)	<0.05	Isopropylbenzene	<0.05
trans-1,2-Dichloroethene	<0.05	Bromoform	<0.05
1,1-Dichloroethane	<0.05	n-Propylbenzene	<0.05
2,2-Dichloropropane	<0.05	Bromobenzene	<0.05
cis-1,2-Dichloroethene	<0.05	1,3,5-Trimethylbenzene	<0.05
Chloroform	<0.05	1,1,2,2-Tetrachloroethane	<0.05
2-Butanone (MEK)	<0.5	1,2,3-Trichloropropane	<0.05
1,2-Dichloroethane (EDC)	<0.05	2-Chlorotoluene	<0.05
1,1,1-Trichloroethane	<0.05	4-Chlorotoluene	<0.05
1,1-Dichloropropene	<0.05	tert-Butylbenzene	<0.05
Carbon tetrachloride	<0.05	1,2,4-Trimethylbenzene	<0.05
Benzene	<0.03	sec-Butylbenzene	<0.05
Trichloroethene	<0.02	p-Isopropyltoluene	<0.05
1,2-Dichloropropane	<0.05	1,3-Dichlorobenzene	<0.05
Bromodichloromethane	<0.05	1,4-Dichlorobenzene	<0.05
Dibromomethane	<0.05	1,2-Dichlorobenzene	<0.05
4-Methyl-2-pentanone	<0.5	1,2-Dibromo-3-chloropropane	<0.5
cis-1,3-Dichloropropene	<0.05	1,2,4-Trichlorobenzene	<0.25
Toluene	<0.05	Hexachlorobutadiene	<0.25
trans-1,3-Dichloropropene	<0.05	Naphthalene	<0.05
1,1,2-Trichloroethane	<0.05	1,2,3-Trichlorobenzene	<0.25
2-Hexanone	<0.5		

Date of Report: 04/09/20
Date Received: 03/27/20
Project: POT - Parcel 40, F&BI 003444

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: 003447-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	83	55-137
Chloromethane	ug/L (ppb)	50	<10	85	57-129
Vinyl chloride	ug/L (ppb)	50	45	84 b	61-139
Bromomethane	ug/L (ppb)	50	<1	90	20-265
Chloroethane	ug/L (ppb)	50	<1	90	55-149
Trichlorofluoromethane	ug/L (ppb)	50	<1	95	65-137
Acetone	ug/L (ppb)	250	<50	84	48-149
1,1-Dichloroethene	ug/L (ppb)	50	3.5	95	71-123
Hexane	ug/L (ppb)	50	<1	90	44-139
Methylene chloride	ug/L (ppb)	50	<5	87	61-126
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	96	68-125
trans-1,2-Dichloroethene	ug/L (ppb)	50	3.7	92	72-122
1,1-Dichloroethane	ug/L (ppb)	50	<1	94	79-113
2,2-Dichloropropane	ug/L (ppb)	50	<1	94	48-157
cis-1,2-Dichloroethene	ug/L (ppb)	50	580	18 b	63-126
Chloroform	ug/L (ppb)	50	<1	95	77-117
2-Butanone (MEK)	ug/L (ppb)	250	<10	86	70-135
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	90	70-119
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	97	75-121
1,1-Dichloropropene	ug/L (ppb)	50	<1	99	67-121
Carbon tetrachloride	ug/L (ppb)	50	<1	97	70-132
Benzene	ug/L (ppb)	50	<0.35	95	75-114
Trichloroethene	ug/L (ppb)	50	390	84 b	73-122
1,2-Dichloropropane	ug/L (ppb)	50	<1	94	80-111
Bromodichloromethane	ug/L (ppb)	50	<1	98	78-117
Dibromomethane	ug/L (ppb)	50	<1	90	73-125
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	98	79-140
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	92	76-120
Toluene	ug/L (ppb)	50	<1	104	73-117
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	91	75-122
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	94	81-116
2-Hexanone	ug/L (ppb)	250	<10	90	74-127
1,3-Dichloropropane	ug/L (ppb)	50	<1	90	80-113
Tetrachloroethene	ug/L (ppb)	50	4,700	0 b	40-155
Dibromochloromethane	ug/L (ppb)	50	<1	104	69-129
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	94	79-120
Chlorobenzene	ug/L (ppb)	50	1.7	98	75-115
Ethylbenzene	ug/L (ppb)	50	<1	100	66-124
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	108	76-130
m,p-Xylene	ug/L (ppb)	100	<2	103	63-128
o-Xylene	ug/L (ppb)	50	<1	108	64-129
Styrene	ug/L (ppb)	50	<1	104	56-142
Isopropylbenzene	ug/L (ppb)	50	<1	105	74-122
Bromoform	ug/L (ppb)	50	<1	100	49-138
n-Propylbenzene	ug/L (ppb)	50	<1	103	65-129
Bromobenzene	ug/L (ppb)	50	<1	104	70-121
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	106	60-138
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	98	77-120
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	94	62-125
2-Chlorotoluene	ug/L (ppb)	50	<1	102	40-159
4-Chlorotoluene	ug/L (ppb)	50	<1	97	76-122
tert-Butylbenzene	ug/L (ppb)	50	<1	109	74-125
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	106	59-136
sec-Butylbenzene	ug/L (ppb)	50	<1	104	69-127
p-Isopropyltoluene	ug/L (ppb)	50	<1	102	64-132
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	100	77-113
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	99	75-110
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	102	70-120
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	92	69-129
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	102	66-123
Hexachlorobutadiene	ug/L (ppb)	50	<1	101	53-136
Naphthalene	ug/L (ppb)	50	<1	101	60-145
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	99	59-130

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QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	98	93	50-157	5
Chloromethane	ug/L (ppb)	50	100	98	62-130	2
Vinyl chloride	ug/L (ppb)	50	106	105	70-128	1
Bromomethane	ug/L (ppb)	50	105	104	60-143	1
Chloroethane	ug/L (ppb)	50	105	103	66-149	2
Trichlorofluoromethane	ug/L (ppb)	50	109	109	65-138	0
Acetone	ug/L (ppb)	250	89	83	44-145	7
1,1-Dichloroethene	ug/L (ppb)	50	111	111	72-121	0
Hexane	ug/L (ppb)	50	104	103	51-153	1
Methylene chloride	ug/L (ppb)	50	102	101	63-132	1
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	108	109	70-122	1
trans-1,2-Dichloroethene	ug/L (ppb)	50	107	107	76-118	0
1,1-Dichloroethane	ug/L (ppb)	50	105	105	77-119	0
2,2-Dichloropropane	ug/L (ppb)	50	113	112	62-141	1
cis-1,2-Dichloroethene	ug/L (ppb)	50	109	110	76-119	1
Chloroform	ug/L (ppb)	50	105	104	78-117	1
2-Butanone (MEK)	ug/L (ppb)	250	90	91	48-150	1
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	93	95	75-116	2
1,1,1-Trichloroethane	ug/L (ppb)	50	109	110	80-116	1
1,1-Dichloropropene	ug/L (ppb)	50	103	102	78-119	1
Carbon tetrachloride	ug/L (ppb)	50	110	110	72-128	0
Benzene	ug/L (ppb)	50	99	100	75-116	1
Trichloroethene	ug/L (ppb)	50	99	100	72-119	1
1,2-Dichloropropane	ug/L (ppb)	50	101	102	79-121	1
Bromodichloromethane	ug/L (ppb)	50	102	103	76-120	1
Dibromomethane	ug/L (ppb)	50	96	97	79-121	1
4-Methyl-2-pentanone	ug/L (ppb)	250	105	110	54-153	5
cis-1,3-Dichloropropene	ug/L (ppb)	50	99	101	76-128	2
Toluene	ug/L (ppb)	50	103	103	79-115	0
trans-1,3-Dichloropropene	ug/L (ppb)	50	98	98	76-128	0
1,1,2-Trichloroethane	ug/L (ppb)	50	97	100	78-120	3
2-Hexanone	ug/L (ppb)	250	87	90	49-147	3
1,3-Dichloropropane	ug/L (ppb)	50	95	94	81-111	1
Tetrachloroethene	ug/L (ppb)	50	105	105	78-109	0
Dibromochloromethane	ug/L (ppb)	50	108	108	63-140	0
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	98	100	82-118	2
Chlorobenzene	ug/L (ppb)	50	99	100	80-113	1
Ethylbenzene	ug/L (ppb)	50	103	102	83-111	1
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	111	111	76-125	0
m,p-Xylene	ug/L (ppb)	100	106	107	81-112	1
o-Xylene	ug/L (ppb)	50	110	111	81-117	1
Styrene	ug/L (ppb)	50	106	107	83-121	1
Isopropylbenzene	ug/L (ppb)	50	110	110	78-118	0
Bromoform	ug/L (ppb)	50	106	106	40-161	0
n-Propylbenzene	ug/L (ppb)	50	103	104	81-115	1
Bromobenzene	ug/L (ppb)	50	101	104	80-113	3
1,3,5-Trimethylbenzene	ug/L (ppb)	50	109	109	83-117	0
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	98	100	79-118	2
1,2,3-Trichloropropane	ug/L (ppb)	50	93	95	74-116	2
2-Chlorotoluene	ug/L (ppb)	50	103	104	79-112	1
4-Chlorotoluene	ug/L (ppb)	50	98	99	80-116	1
tert-Butylbenzene	ug/L (ppb)	50	110	109	81-119	1
1,2,4-Trimethylbenzene	ug/L (ppb)	50	107	108	81-121	1
sec-Butylbenzene	ug/L (ppb)	50	109	108	83-123	1
p-Isopropyltoluene	ug/L (ppb)	50	108	105	81-117	3
1,3-Dichlorobenzene	ug/L (ppb)	50	101	101	80-115	0
1,4-Dichlorobenzene	ug/L (ppb)	50	98	100	77-112	2
1,2-Dichlorobenzene	ug/L (ppb)	50	101	101	79-115	0
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	98	99	62-133	1
1,2,4-Trichlorobenzene	ug/L (ppb)	50	108	107	75-119	1
Hexachlorobutadiene	ug/L (ppb)	50	107	107	70-116	0
Naphthalene	ug/L (ppb)	50	106	105	72-131	1
1,2,3-Trichlorobenzene	ug/L (ppb)	50	106	104	74-122	2

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QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL/PRODUCT SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: 003464-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	mg/kg (ppm)	2.5	<0.5	4 vo	5 vo	10-142	22 vo
Chloromethane	mg/kg (ppm)	2.5	<0.5	22	28	10-126	24 vo
Vinyl chloride	mg/kg (ppm)	2.5	<0.05	22	29	10-138	27 vo
Bromomethane	mg/kg (ppm)	2.5	<0.5	43	47	10-163	9
Chloroethane	mg/kg (ppm)	2.5	<0.5	42	48	10-176	13
Trichlorofluoromethane	mg/kg (ppm)	2.5	<0.5	33	40	10-176	19
Acetone	mg/kg (ppm)	12.5	<0.5	72	82	10-163	13
1,1-Dichloroethene	mg/kg (ppm)	2.5	<0.05	51	56	10-160	9
Hexane	mg/kg (ppm)	2.5	<0.25	20	26	10-137	26 vo
Methylene chloride	mg/kg (ppm)	2.5	<0.5	73	74	10-156	1
Methyl t-butyl ether (MTBE)	mg/kg (ppm)	2.5	<0.05	83	81	21-145	2
trans-1,2-Dichloroethene	mg/kg (ppm)	2.5	<0.05	66	68	14-137	3
1,1-Dichloroethane	mg/kg (ppm)	2.5	<0.05	76	75	19-140	1
2,2-Dichloropropane	mg/kg (ppm)	2.5	<0.05	70	71	10-158	1
cis-1,2-Dichloroethene	mg/kg (ppm)	2.5	<0.05	80	78	25-135	3
Chloroform	mg/kg (ppm)	2.5	<0.05	82	81	21-145	1
2-Butanone (MEK)	mg/kg (ppm)	12.5	<0.5	83	81	19-147	2
1,2-Dichloroethane (EDC)	mg/kg (ppm)	2.5	<0.05	80	77	12-160	4
1,1,1-Trichloroethane	mg/kg (ppm)	2.5	<0.05	77	77	10-156	0
1,1-Dichloropropene	mg/kg (ppm)	2.5	<0.05	73	75	17-140	3
Carbon tetrachloride	mg/kg (ppm)	2.5	<0.05	76	77	9-164	1
Benzene	mg/kg (ppm)	2.5	<0.03	80	79	29-129	1
Trichloroethene	mg/kg (ppm)	2.5	<0.02	82	82	21-139	0
1,2-Dichloropropane	mg/kg (ppm)	2.5	<0.05	83	82	30-135	1
Bromodichloromethane	mg/kg (ppm)	2.5	<0.05	89	87	23-155	2
Dibromomethane	mg/kg (ppm)	2.5	<0.05	88	85	23-145	3
4-Methyl-2-pentanone	mg/kg (ppm)	12.5	<0.5	89	83	24-155	7
cis-1,3-Dichloropropene	mg/kg (ppm)	2.5	<0.05	83	81	28-144	2
Toluene	mg/kg (ppm)	2.5	<0.05	74	72	35-130	3
trans-1,3-Dichloropropene	mg/kg (ppm)	2.5	<0.05	70	69	26-149	1
1,1,2-Trichloroethane	mg/kg (ppm)	2.5	<0.05	71	71	10-205	0
2-Hexanone	mg/kg (ppm)	12.5	<0.5	71	68	15-166	4
1,3-Dichloropropane	mg/kg (ppm)	2.5	<0.05	73	70	31-137	4
Tetrachloroethene	mg/kg (ppm)	2.5	<0.025	73	74	20-133	1
Dibromochloromethane	mg/kg (ppm)	2.5	<0.05	78	76	28-150	3
1,2-Dibromoethane (EDB)	mg/kg (ppm)	2.5	<0.05	73	71	28-142	3
Chlorobenzene	mg/kg (ppm)	2.5	<0.05	77	74	32-129	4
Ethylbenzene	mg/kg (ppm)	2.5	<0.05	76	74	32-137	3
1,1,1,2-Tetrachloroethane	mg/kg (ppm)	2.5	<0.05	75	73	31-143	3
m,p-Xylene	mg/kg (ppm)	5	<0.1	78	75	34-136	4
o-Xylene	mg/kg (ppm)	2.5	<0.05	77	74	33-134	4
Styrene	mg/kg (ppm)	2.5	<0.05	75	72	35-137	4
Isopropylbenzene	mg/kg (ppm)	2.5	<0.05	80	78	31-142	3
Bromoform	mg/kg (ppm)	2.5	<0.05	77	77	21-156	0
n-Propylbenzene	mg/kg (ppm)	2.5	<0.05	74	71	23-146	4
Bromobenzene	mg/kg (ppm)	2.5	<0.05	74	71	34-130	4
1,3,5-Trimethylbenzene	mg/kg (ppm)	2.5	<0.05	73	71	18-149	3
1,1,2,2-Tetrachloroethane	mg/kg (ppm)	2.5	<0.05	71	67	28-140	6
1,2,3-Trichloropropane	mg/kg (ppm)	2.5	<0.05	69	67	25-144	3
2-Chlorotoluene	mg/kg (ppm)	2.5	<0.05	73	70	31-134	4
4-Chlorotoluene	mg/kg (ppm)	2.5	<0.05	72	70	31-136	3
tert-Butylbenzene	mg/kg (ppm)	2.5	<0.05	77	74	30-137	4
1,2,4-Trimethylbenzene	mg/kg (ppm)	2.5	<0.05	75	72	10-182	4
sec-Butylbenzene	mg/kg (ppm)	2.5	<0.05	77	74	23-145	4
p-Isopropyltoluene	mg/kg (ppm)	2.5	<0.05	77	76	21-149	1
1,3-Dichlorobenzene	mg/kg (ppm)	2.5	<0.05	77	74	30-131	4
1,4-Dichlorobenzene	mg/kg (ppm)	2.5	<0.05	78	75	29-129	4
1,2-Dichlorobenzene	mg/kg (ppm)	2.5	<0.05	77	74	31-132	4
1,2-Dibromo-3-chloropropane	mg/kg (ppm)	2.5	<0.5	68	66	11-161	3
1,2,4-Trichlorobenzene	mg/kg (ppm)	2.5	<0.25	80	78	22-142	3
Hexachlorobutadiene	mg/kg (ppm)	2.5	<0.25	87	83	10-142	5
Naphthalene	mg/kg (ppm)	2.5	<0.05	72	70	14-157	3
1,2,3-Trichlorobenzene	mg/kg (ppm)	2.5	<0.25	77	74	20-144	4

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QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF PRODUCT SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Dichlorodifluoromethane	mg/kg (ppm)	2.5	73	10-146
Chloromethane	mg/kg (ppm)	2.5	86	27-133
Vinyl chloride	mg/kg (ppm)	2.5	94	22-139
Bromomethane	mg/kg (ppm)	2.5	102	38-114
Chloroethane	mg/kg (ppm)	2.5	109	9-163
Trichlorofluoromethane	mg/kg (ppm)	2.5	109	10-196
Acetone	mg/kg (ppm)	12.5	110	52-141
1,1-Dichloroethene	mg/kg (ppm)	2.5	111	47-128
Hexane	mg/kg (ppm)	2.5	99	43-142
Methylene chloride	mg/kg (ppm)	2.5	109	42-132
Methyl t-butyl ether (MTBE)	mg/kg (ppm)	2.5	107	60-123
trans-1,2-Dichloroethene	mg/kg (ppm)	2.5	105	67-129
1,1-Dichloroethane	mg/kg (ppm)	2.5	110	68-115
2,2-Dichloropropane	mg/kg (ppm)	2.5	112	52-170
cis-1,2-Dichloroethene	mg/kg (ppm)	2.5	108	72-127
Chloroform	mg/kg (ppm)	2.5	108	66-120
2-Butanone (MEK)	mg/kg (ppm)	12.5	106	72-127
1,2-Dichloroethane (EDC)	mg/kg (ppm)	2.5	104	56-135
1,1,1-Trichloroethane	mg/kg (ppm)	2.5	113	62-131
1,1-Dichloropropene	mg/kg (ppm)	2.5	109	69-128
Carbon tetrachloride	mg/kg (ppm)	2.5	115	60-139
Benzene	mg/kg (ppm)	2.5	109	68-114
Trichloroethene	mg/kg (ppm)	2.5	110	64-117
1,2-Dichloropropane	mg/kg (ppm)	2.5	109	72-127
Bromodichloromethane	mg/kg (ppm)	2.5	112	72-130
Dibromomethane	mg/kg (ppm)	2.5	112	70-120
4-Methyl-2-pentanone	mg/kg (ppm)	12.5	108	45-145
cis-1,3-Dichloropropene	mg/kg (ppm)	2.5	106	75-136
Toluene	mg/kg (ppm)	2.5	100	66-126
trans-1,3-Dichloropropene	mg/kg (ppm)	2.5	95	72-132
1,1,2-Trichloroethane	mg/kg (ppm)	2.5	93	75-113
2-Hexanone	mg/kg (ppm)	12.5	95	33-152
1,3-Dichloropropane	mg/kg (ppm)	2.5	95	72-130
Tetrachloroethene	mg/kg (ppm)	2.5	100	72-114
Dibromochloromethane	mg/kg (ppm)	2.5	105	74-125
1,2-Dibromoethane (EDB)	mg/kg (ppm)	2.5	97	74-132
Chlorobenzene	mg/kg (ppm)	2.5	99	76-111
Ethylbenzene	mg/kg (ppm)	2.5	100	64-123
1,1,1,2-Tetrachloroethane	mg/kg (ppm)	2.5	98	69-135
m,p-Xylene	mg/kg (ppm)	5	100	78-122
o-Xylene	mg/kg (ppm)	2.5	99	77-124
Styrene	mg/kg (ppm)	2.5	97	74-126
Isopropylbenzene	mg/kg (ppm)	2.5	102	76-127
Bromoform	mg/kg (ppm)	2.5	109	56-132
n-Propylbenzene	mg/kg (ppm)	2.5	97	74-124
Bromobenzene	mg/kg (ppm)	2.5	95	72-122
1,3,5-Trimethylbenzene	mg/kg (ppm)	2.5	95	76-126
1,1,2,2-Tetrachloroethane	mg/kg (ppm)	2.5	92	56-143
1,2,3-Trichloropropane	mg/kg (ppm)	2.5	92	61-137
2-Chlorotoluene	mg/kg (ppm)	2.5	95	74-121
4-Chlorotoluene	mg/kg (ppm)	2.5	94	75-122
tert-Butylbenzene	mg/kg (ppm)	2.5	98	73-130
1,2,4-Trimethylbenzene	mg/kg (ppm)	2.5	97	76-125
sec-Butylbenzene	mg/kg (ppm)	2.5	99	71-130
p-Isopropyltoluene	mg/kg (ppm)	2.5	100	70-132
1,3-Dichlorobenzene	mg/kg (ppm)	2.5	97	75-121
1,4-Dichlorobenzene	mg/kg (ppm)	2.5	99	74-117
1,2-Dichlorobenzene	mg/kg (ppm)	2.5	98	76-121
1,2-Dibromo-3-chloropropane	mg/kg (ppm)	2.5	91	58-138
1,2,4-Trichlorobenzene	mg/kg (ppm)	2.5	100	64-135
Hexachlorobutadiene	mg/kg (ppm)	2.5	108	50-153
Naphthalene	mg/kg (ppm)	2.5	94	63-140
1,2,3-Trichlorobenzene	mg/kg (ppm)	2.5	94	63-138

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.

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RE: 003444
Work Order Number: 2003438

April 06, 2020

Attention Michael Erdahl:

Fremont Analytical, Inc. received 2 sample(s) on 3/30/2020 for the analyses presented in the following report.

Volatile Petroleum Hydrocarbons by NWVPH

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: *04/06/2020*

CLIENT: Friedman & Bruya
Project: 003444
Work Order: 2003438

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2003438-001	GEI-MW1-0320	03/26/2020 11:40 AM	03/30/2020 10:26 AM
2003438-002	GEI-MW9-0320	03/26/2020 9:40 AM	03/30/2020 10:26 AM

Case Narrative

WO#: **2003438**
Date: **4/6/2020**

CLIENT: Friedman & Bruya
Project: 003444

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").

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 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 (<20%RSD, <20% Drift or minimum RRF)
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
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **2003438**
Date Reported: **4/6/2020**

Client: Friedman & Bruya
Collection Date: 3/26/2020 11:40:00 AM
Project: 003444
Lab ID: 2003438-001
Matrix: Water
Client Sample ID: **GEI-MW1-0320**

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Volatile Petroleum Hydrocarbons by NWVPH				Batch ID: 27970		Analyst: CR
Aliphatic Hydrocarbon (C5-C6)	ND	40.0		µg/L	1	4/3/2020 12:13:41 AM
Aliphatic Hydrocarbon (C6-C8)	87.9	20.0		µg/L	1	4/3/2020 12:13:41 AM
Aliphatic Hydrocarbon (C8-C10)	37.2	20.0		µg/L	1	4/3/2020 12:13:41 AM
Aliphatic Hydrocarbon (C10-C12)	231	20.0		µg/L	1	4/3/2020 12:13:41 AM
Aromatic Hydrocarbon (C8-C10)	138	50.0		µg/L	1	4/3/2020 12:13:41 AM
Aromatic Hydrocarbon (C10-C12)	505	20.0		µg/L	1	4/3/2020 12:13:41 AM
Aromatic Hydrocarbon (C12-C13)	896	20.0		µg/L	1	4/3/2020 12:13:41 AM
Benzene	35.7	20.0		µg/L	1	4/3/2020 12:13:41 AM
Toluene	ND	20.0		µg/L	1	4/3/2020 12:13:41 AM
Ethylbenzene	ND	20.0		µg/L	1	4/3/2020 12:13:41 AM
m,p-Xylene	ND	40.0		µg/L	1	4/3/2020 12:13:41 AM
o-Xylene	ND	20.0		µg/L	1	4/3/2020 12:13:41 AM
Naphthalene	ND	20.0		µg/L	1	4/3/2020 12:13:41 AM
Methyl tert-butyl ether (MTBE)	ND	20.0		µg/L	1	4/3/2020 12:13:41 AM
Surr: 1,4-Difluorobenzene	99.5	65 - 140		%Rec	1	4/3/2020 12:13:41 AM
Surr: Bromofluorobenzene	106	65 - 140		%Rec	1	4/3/2020 12:13:41 AM

Analytical Report

Work Order: **2003438**
Date Reported: **4/6/2020**

Client: Friedman & Bruya
Collection Date: 3/26/2020 9:40:00 AM
Project: 003444
Lab ID: 2003438-002
Matrix: Water
Client Sample ID: **GEI-MW9-0320**

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Volatile Petroleum Hydrocarbons by NWVPH				Batch ID: 27970		Analyst: CR
Aliphatic Hydrocarbon (C5-C6)	ND	40.0		µg/L	1	4/2/2020 10:48:44 PM
Aliphatic Hydrocarbon (C6-C8)	ND	20.0		µg/L	1	4/2/2020 10:48:44 PM
Aliphatic Hydrocarbon (C8-C10)	29.3	20.0		µg/L	1	4/2/2020 10:48:44 PM
Aliphatic Hydrocarbon (C10-C12)	172	20.0		µg/L	1	4/2/2020 10:48:44 PM
Aromatic Hydrocarbon (C8-C10)	ND	50.0		µg/L	1	4/2/2020 10:48:44 PM
Aromatic Hydrocarbon (C10-C12)	343	20.0		µg/L	1	4/2/2020 10:48:44 PM
Aromatic Hydrocarbon (C12-C13)	461	20.0		µg/L	1	4/2/2020 10:48:44 PM
Benzene	ND	20.0		µg/L	1	4/2/2020 10:48:44 PM
Toluene	ND	20.0		µg/L	1	4/2/2020 10:48:44 PM
Ethylbenzene	ND	20.0		µg/L	1	4/2/2020 10:48:44 PM
m,p-Xylene	ND	40.0		µg/L	1	4/2/2020 10:48:44 PM
o-Xylene	ND	20.0		µg/L	1	4/2/2020 10:48:44 PM
Naphthalene	ND	20.0		µg/L	1	4/2/2020 10:48:44 PM
Methyl tert-butyl ether (MTBE)	ND	20.0		µg/L	1	4/2/2020 10:48:44 PM
Surr: 1,4-Difluorobenzene	102	65 - 140		%Rec	1	4/2/2020 10:48:44 PM
Surr: Bromofluorobenzene	102	65 - 140		%Rec	1	4/2/2020 10:48:44 PM

Work Order: 2003438
CLIENT: Friedman & Bruya
Project: 003444

QC SUMMARY REPORT

Volatile Petroleum Hydrocarbons by NWVPH

Sample ID: **LCS-27970** SampType: **LCS** Units: **µg/L** Prep Date: **4/2/2020** RunNo: **58458**
Client ID: **LCSW** Batch ID: **27970** Analysis Date: **4/2/2020** SeqNo: **1168159**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aliphatic Hydrocarbon (C5-C6)	670	40.0	600.0	0	112	70	130				
Aliphatic Hydrocarbon (C6-C8)	200	20.0	200.0	0	100	70	130				
Aliphatic Hydrocarbon (C8-C10)	219	20.0	200.0	0	109	70	130				
Aliphatic Hydrocarbon (C10-C12)	211	20.0	200.0	0	105	70	130				
Aromatic Hydrocarbon (C8-C10)	914	50.0	800.0	0	114	70	130				
Aromatic Hydrocarbon (C10-C12)	204	20.0	200.0	0	102	70	130				
Aromatic Hydrocarbon (C12-C13)	171	20.0	200.0	0	85.6	70	130				
Benzene	228	20.0	200.0	0	114	70	130				
Toluene	230	20.0	200.0	0	115	70	130				
Ethylbenzene	229	20.0	200.0	0	114	70	130				
m,p-Xylene	467	40.0	400.0	0	117	70	130				
o-Xylene	231	20.0	200.0	0	116	70	130				
Naphthalene	171	20.0	200.0	0	85.4	70	130				
Methyl tert-butyl ether (MTBE)	222	20.0	200.0	0	111	70	130				
Surr: 1,4-Difluorobenzene	49.6		50.00		99.2	65	140				
Surr: Bromofluorobenzene	49.6		50.00		99.1	65	140				

Sample ID: **LCSD-27970** SampType: **LCSD** Units: **µg/L** Prep Date: **4/2/2020** RunNo: **58458**
Client ID: **LCSW02** Batch ID: **27970** Analysis Date: **4/2/2020** SeqNo: **1168160**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aliphatic Hydrocarbon (C5-C6)	642	40.0	600.0	0	107	70	130	669.6	4.24	20	
Aliphatic Hydrocarbon (C6-C8)	207	20.0	200.0	0	103	70	130	200.0	3.23	20	
Aliphatic Hydrocarbon (C8-C10)	221	20.0	200.0	0	111	70	130	218.5	1.14	20	
Aliphatic Hydrocarbon (C10-C12)	193	20.0	200.0	0	96.7	70	130	210.9	8.69	20	
Aromatic Hydrocarbon (C8-C10)	875	50.0	800.0	0	109	70	130	914.3	4.41	20	
Aromatic Hydrocarbon (C10-C12)	193	20.0	200.0	0	96.3	70	130	203.9	5.67	20	
Aromatic Hydrocarbon (C12-C13)	209	20.0	200.0	0	105	70	130	171.2	20.0	20	R
Benzene	217	20.0	200.0	0	109	70	130	227.9	4.83	20	
Toluene	219	20.0	200.0	0	109	70	130	229.7	4.82	20	

Work Order: 2003438
CLIENT: Friedman & Bruya
Project: 003444

QC SUMMARY REPORT

Volatile Petroleum Hydrocarbons by NWVPH

Sample ID: **LCSD-27970** SampType: **LCSD** Units: **µg/L** Prep Date: **4/2/2020** RunNo: **58458**
Client ID: **LCSW02** Batch ID: **27970** Analysis Date: **4/2/2020** SeqNo: **1168160**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ethylbenzene	221	20.0	200.0	0	111	70	130	228.9	3.41	20	
m,p-Xylene	446	40.0	400.0	0	111	70	130	466.6	4.62	20	
o-Xylene	221	20.0	200.0	0	111	70	130	231.3	4.39	20	
Naphthalene	175	20.0	200.0	0	87.3	70	130	170.7	2.31	20	
Methyl tert-butyl ether (MTBE)	210	20.0	200.0	0	105	70	130	221.7	5.20	20	
Surr: 1,4-Difluorobenzene	48.1		50.00		96.3	65	140		0		
Surr: Bromofluorobenzene	48.4		50.00		96.9	65	140		0		

NOTES:
R - High RPD observed, spike recovery is within range.

Sample ID: **MB-27970** SampType: **MBLK** Units: **µg/L** Prep Date: **4/2/2020** RunNo: **58458**
Client ID: **MBLKW** Batch ID: **27970** Analysis Date: **4/2/2020** SeqNo: **1168161**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aliphatic Hydrocarbon (C5-C6)	ND	40.0		0	0						
Aliphatic Hydrocarbon (C6-C8)	ND	20.0		0	0						
Aliphatic Hydrocarbon (C8-C10)	ND	20.0		0	0						
Aliphatic Hydrocarbon (C10-C12)	ND	20.0		0	0						
Aromatic Hydrocarbon (C8-C10)	ND	50.0		0	0						
Aromatic Hydrocarbon (C10-C12)	ND	20.0		0	0						
Aromatic Hydrocarbon (C12-C13)	ND	20.0		0	0						
Benzene	ND	20.0		0	0						
Toluene	ND	20.0		0	0						
Ethylbenzene	ND	20.0		0	0						
m,p-Xylene	ND	40.0		0	0						
o-Xylene	ND	20.0		0	0						
Naphthalene	ND	20.0		0	0						
Methyl tert-butyl ether (MTBE)	ND	20.0		0	0						
Surr: 1,4-Difluorobenzene	50.4		50.00		101	65	140				
Surr: Bromofluorobenzene	51.2		50.00		102	65	140				

Work Order: 2003438
CLIENT: Friedman & Bruya
Project: 003444

QC SUMMARY REPORT

Volatile Petroleum Hydrocarbons by NWVPH

Sample ID: **2003438-002ADUP** SampType: **DUP** Units: **µg/L** Prep Date: **4/2/2020** RunNo: **58458**
Client ID: **GEI-MW9-0320** Batch ID: **27970** Analysis Date: **4/2/2020** SeqNo: **1168155**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aliphatic Hydrocarbon (C5-C6)	ND	40.0		0	0			0		25	
Aliphatic Hydrocarbon (C6-C8)	ND	20.0		0	0			0		25	
Aliphatic Hydrocarbon (C8-C10)	ND	20.0		0	0			29.26	50.3	25	
Aliphatic Hydrocarbon (C10-C12)	181	20.0		0	0			171.7	5.41	25	
Aromatic Hydrocarbon (C8-C10)	ND	50.0		0	0			0		25	
Aromatic Hydrocarbon (C10-C12)	299	20.0		0	0			343.0	13.7	25	
Aromatic Hydrocarbon (C12-C13)	453	20.0		0	0			461.4	1.79	25	
Benzene	ND	20.0		0	0			0		25	
Toluene	ND	20.0		0	0			0		25	
Ethylbenzene	ND	20.0		0	0			0		25	
m,p-Xylene	ND	40.0		0	0			0		25	
o-Xylene	ND	20.0		0	0			0		25	
Naphthalene	ND	20.0		0	0			0		25	
Methyl tert-butyl ether (MTBE)	ND	20.0		0	0			0		25	
Surr: 1,4-Difluorobenzene	52.1		50.00		104	65	140		0		
Surr: Bromofluorobenzene	51.9		50.00		104	65	140		0		

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2003438**
Logged by:	**Carissa True**	Date Received:	**3/30/2020 10:26:00 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 Required ☐
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
Cooler 1	0.5
Sample 1	0.6

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

SUBCONTRACT SAMPLE CHAIN OF CUSTODY 2003438

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 #
003444	B-162

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								Notes
GEI-MW1-0320		3/26/20	1140	water	2			X								
GEI-MW9-0320		3/26/20	0940	water	2			X								
					EP 3/30											

Page 11 of 11

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	3/27/20	1520
Received by:		Carter Johnson	FAI	3/30/20	1026
Relinquished by:					
Received by:					

003444

SAMPLE CHAIN OF CUSTODY

ME 03-27-20

80, / VW3

Page # 1 of 1

Report To Ms. Jamie Stevens

Company Crete Consulting

Address 1085. Washington St, Suite 300

City, State, ZIP Seattle, WA

Phone 206.799.2744 Email jamie.stevens@creteconsulting.com

SAMPLERS (*signature*) P V B

PROJECT NAME: PoT - Parcel 40

PO #:

REMARKS: Project specific RLs? (Yes) / No

INVOICE TO: Crete

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	VPH				Notes
GEI-MW1-0320	01 A-C	3.26.20	11:40	W	3					X							RLs for:
GEI-MW5-0320	02 |	3.26.20	14:00	W	3					X							carbon Tetrachloride = 0.56 mg/L
GEI-MW8-0320	03 |	3.26.20	13:00	W	3					X							
GEI-MW9-0320	04 A-E	3.26.20	9:40	W	5					X			X				D: bromomethane = 0.27 mg/L
ITC-RW1-0320	05 |	3.26.20	14:30	~~W~~ P	5					X			X				Hexachlorobutadiene = 0.81 mg/L
GEI-MW39-0320	06 A-B	3.26.20	12:02	W	2					X							
																	SAMPLE ITC-RW1-0320 IS MOSTLY FREE PRODUCT
																	Samples received at 2 °C

ANALYSES REQUESTED

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: P V B	Paul V. Bianco	Crete	3.27.20	12:27
Received by: S. Okam	S. Okam	FJB, Inc	3.27.20	12:28
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

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 24, 2020

Grant Hainsworth, Project Manager
Crete Consulting
108 S. Washington St., Suite 300
Seattle, WA 98104

Dear Mr Hainsworth:

Included are the results from the testing of material submitted on June 13, 2020 from the PoT-Parcel 40, F&BI 006216 project. There are 21 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: Jamie Stevens
CTC0624R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on June 13, 2020 by Friedman & Bruya, Inc. from the Crete Consulting PoT-Parcel 40, F&BI 006216 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
006216 -01	SB-0210-0620
006216 -02	SB-0310-10
006216 -03	SB-01-09
006216 -04	SB-01-0620
006216 -05	SB-02-09.5
006216 -06	SB-02-0620
006216 -07	SB-03-10
006216 -08	SB-03-0620
006216 -09	SB-04-08
006216 -10	SB-04-0620
006216 -11	SB-05-09.5
006216 -12	SB-05-0620
006216 -13	SB-06-09
006216 -14	SB-06-0620
006216 -15	SB-07-07.5
006216 -16	SB-07-0620
006216 -17	SB-08-09
006216 -18	SB-08-0620
006216 -19	SB-08D-0620
006216 -20	SB-09-07.5
006216 -21	SB-09-0620
006216 -22	Drum-2
006216 -23	SB-01D-0620

All quality control requirements were acceptable.

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216
Date Extracted: 06/19/20
Date Analyzed: 06/19/20

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 50-132)
SB-0310-10 006216-02 1/50	1.3	5.0	13	17	2,000	91
SB-01-09 006216-03 1/10	<0.2	<0.2	7.0	24	3,000	95
SB-02-09.5 006216-05 1/10	<0.2	<0.2	1.6	2.3	600	86
SB-03-10 006216-07 1/50	<1	3.8	20	14	2,400	89
SB-04-08 006216-09 1/10	<0.2	<0.2	7.9	20	2,800	101
SB-05-09.5 006216-11 1/5	<0.1	<0.1	1.7	2.1	600	86
Drum-2 006216-22	<0.02	<0.02	0.70	0.91	330	98
Method Blank 00-1314 MB2	<0.02	<0.02	<0.02	<0.06	<5	89

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216
Date Extracted: 06/18/20
Date Analyzed: 06/18/20, 06/19/20 and 06/22/20

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)
SB-0210-0620 006216-01	<1	1.1	<1	4.0	830	85
SB-01-0620 006216-04 1/10	22	<10	25	<30	4,100	82
SB-02-0620 006216-06	<1	<1	1.0	4.2	1,800	80
SB-03-0620 006216-08	<1	10	27	<3	4,100	97
SB-04-0620 006216-10	81	4.6	19	14	1,600	86
SB-05-0620 006216-12	1.1	3.4	<1	38	7,500	90
SB-06-0620 006216-14	<1	<1	1.5	<3	750	83
SB-07-0620 006216-16	<1	<1	<1	<3	<100	90
SB-08-0620 006216-18	<1	<1	<1	<3	<100	89
SB-08D-0620 006216-19	<1	<1	<1	<3	<100	90

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216
Date Extracted: 06/18/20
Date Analyzed: 06/18/20, 06/19/20 and 06/22/20

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)
SB-09-0620 006216-21	3.2	<1	11	9.3	3,500	93
SB-01D-0620 006216-23	<1	<1	<1	<3	<100	89
Method Blank 00-1313 MB	<1	<1	<1	<3	<100	93

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216
Date Extracted: 06/15/20
Date Analyzed: 06/15/20

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)
SB-0310-10 006216-02	40,000	4,700 x	122
SB-01-09 006216-03	23,000	1,600 x	121
SB-02-09.5 006216-05	3,800	390 x	90
SB-03-10 006216-07	27,000	3,100 x	109
SB-04-08 006216-09	15,000	1,100 x	109
SB-05-09.5 006216-11	9,500	750 x	89
SB-06-09 006216-13	15,000	490 x	107
SB-07-07.5 006216-15	<50	<250	87
SB-08-09 006216-17	<50	<250	86
SB-09-07.5 006216-20	18,000	610 x	102

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216
Date Extracted: 06/15/20
Date Analyzed: 06/15/20

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)
Drum-2 006216-22	1,200	<250	85
Method Blank 00-1353 MB	<50	<250	96

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216
Date Extracted: 06/15/20
Date Analyzed: 06/16/20 and 06/18/20

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 41-152)
SB-0210-0620 006216-01 1/100	97,000	<25,000	ip
SB-01-0620 006216-04 1/100	620,000	<25,000	ip
SB-02-0620 006216-06 1/100	77,000	<25,000	ip
SB-03-0620 006216-08 1/100	1,700,000	72,000 x	ip
SB-04-0620 006216-10 1/10	12,000	<2,500	109
SB-05-0620 006216-12 1/100	71,000,000	2,000,000 x	ip
SB-06-0620 006216-14 1/10	15,000	<2,500	94
SB-07-0620 006216-16	550	<250	102
SB-08-0620 006216-18	55 x	290	106

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216
Date Extracted: 06/15/20
Date Analyzed: 06/16/20 and 06/18/20

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 41-152)
SB-08D-0620 006216-19	310	<250	55
SB-09-0620 006216-21 1/10	61,000	<2,500	ip
SB-01D-0620 006216-23	470	<250	83
Method Blank 00-1356 MB	<50	<250	99
Method Blank 00-1410 MB2	<50	<250	87

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216
Date Extracted: 06/15/20
Date Analyzed: 06/15/20, 06/16/20 and 06/17/20

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 47-140)
SB-0210-0620 006216-01 1/100	94,000	<25,000	ip
SB-01-0620 006216-04 1/100	690,000	<25,000	ip
SB-02-0620 006216-06 1/100	78,000	<25,000	ip
SB-03-0620 006216-08 1/100	1,700,000	64,000 x	ip
SB-04-0620 006216-10 1/10	25,000	3,100 x	82
SB-05-0620 006216-12 1/100	62,000,000	1,500,000 x	ip
SB-06-0620 006216-14 1/10	18,000	<2,500	98
SB-07-0620 006216-16	1,100	<250	113
SB-08-0620 006216-18	280	330	110
SB-08D-0620 006216-19	640	<250	61

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216
Date Extracted: 06/15/20
Date Analyzed: 06/15/20, 06/16/20 and 06/17/20

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 47-140)
SB-09-0620 006216-21 1/10	54,000	<2,500	ip
SB-01D-0620 006216-23	880	<250	84
Method Blank 00-1356 MB	<50	<250	104
Method Blank 00-1410 MB2	<50	<250	86

Analysis For Total Metals By EPA Method 6020B

Client ID:	Drum-2	Client:	Crete Consulting
Date Received:	06/13/20	Project:	PoT-Parcel 40, F&BI 006216
Date Extracted:	06/15/20	Lab ID:	006216-22
Date Analyzed:	06/16/20	Data File:	006216-22.061
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	1.59
Barium	29.4
Cadmium	<1
Chromium	10.2
Lead	8.38
Mercury	<1
Selenium	<1
Silver	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Crete Consulting
Date Received:	NA	Project:	PoT-Parcel 40, F&BI 006216
Date Extracted:	06/15/20	Lab ID:	I0-341 mb
Date Analyzed:	06/15/20	Data File:	I0-341 mb.112
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

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING METHOD 8021B AND NWTPH-Gx

Laboratory Code: 006286-01 (Duplicate)

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Benzene	mg/kg (ppm)	<0.1	<0.1	nm
Toluene	mg/kg (ppm)	<0.1	<0.1	nm
Ethylbenzene	mg/kg (ppm)	0.62	<0.1	nm
Xylenes	mg/kg (ppm)	0.40	<0.3	nm
Gasoline	mg/kg (ppm)	<5	13	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/kg (ppm)	0.5	90	69-120
Toluene	mg/kg (ppm)	0.5	88	70-117
Ethylbenzene	mg/kg (ppm)	0.5	89	65-123
Xylenes	mg/kg (ppm)	1.5	90	66-120
Gasoline	mg/kg (ppm)	20	90	71-131

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING METHOD 8021B AND NWTPH-Gx

Laboratory Code: 006280-01 (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	95	65-118
Toluene	ug/L (ppb)	50	94	72-122
Ethylbenzene	ug/L (ppb)	50	100	73-126
Xylenes	ug/L (ppb)	150	99	74-118
Gasoline	ug/L (ppb)	1,000	109	69-134

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 006214-01 (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	108	98	64-133	10

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	108	58-147

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216

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	84	88	63-142	5

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216

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	96	88	61-133	9

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216

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	88	92	61-133	4

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216

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	96	104	63-142	8

Date of Report: 06/24/20
Date Received: 06/13/20
Project: PoT-Parcel 40, F&BI 006216

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 006187-01 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	<5	83	83	75-125	0
Barium	mg/kg (ppm)	50	39.2	106	102	75-125	4
Cadmium	mg/kg (ppm)	10	<5	96	96	75-125	0
Chromium	mg/kg (ppm)	50	19.4	95	95	75-125	0
Lead	mg/kg (ppm)	50	13.9	97	100	75-125	3
Mercury	mg/kg (ppm	5	<5	100	97	75-125	3
Selenium	mg/kg (ppm)	5	<5	86	87	75-125	1
Silver	mg/kg (ppm)	10	<5	94	98	75-125	4

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/kg (ppm)	10	92	80-120
Barium	mg/kg (ppm)	50	100	80-120
Cadmium	mg/kg (ppm)	10	99	80-120
Chromium	mg/kg (ppm)	50	101	80-120
Lead	mg/kg (ppm)	50	102	80-120
Mercury	mg/kg (ppm)	5	94	80-120
Selenium	mg/kg (ppm)	5	98	80-120
Silver	mg/kg (ppm)	10	101	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.

006216

SAMPLE CHAIN OF CUSTODY ME 6-13-20

COC 1/VS2/VS3

Page # 1 of 3

Report To G. Hainsworth / J. Stevens

Company CRETE Consulting

Address 108 S. Washington St., Ste. 300

City, State, ZIP Seattle, WA 98104

Phone 253-797-6383 Email

SAMPLERS (signature) Rusty Jones R. Jones

PROJECT NAME: POT - Parcel 40

PO #

REMARKS: Dx waters - with & without SG per GH ME 6/16/20

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					Notes
						ANALYSES REQUESTED											
SB-0210-0620	01 A-D	06.12.2020	0900	WATER	4	✓	✓	✓									
SB-0310-10	02 A-E		0930	SOIL	5	✓	✓	✓									
SB-01-09	03 A-E		0940	SOIL	5	✓	✓	✓									
SB-01-0620	04 A-D		0950	WATER	4	✓	✓	✓									
SB-02-09.5	05 A-E		1035	SOIL	5	✓	✓	✓									
SB-02-0620	06 A-D		1045	WATER	4	✓	✓	✓									
SB-03-10	07 A-E		1130	SOIL	5	✓	✓	✓									
SB-03-0620	08 A-D		1145	WATER	4	✓	✓	✓									1 VOA labeled as 1315
SB-04-08	09 A-E		1305	SOIL	5	✓	✓	✓									
SB-04-0620	10 A-D	↓	1315	WATER	4	✓	✓	✓									

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R Jones	Rusty Jones	CRETE Consulting	06.13.2020	1024
Received by:	Michael Erdahl	FLBa	↓	↓
Relinquished by:				
Received by:		Samples received at 2 °C		

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

UU624

SAMPLE CHAIN OF CUSTODY ME 6-13-20

COC 1 / VOA / WW3

Page # 2 of 3

Report To Hainsworth/Stevens

Company CRETE Consulting

Address

City, State, ZIP

Phone 253-797-6323 Email

SAMPLERS (*signature*) Rusty Jones R. Jones

PROJECT NAME: POT - Parcel 40

PO #

REMARKS

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					Notes
SB-05-09.5	11 A-E	06.12.2020	1405	SOIL	5	✓	✓	✓									
SB-05-0620	12 A-D		1415	WATER	4	✓	✓	✓									1 VOA Sample D&Time Illegible
SB-06-09	13		1455	SOIL	1	✓											
SB-06-0620	14 A-D		1505	WATER	4	✓	✓	✓									
SB-07-07.5	15		1555	SOIL	1	✓											
SB-07-0620	16 A-D		1605	WATER	4	✓	✓	✓									
SB-08-09	17		1645	SOIL	1	✓											
SB-08-0620	18 A-D		1700	WATER	4	✓	✓	✓									
SB-08D-0620	19 A-D		1750	WATER	4	✓	✓	✓									
SB-09-07.5	20	↓	1840	SOIL	1	✓											

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	CRETE Consulting	06.13.2020	1024
Received by:	Michael Eschl	FCBna	1	1
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

006216

SAMPLE CHAIN OF CUSTODY ME

Page # 3 of 3

Report To Hainsworth/Stevens

Company CRETE Consulting

Address

City, State, ZIP

Phone 253-797 6323 Email

SAMPLERS (*signature*) Rusty Jones R. Jones

PROJECT NAME: POT - Parcel 40

PO #

REMARKS

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	RCRA 8 Metals				Notes
SB-09-0620	21A-D	06.12.2020	1845	WATER	4	✓	✓	✓									
DRUM-2	22A-E	06.12.2020	1845	SOIL	5	✓	✓	✓					✓				
SB-DID-0620	23A-D					(X)	(X)	(X)									Sample recieved not on COC - added (X) - per TS 6/19/20 ME

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	CRETE Consulting	06.13.2020	1024
Received by:	Michael Eschli	FCBa	1	1
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

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

August 12, 2020

Grant Hainsworth, Project Manager
Crete Consulting
108 S. Washington St., Suite 300
Seattle, WA 98104

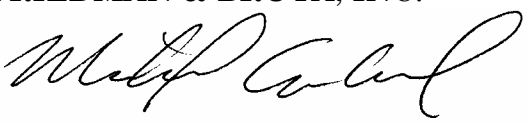
Dear Mr Hainsworth:

Included are the results from the testing of material submitted on August 6, 2020 from the Port of Tacoma, Parcel 40, F&BI 008077 project. There are 13 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: Jamie Stevens
CTC0812R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on August 6, 2020 by Friedman & Bruya, Inc. from the Crete Consulting Port of Tacoma, Parcel 40, F&BI 008077 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
008077 -01	SB-10-05
008077 -02	SB-10-0820
008077 -03	SB-10D-0820
008077 -04	SB-11-09
008077 -05	SB-110-09
008077 -06	SB-11-0820
008077 -07	SB-12-10
008077 -08	SB-12-0820
008077 -09	SB-12D-0820
008077 -10	SB-13-09
008077 -11	SB-13-0820
008077 -12	SB-130-0820
008077 -13	SB-14-09
008077 -14	SB-14-0820
008077 -15	SB-15-08
008077 -16	SB-15-0820
008077 -17	SB-16-05
008077 -18	SB-16-0820

All quality control requirements were acceptable.

Date of Report: 08/12/20
Date Received: 08/06/20
Project: Port of Tacoma, Parcel 40, F&BI 008077
Date Extracted: 08/06/20
Date Analyzed: 08/07/20

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)
SB-10-05 008077-01	<0.02	<0.02	<0.02	<0.06	<5	95
SB-11-09 008077-04 1/5	<0.02 j	<0.1	3.3	2.6	1,500	112
SB-110-09 008077-05 1/5	<0.02 j	<0.1	2.9	2.3	1,500	112
SB-12-10 008077-07	<0.02	<0.02	<0.02	<0.06	36	96
SB-13-09 008077-10 1/5	<0.02 j	<0.1	2.0	1.7	1,400	115
SB-14-09 008077-13	<0.02	<0.02	<0.02	<0.06	<5	95
SB-15-08 008077-15	<0.02	<0.02	<0.02	<0.06	<5	94
SB-16-05 008077-17	<0.02	<0.02	<0.02	<0.06	<5	94
Method Blank 00-1780 MB	<0.02	<0.02	<0.02	<0.06	<5	94
Method Blank 00-1399 MB2	<0.02	<0.02	<0.02	<0.06	<5	94

Date of Report: 08/12/20
Date Received: 08/06/20
Project: Port of Tacoma, Parcel 40, F&BI 008077
Date Extracted: 08/10/20
Date Analyzed: 08/10/20

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)
SB-10-0820 008077-02	<1	<1	<1	<3	<100	83
SB-10D-0820 008077-03	<1	<1	<1	<3	<100	85
SB-11-0820 008077-06	<1	<1	<1	<3	430	82
SB-12-0820 008077-08	<1	<1	<1	<3	<100	81
SB-12D-0820 008077-09	<1	<1	<1	<3	<100	82
SB-13-0820 008077-11	<1	<1	<1	<3	280	83
SB-130-0820 008077-12	<1	<1	<1	<3	320	78
SB-14-0820 008077-14	<1	<1	3.0	<3	1,200	83
SB-15-0820 008077-16	<1	<1	<1	<3	<100	80
SB-16-0820 008077-18	<1	<1	<1	<3	<100	83
Method Blank 00-1782 MB	<1	<1	<1	<3	<100	85

Date of Report: 08/12/20
Date Received: 08/06/20
Project: Port of Tacoma, Parcel 40, F&BI 008077
Date Extracted: 08/06/20
Date Analyzed: 08/06/20

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)
SB-10-05 008077-01	<50	<250	89
SB-11-09 008077-04	8,000	550 x	97
SB-110-09 008077-05	9,400	640 x	99
SB-12-10 008077-07	150	<250	87
SB-13-09 008077-10	12,000	860 x	93
SB-14-09 008077-13	<50	<250	88
SB-15-08 008077-15	<50	<250	93
SB-16-05 008077-17	<50	<250	85
Method Blank 00-1774 MB	<50	<250	90

Date of Report: 08/12/20
Date Received: 08/06/20
Project: Port of Tacoma, Parcel 40, F&BI 008077
Date Extracted: 08/06/20
Date Analyzed: 08/06/20 and 08/07/20

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)
SB-10-0820 008077-02	<50	<250	115
SB-10D-0820 008077-03	<50	<250	102
SB-11-0820 008077-06	5,900	<250	114
SB-12-0820 008077-08	2,600	1,300	102
SB-12D-0820 008077-09	<50	<250	113
SB-13-0820 008077-11	9,000	960 x	78
SB-130-0820 008077-12	12,000	1,400 x	66
SB-14-0820 008077-14 1/10	130,000	5,600 x	ip
SB-15-0820 008077-16	2,900	330 x	78
SB-16-0820 008077-18	<50	<250	132
Method Blank 00-1776 MB	<50	<250	115

Date of Report: 08/12/20
Date Received: 08/06/20
Project: Port of Tacoma, Parcel 40, F&BI 008077
Date Extracted: 08/06/20
Date Analyzed: 08/06/20 and 08/07/20

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)
SB-10-0820 008077-02	<50	<250	97
SB-10D-0820 008077-03	400 x	<250	101
SB-11-0820 008077-06	7,200	<250	103
SB-12-0820 008077-08	3,600	1,300	110
SB-12D-0820 008077-09	1,700 x	380 x	103
SB-13-0820 008077-11	12,000	1,400 x	71
SB-130-0820 008077-12	16,000	1,900 x	60
SB-14-0820 008077-14 1/10	150,000	6,200 x	ip
SB-15-0820 008077-16	2,900	410 x	66
SB-16-0820 008077-18	<50	<250	115
Method Blank 00-1776 MB	<50	<250	109

Date of Report: 08/12/20
Date Received: 08/06/20
Project: Port of Tacoma, Parcel 40, F&BI 008077

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: 008054-02 (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	94	69-120
Toluene	mg/kg (ppm)	0.5	94	70-117
Ethylbenzene	mg/kg (ppm)	0.5	96	65-123
Xylenes	mg/kg (ppm)	1.5	93	66-120
Gasoline	mg/kg (ppm)	20	95	71-131

Date of Report: 08/12/20
Date Received: 08/06/20
Project: Port of Tacoma, Parcel 40, F&BI 008077

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: 008020-01 (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	92	69-120
Toluene	mg/kg (ppm)	0.5	94	70-117
Ethylbenzene	mg/kg (ppm)	0.5	96	65-123
Xylenes	mg/kg (ppm)	1.5	93	66-120
Gasoline	mg/kg (ppm)	20	90	71-131

Date of Report: 08/12/20
Date Received: 08/06/20
Project: Port of Tacoma, Parcel 40, F&BI 008077

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: 008021-01 (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	99	65-118
Toluene	ug/L (ppb)	50	99	72-122
Ethylbenzene	ug/L (ppb)	50	100	73-126
Xylenes	ug/L (ppb)	150	100	74-118
Gasoline	ug/L (ppb)	1,000	108	69-134

Date of Report: 08/12/20
Date Received: 08/06/20
Project: Port of Tacoma, Parcel 40, F&BI 008077

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 008075-01 (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	102	104	64-133	2

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	94	58-147

Date of Report: 08/12/20
Date Received: 08/06/20
Project: Port of Tacoma, Parcel 40, F&BI 008077

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	84	96	61-133	13

Date of Report: 08/12/20
Date Received: 08/06/20
Project: Port of Tacoma, Parcel 40, F&BI 008077

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	88	92	63-142	4

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.

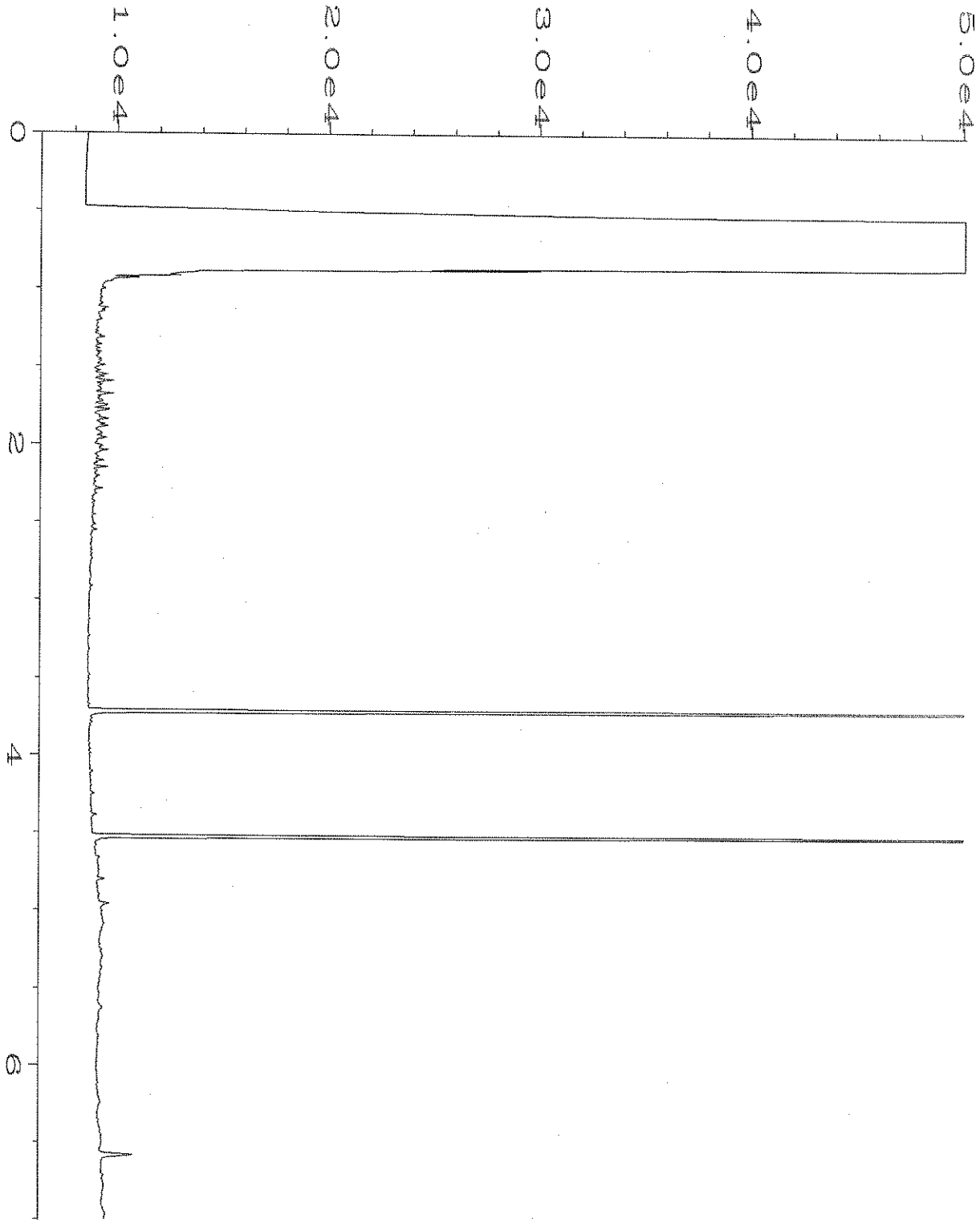
nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

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.



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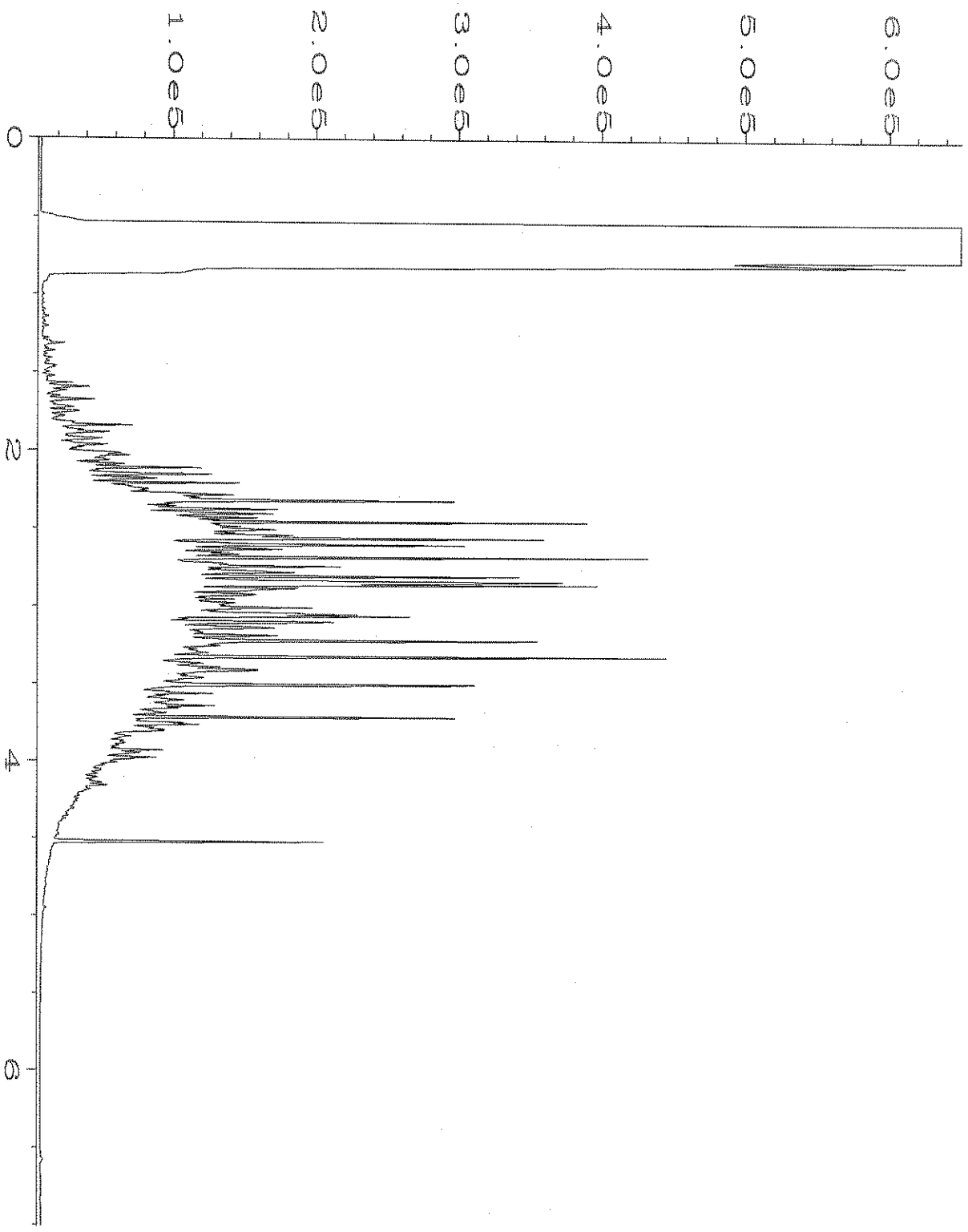
Operator : TL
Instrument : GC6
Sample Name : 008077-01
Run Time Bar Code:
Acquired on : 06 Aug 20 05:02 PM
Report Created on: 07 Aug 20 07:27 AM

Page Number : 1
Vial Number : 46
Injection Number : 1
Sequence Line : 7
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



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Instrument	: GC6	Vial Number	: 47
Sample Name	: 008077-04	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 7
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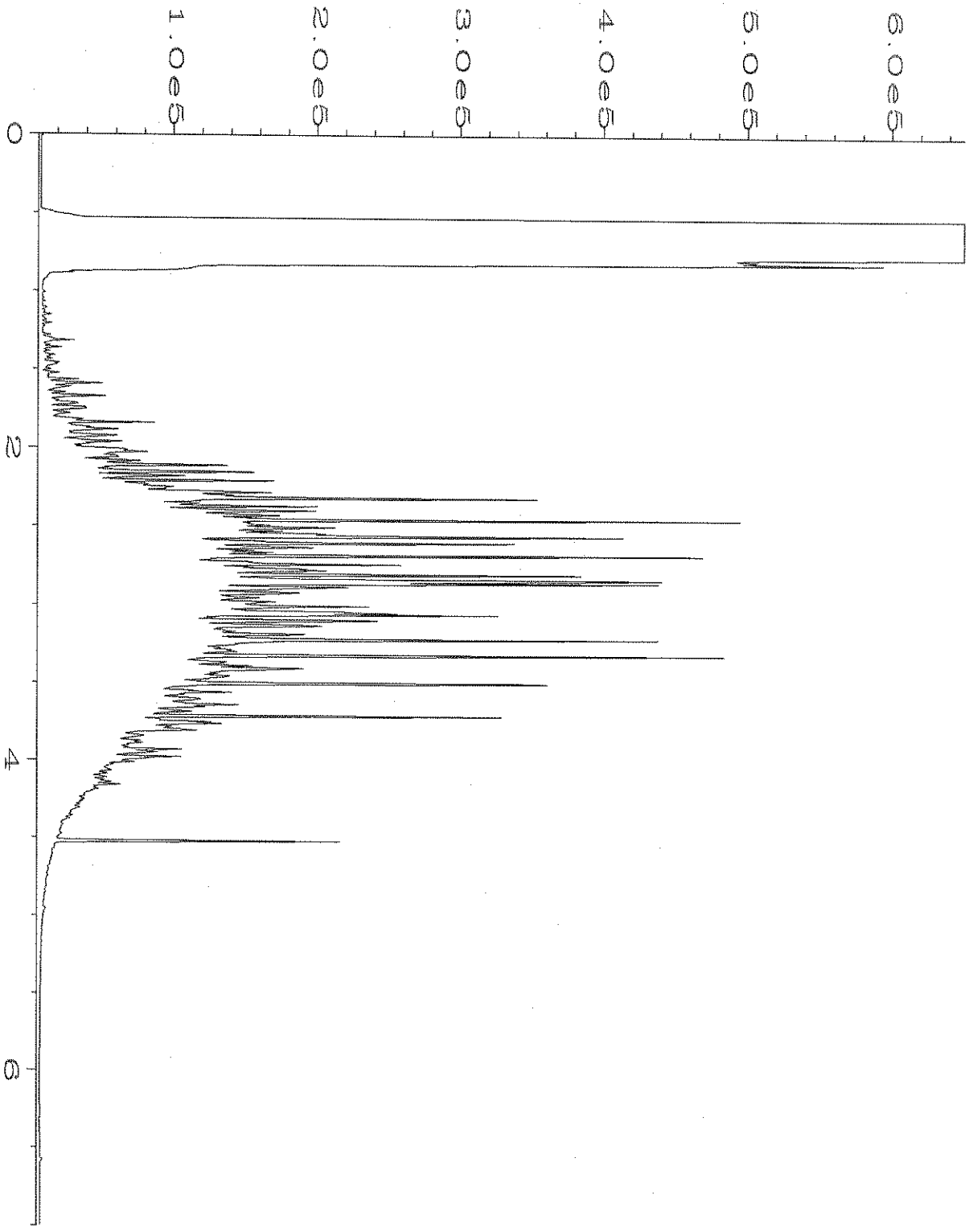
Report Created on	: 07 Aug 20 07:27 AM	Analysis Method	: DEFAULT.MTH



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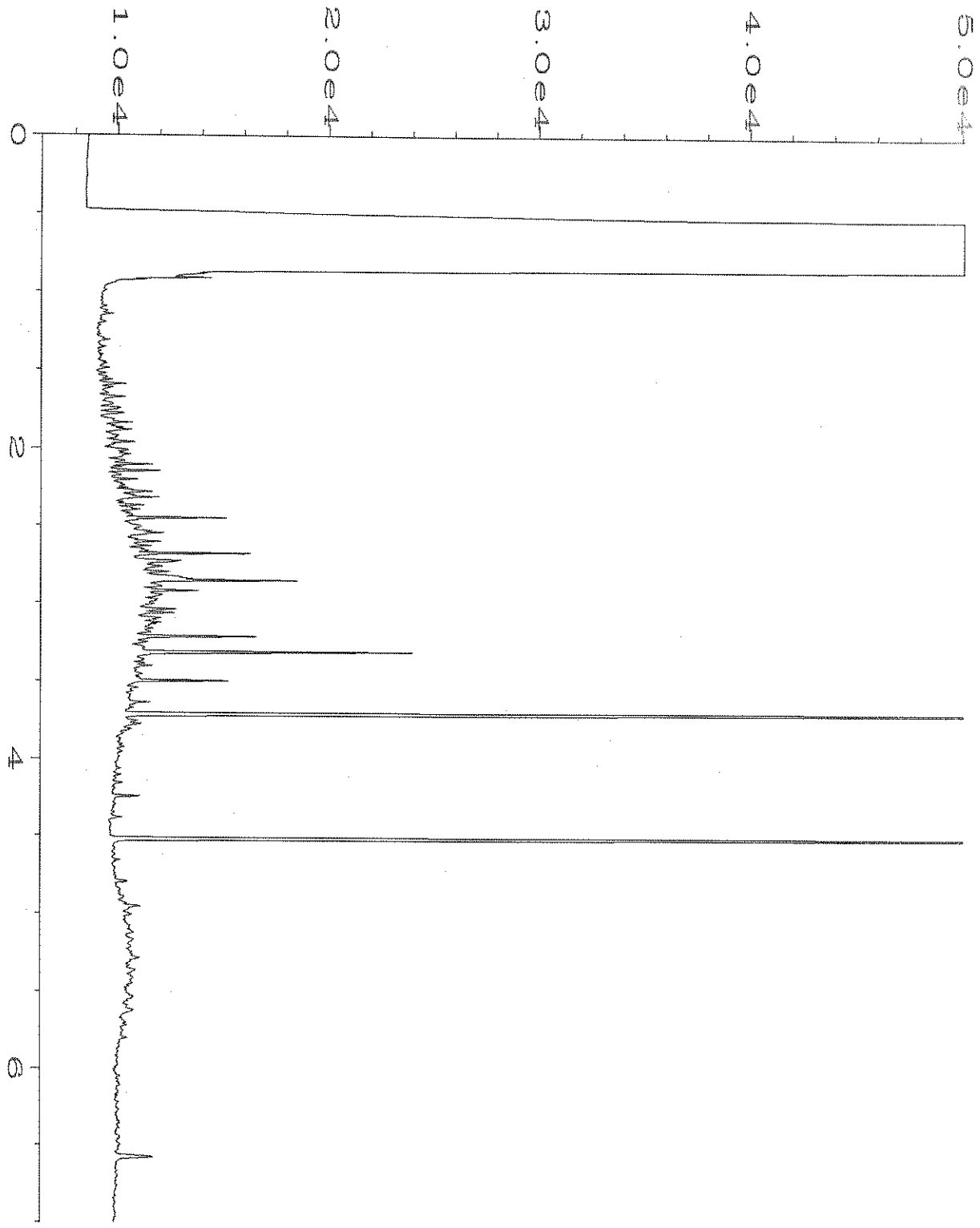
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 48
Sample Name	: 008077-05	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 7
Acquired on	: 06 Aug 20 05:24 PM	Instrument Method	: DX.MTH
Report Created on	: 07 Aug 20 07:27 AM	Analysis Method	: DEFAULT.MTH



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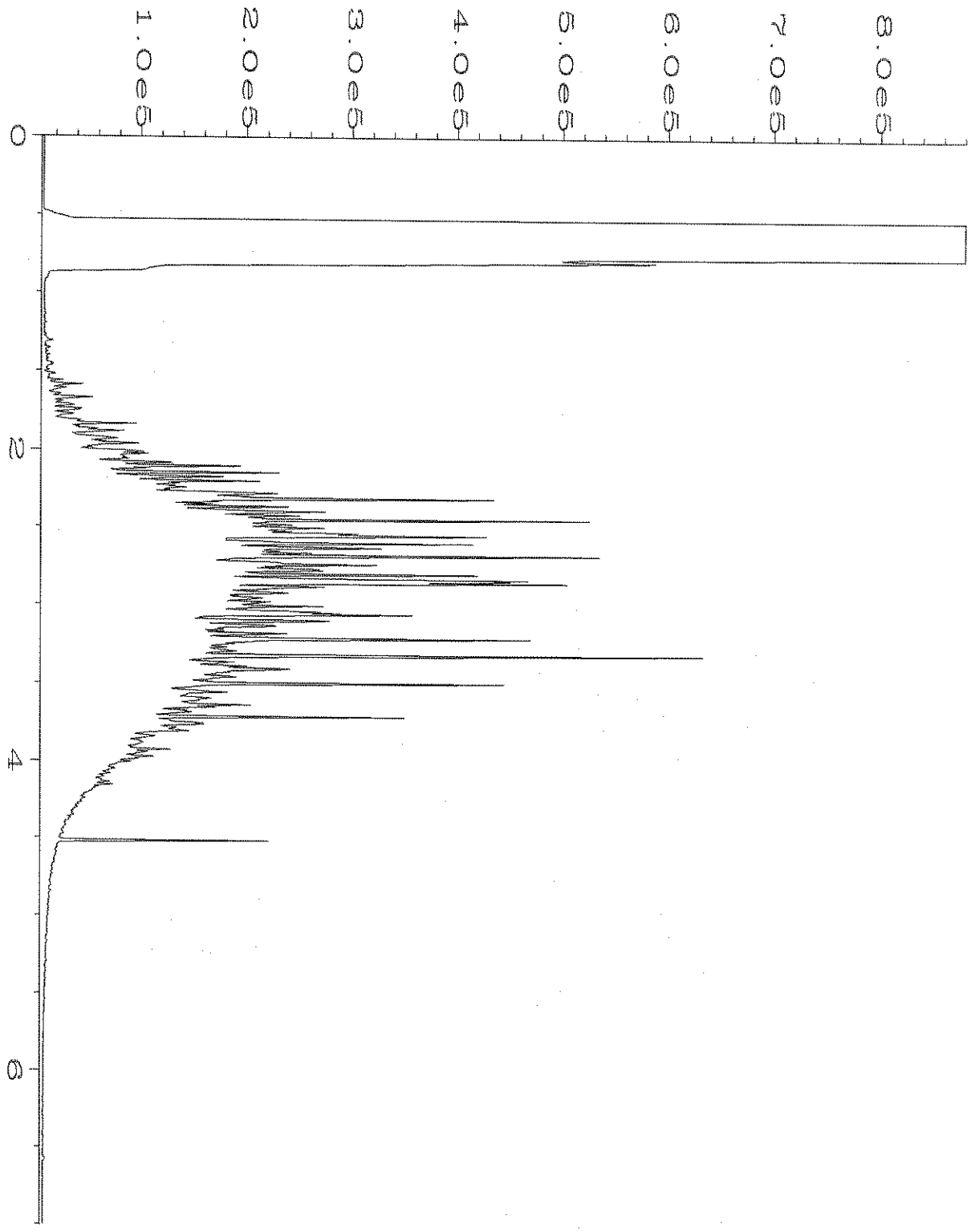
Operator : TL
Instrument : GC6
Sample Name : 008077-07
Run Time Bar Code:
Acquired on : 06 Aug 20 05:35 PM
Report Created on: 07 Aug 20 07:28 AM

Page Number : 1
Vial Number : 49
Injection Number : 1
Sequence Line : 7
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



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Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 50
Sample Name	: 008077-10	Injection Number	: 1
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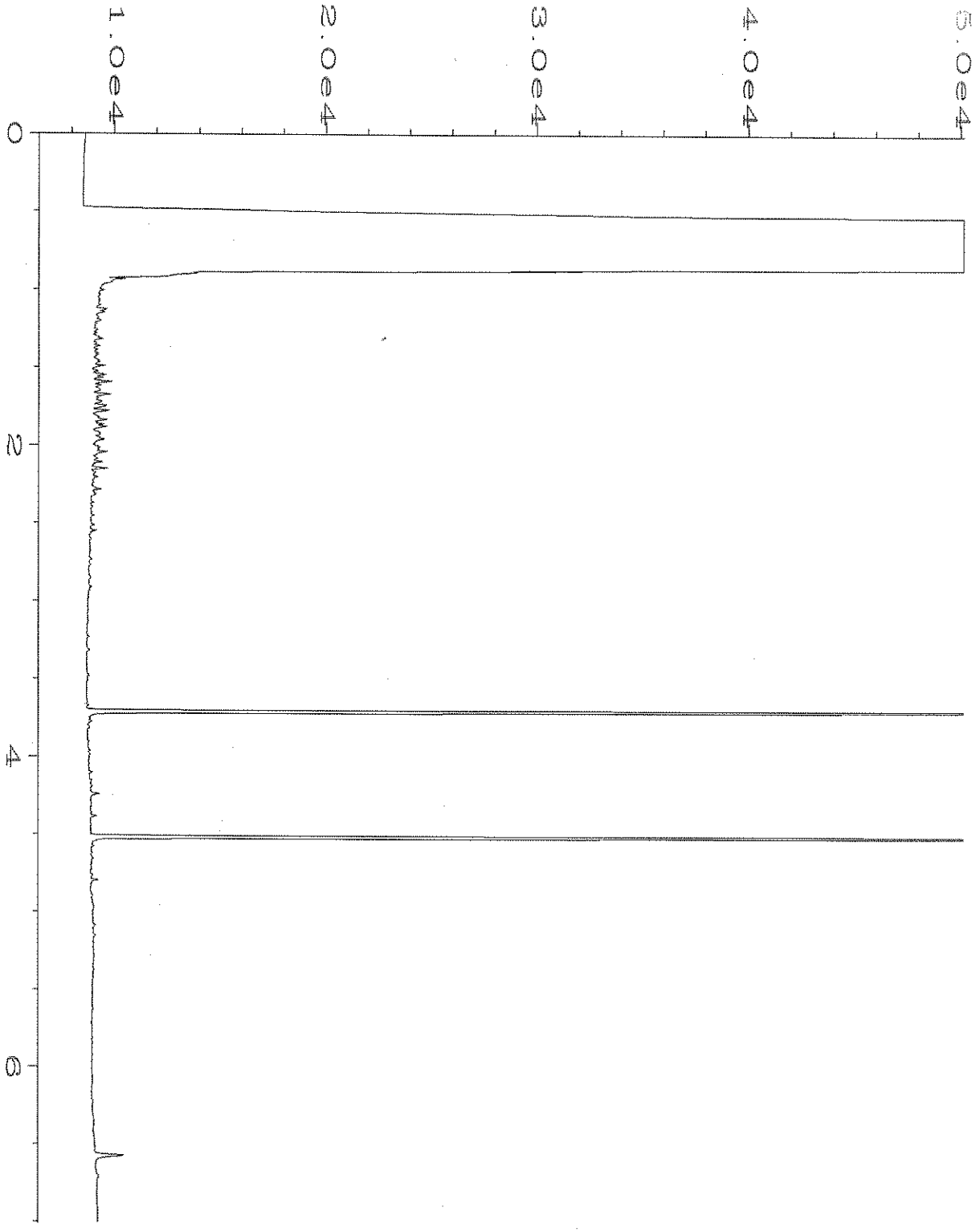
Report Created on	: 07 Aug 20 07:28 AM	Analysis Method	: DEFAULT.MTH



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Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 51
Sample Name	: 008077-13	Injection Number	: 1
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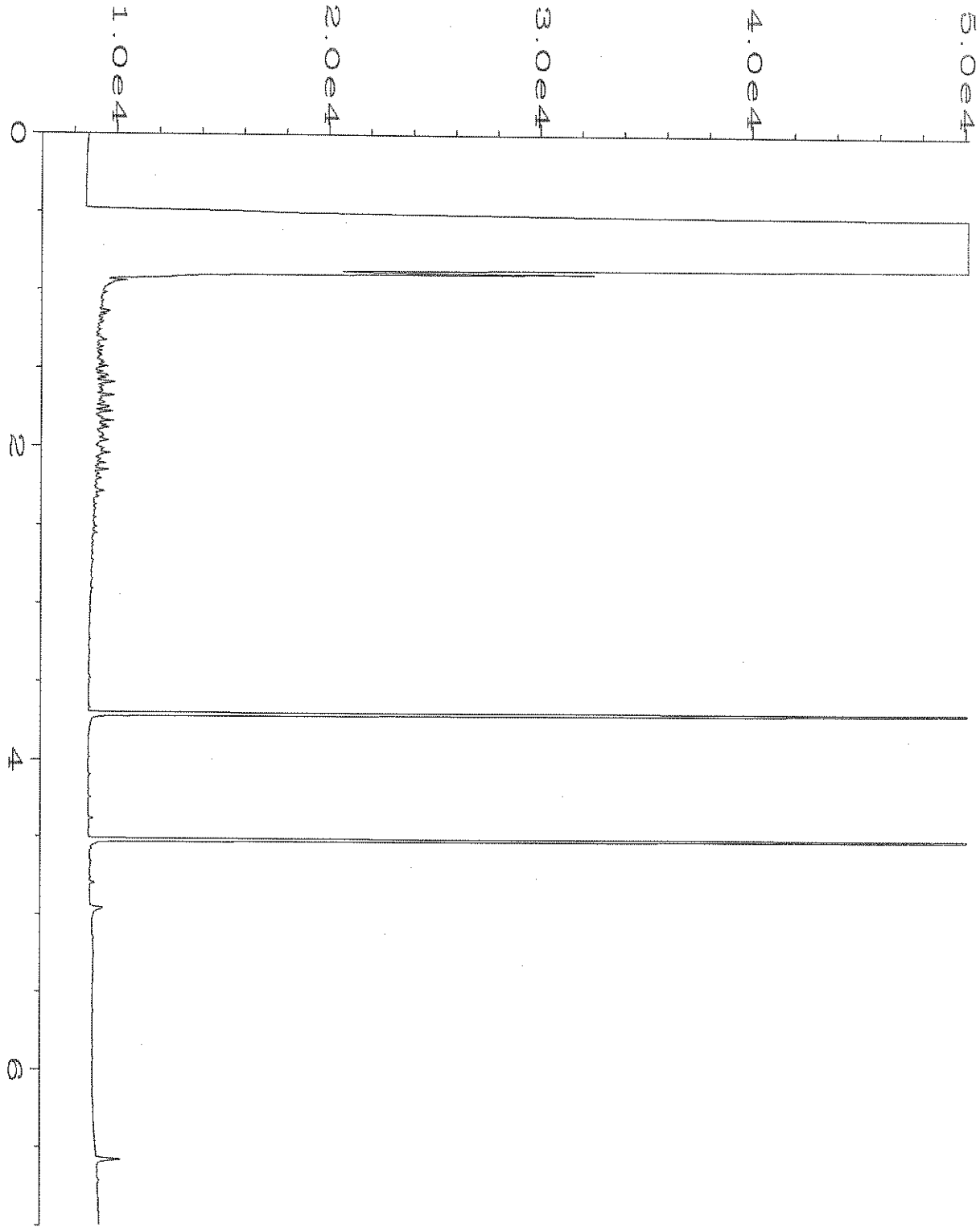
Report Created on:	07 Aug 20 07:28 AM	Analysis Method	: DEFAULT.MTH



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Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 52
Sample Name	: 008077-15	Injection Number	: 1
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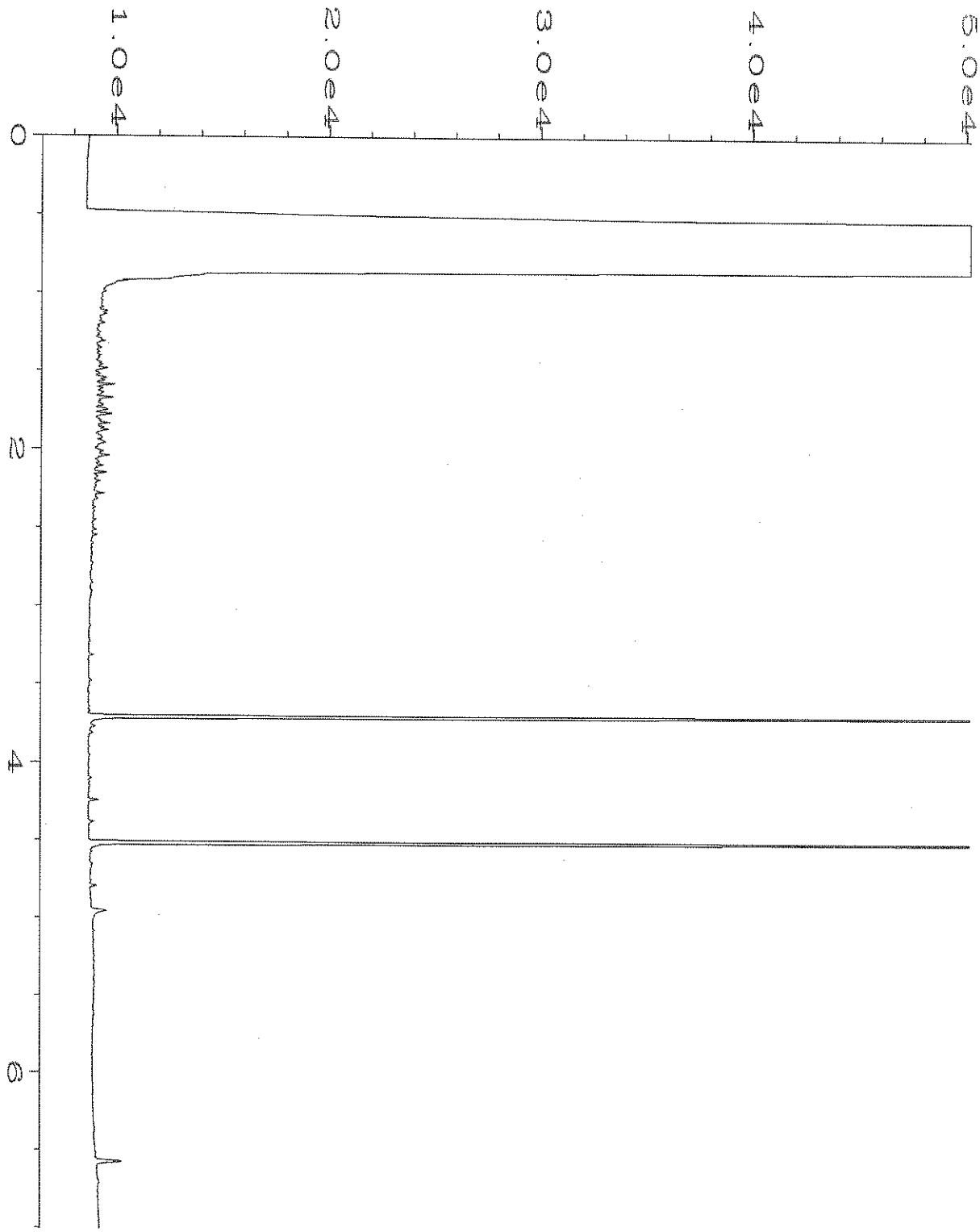

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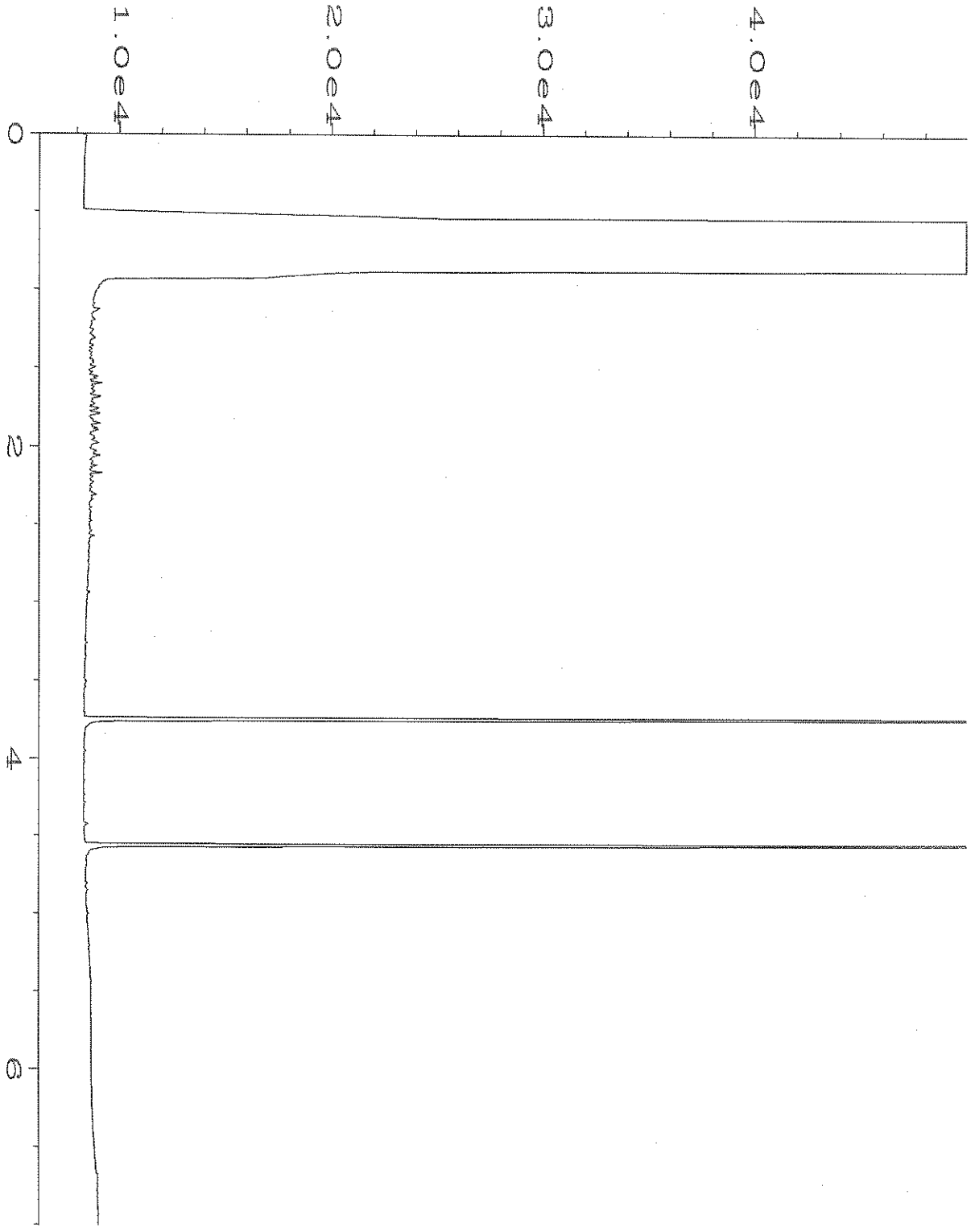
Operator : TL
Instrument : GC6
Sample Name : 008077-17
Run Time Bar Code:
Acquired on : 06 Aug 20 06:19 PM
Report Created on: 07 Aug 20 07:28 AM

Page Number : 1
Vial Number : 53
Injection Number : 1
Sequence Line : 7
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



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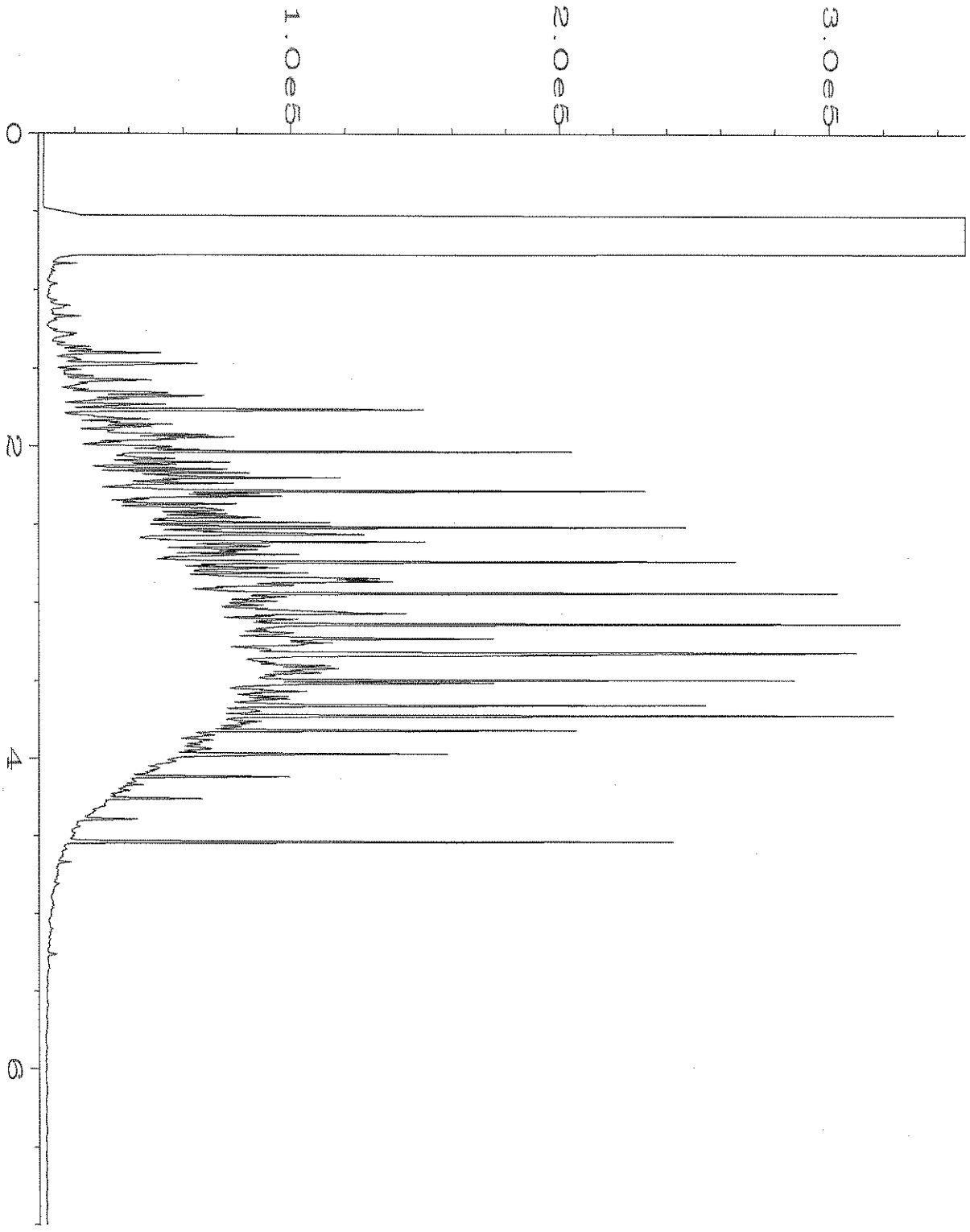
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 6
Sample Name	: 00-1774 mb	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 3
Acquired on	: 06 Aug 20 08:39 AM	Instrument Method	: DX.MTH
Report Created on	: 07 Aug 20 07:29 AM	Analysis Method	: DEFAULT.MTH



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Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 5
Sample Name	: 1000 Dx 60-170B	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 4
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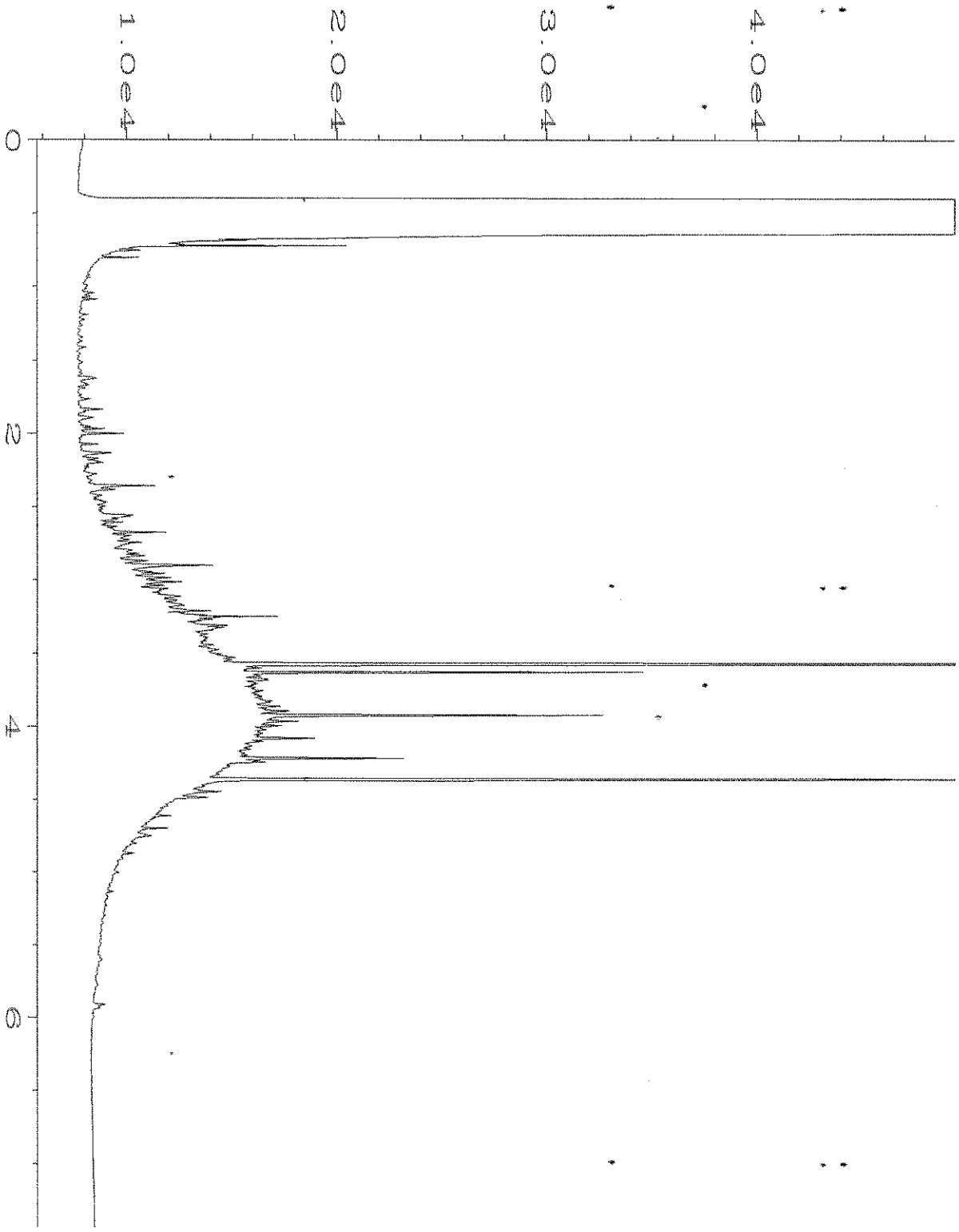
Report Created on	: 07 Aug 20 07:29 AM	Analysis Method	: DEFAULT.MTH



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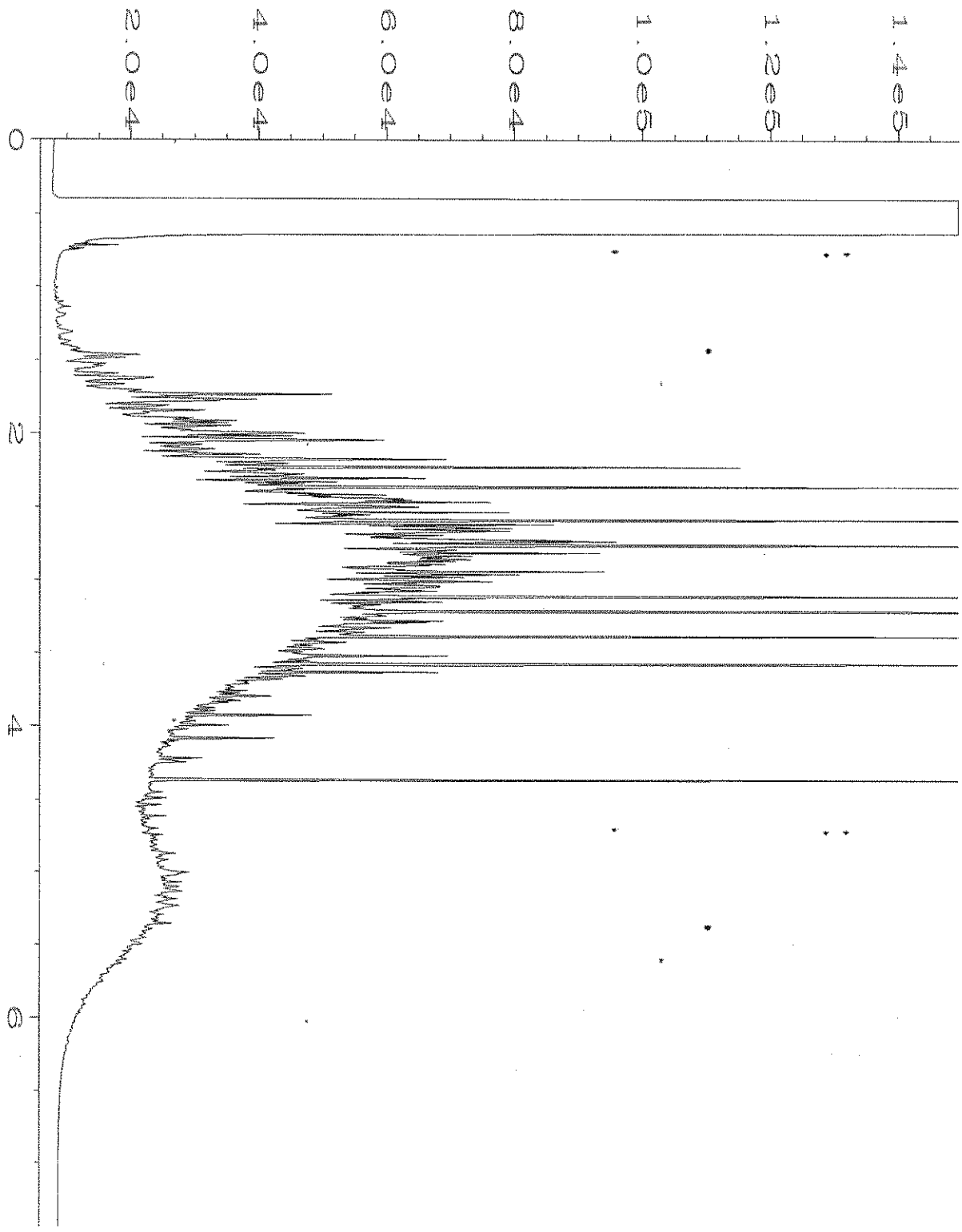
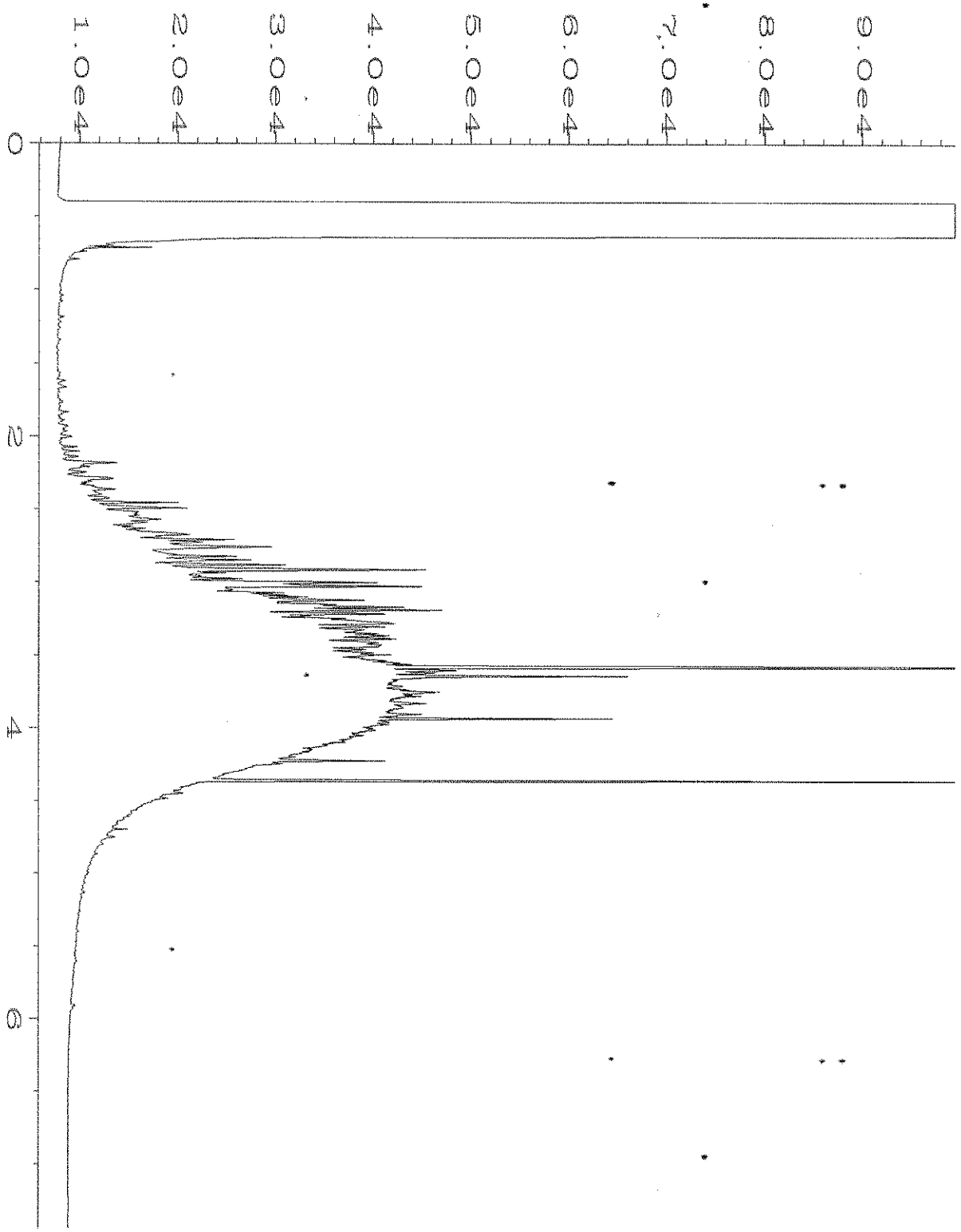
Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 22
Sample Name	: 008077-03	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 6
Acquired on	: 06 Aug 20 03:04 PM	Instrument Method	: DX.MTH
Report Created on	: 07 Aug 20 08:06 AM	Analysis Method	: DEFAULT.MTH

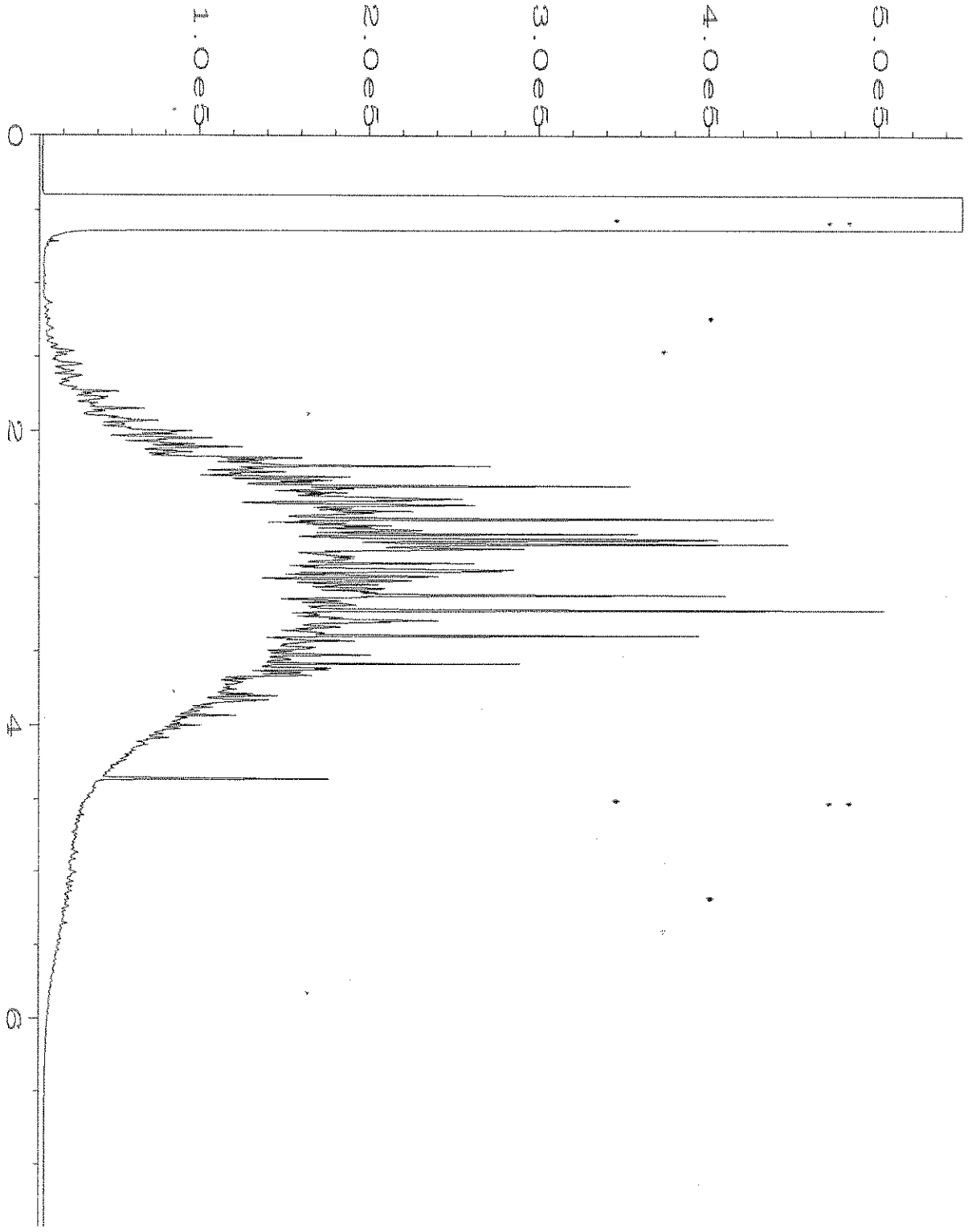


Data File Name : C:\HPCHEM\1\DATA\08-06-20\024F0601.D
Operator : TL
Instrument : GC1
Sample Name : 008077-08
Run Time Bar Code:
Acquired on : 06 Aug 20 03:27 PM
Report Created on: 07 Aug 20 08:06 AM

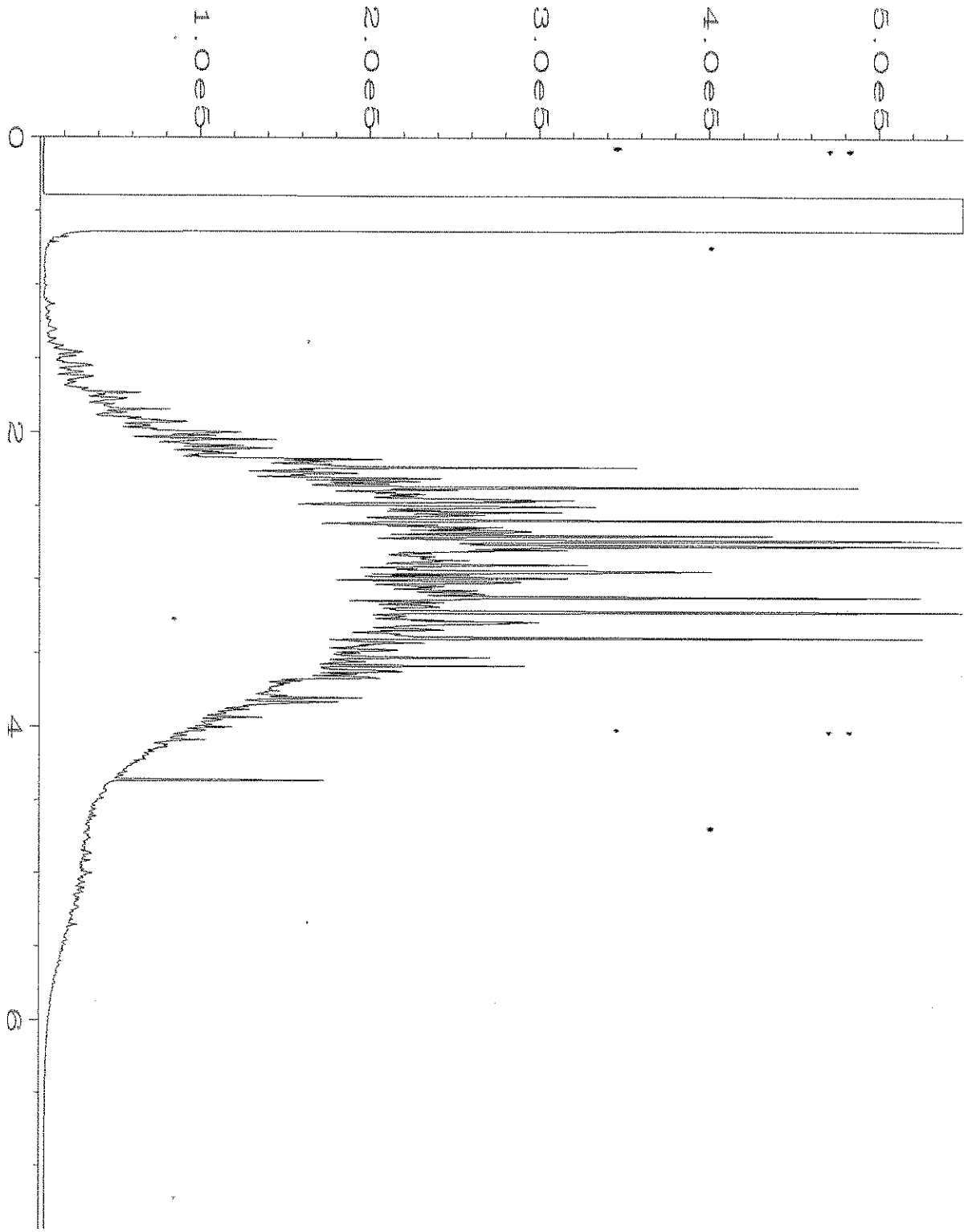
Page Number : 1
Vial Number : 24
Injection Number : 1
Sequence Line : 6
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



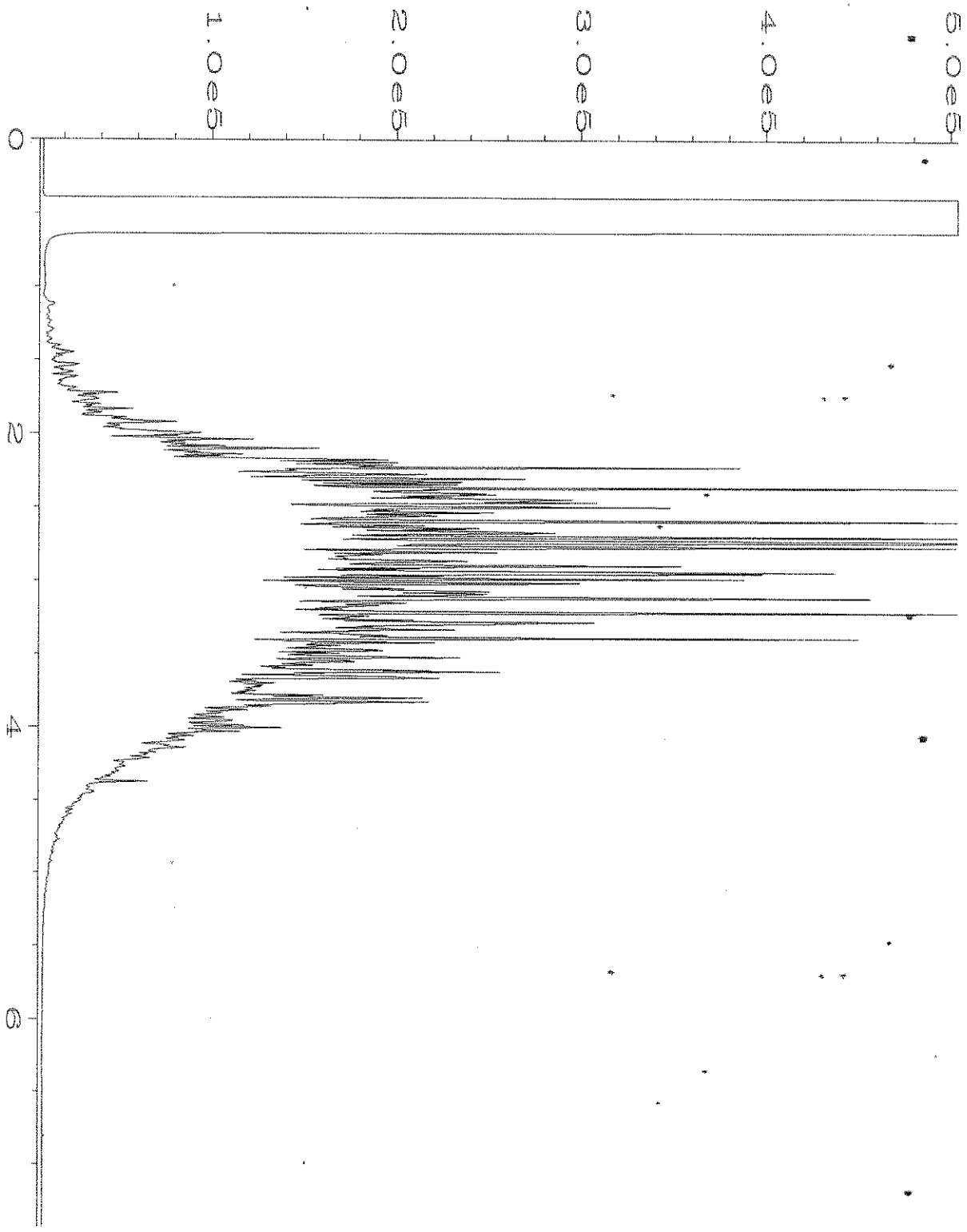
Data File Name	: C:\HPCHEM\1\DATA\08-06-20\025F0601.D		
Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 25
Sample Name	: 008077-09	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 6
Acquired on	: 06 Aug 20 03:39 PM	Instrument Method	: DX.MTH
Report Created on	: 07 Aug 20 08:06 AM	Analysis Method	: DEFAULT.MTH



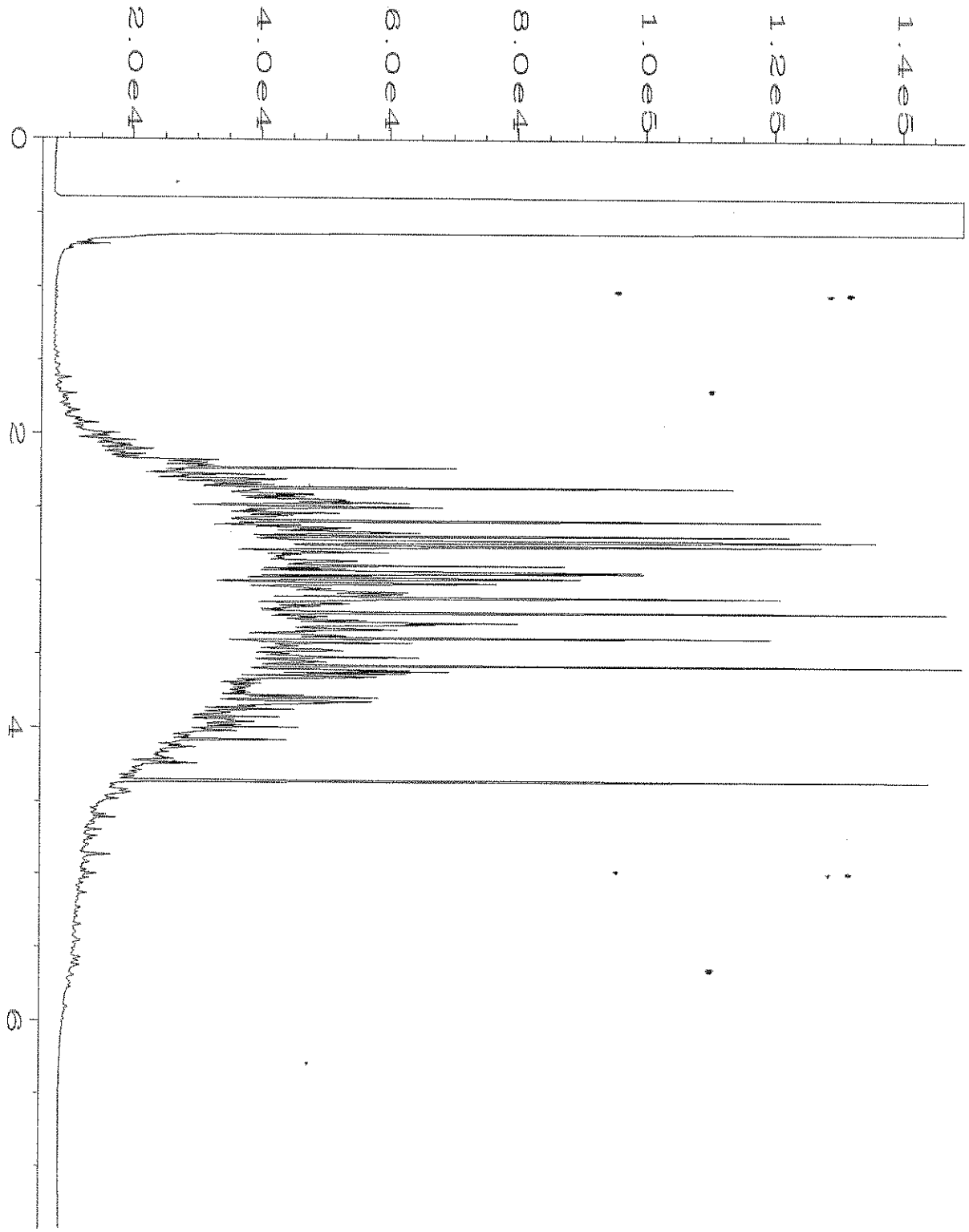
Data File Name	: C:\HPCHEM\1\DATA\08-06-20\026F0601.D		
Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 26
Sample Name	: 008077-11	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 6
Acquired on	: 06 Aug 20 03:51 PM	Instrument Method	: DX.MTH
Report Created on:	07 Aug 20 08:07 AM	Analysis Method	: DEFAULT.MTH



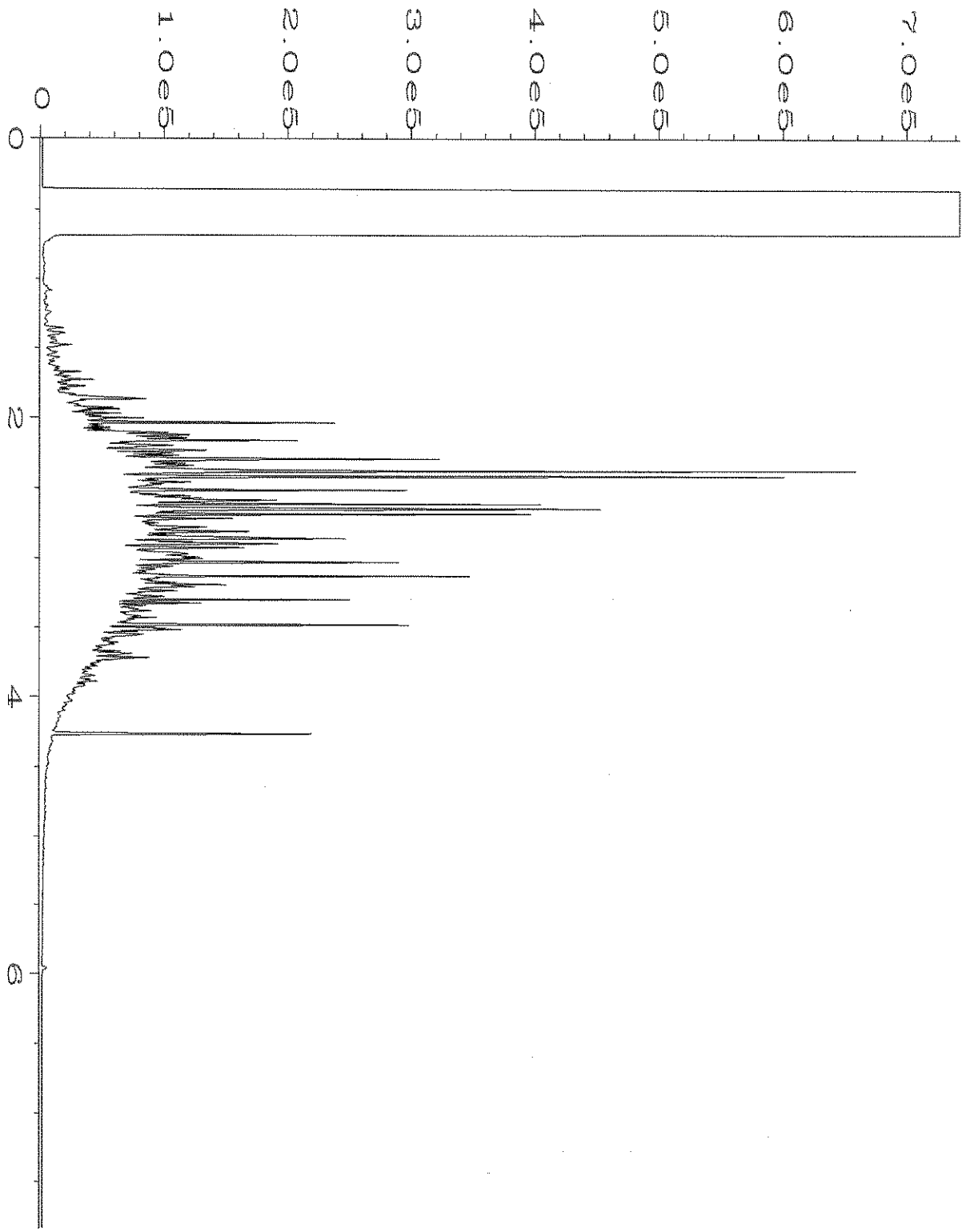
Data File Name	: C:\HPCHEM\1\DATA\08-06-20\027F0601.D		
Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 27
Sample Name	: 008077-12	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 6
Acquired on	: 06 Aug 20 04:03 PM	Instrument Method	: DX.MTH
Report Created on	: 07 Aug 20 08:07 AM	Analysis Method	: DEFAULT.MTH



Data File Name	: C:\HPCHEM\1\DATA\08-07-20\006F0301.D		
Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 6
Sample Name	: 008077-14 1/10	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 3
Acquired on	: 07 Aug 20 09:49 AM	Instrument Method	: DX.MTH
Report Created on	: 10 Aug 20 07:43 AM	Analysis Method	: DEFAULT.MTH

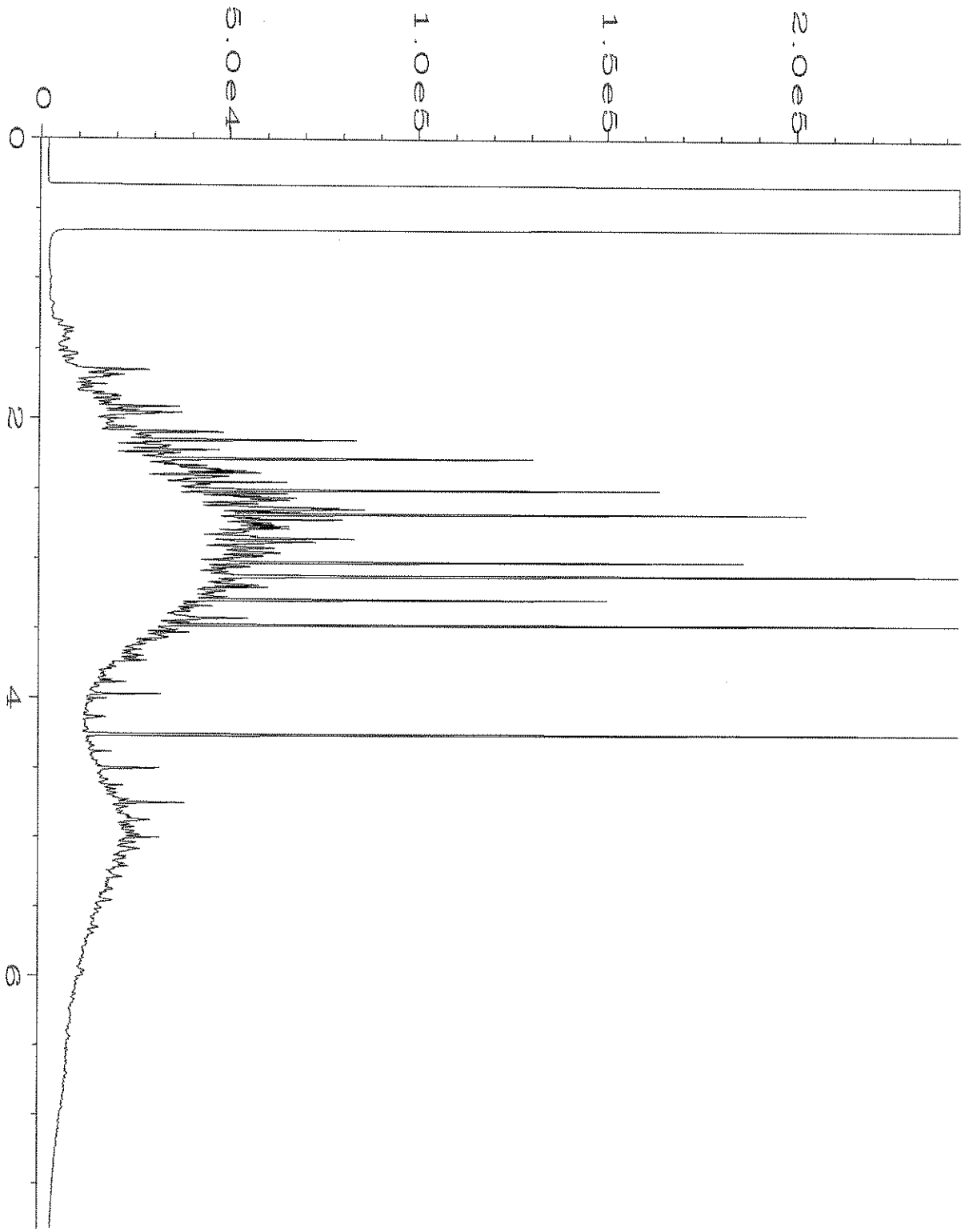


Data File Name	: C:\HPCHEM\1\DATA\08-06-20\029F0601.D		
Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 29
Sample Name	: 008077-16	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 6
Acquired on	: 06 Aug 20 04:26 PM	Instrument Method	: DX.MTH
Report Created on	: 07 Aug 20 08:08 AM	Analysis Method	: DEFAULT.MTH

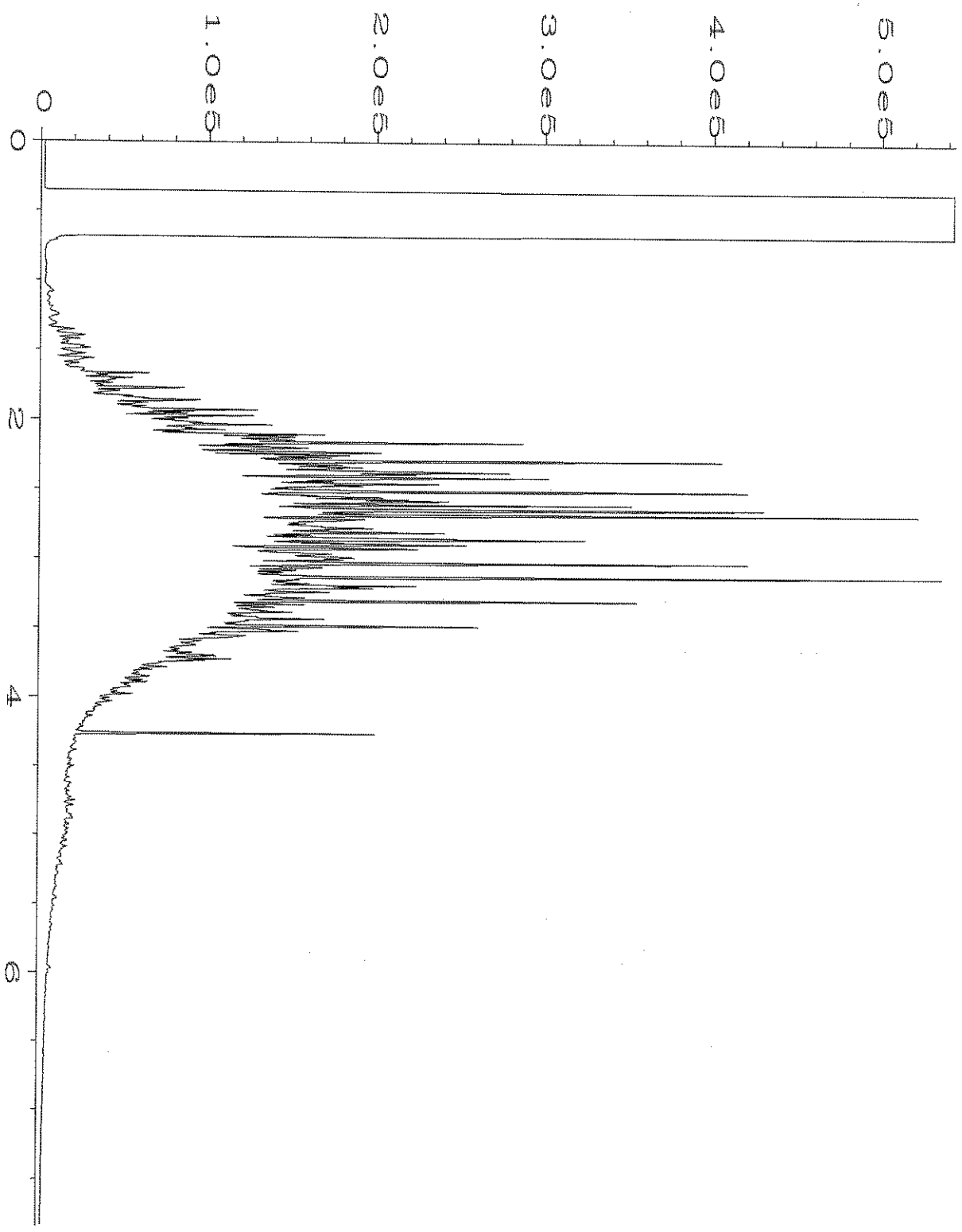


Data File Name : C:\HPCHEM\4\DATA\08-06-20\052F0901.D
Operator : TL
Instrument : GC#4
Sample Name : 008077-06 sg
Run Time Bar Code:
Acquired on : 06 Aug 20 07:53 PM
Report Created on: 07 Aug 20 08:44 AM

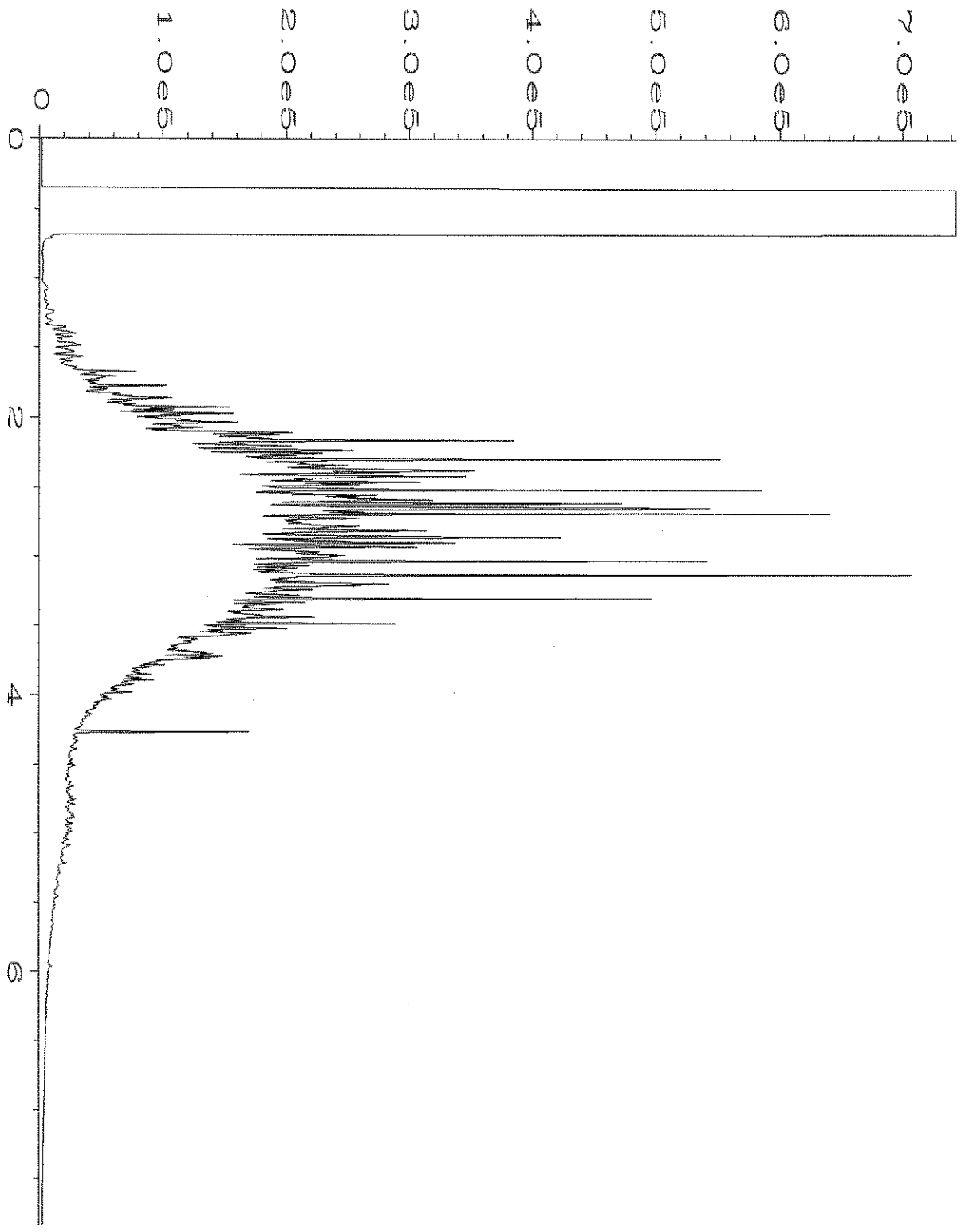
Page Number : 1
Vial Number : 52
Injection Number : 1
Sequence Line : 9
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



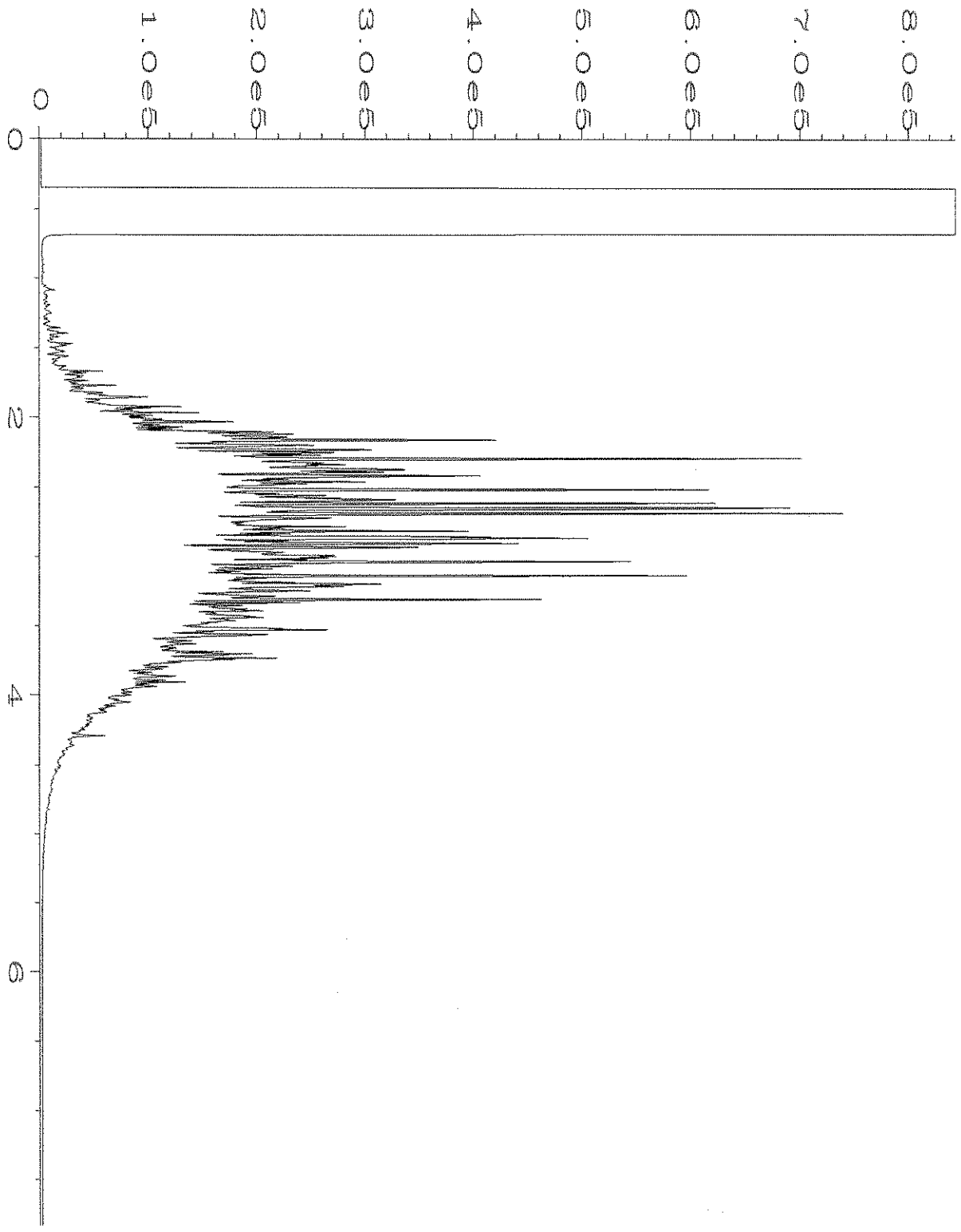
Data File Name	: C:\HPCHEM\4\DATA\08-06-20\053F0901.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 53
Sample Name	: 008077-08 sg	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 9
Acquired on	: 06 Aug 20 08:06 PM	Instrument Method	: DX.MTH
Report Created on	: 07 Aug 20 08:45 AM	Analysis Method	: DEFAULT.MTH



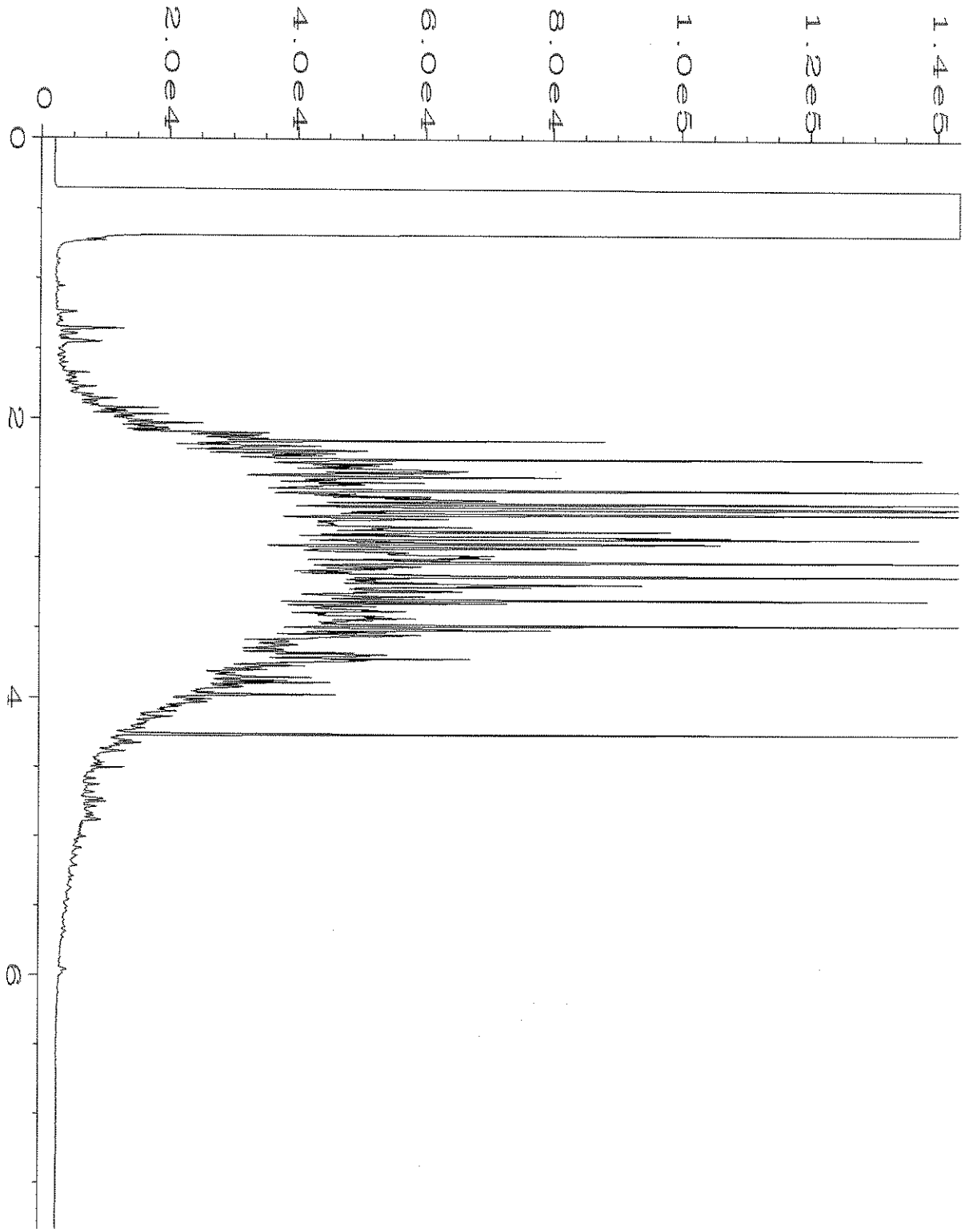
Data File Name	: C:\HPCHEM\4\DATA\08-06-20\055F0901.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 55
Sample Name	: 008077-11 sg	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 9
Acquired on	: 06 Aug 20 08:32 PM	Instrument Method	: DX.MTH
Report Created on	: 07 Aug 20 08:45 AM	Analysis Method	: DEFAULT.MTH



Data File Name	: C:\HPCHEM\4\DATA\08-06-20\056F0901.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 56
Sample Name	: 008077-12 sg	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 9
Acquired on	: 06 Aug 20 08:45 PM	Instrument Method	: DX.MTH
Report Created on	: 07 Aug 20 08:45 AM	Analysis Method	: DEFAULT.MTH



Data File Name	: C:\HPCHEM\4\DATA\08-07-20\006F0301.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 6
Sample Name	: 008077-14 1/10 s	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 3
Acquired on	: 07 Aug 20 09:54 AM	Instrument Method	: DX.MTH
Report Created on	: 10 Aug 20 07:14 AM	Analysis Method	: DEFAULT.MTH



Data File Name	: C:\HPCHEM\4\DATA\08-06-20\058F0901.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 58
Sample Name	: 008077-16 sg	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 9
Acquired on	: 06 Aug 20 09:10 PM	Instrument Method	: DX.MTH
Report Created on	: 07 Aug 20 08:46 AM	Analysis Method	: DEFAULT.MTH

008077

SAMPLE CHAIN OF CUSTODY ME 8/6/20 VW2/VS2/C03

Page # 1 of 2

Report To Grant Hainsworth

Company CRETE CONSULTING, INC.

Address 108 S. Washington St., Ste. 300

City, State, ZIP Seattle, WA 98104

Phone 253-797-6323 Email

SAMPLERS (*signature*) Rusty Jones R. Jones

PROJECT NAME: Port of Tacoma, Parcel 40

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	w/ silica gel	w/o Silica gel			Notes
SB-10-05	01 A-E	8.5.2020	0815	SOIL	5	✓	✓	✓									
SB-10-0820	02		0825	WATER	5	✓	✓	✓					✓	✓			
SB-10D-0820	03		0910	↓	5	✓	✓	✓					✓	✓			
SB-11-09	04		1010	SOIL	5	✓	✓	✓									
SB-110-09	05		1010	↓	5	✓	✓	✓									
SB-11-0820	06		1015	WATER	5	✓	✓	✓					✓	✓			
SB-12-10	07		1055	SOIL	5	✓	✓	✓									
SB-12-0820	08		1100	WATER	5	✓	✓	✓					✓	✓			
SB-12D-0820	09		1225	↓	5	✓	✓	✓					✓	✓			
SB-13-09	10	↓	1330	SOIL	5	✓	✓	✓									

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Rusty Jones R. Jones	Rusty Jones	CRETE CONSULTING	8.6.20	0831
Received by:	Ann Webber Bruya	F&B		
Relinquished by:				
Received by:		Samples received at Ø °C		

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

008077

SAMPLE CHAIN OF CUSTODY ME 8/6/20 VW2/VS2/C03

Report To G. Hainsworth

Company CRETE Consulting

Address

City, State, ZIP

Phone 253-797-6323 Email

SAMPLERS (*signature*) Rusty Jones R. Jones

PROJECT NAME: Port of Tacoma, Parcel 40

PO #

REMARKS

Project specific RLs? - Yes / No

INVOICE TO

Page # ____ of ____

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	ANALYSES REQUESTED: NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	w/ silica gel	w/o silica gel			Notes
SB-13-0820	11 A-E	8.5.2020	1335	WATER	5	✓	✓	✓					✓	✓			
SB-130-0820	12		1335	↓	5	✓	✓	✓					✓	✓			
SB-14-09	13		1420	SOIL	5	✓	✓	✓									
SB-14-0820	14		1425	WATER	5	✓	✓	✓					✓	✓			
SB-15-08	15		1510	SOIL	5	✓	✓	✓									
SB-15-0820	16		1515	WATER	5	✓	✓	✓					✓	✓			
SB-16-05	17		1600	SOIL	5	✓	✓	✓									
SB-16-0820	18	↓	1605	WATER	5	✓	✓	✓					✓	✓			

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	CRETE CONSULTING	8.6.20	0831
Received by: Ann Webber Bruya	Ann Webber Bruya	F&B		
Relinquished by:				
Received by:		Samples received at ____ °C		

Friedman & Bruya, Inc.
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Seattle, WA 98119-2029
Ph. (206) 285-8282

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

October 12, 2020

Grant Hainsworth, Project Manager
Crete Consulting
108 S. Washington St., Suite 300
Seattle, WA 98104

Dear Mr Hainsworth:

Included are the results from the testing of material submitted on October 5, 2020 from the Port of Tacoma Parcel 40, F&BI 010077 project. There are 6 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
CTC1012R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on October 5, 2020 by Friedman & Bruya, Inc. from the Crete Consulting Port of Tacoma Parcel 40, F&BI 010077 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
010077 -01	MW-11-10-11.5

All quality control requirements were acceptable.

Date of Report: 10/12/20
Date Received: 10/05/20
Project: Port of Tacoma Parcel 40, F&BI 010077
Date Extracted: 10/07/20
Date Analyzed: 10/08/20

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 50-132)
MW-11-10-11.5 010077-01	<0.02	<0.02	<0.02	<0.06	<5	78
Method Blank 00-2168 MB	<0.02	<0.02	<0.02	<0.06	<5	77

Date of Report: 10/12/20
Date Received: 10/05/20
Project: Port of Tacoma Parcel 40, F&BI 010077
Date Extracted: 10/06/20
Date Analyzed: 10/06/20

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 56-165)
MW-11-10-11.5 010077-01	<50	<250	89
Method Blank 00-2274 MB	<50	<250	81

Date of Report: 10/12/20
Date Received: 10/05/20
Project: Port of Tacoma Parcel 40, F&BI 010077

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: 010077-01 (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	0.032	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	90	66-121
Toluene	mg/kg (ppm)	0.5	88	72-128
Ethylbenzene	mg/kg (ppm)	0.5	90	69-132
Xylenes	mg/kg (ppm)	1.5	93	69-131
Gasoline	mg/kg (ppm)	20	80	61-153

Date of Report: 10/12/20
Date Received: 10/05/20
Project: Port of Tacoma Parcel 40, F&BI 010077

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 010077-01 (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	90	104	63-146	14

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	98	79-144

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.

010077

SAMPLE CHAIN OF CUSTODY

ME 10/5/20

VS1/C01

Page # 1 of 1

Report To Grant Hainsworth/Rusty Jones

Company Crete Consulting

Address 108 S. Washington, Ste. 300

City, State, ZIP Seattle, WA 98104

Phone _____ Email _____

SAMPLERS (*signature*): Rusty Jones R. Jones

PROJECT NAME: Port of Tacoma, Parcel 40

PO #:

REMARKS:

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					Notes
MW-11-10-11.5		10.4.2020	0845	Soil	5	X	X	X									
																	Samples received at 4 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	Crete Consulting	10/5/2020 10.4.2020	1030
Received by:	Nhan Phan	FEBT	10/5/20	1030
Relinquished by:			NP	
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

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

November 25, 2020

Grant Hainsworth, Project Manager
Crete Consulting
108 S. Washington St., Suite 300
Seattle, WA 98104

Dear Mr Hainsworth:

Included are the results from the testing of material submitted on November 18, 2020 from the Port of Tacoma, Parcel 40, F&BI 011334 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
c: Rusty Jones
CTC1125R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on November 18, 2020 by Friedman & Bruya, Inc. from the Crete Consulting Port of Tacoma, Parcel 40, F&BI 011334 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
011334 -01	GEI-MW11-1120
011334 -02	GEI-MW3-1120

All quality control requirements were acceptable.

Date of Report: 11/25/20
Date Received: 11/18/20
Project: Port of Tacoma, Parcel 40, F&BI 011334
Date Extracted: 11/19/20
Date Analyzed: 11/19/20

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)
GEI-MW11-1120 011334-01	<1	<1	<1	<3	<100	83
GEI-MW3-1120 011334-02	<1	<1	<1	<3	<100	82
Method Blank 00-2424 MB	<1	<1	<1	<3	<100	83

Date of Report: 11/25/20
Date Received: 11/18/20
Project: Port of Tacoma, Parcel 40, F&BI 011334
Date Extracted: 11/19/20
Date Analyzed: 11/19/20

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)
GEI-MW11-1120 011334-01	<50	<250	127
GEI-MW3-1120 011334-02	<50	<250	115
Method Blank 00-2542 MB	<50	<250	116

Date of Report: 11/25/20
Date Received: 11/18/20
Project: Port of Tacoma, Parcel 40, F&BI 011334
Date Extracted: 11/19/20
Date Analyzed: 11/19/20

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)
GEI-MW11-1120 011334-01	150 x	<250	109
GEI-MW3-1120 011334-02	430 x	540 x	103
Method Blank 00-2542 MB	<50	<250	95

Date of Report: 11/25/20
Date Received: 11/18/20
Project: Port of Tacoma, Parcel 40, F&BI 011334

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: 011333-05 (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	106	65-118
Toluene	ug/L (ppb)	50	99	72-122
Ethylbenzene	ug/L (ppb)	50	97	73-126
Xylenes	ug/L (ppb)	150	96	74-118
Gasoline	ug/L (ppb)	1,000	97	69-134

Date of Report: 11/25/20
Date Received: 11/18/20
Project: Port of Tacoma, Parcel 40, F&BI 011334

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	83	102	61-133	20

Date of Report: 11/25/20
Date Received: 11/18/20
Project: Port of Tacoma, Parcel 40, F&BI 011334

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	89	108	63-142	19

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.

011334

SAMPLE CHAIN OF CUSTODY

M E 11-18-20

Page # 1 of 1 VW2 603

Report To G. Hainsworth, R. Jones

Company Crete Consulting

Address 108 S. Washington, Ste. 300

City, State, ZIP Seattle, WA 98104

Phone _____ Email _____

SAMPLERS (*signature*) Rusty Jones R. Jones

PROJECT NAME Port of Tacoma, Parcel 40

PO #

REMARKS With and without SGC

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	ANALYSES REQUESTED: NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082					Notes
GEI-MW11-1120	01 A-E	11.18.20	0359	WATER	5	X	X	X									
GEI-MW3-1120	02 1	↓	0441	↓	5	X	X	X									
																	Samples received at 2 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	Crete Consulting	11.18.20	1316
Received by:	Khan Phan	FEBI	11-18-20	1316
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

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

December 1, 2020

Grant Hainsworth, Project Manager
Crete Consulting
108 S. Washington St., Suite 300
Seattle, WA 98104

Dear Mr Hainsworth:

Included are the results from the testing of material submitted on November 19, 2020 from the Port of Tacoma Parcel 40, F&BI 011362 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
c: Rusty Jones, Jamie Stevens
CTC1201R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on November 19, 2020 by Friedman & Bruya, Inc. from the Crete Consulting Port of Tacoma Parcel 40, F&BI 011362 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
011362 -01	GEI-MW10-1120
011362 -02	GEI-MW5-1120
011362 -03	GEI-MW8-1120
011362 -04	GEI-MW6-1120
011362 -05	DUP-1120
011362 -06	GEI-MW1-1120

All quality control requirements were acceptable.

Date of Report: 12/01/20
Date Received: 11/19/20
Project: Port of Tacoma Parcel 40, F&BI 011362
Date Extracted: 11/24/20
Date Analyzed: 11/25/20

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)
GEI-MW10-1120 011362-01	<1	<1	<1	<3	<100	87
GEI-MW5-1120 011362-02	<1	<1	<1	<3	<100	87
GEI-MW8-1120 011362-03	<1	<1	<1	<3	130	88
GEI-MW6-1120 011362-04	<1	<1	<1	<3	<100	88
DUP-1120 011362-05	<1	<1	<1	<3	<100	87
GEI-MW1-1120 011362-06	46	6.7	22	14	1,700	102
Method Blank 00-2430 MB	<1	<1	<1	<3	<100	84

Date of Report: 12/01/20
Date Received: 11/19/20
Project: Port of Tacoma Parcel 40, F&BI 011362
Date Extracted: 11/20/20
Date Analyzed: 11/24/20

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 41-152)
GEI-MW10-1120 011362-01	<50	<250	111
GEI-MW5-1120 011362-02	<50	<250	116
GEI-MW8-1120 011362-03	550	<250	122
GEI-MW6-1120 011362-04	<50	<250	118
DUP-1120 011362-05	<50	<250	116
GEI-MW1-1120 011362-06	8,500	320 x	123
Method Blank 00-2574 MB	<50	<250	122

Date of Report: 12/01/20
Date Received: 11/19/20
Project: Port of Tacoma Parcel 40, F&BI 011362
Date Extracted: 11/20/20
Date Analyzed: 11/20/20

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)
GEI-MW10-1120 011362-01	720 x	430 x	129
GEI-MW5-1120 011362-02	370 x	<250	114
GEI-MW8-1120 011362-03	2,400 x	820 x	79
GEI-MW6-1120 011362-04	270 x	440 x	117
DUP-1120 011362-05	730 x	400 x	127
GEI-MW1-1120 011362-06	25,000	5,600	134
Method Blank 00-2574 MB	<50	<250	122

Date of Report: 12/01/20
Date Received: 11/19/20
Project: Port of Tacoma Parcel 40, F&BI 011362

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: 011371-02 (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	107	65-118
Toluene	ug/L (ppb)	50	100	72-122
Ethylbenzene	ug/L (ppb)	50	99	73-126
Xylenes	ug/L (ppb)	150	97	74-118
Gasoline	ug/L (ppb)	1,000	98	69-134

Date of Report: 12/01/20
Date Received: 11/19/20
Project: Port of Tacoma Parcel 40, F&BI 011362

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	94	95	63-142	1

Date of Report: 12/01/20
Date Received: 11/19/20
Project: Port of Tacoma Parcel 40, F&BI 011362

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	96	96	63-142	0

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.

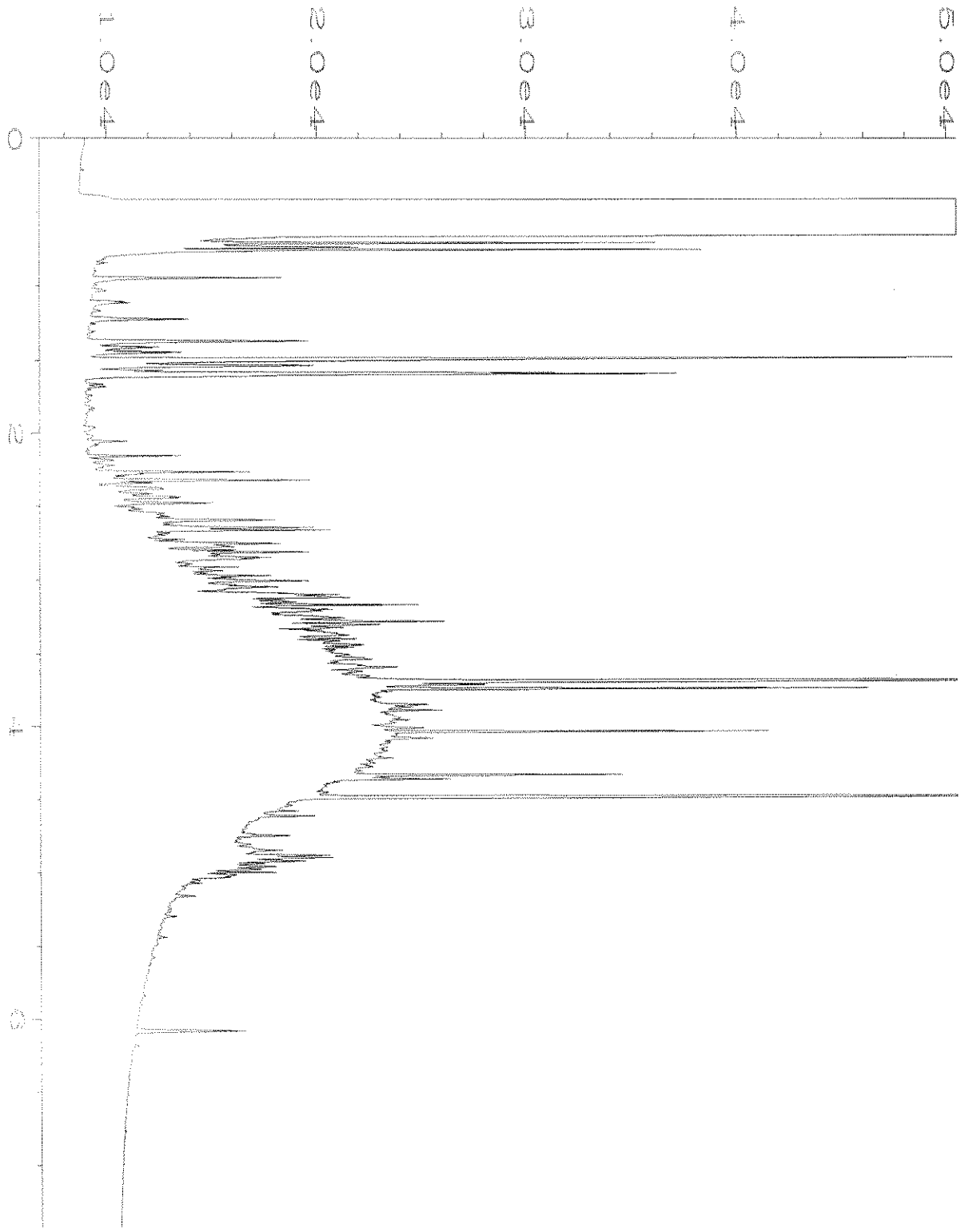
nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

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.



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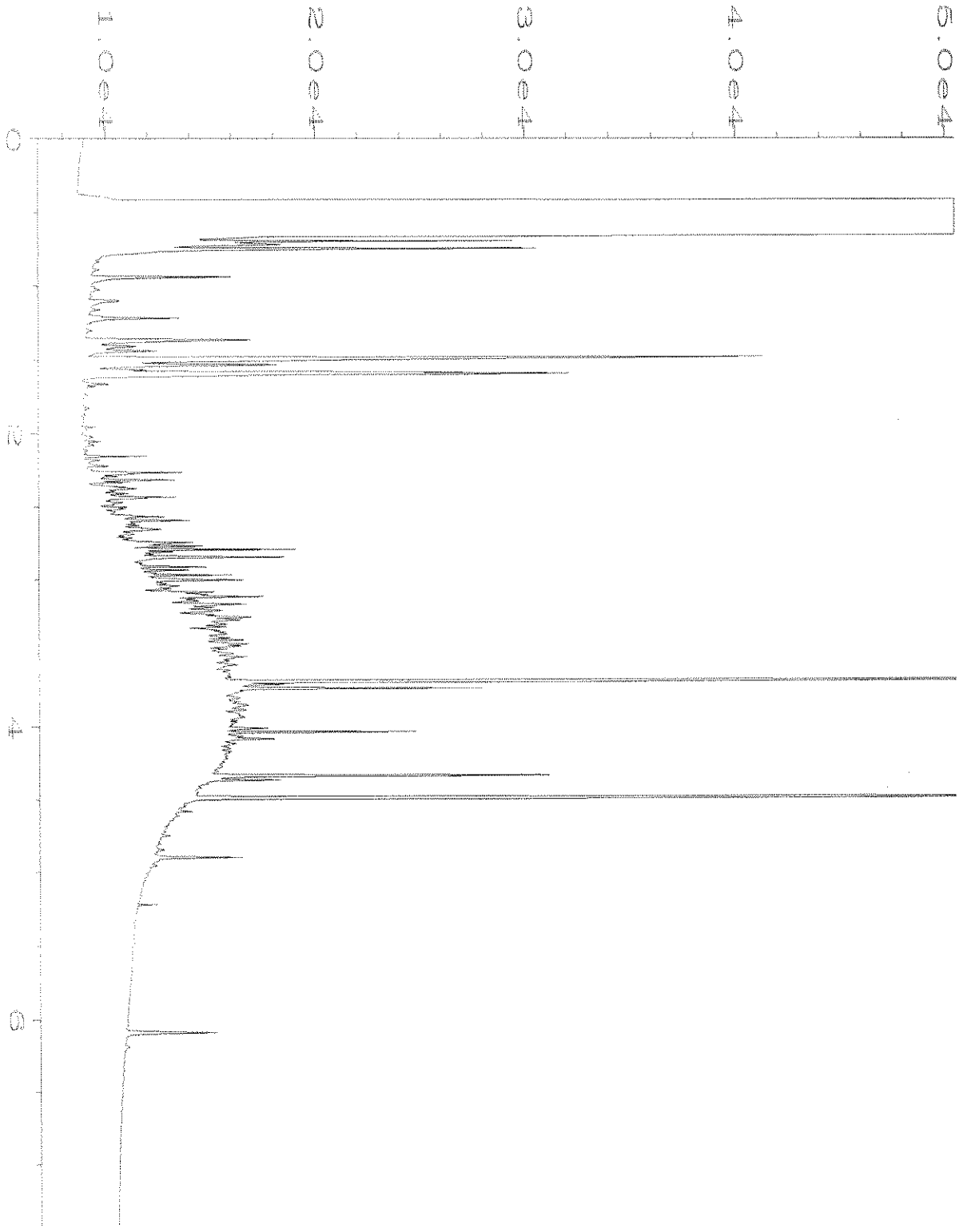
Operator : TL
Instrument : GC1
Sample Name : 011362-01
Run Time Bar Code:
Acquired on : 20 Nov 20 11:34 PM
Report Created on: 30 Nov 20 10:47 AM

Page Number : 1
Vial Number : 66
Injection Number : 1
Sequence Line : 10
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



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Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 67
Sample Name	: 011362-02	Injection Number	: 1
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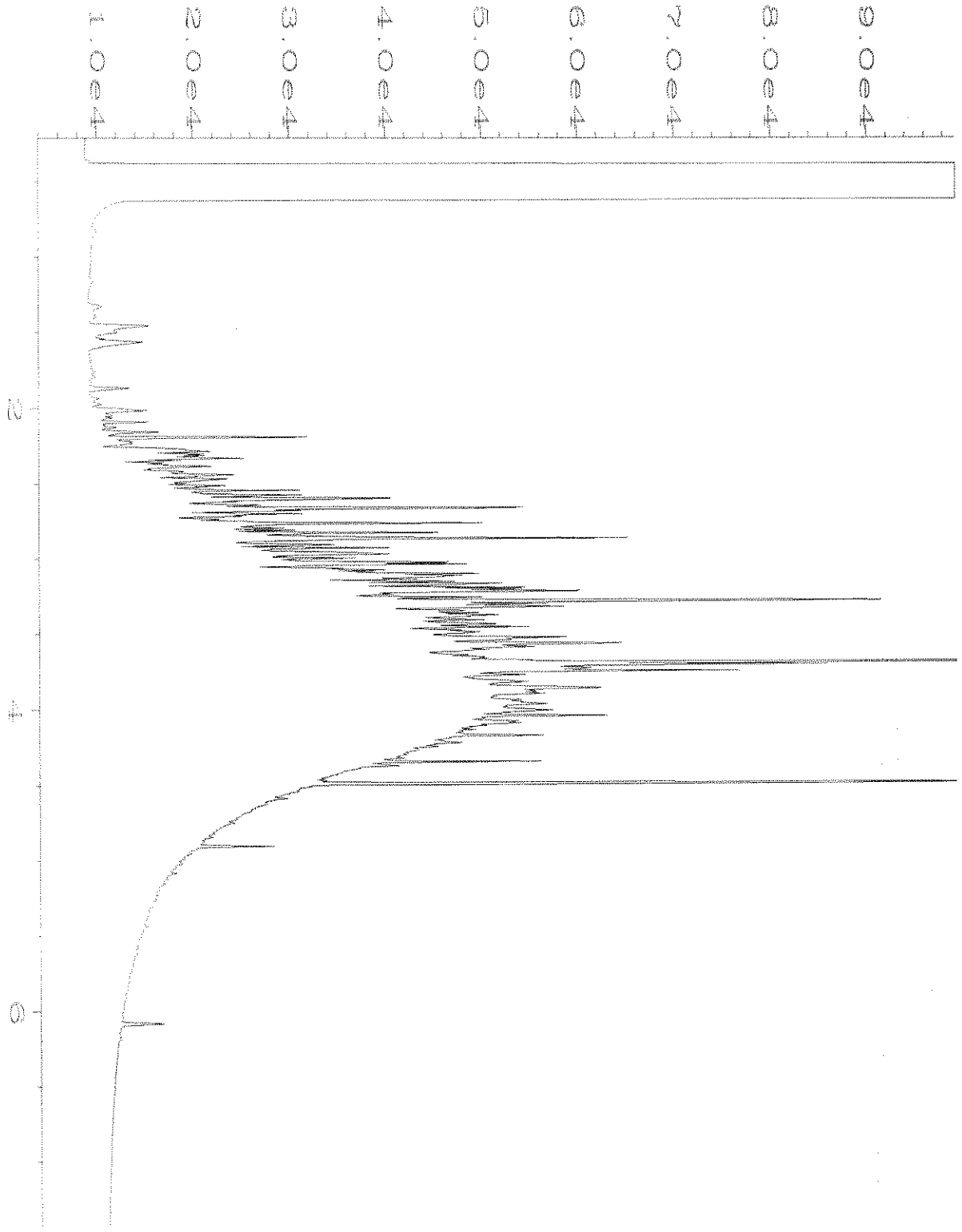
Report Created on	: 30 Nov 20 10:47 AM	Analysis Method	: DEFAULT.MTH



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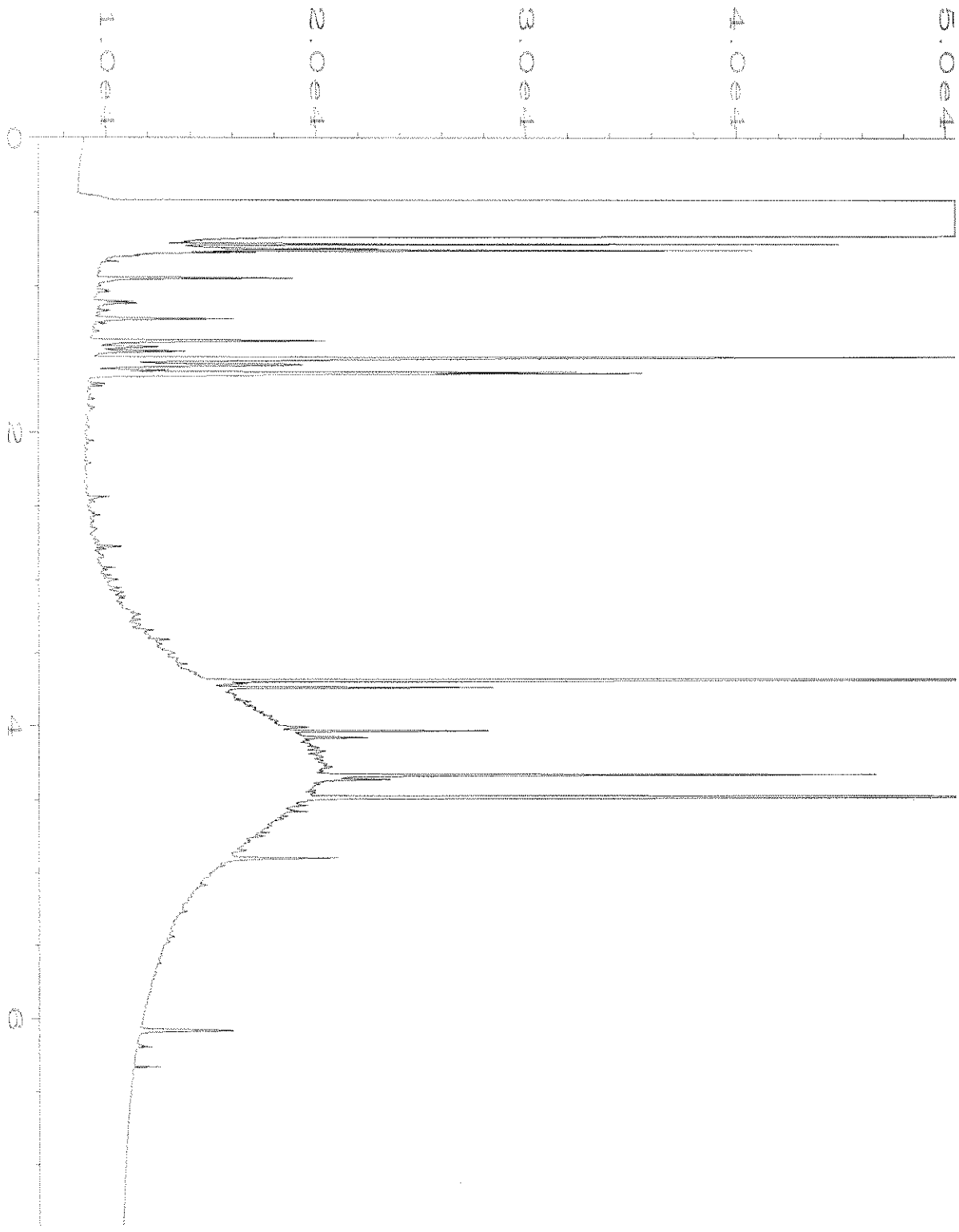
Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 68
Sample Name	: 011362-03	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 10
Acquired on	: 20 Nov 20 11:57 PM	Instrument Method	: DX.MTH
Report Created on	: 30 Nov 20 10:48 AM	Analysis Method	: DEFAULT.MTH



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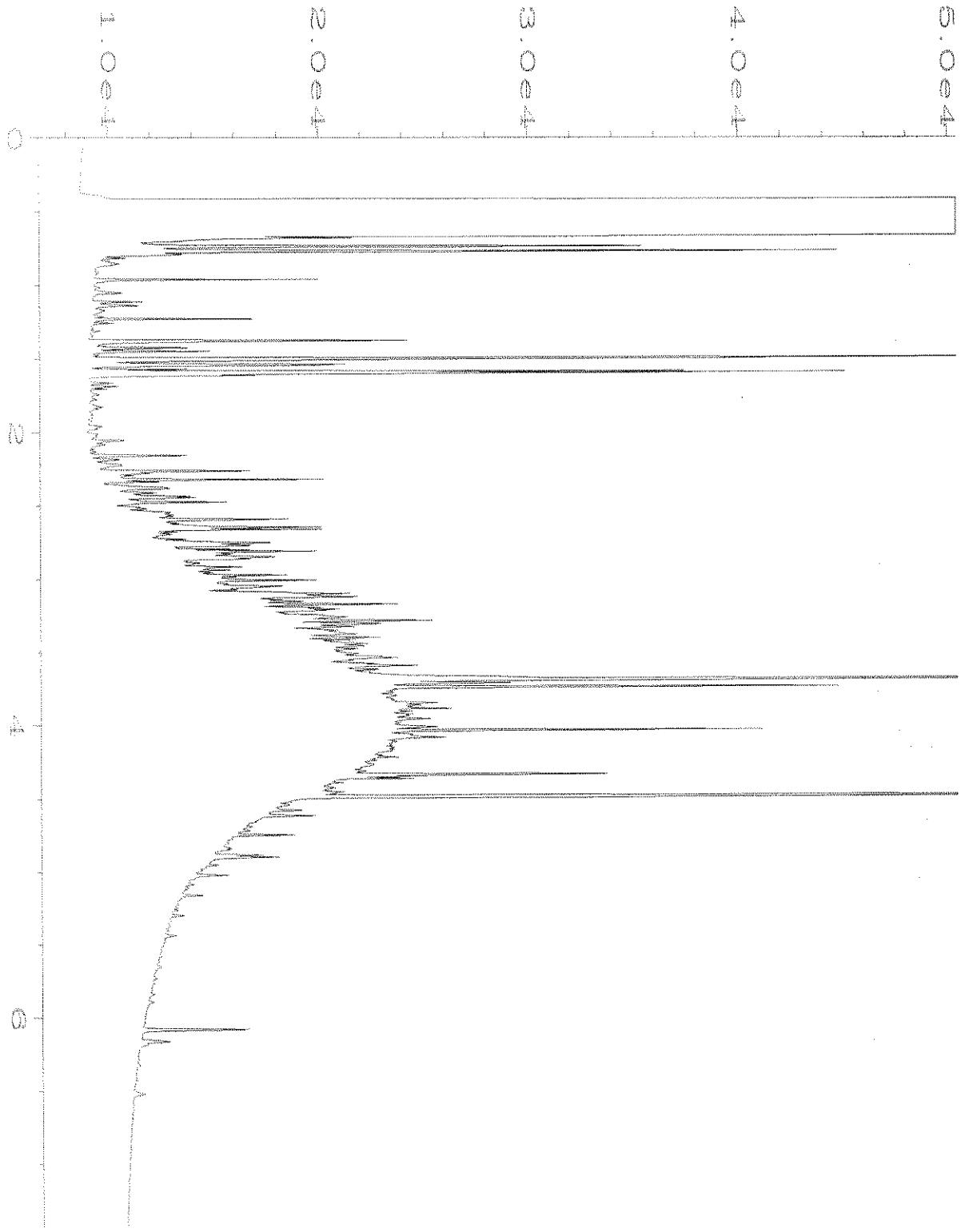
Operator : TL
Instrument : GC1
Sample Name : 011362-04
Run Time Bar Code:
Acquired on : 21 Nov 20 00:09 AM
Report Created on: 30 Nov 20 10:48 AM

Page Number : 1
Vial Number : 69
Injection Number : 1
Sequence Line : 10
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



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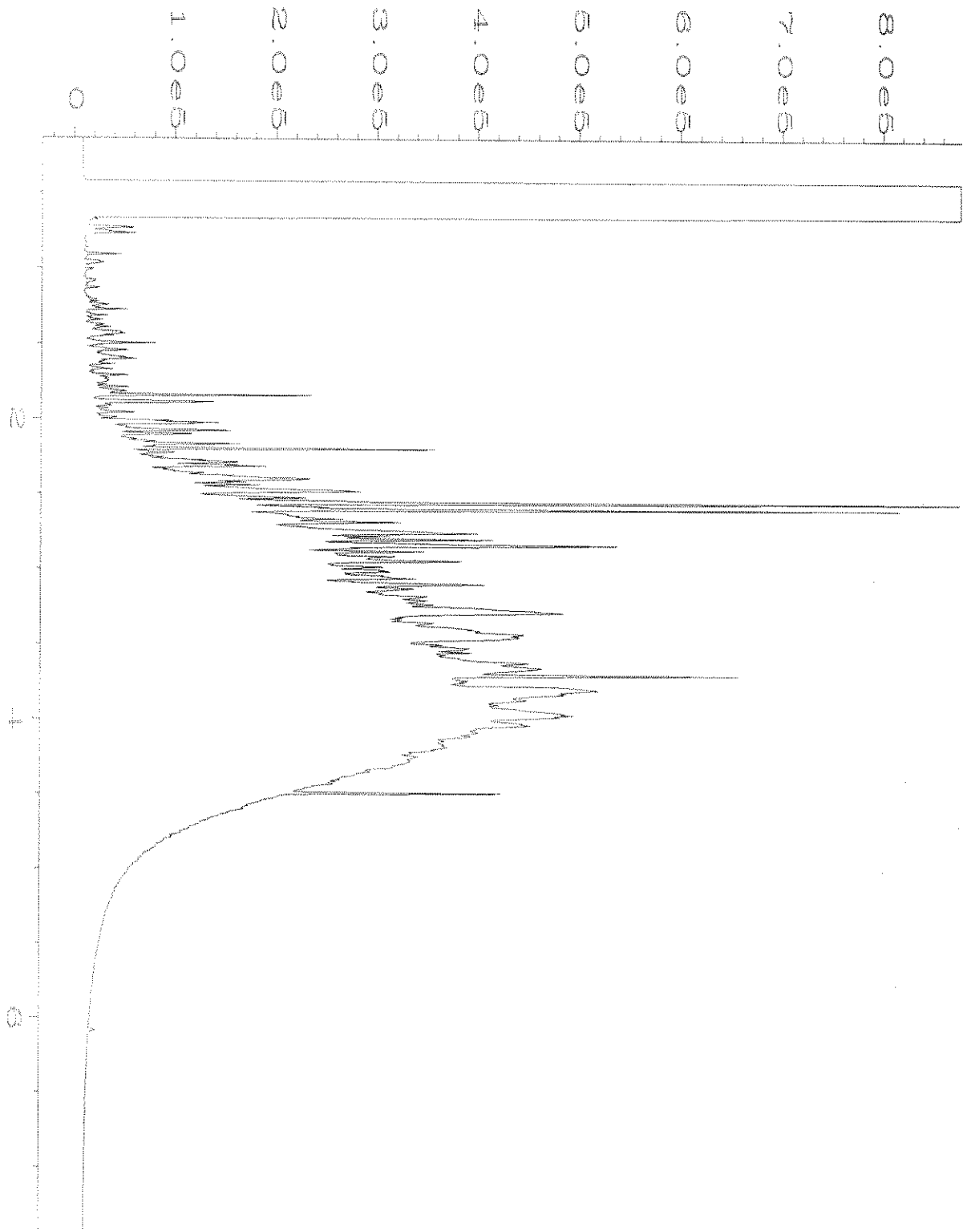
Operator : TL
Instrument : GC1
Sample Name : 011362-05
Run Time Bar Code:
Acquired on : 21 Nov 20 00:20 AM
Report Created on: 30 Nov 20 10:48 AM

Page Number : 1
Vial Number : 70
Injection Number : 1
Sequence Line : 10
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



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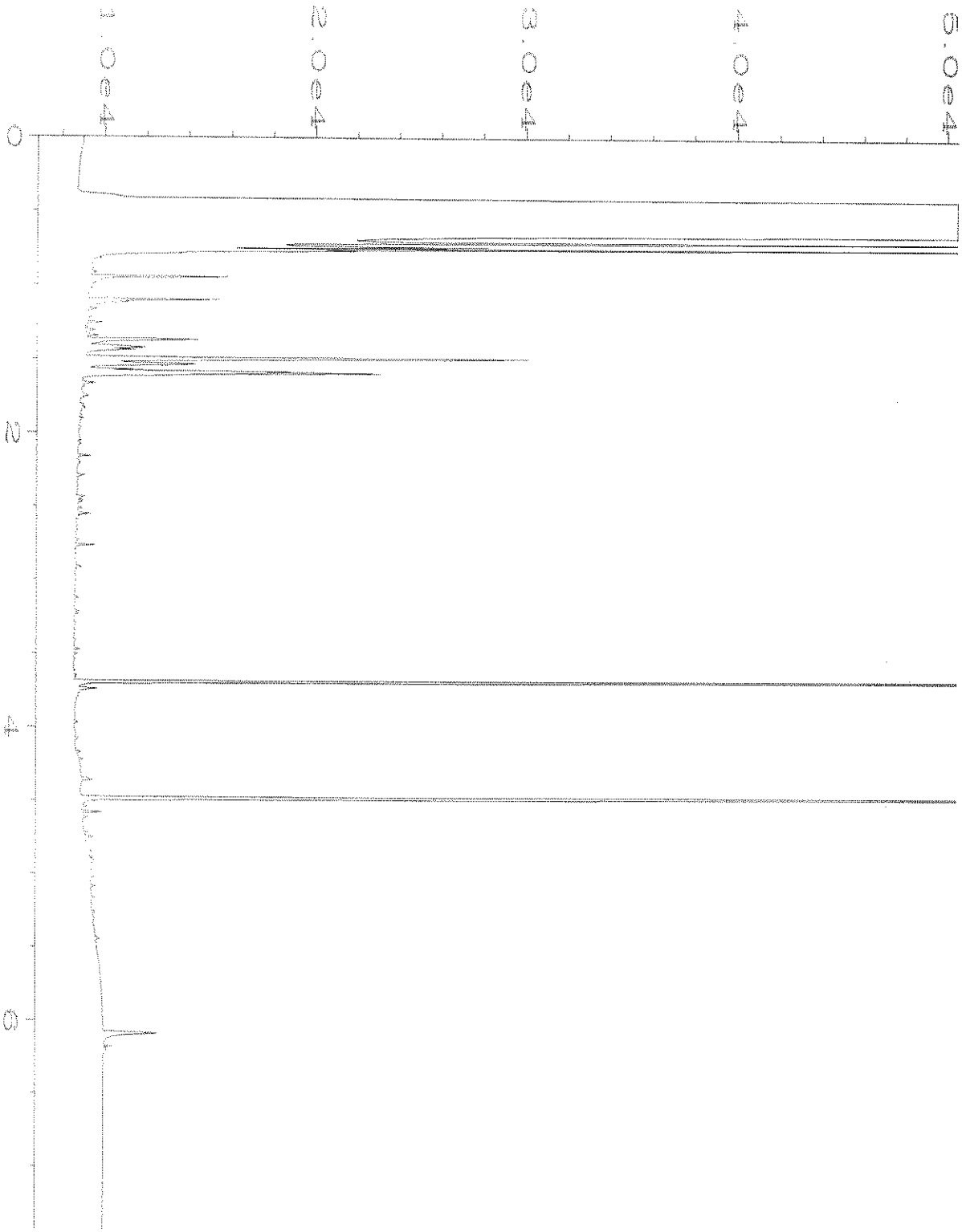
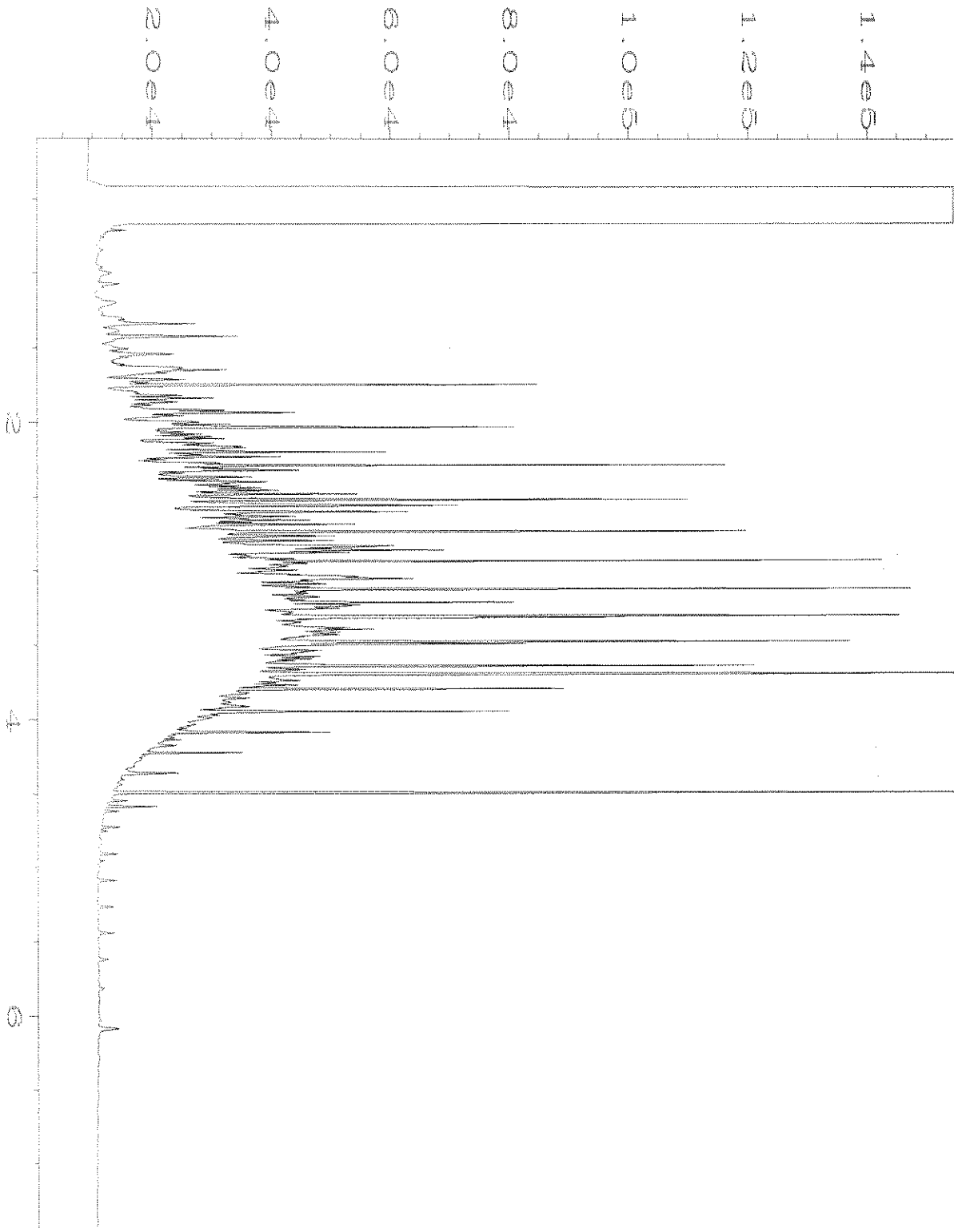
Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 71
Sample Name	: 011362-06	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 12
Acquired on	: 21 Nov 20 00:55 AM	Instrument Method	: DX.MTH
Report Created on:	30 Nov 20 10:48 AM	Analysis Method	: DEFAULT.MTH

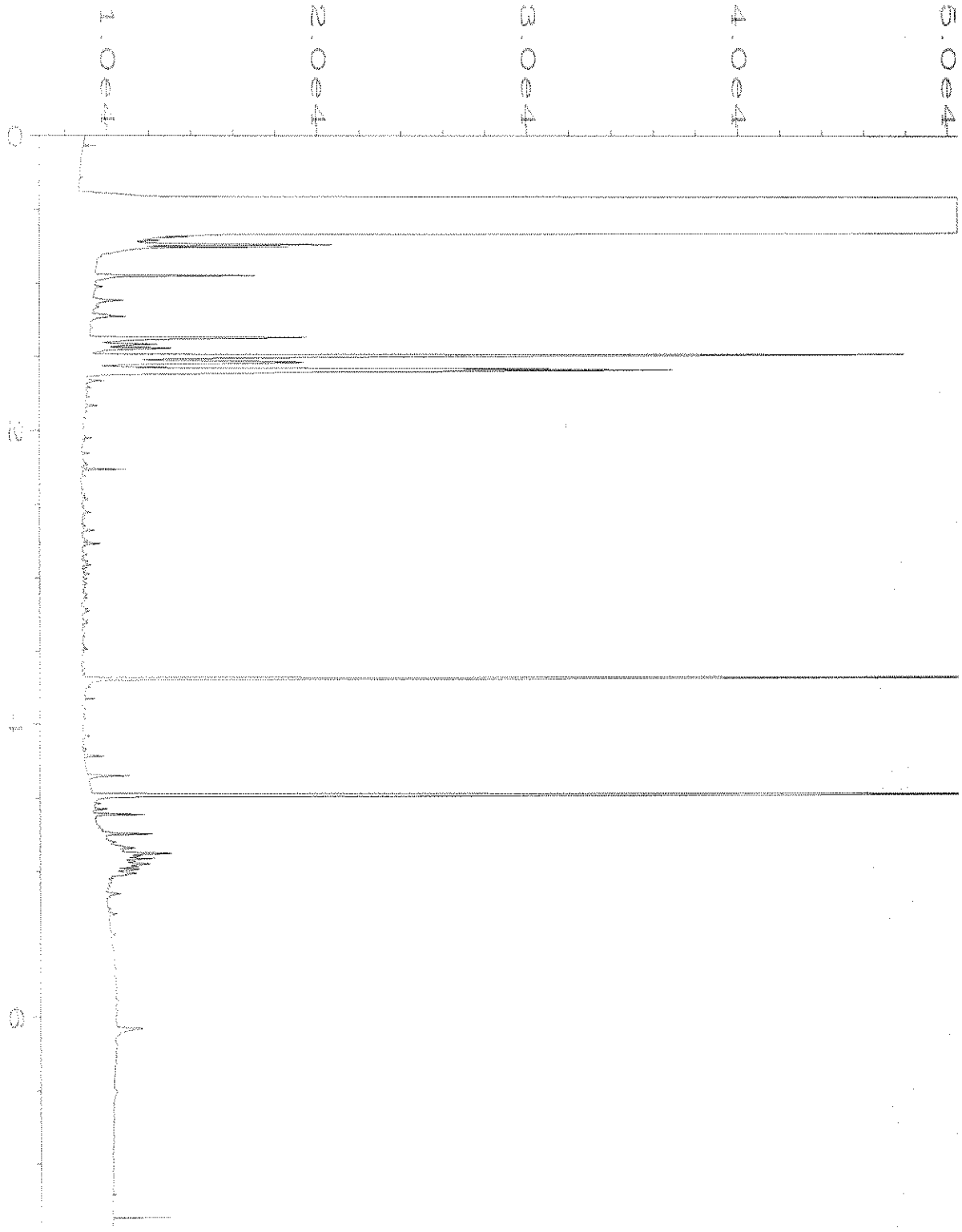


Data File Name	: C:\HPCHEM\1\DATA\11-20-20\055F1001.D		
Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 55
Sample Name	: 00-2574 mb	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 10
Acquired on	: 20 Nov 20 09:28 PM	Instrument Method	: DX.MTH
Report Created on:	30 Nov 20 10:48 AM	Analysis Method	: DEFAULT.MTH



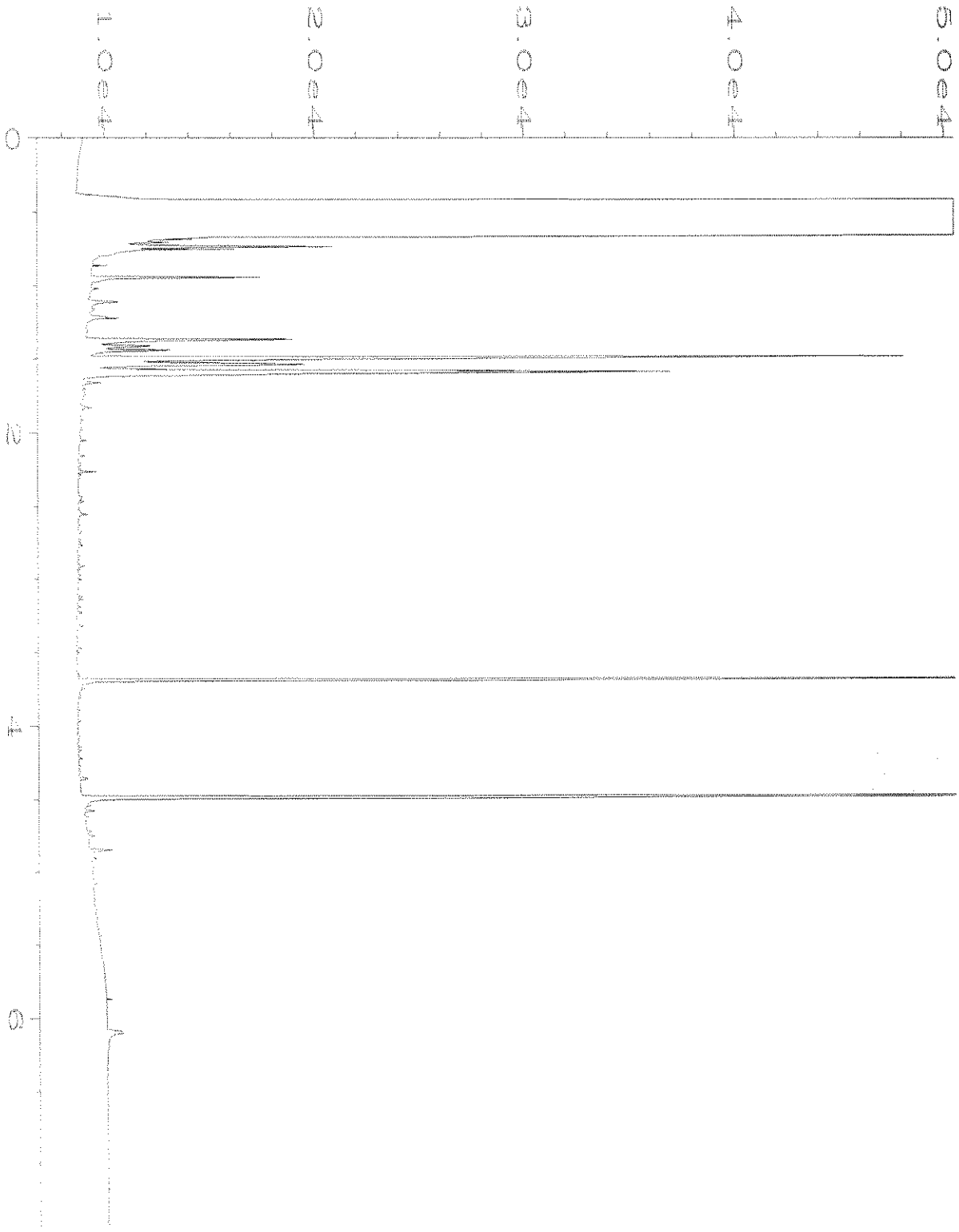
Data File Name : C:\HPCHEM\1\DATA\11-20-20\003F0201.D
Operator : TL
Instrument : GC1
Sample Name : 500 Dx 61-146D
Run Time Bar Code:
Acquired on : 20 Nov 20 05:50 AM
Report Created on: 30 Nov 20 10:49 AM

Page Number : 1
Vial Number : 3
Injection Number : 1
Sequence Line : 2
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



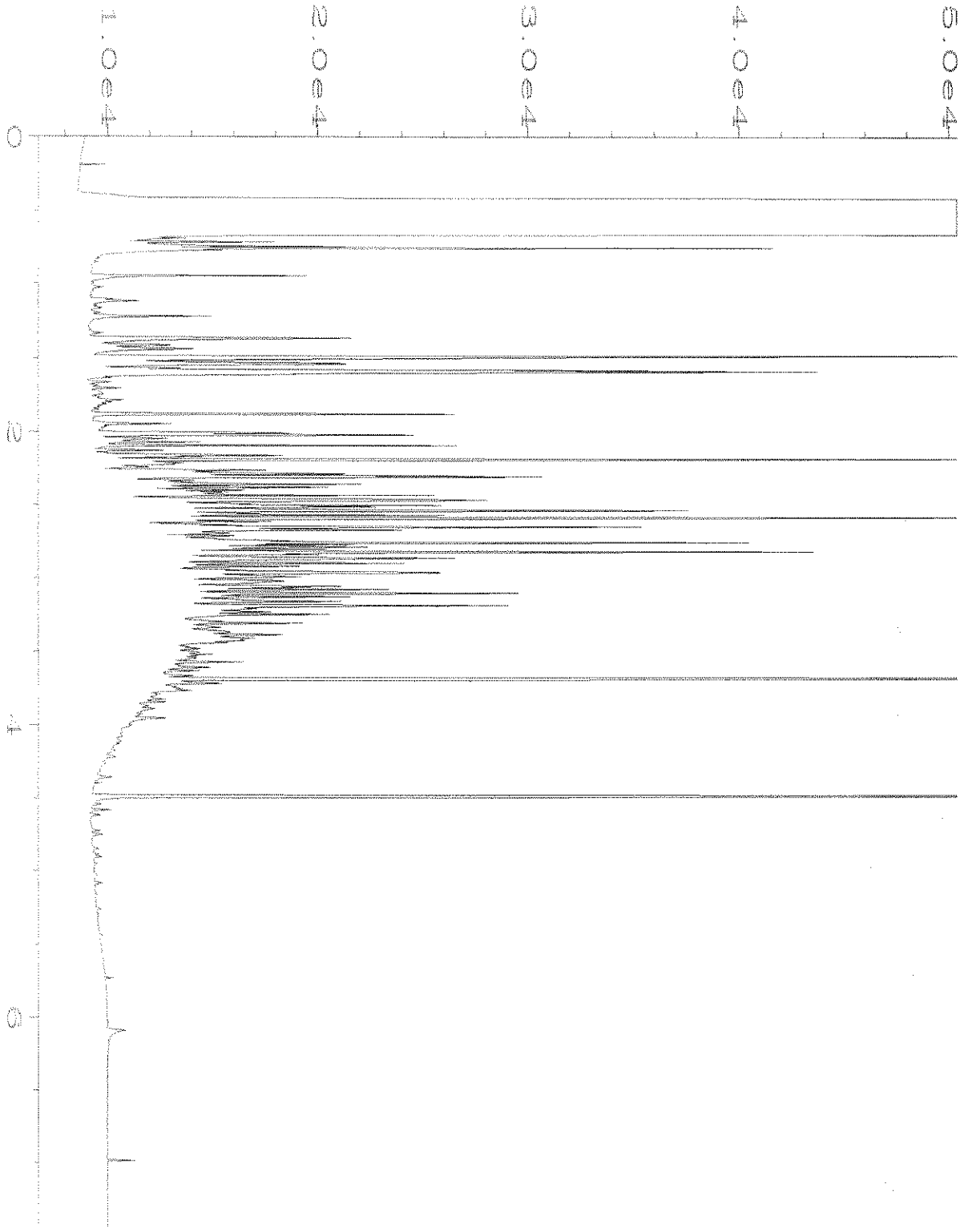
Data File Name : C:\HPCHEM\1\DATA\11-24-20\019F0301.D
Operator : TL
Instrument : GC1
Sample Name : 011362-01 sg
Run Time Bar Code:
Acquired on : 24 Nov 20 11:17 AM
Report Created on: 30 Nov 20 10:44 AM

Page Number : 1
Vial Number : 19
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



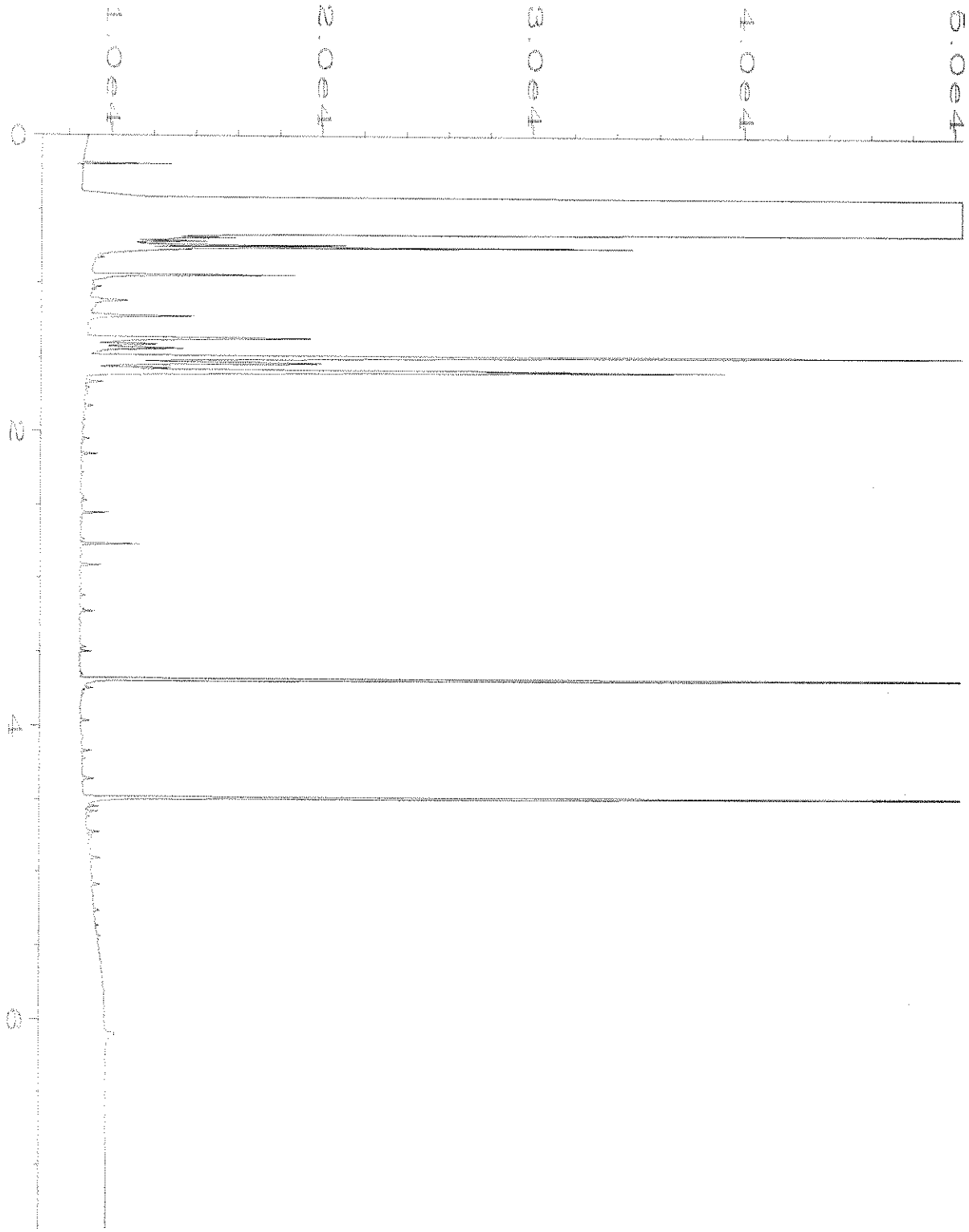
Data File Name : C:\HPCHEM\1\DATA\11-24-20\020F0301.D
Operator : TL
Instrument : GC1
Sample Name : 011362-02 sg
Run Time Bar Code:
Acquired on : 24 Nov 20 11:29 AM
Report Created on: 30 Nov 20 10:44 AM

Page Number : 1
Vial Number : 20
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



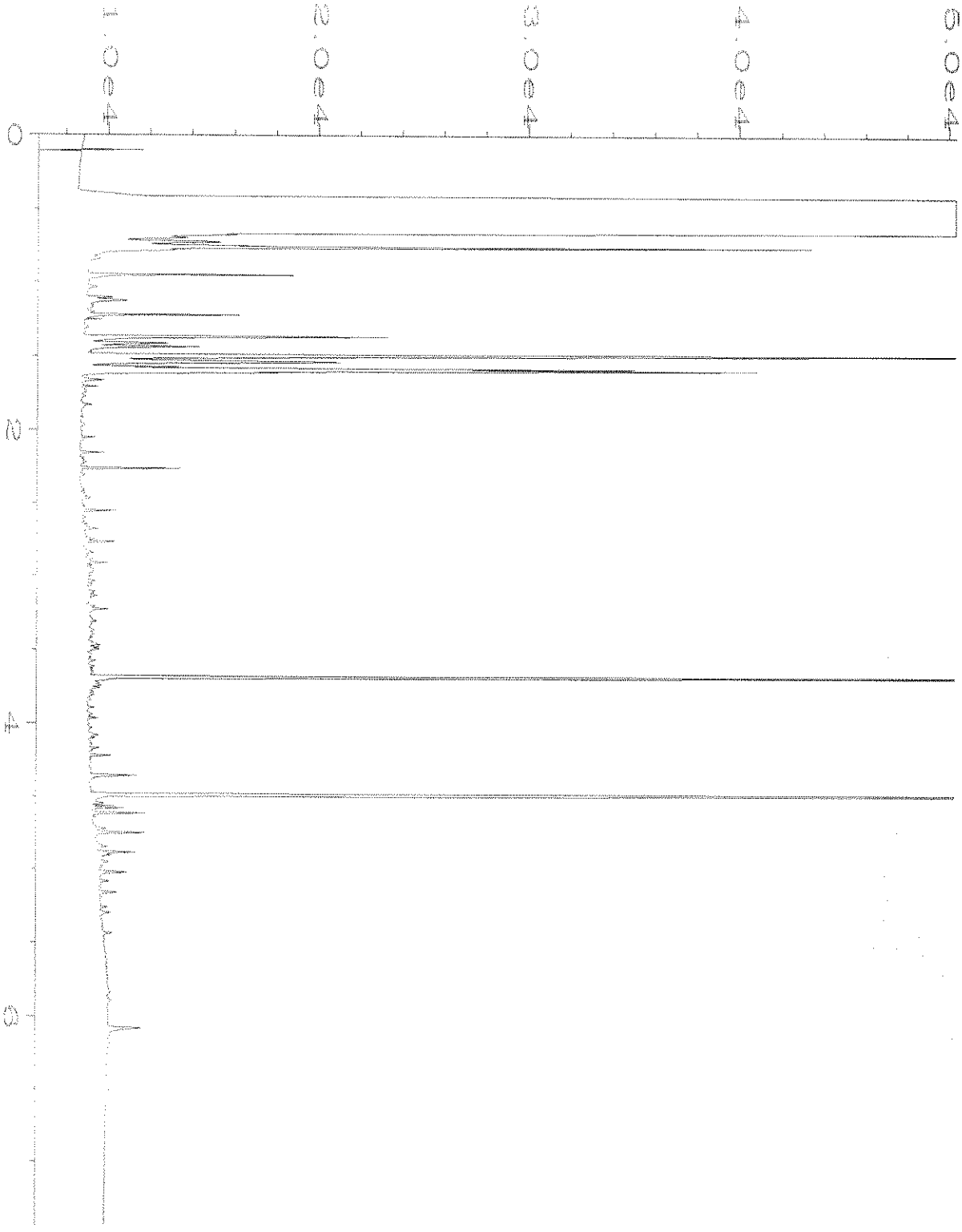
Data File Name : C:\HPCHEM\1\DATA\11-24-20\021F0301.D
Operator : TL
Instrument : GC1
Sample Name : 011362-03 sg
Run Time Bar Code:
Acquired on : 24 Nov 20 11:40 AM
Report Created on: 30 Nov 20 10:44 AM

Page Number : 1
Vial Number : 21
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



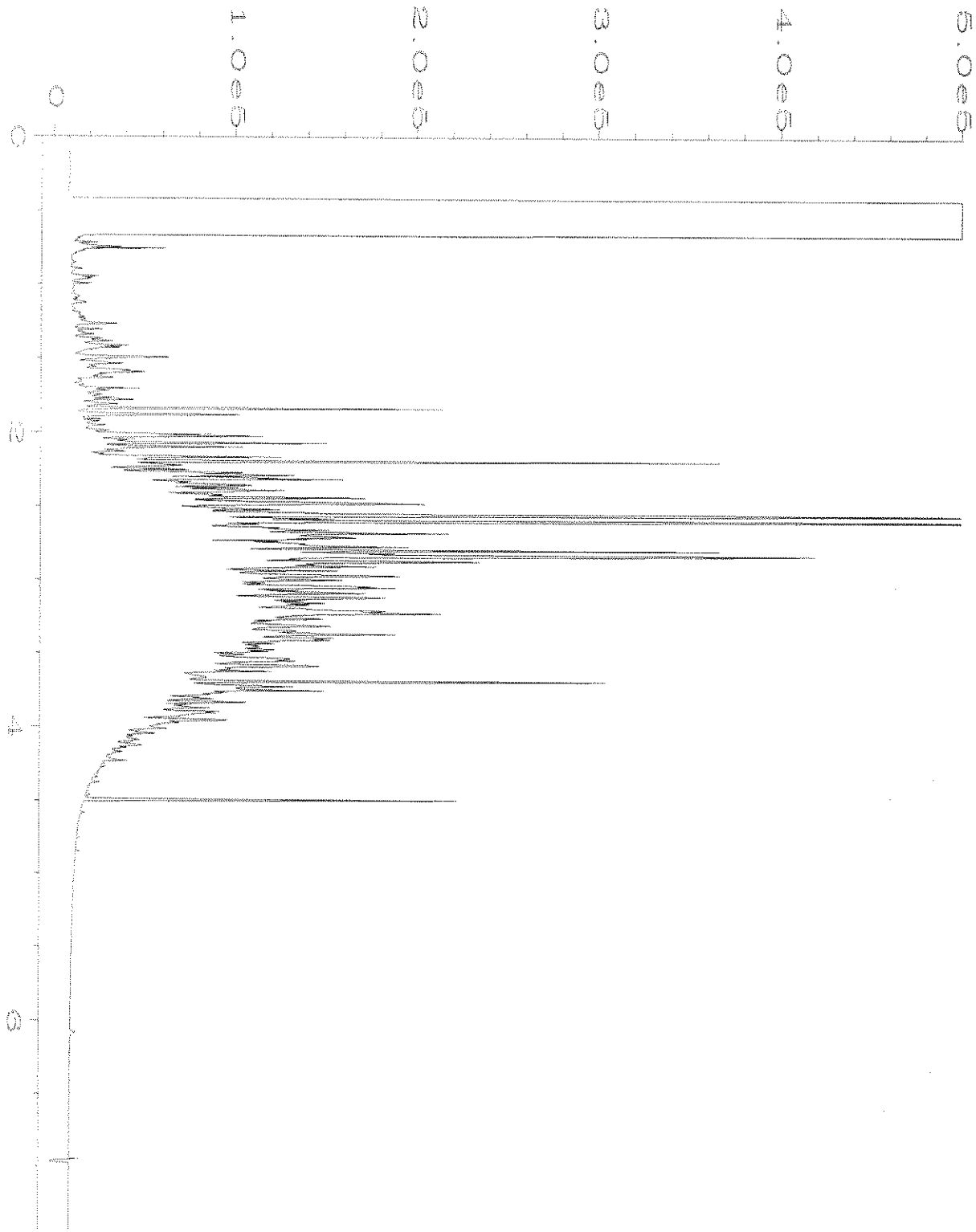
Data File Name : C:\HPCHEM\1\DATA\11-24-20\022F0301.D
Operator : TL
Instrument : GC1
Sample Name : 011362-04 sg
Run Time Bar Code:
Acquired on : 24 Nov 20 11:52 AM
Report Created on: 30 Nov 20 10:44 AM

Page Number : 1
Vial Number : 22
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



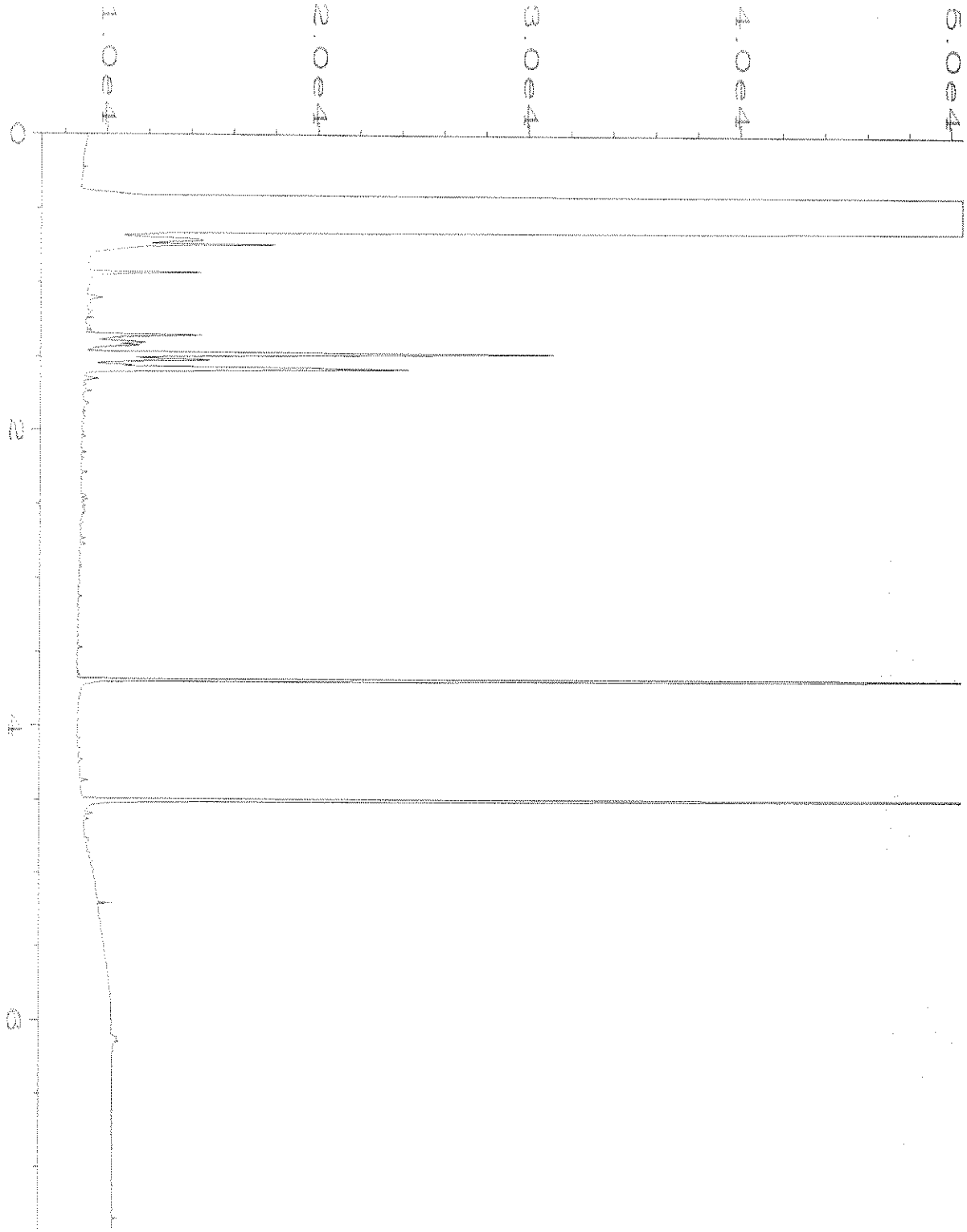
Data File Name : C:\HPCHEM\1\DATA\11-24-20\023F0301.D

Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 23
Sample Name	: 011362-05 sg	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 3
Acquired on	: 24 Nov 20 12:03 PM	Instrument Method	: DX.MTH
Report Created on	: 30 Nov 20 10:45 AM	Analysis Method	: DEFAULT.MTH



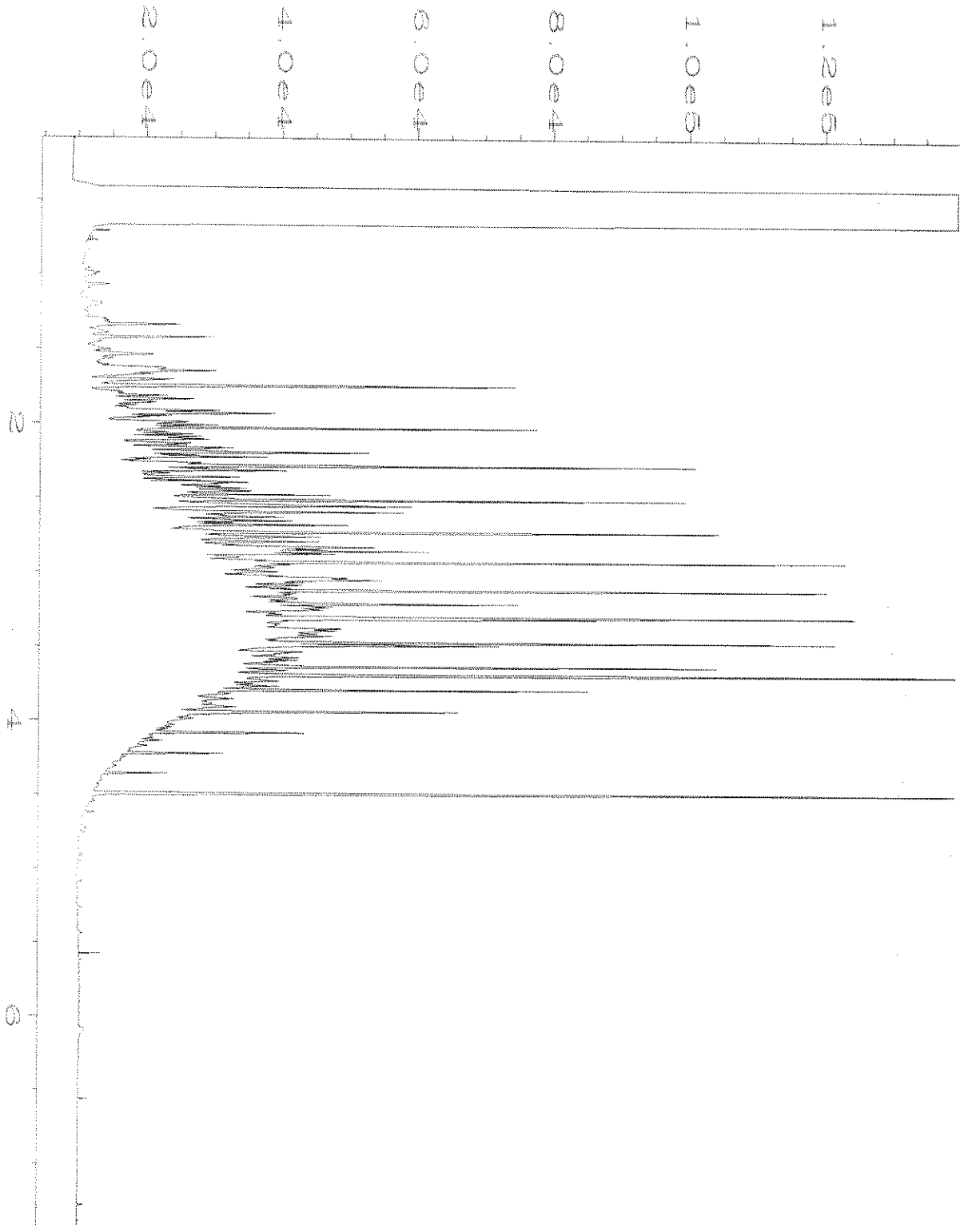
Data File Name : C:\HPCHEM\1\DATA\11-24-20\024F0301.D
Operator : TL
Instrument : GC1
Sample Name : 011362-06 sg
Run Time Bar Code:
Acquired on : 24 Nov 20 12:15 PM
Report Created on: 30 Nov 20 10:45 AM

Page Number : 1
Vial Number : 24
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\1\DATA\11-24-20\014F0301.D
Operator : TL
Instrument : GC1
Sample Name : 00-2574 mb sg
Run Time Bar Code:
Acquired on : 24 Nov 20 10:22 AM
Report Created on: 30 Nov 20 10:45 AM

Page Number : 1
Vial Number : 14
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\1\DATA\11-24-20\003F0201.D
Operator : TL
Instrument : GC1
Sample Name : 500 Dx 61-146D
Run Time Bar Code:
Acquired on : 24 Nov 20 05:29 AM
Report Created on: 30 Nov 20 10:45 AM

Page Number : 1
Vial Number : 3
Injection Number : 1
Sequence Line : 2
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH

011362

SAMPLE CHAIN OF CUSTODY

11-19-20 VWY/E031

Page # 1 of 1

Report To R. Jones / G. Hainsworth
Company Crete Consulting
Address 108 S. Washington, Ste. 300
City, State, ZIP Seattle, WA 98104
Phone _____ Email _____

SAMPLERS (*signature*): Rusty Jones R. Jones
PROJECT NAME: Port of Tacoma, Parcel 40
PO #:
REMARKS: with and without SGC
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					Notes
GEI-MW10-1120	01	11/19/20	0310	WATER	5	X	X	X									
GEI-MW5-1120	02	↓	0355	↓	5	X	X	X									
~~GEI-MW8-RS~~																	RS
GEI-MW8-1120	03	11/19/20	0440	WATER	5	X	X	X									
GEI-MW6-1120	04		0517		5	X	X	X									
DUP-1120	05		0600		5	X	X	X									
GEI-MW1-1120	06	↓	0606	↓	5	X	X	X									

ANALYSES REQUESTED

Samples received at 1 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	Crete Consulting	11/19/20	1358
Received by: Ann Webber Bruya	Ann Webber Bruya	F&B	11/19	1358
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

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

December 1, 2020

Grant Hainsworth, Project Manager
Crete Consulting
108 S. Washington St., Suite 300
Seattle, WA 98104

Dear Mr Hainsworth:

Included are the results from the testing of material submitted on November 20, 2020 from the Port of Tacoma, Parcel 40, F&BI 011391 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
c: Rusty Jones, Jamie Stevens
CTC1201R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on November 20, 2020 by Friedman & Bruya, Inc. from the Crete Consulting Port of Tacoma, Parcel 40, F&BI 011391 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Crete Consulting
011391 -01	GEI-MW9-1120
011391 -02	GEI-MW4-1120
011391 -03	GEI-MW2-1120

All quality control requirements were acceptable.

Date of Report: 12/01/20
Date Received: 11/20/20
Project: Port of Tacoma, Parcel 40, F&BI 011391
Date Extracted: 11/25/20
Date Analyzed: 11/25/20

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)
GEI-MW9-1120 011391-01	<1	<1	<1	<3	360	86
GEI-MW4-1120 011391-02	<1	<1	<1	<3	<100	85
GEI-MW2-1120 011391-03	<1	<1	<1	<3	<100	86
Method Blank 00-2593 MB	<1	<1	<1	<3	<100	84

Date of Report: 12/01/20
Date Received: 11/20/20
Project: Port of Tacoma, Parcel 40, F&BI 011391
Date Extracted: 11/23/20
Date Analyzed: 11/24/20

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 41-152)
GEI-MW9-1120 011391-01	920	<250	136
GEI-MW4-1120 011391-02	<50	<250	126
GEI-MW2-1120 011391-03	<50	<250	87
Method Blank 00-2585 MB	<50	<250	120

Date of Report: 12/01/20
Date Received: 11/20/20
Project: Port of Tacoma, Parcel 40, F&BI 011391
Date Extracted: 11/23/20
Date Analyzed: 11/23/20

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 47-140)
GEI-MW9-1120 011391-01	2,900	<250	95
GEI-MW4-1120 011391-02	370 x	<250	139
GEI-MW2-1120 011391-03	1,500 x	330 x	89
Method Blank 00-2585 MB	<50	<250	130

Date of Report: 12/01/20
Date Received: 11/20/20
Project: Port of Tacoma, Parcel 40, F&BI 011391

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: 011391-01 (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)	360	370	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	102	65-118
Toluene	ug/L (ppb)	50	97	72-122
Ethylbenzene	ug/L (ppb)	50	95	73-126
Xylenes	ug/L (ppb)	150	94	74-118
Gasoline	ug/L (ppb)	1,000	98	69-134

Date of Report: 12/01/20
Date Received: 11/20/20
Project: Port of Tacoma, Parcel 40, F&BI 011391

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	89	90	63-142	1

Date of Report: 12/01/20
Date Received: 11/20/20
Project: Port of Tacoma, Parcel 40, F&BI 011391

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	104	61-133	4

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.

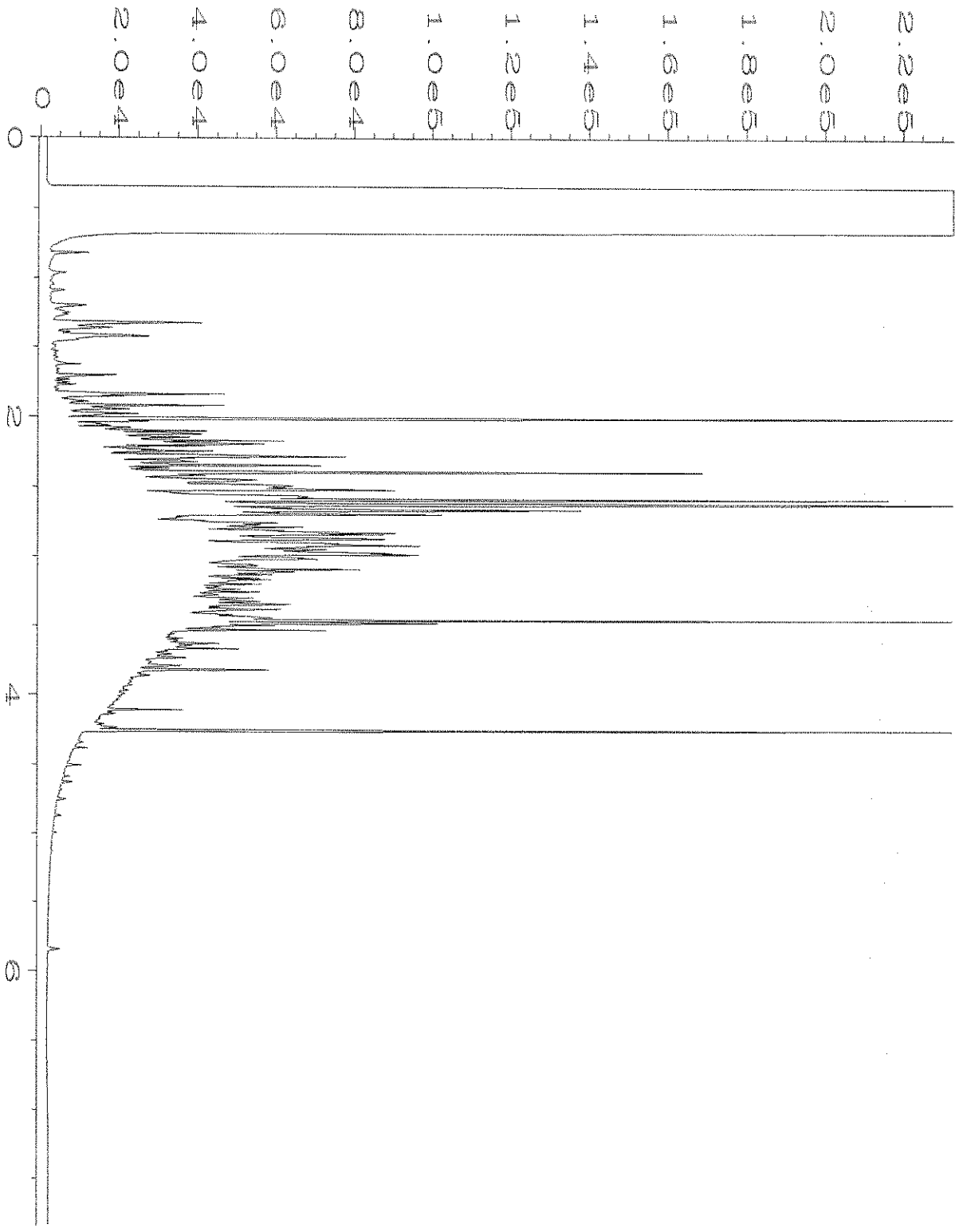
nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

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.

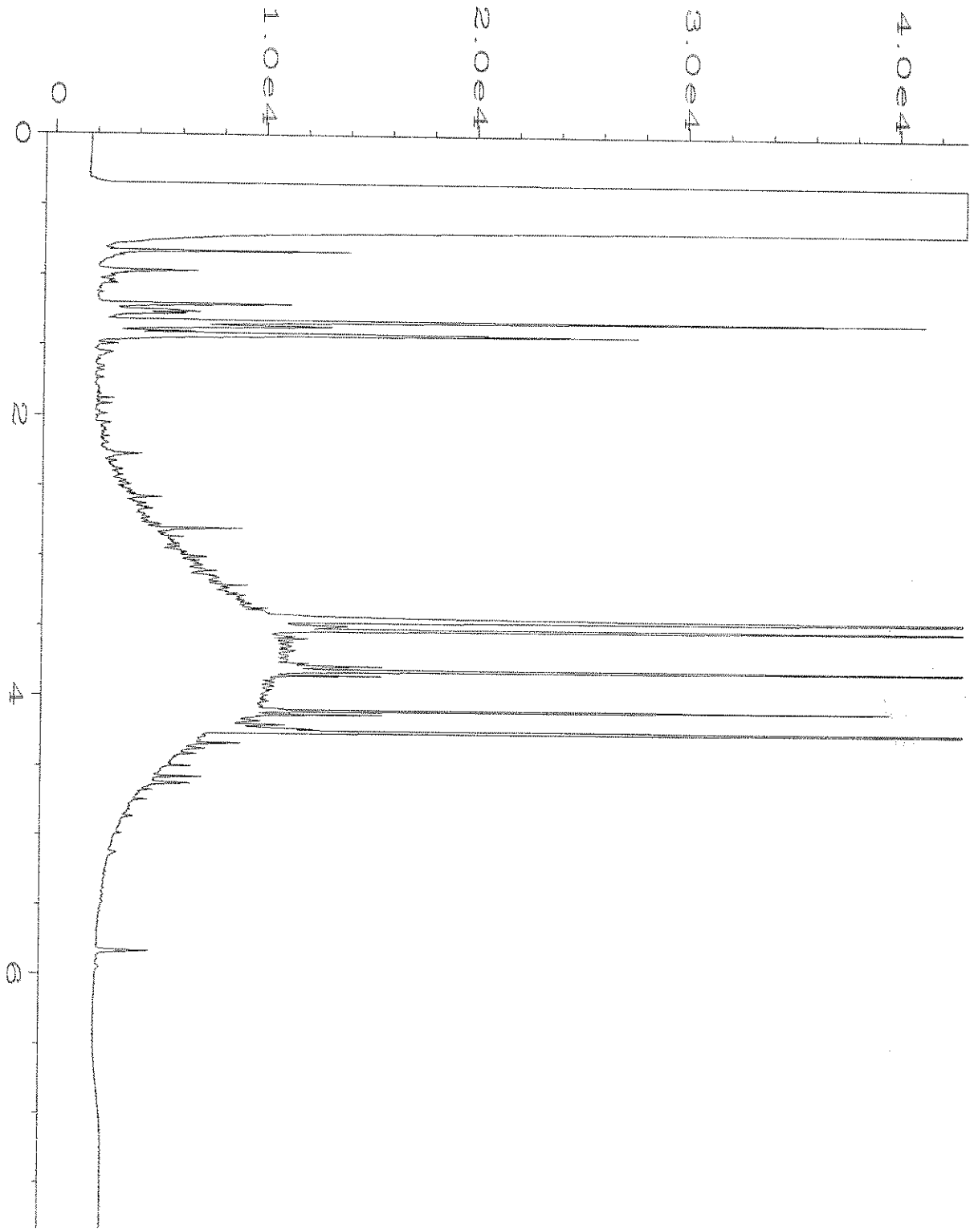
ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

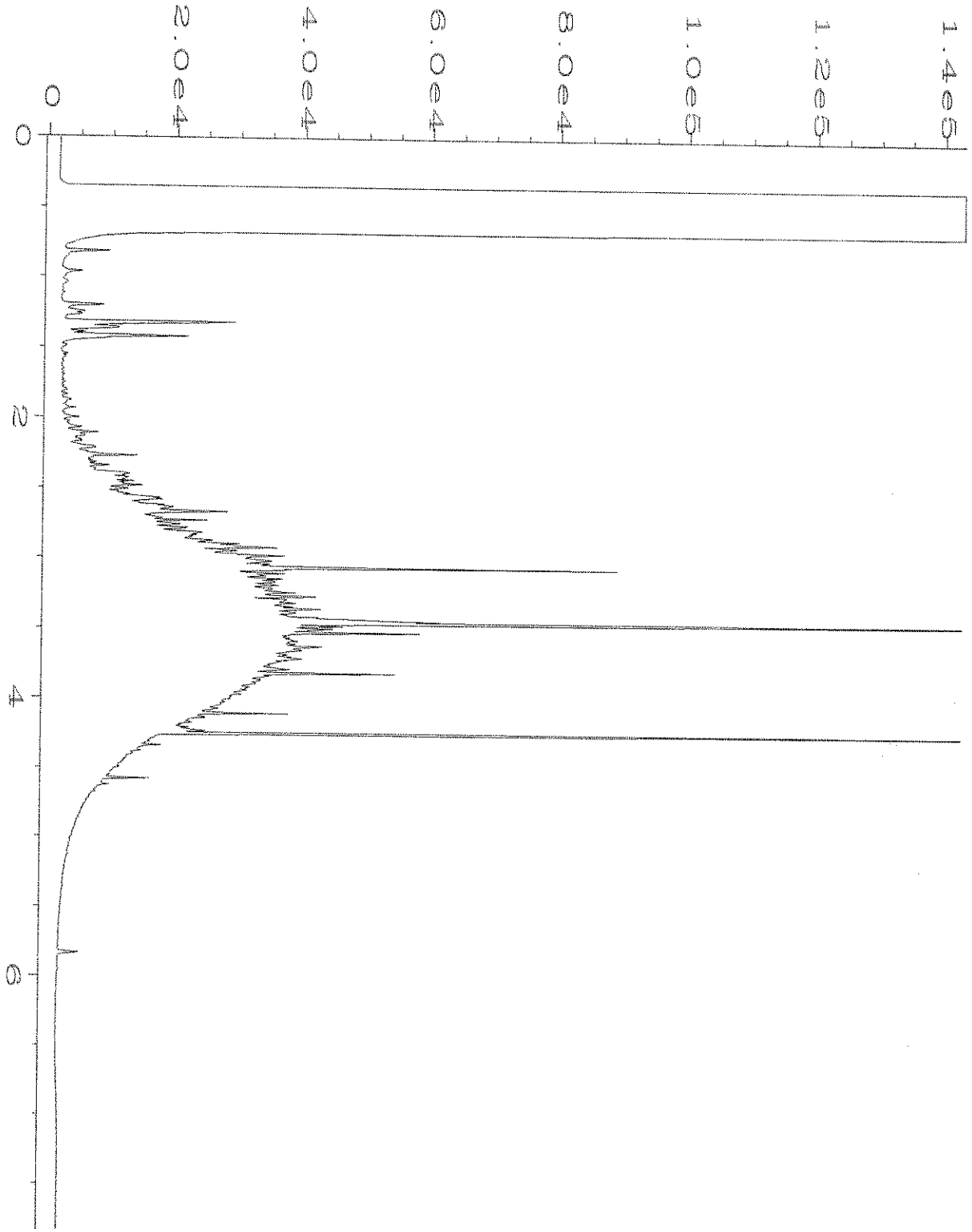
x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



Data File Name	: C:\HPCHEM\4\DATA\11-23-20\036F0801.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 36
Sample Name	: 011391-01	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 8
Acquired on	: 23 Nov 20 05:26 PM	Instrument Method	: DX.MTH
Report Created on	: 24 Nov 20 09:01 AM	Analysis Method	: DEFAULT.MTH

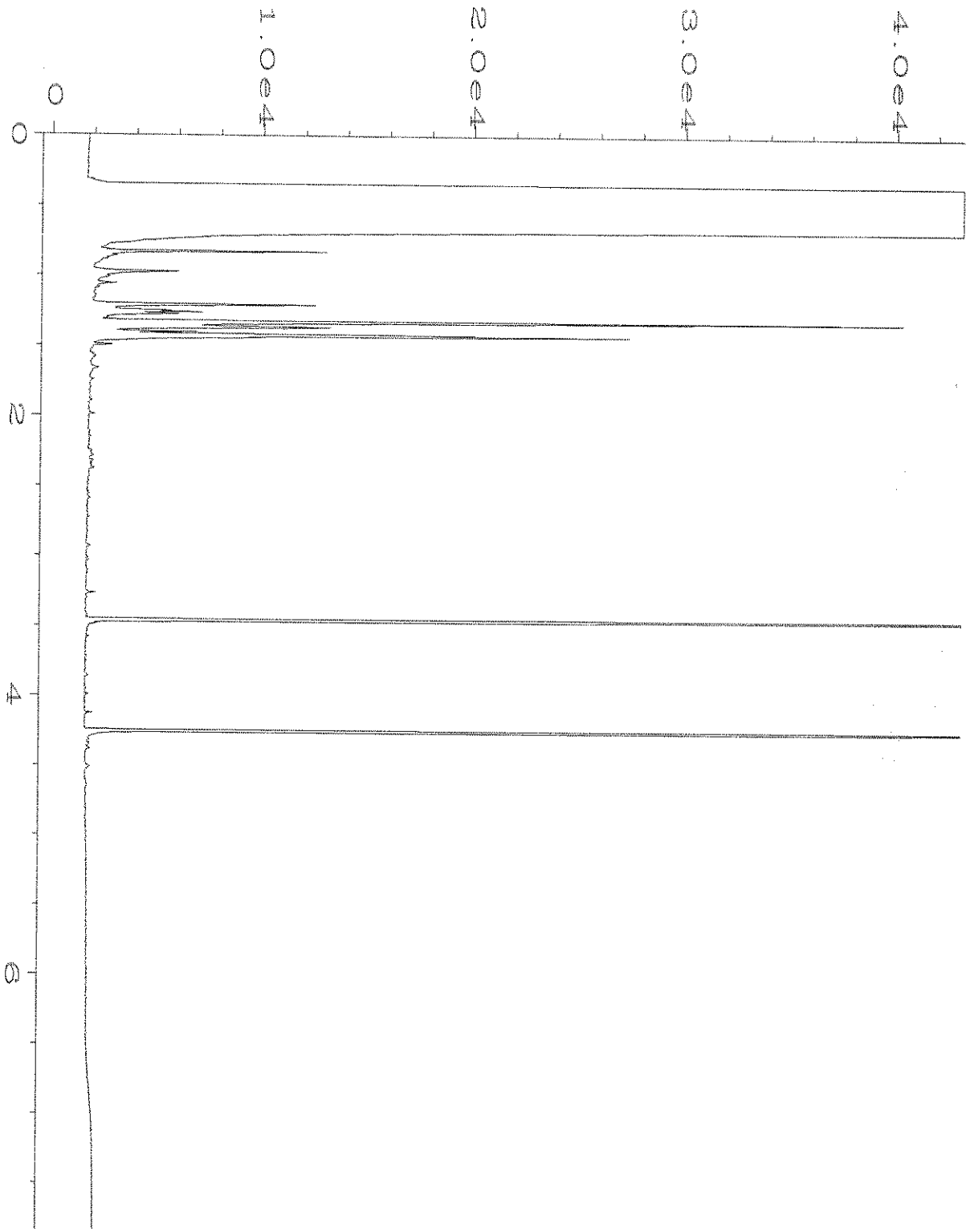


Data File Name	: C:\HPCHEM\4\DATA\11-23-20\037F0801.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 37
Sample Name	: 011391-02	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 8
Acquired on	: 23 Nov 20 05:38 PM	Instrument Method	: DX.MTH
Report Created on	: 24 Nov 20 09:02 AM	Analysis Method	: DEFAULT.MTH



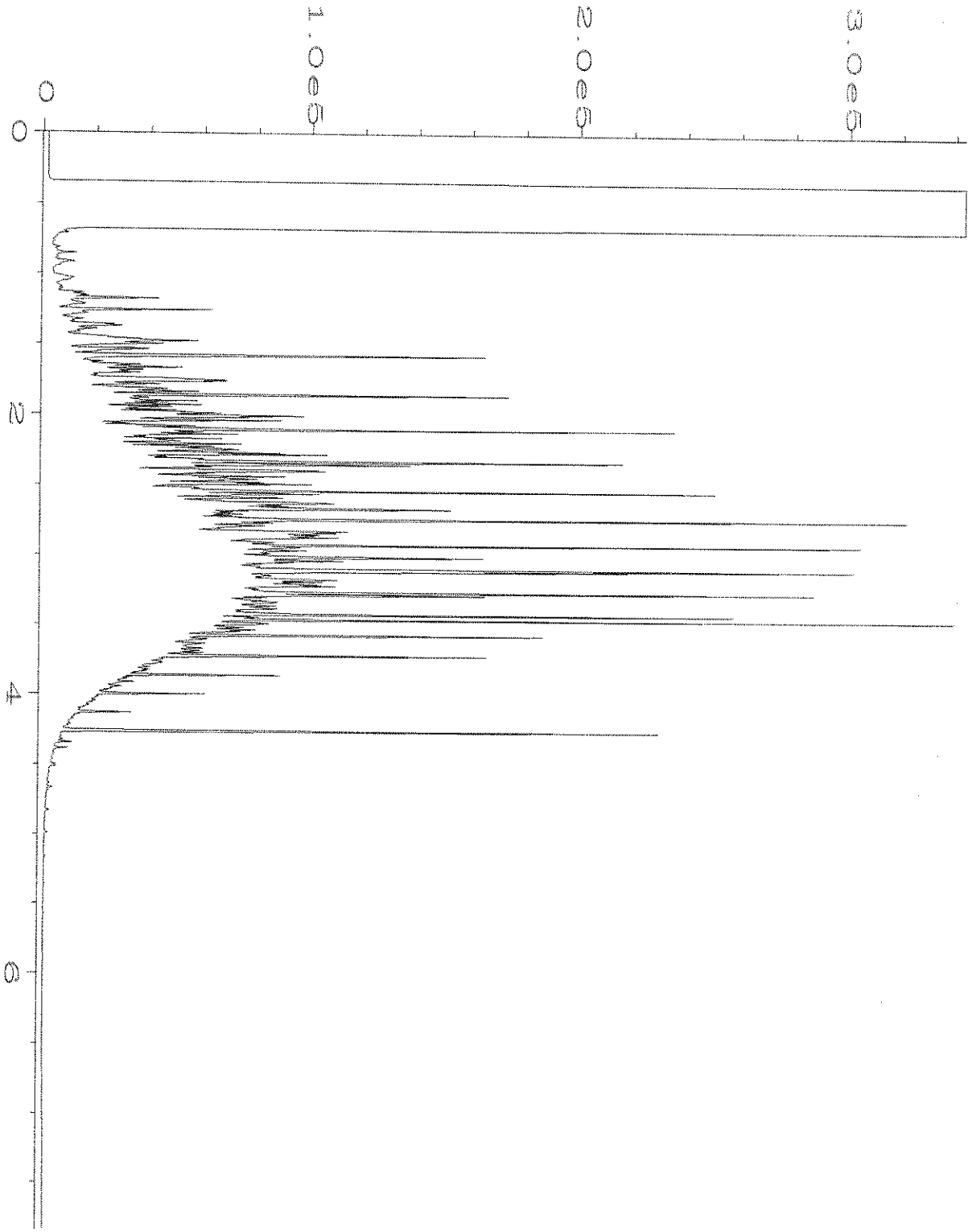
Data File Name : C:\HPCHEM\4\DATA\11-23-20\038F0801.D
Operator : TL
Instrument : GC#4
Sample Name : 011391-03
Run Time Bar Code:
Acquired on : 23 Nov 20 05:51 PM
Report Created on: 24 Nov 20 09:02 AM

Page Number : 1
Vial Number : 38
Injection Number : 1
Sequence Line : 8
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH

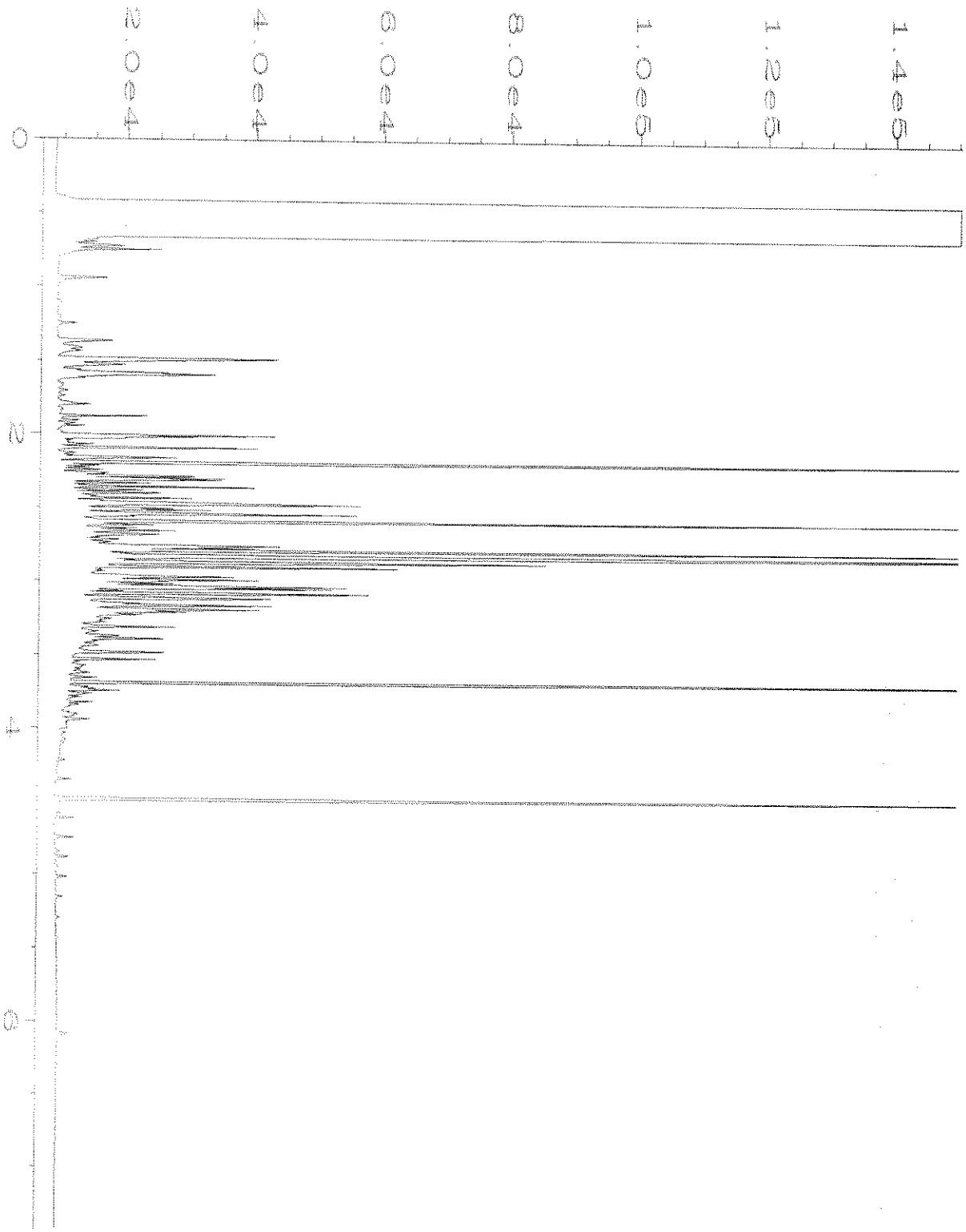


Data File Name : C:\HPCHEM\4\DATA\11-23-20\032F0801.D
Operator : TL
Instrument : GC#4
Sample Name : 00-2585 mb
Run Time Bar Code:
Acquired on : 23 Nov 20 04:36 PM
Report Created on: 24 Nov 20 09:01 AM

Page Number : 1
Vial Number : 32
Injection Number : 1
Sequence Line : 8
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH

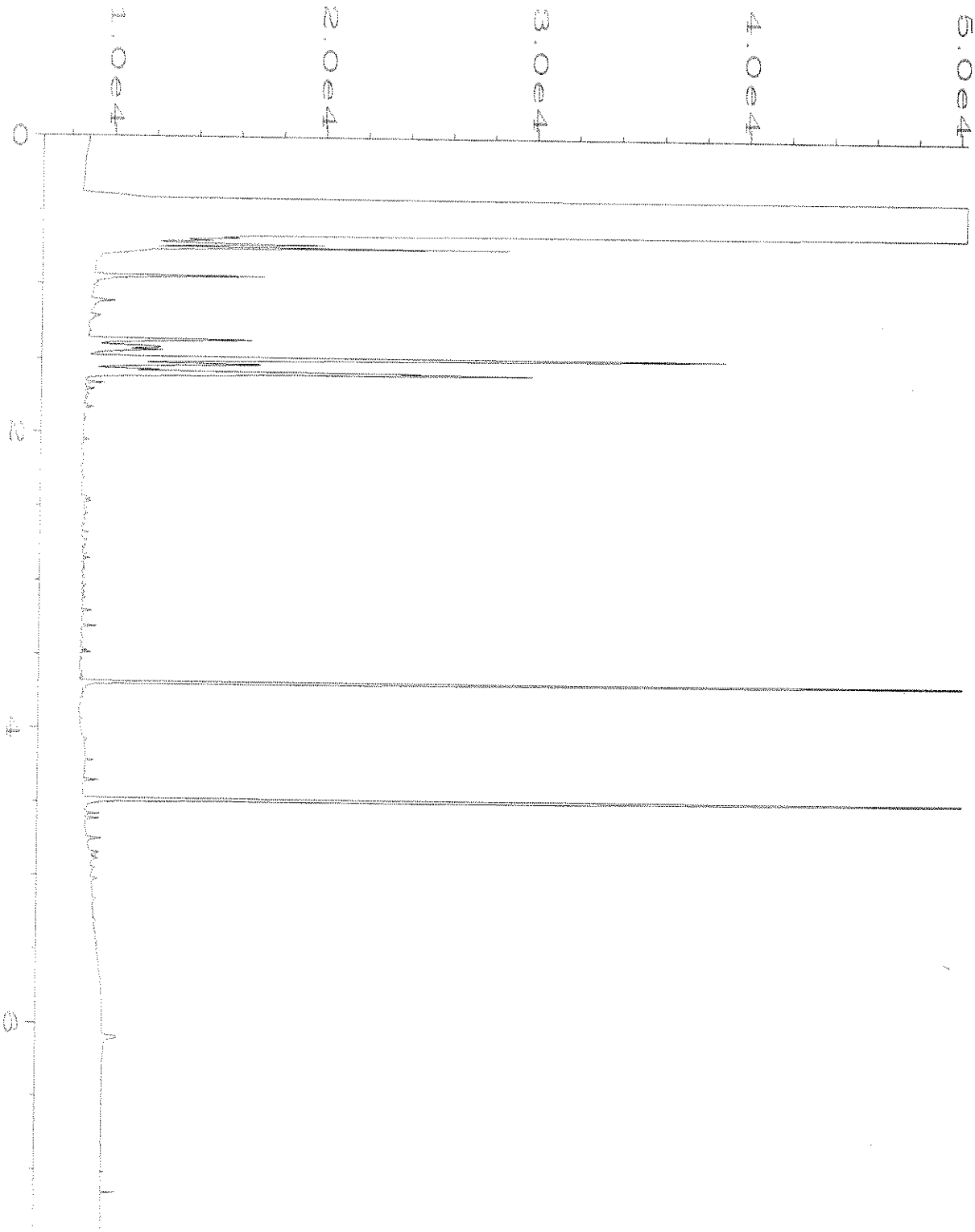


Data File Name	: C:\HPCHEM\4\DATA\11-23-20\005F0401.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 5
Sample Name	: 1000 Dx 61-146C	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 4
Acquired on	: 23 Nov 20 01:35 PM	Instrument Method	: DX.MTH
Report Created on:	24 Nov 20 09:00 AM	Analysis Method	: DEFAULT.MTH



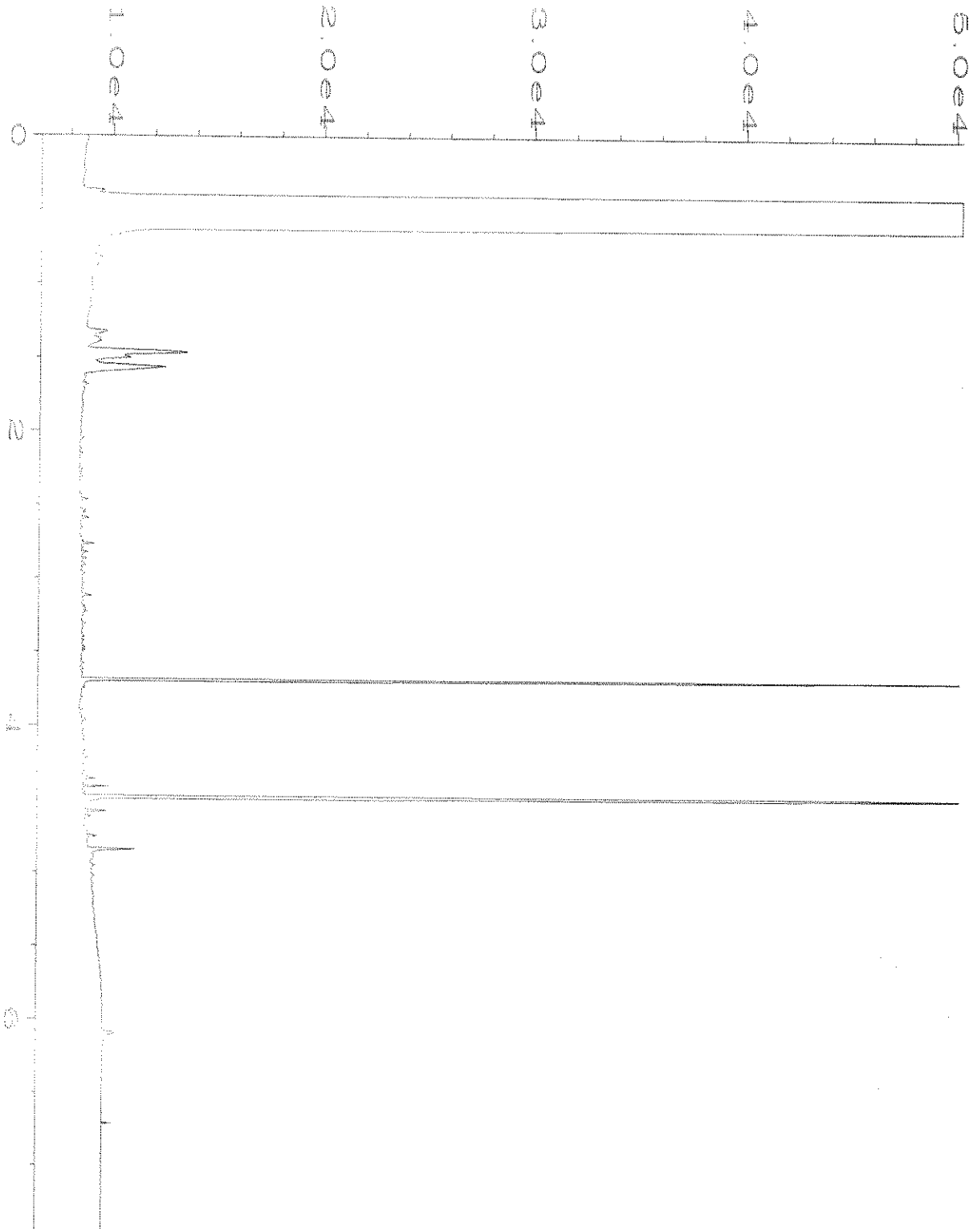
Data File Name : C:\HPCHEM\1\DATA\11-24-20\029F0501.D
Operator : TL
Instrument : GC1
Sample Name : 011391-01 sg
Run Time Bar Code:
Acquired on : 24 Nov 20 01:24 PM
Report Created on: 25 Nov 20 08:32 AM

Page Number : 1
Vial Number : 29
Injection Number : 1
Sequence Line : 5
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



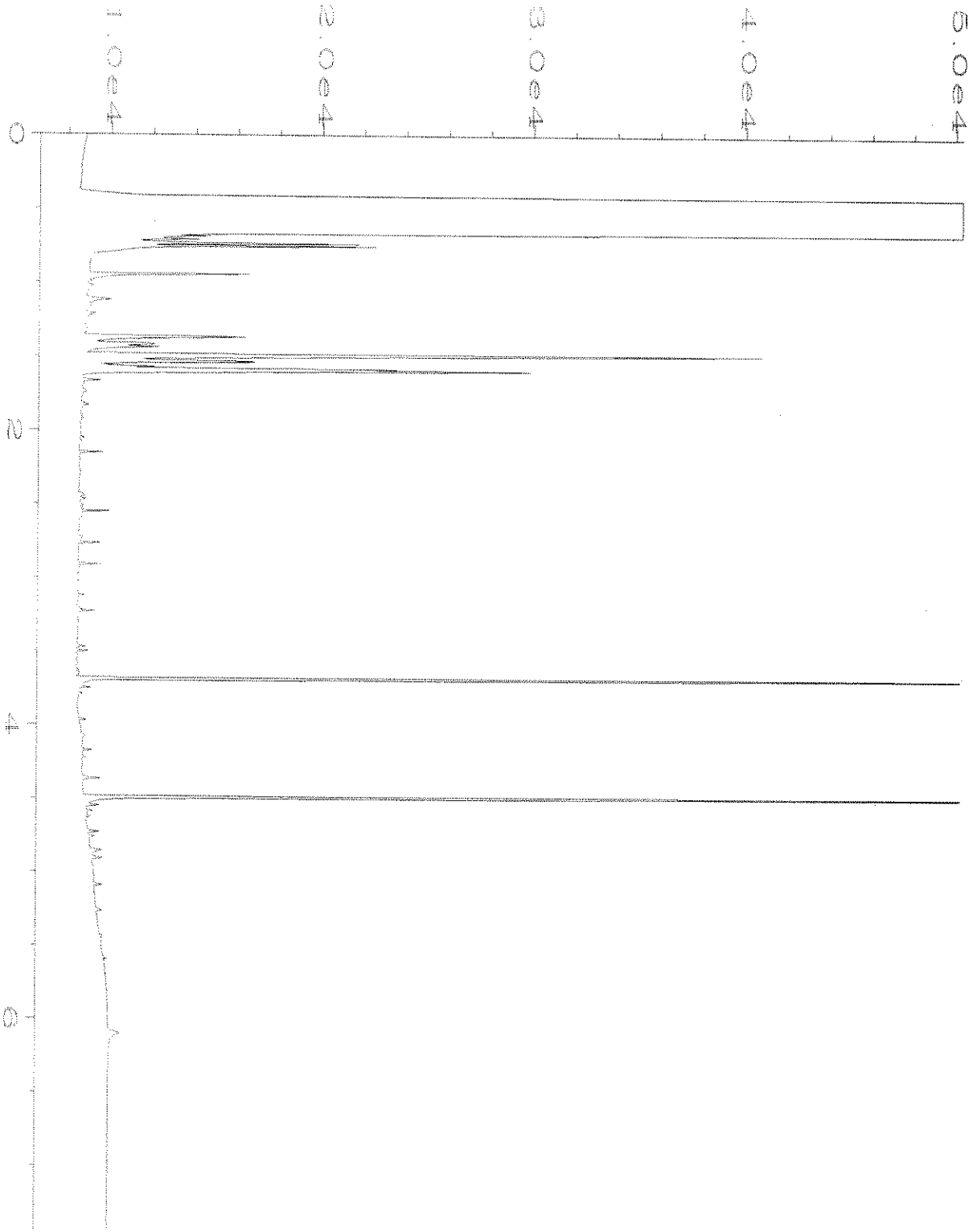
Data File Name : C:\HPCHEM\1\DATA\11-24-20\030F0501.D
Operator : TL
Instrument : GC1
Sample Name : 011391-02 sg
Run Time Bar Code:
Acquired on : 24 Nov 20 01:35 PM
Report Created on: 25 Nov 20 08:32 AM

Page Number : 1
Vial Number : 30
Injection Number : 1
Sequence Line : 5
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH

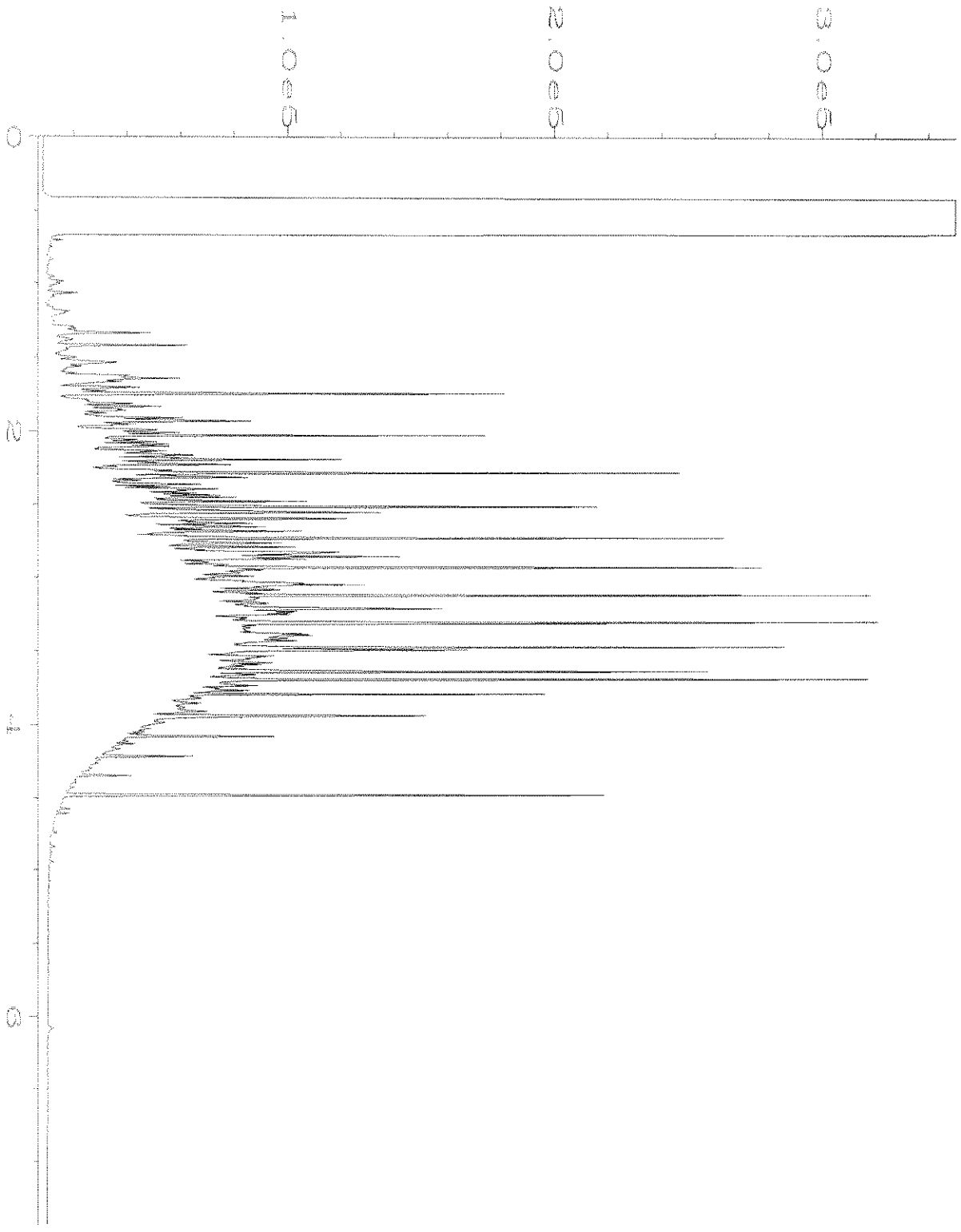


Data File Name : C:\HPCHEM\1\DATA\11-24-20\031F0501.D
Operator : TL
Instrument : GC1
Sample Name : 011391-03 sg
Run Time Bar Code:
Acquired on : 24 Nov 20 01:47 PM
Report Created on: 25 Nov 20 08:32 AM

Page Number : 1
Vial Number : 31
Injection Number : 1
Sequence Line : 5
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name	: C:\HPCHEM\1\DATA\11-24-20\025F0301.D		
Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 25
Sample Name	: 00-2585 mb sg	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 3
Acquired on	: 24 Nov 20 12:26 PM	Instrument Method	: DX.MTH
Report Created on	: 25 Nov 20 08:32 AM	Analysis Method	: DEFAULT.MTH



Data File Name	: C:\HPCHEM\1\DATA\11-24-20\005F1101.D		
Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 5
Sample Name	: 1000 Dx 61-146C	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 11
Acquired on	: 24 Nov 20 07:30 PM	Instrument Method	: DX.MTH
Report Created on	: 25 Nov 20 08:33 AM	Analysis Method	: DEFAULT.MTH

011391

SAMPLE CHAIN OF CUSTODY

ME 11-20-20

Page # 1 of 1 EQ4

Report To R. Jones, G. Hainsworth, Stevens

Company Crete Consulting

Address 108 S. Washington, Ste. 300

City, State, ZIP Seattle, WA 98104

Phone _____ Email _____

SAMPLERS (*signature*) Rusty Jones R. Jones

PROJECT NAME: Port of Tacoma, Parcel 40

PO #

REMARKS: With and without SGC

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME VW2

☒ 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	ANALYSES REQUESTED: NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082					Notes
GEI-MW9-1120	01A-D	11.20.20	0409	WATER	4	X	X	X									
GEI-MW4-1120	02	↓	0447	↓	4	X	X	X									
GEI-MW2-1120	03	↓	0537	↓	4	X	X	X									
																	Samples received at 4 °C 2GB

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: R. Jones	Rusty Jones	Crete Consulting	11/20/20	1311
Received by: [signature]	Nhan Phan	FEBI	11/20/20	1311
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

TO:	Sarah Weeks, Port of Tacoma
FROM:	Grant Hainsworth – CRETE Consulting Inc.
PROJECT:	Parcel 40, Building 600 – Port of Tacoma, Tacoma, WA Professional Services 101486.01
SUBJECT:	Review of NWTPH-Dx Chromatograms (PSA No. 071251)
DATE:	January 21, 2022
CC:	Rob Healy – Port of Tacoma

This memorandum presents a review of TPH chromatograms from soil and groundwater samples collected at Building 600. Likely sources in the vicinity of Building 600 include diesel and Bunker C associated with former railyard operations and lube oil from a documented pipe leak. Diesel is most likely to be the primary contaminant since the investigation locations were in close proximity to the former True's Oil 1.25-million-gallon diesel tank, a 4-inch diesel line between the former tank and the former Milwaukee Railyard, and a former 14,000-gallon diesel UST on the Former Milwaukee Railyard.

Although there was no known gasoline source, gasoline was regularly detected in soil and groundwater samples. These gasoline detections usually occurred when TPH-DRO and TPH-ORO were also detected. In addition, the TPH-GRO concentration generally increased in proportion of the TPH-DRO/ORO concentration suggesting that the TPH-GRO response was primarily due to the middle distillate rather than gasoline-range hydrocarbons. Figure 1 illustrates this relationship based on analytical results for the soil samples collected in 2020. Groundwater data collected in 2020 from direct push probes and monitoring wells exhibit a similar pattern.

Since the TPH-GRO concentrations were present at concentrations in proportion to the TPH-DRO/ORO concentration, chromatograms were reviewed to better understand the nature of contamination. The NWTPH-Dx chromatograms for soil and groundwater samples collected during 2020 are included in Appendix E of the summary report (CRETE 2021). The NWTPH-Dx chromatograms suggest that the primary contaminant is a middle distillate, such as diesel, but when compared to the diesel standard, there is additional response in the lighter hydrocarbon range. Figure 2 provides a selection of chromatograms to illustrate this observation. Furthermore, it was suggested by the analytical laboratory that the gasoline concentrations are primarily due to this lighter fraction middle distillate rather than gasoline, although the presence of a small amount of weathered gasoline cannot be ruled out. Historically, lighter middle distillates such as kerosene were added to diesel fuels to improve cold weather properties.

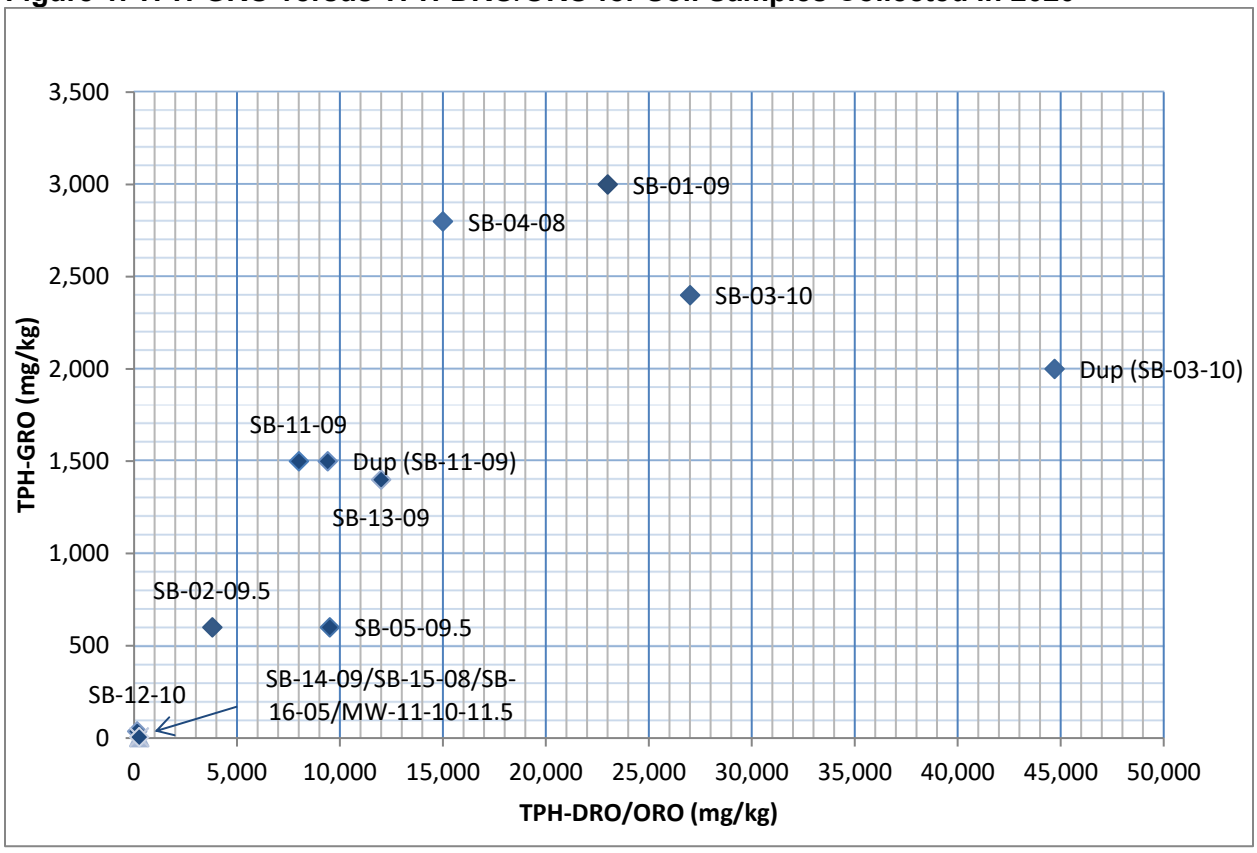
While some weathered gasoline or kerosene may be present, it's possible that the reported TPH-GRO concentrations are not accurately quantified. Since the TPH-GRO quantification is performed based on the gasoline standard and the contaminants present do not resemble the standard, the reported TPH-GRO concentrations may be reported at significantly greater concentrations than are actually present in the gasoline-range.

Soil and groundwater samples were also collected and analyzed in 2019 (AnchorQEA 2019a,b). These data follow a similar pattern with the exception of 2 soil samples that had reported TPH-GRO concentrations that exceeded or were approximately equivalent to the TPH-DRO/ORO concentration

(P40-UST-03-8 and P40-UST-04-14.5, respectively). The contaminant was identified by the analytical laboratory as a middle distillate and the chromatograms (Figure 3) are similar to the 2020 soil sample chromatograms. As noted above, the TPH-GRO concentrations may be reported at significantly greater concentrations that are actually present due to the quantification method. In addition to the elevated TPH-GRO concentration reported for sample P40-UST-03-8, these two samples were also notable for the lower reported TPH-DRO concentrations relative to the TPH-GRO concentrations plus the concentrations did not appear to reflect the contamination descriptions provided on the borehole logs. One possible explanation for the low TPH-DRO concentrations is that these samples were analyzed by a different laboratory and extraction of these samples was performed using microwave extraction rather than ultrasonic extraction. It's possible that the microwave extraction method did not adequately extract the petroleum from the finer-grained portions of the soil matrix.

In summary, the primary source of contamination at Building 600 is a middle distillate, likely diesel fuel. Lighter fraction hydrocarbons such as weathered gasoline or kerosene are present but the TPH-GRO concentrations appear to be driven by bleed over of the middle distillate and may be reported at higher concentrations than are actually present. The elevated TPH-GRO concentration reported for 2019 sample P40-UST-03-8 does not appear to accurately reflect site conditions and some TPH-DRO/ORO concentrations for 2019 soil samples may be under reported due to the use of the microwave extraction methodology.

Figure 1. TPH-GRO versus TPH-DRO/ORO for Soil Samples Collected in 2020



Enclosures:

Figures 2 and 3

Appendix G

Tidal Study

1 Tidal Study

A tidal study was conducted at the Parcel 40 site at the Port of Tacoma between November 2 and November 6, 2020. The tidal study was conducted to evaluate the extent of the tidal influence across Parcel 40 via use of the existing monitor wells. Tidal lags or the delay between low tide, from NOAA tidal data, and low water observed in each well measured. These tidal lags were used to time the groundwater monitoring event conducted during November 2020.

1.1 Data Collection

Water levels were measured using eight Level TROLL 400 data loggers, one BaroTROLL data logger, and a Heron H01L Oil/Water Interface probe. All transducers were set to record on a 3-minute interval. The Level TROLL 400 data loggers measure and record pressure and temperature and record a calculated level depth to water (function of water pressure and programmed depth). Data loggers were installed in monitoring wells MW-1, MW-3, MW-4, MW-5, MW-6, MW-8, MW-10, MW-11. Tidal measurements were downloaded from tide gauge NOAA station 9446484 in Tacoma, WA. Barometric pressure at the site was recorded by the BaroTROLL data logger mounted to a utility pole in the vicinity of the monitor wells.

Depth to water was measured manually to the nearest 0.01-feet concurrent with transducer installation and removal. Transducer water levels were corrected for barometric pressure change and corrected for instrument drift using the manual water level measurements and In-Situ Win-Situ 5.7.6.1 software. No specific conductivity measurements (indicates the salinity of water) were collected during the tidal study, although water quality parameters were collected during the groundwater monitoring event conducted from November 18 through November 20, 2020. This water quality data confirms fresh water conditions present at the site with specific conductance ranges from 905 to 2,697 micro-Siemens per centimeter.

1.2 Results

Corrected hydrographs are included in Figure F-1. Tidal efficiency is the ratio of variations in water levels observed in wells relative to measured tidal fluctuation. For this study, the tidal efficiency was calculated for tide cycles from November 2 through November 6, 2020 (Tables F-1, F-2, F-3, and F-4). The tidal efficiencies ranged from 4.9% to 16.3%, depending on the specific tide cycle (day).

Tidal lags are the delay between peaks/troughs (minimums/maximums) in a given tide cycle, and ranged from 2 hours and 9 minutes (2:09) to 6:26 over the duration of this tidal study at Parcel 40.

Average water levels were calculated based on water levels measured from November 2 to November 6, as measured by the Level TROLLs (barometrically corrected and instrument drift corrected). Contours of average water level elevations are used to estimate the net groundwater flow direction(s). The hydraulic gradient based on the average water levels ranged from about 0.001 to 0.002 ft/ft for flow southwest to the Puyallup River. The hydraulic gradient

was about 0.0001 ft/ft for flow to the north and northwest but there very limited data available.

One well, MW-1, did not exhibit tidal efficiency above 0%. The numerical data consistently demonstrated no clear higher high water peaks during the observed tidal cycles. It is plausible that the compacted soils and likely fill below Building 600 disrupt groundwater flow between MW-1 and the shoreline and nearshore tidal environments. The hydrograph of MW-1 water elevations is included as Figure F-2.

Groundwater flow direction at any given time is partially a function of the corresponding tide. To determine general groundwater flow direction(s), a net groundwater flow figure was calculated. The water elevation data recorded from 5:06PM on November 2 through 9:24AM on November 6 was averaged at each studied well and the data were contoured to map the average water elevation conditions. Figure F-3 depicts the Net Groundwater Flow from this tidal study. Groundwater flow on the western half of the site flows west/southwest towards the Puyallup River. Groundwater flow to the east and northeast of Building 600 generally flows north with a groundwater high, or mound, at the very east end of Building 600.

Tables

Figures

Port of Tacoma, Parcel 40
Tidal Study
Table C-1 Summary of Tidal Variations
11/2/2020 through 11/3/2020

Well	Tidal LLW		Tidal HHW		Monitor Well Observed LLW		Monitor Well Observed HHW		Lag Time LLW	Tidal Efficiency	Comment
	Time	Elevation	Time	Elevation	Time	Elevation	Time	Elevation			
MW-1	23:54	-0.84	7:00	11.62	5:20	8.37			5:26	-1.49%	No clear HHW peak
MW-3	23:54	-0.84	7:00	11.62	3:20	7.84	11:32	8.93	3:26	11.43%	
MW-4	23:54	-0.84	7:00	11.62	2:52	7.77	10:37	8.80	2:58	12.10%	
MW-5	23:54	-0.84	7:00	11.62	2:33	6.93	9:48	8.76	2:39	6.81%	
MW-6	23:54	-0.84	7:00	11.62	3:49	7.92	12:01	8.79	3:55	14.32%	
MW-8	23:54	-0.84	7:00	11.62	3:51	7.80	11:39	8.64	3:57	14.83%	
MW-10	23:54	-0.84	7:00	11.62	2:30	6.33	9:27	8.86	2:36	4.92%	
MW-11	23:54	-0.84	7:00	11.62	3:24	7.09	10:42	8.64	3:30	8.04%	

NOTES:
All elevation data in feet above mean lower low water.
LLW- Lower Low Water
HHW - Higher High Water

Port of Tacoma, Parcel 40
Tidal Study
Table C-2 Summary of Tidal Variations
11/4/2020

Well	Tidal LLW		Tidal HHW		Monitor Well Observed LLW		Monitor Well Observed HHW		Lag Time LLW	Tidal Efficiency	Comment
	Time	Elevation	Time	Elevation	Time	Elevation	Time	Elevation			
MW-1	0:30	-0.94	7:42	11.70	6:35	8.35			6:05	-1.51%	No clear HHW peak
MW-3	0:30	-0.94	7:42	11.70	4:14	7.91	12:02	8.97	3:44	11.92%	
MW-4	0:30	-0.94	7:42	11.70	3:07	7.83	11:04	8.83	2:37	12.64%	
MW-5	0:30	-0.94	7:42	11.70	3:06	7.05	10:24	8.81	2:36	7.18%	
MW-6	0:30	-0.94	7:42	11.70	4:49	8.01	13:19	8.83	4:19	15.41%	
MW-8	0:30	-0.94	7:42	11.70	4:15	7.88	12:30	8.69	3:45	15.60%	
MW-10	0:30	-0.94	7:42	11.70	2:39	6.47	10:03	8.91	2:09	5.18%	
MW-11	0:30	-0.94	7:42	11.70	3:30	7.19	11:27	8.69	3:00	8.43%	

NOTES:
All elevation data in feet above mean lower low water.
LLW- Lower Low Water
HHW - Higher High Water

Port of Tacoma, Parcel 40
Tidal Study
Table C-3 Summary of Tidal Variations
11/5/2020

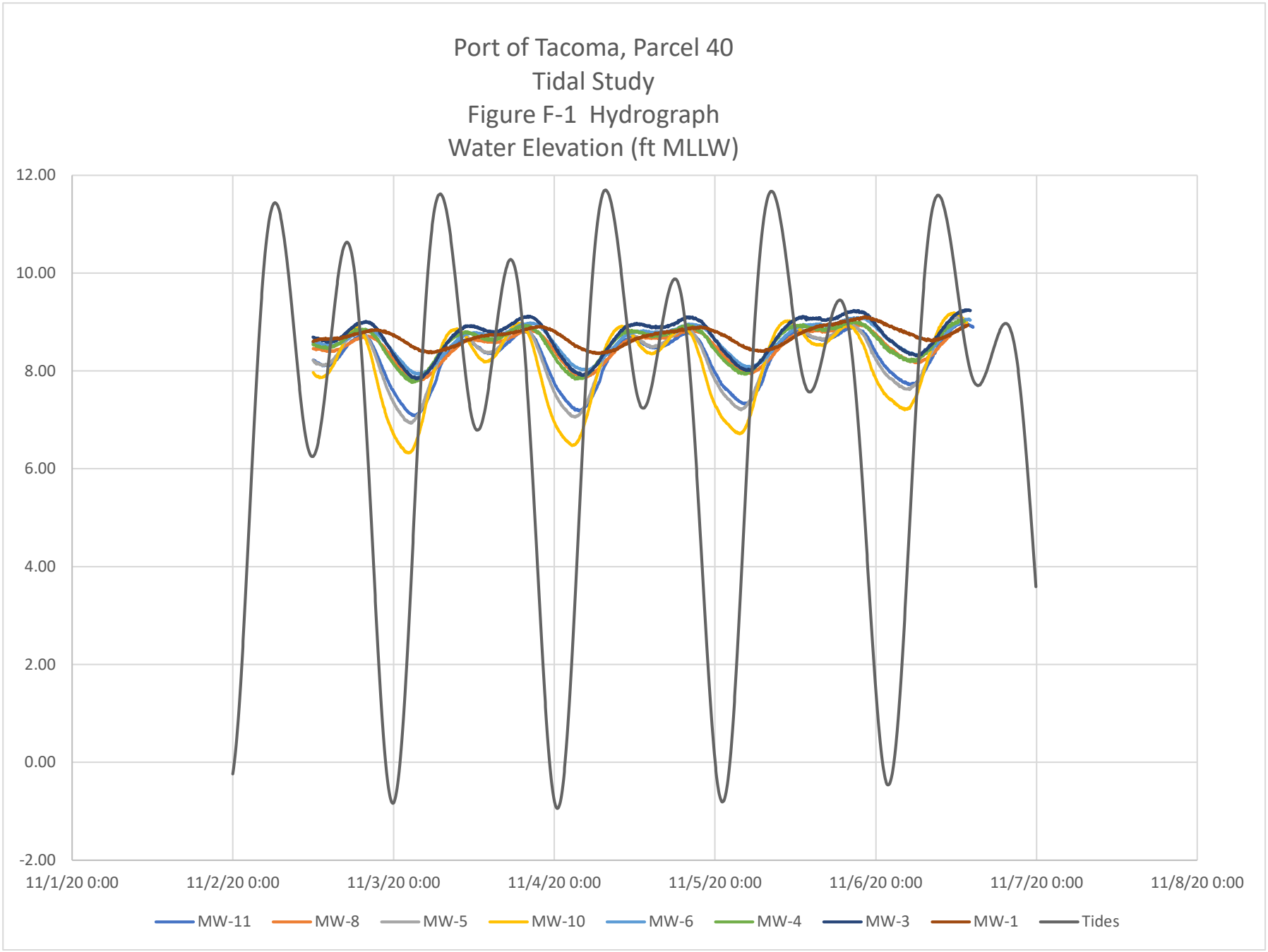
Well	Tidal LLW		Tidal HHW		Monitor Well Observed LLW		Monitor Well Observed HHW		Lag Time LLW	Tidal Efficiency	Comment
	Time	Elevation	Time	Elevation	Time	Elevation	Time	Elevation			
MW-1	1:06	-0.81	8:30	11.67	6:26	8.40			5:20	-1.49%	No clear HHW peak
MW-3	1:06	-0.81	8:30	11.67	4:38	8.01	13:05	9.11	3:32	11.35%	
MW-4	1:06	-0.81	8:30	11.67	4:22	7.93	13:10	8.95	3:16	12.24%	
MW-5	1:06	-0.81	8:30	11.67	3:54	7.20	11:06	8.93	2:48	7.21%	
MW-6	1:06	-0.81	8:30	11.67	5:16	8.07	13:10	8.95	4:10	14.18%	
MW-8	1:06	-0.81	8:30	11.67	5:18	7.94	13:42	8.83	4:12	14.02%	
MW-10	1:06	-0.81	8:30	11.67	3:39	6.71	10:48	9.03	2:33	5.38%	
MW-11	1:06	-0.81	8:30	11.67	4:24	7.33	12:30	8.82	3:18	8.38%	

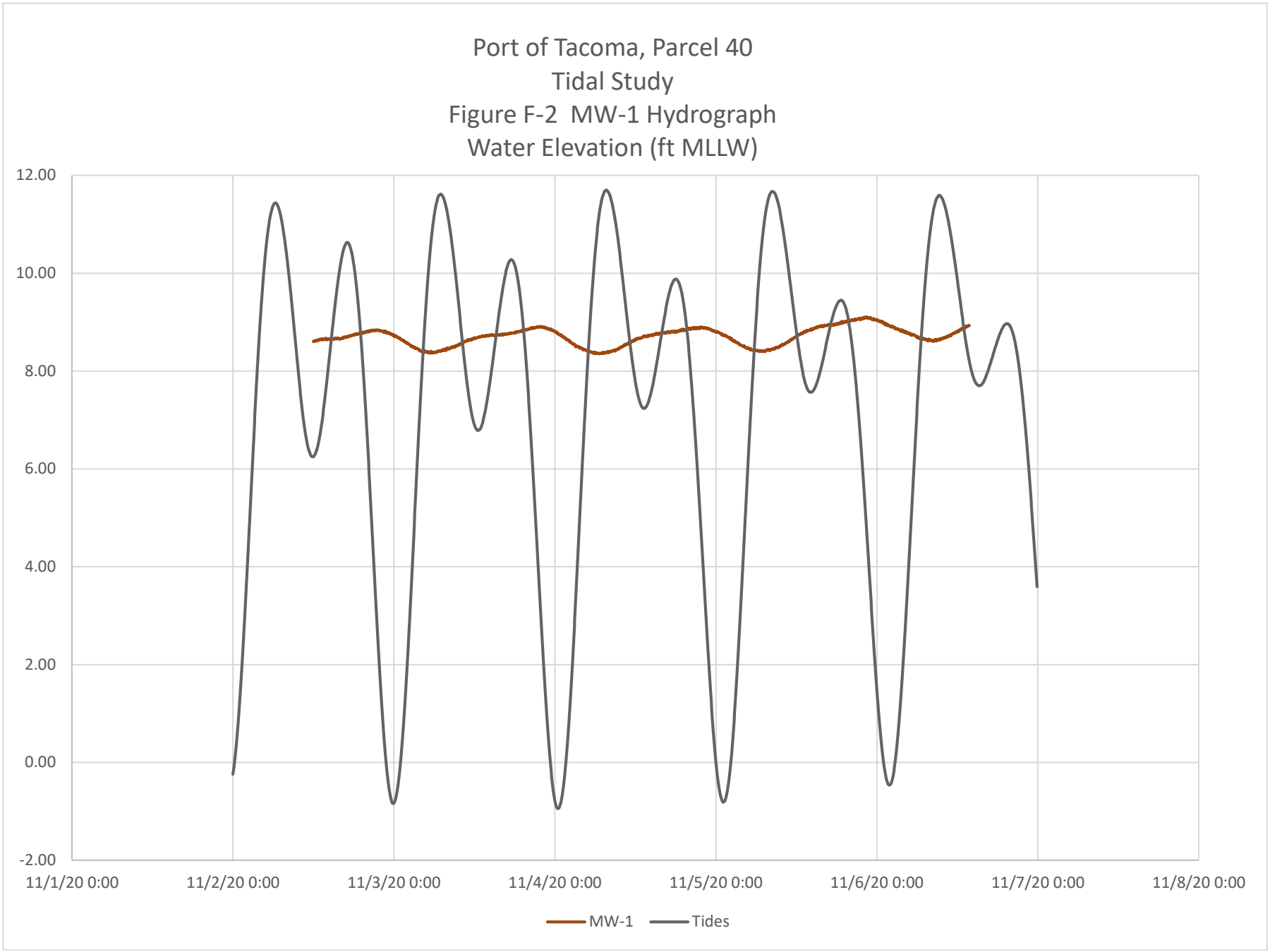
NOTES:
All elevation data in feet above mean lower low water.
LLW- Lower Low Water
HHW - Higher High Water

Port of Tacoma, Parcel 40
Tidal Study
Tidal C-4 Summary of Tidal Variations
11/6/2020

Well	Tidal LLW		Tidal HHW		Monitor Well Observed LLW		Monitor Well Observed HHW		Lag Time LLW	Tidal Efficiency	Comment
	Time	Elevation	Time	Elevation	Time	Elevation	Time	Elevation			
MW-1	1:54	-0.46	9:24	11.59	8:20	8.61			6:26	-1.40%	No clear HHW peak
MW-3	1:54	-0.46	9:24	11.59	5:59	8.31	13:20	9.25	4:05	12.82%	
MW-4	1:54	-0.46	9:24	11.59	5:13	8.19	---	---	3:19	---	Ceased recording prior to HHW peak
MW-5	1:54	-0.46	9:24	11.59	5:03	7.62	12:03	9.09	3:09	8.20%	
MW-6	1:54	-0.46	9:24	11.59	6:19	8.3	13:49	9.06	4:25	15.86%	
MW-8	1:54	-0.46	9:24	11.59	6:12	8.16	13:03	8.90	4:18	16.28%	
MW-10	1:54	-0.46	9:24	11.59	4:18	7.20	11:45	9.19	2:24	6.06%	
MW-11	1:54	-0.46	9:24	11.59	5:09	7.72	12:51	8.98	3:15	9.56%	

NOTES:
All elevation data in feet above mean lower low water.
LLW- Lower Low Water
HHW - Higher High Water


Port of Tacoma, Parcel 40
Tidal Study
Figure F-1 Hydrograph
Water Elevation (ft MLLW)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
11/1/20 0:00
11/2/20 0:00
11/3/20 0:00
11/4/20 0:00
11/5/20 0:00
11/6/20 0:00
11/7/20 0:00
11/8/20 0:00
MW-11
MW-8
MW-5
MW-10
MW-6
MW-4
MW-3
MW-1
Tides


Port of Tacoma, Parcel 40
Tidal Study
Figure F-2 MW-1 Hydrograph
Water Elevation (ft MLLW)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
11/1/20 0:00
11/2/20 0:00
11/3/20 0:00
11/4/20 0:00
11/5/20 0:00
11/6/20 0:00
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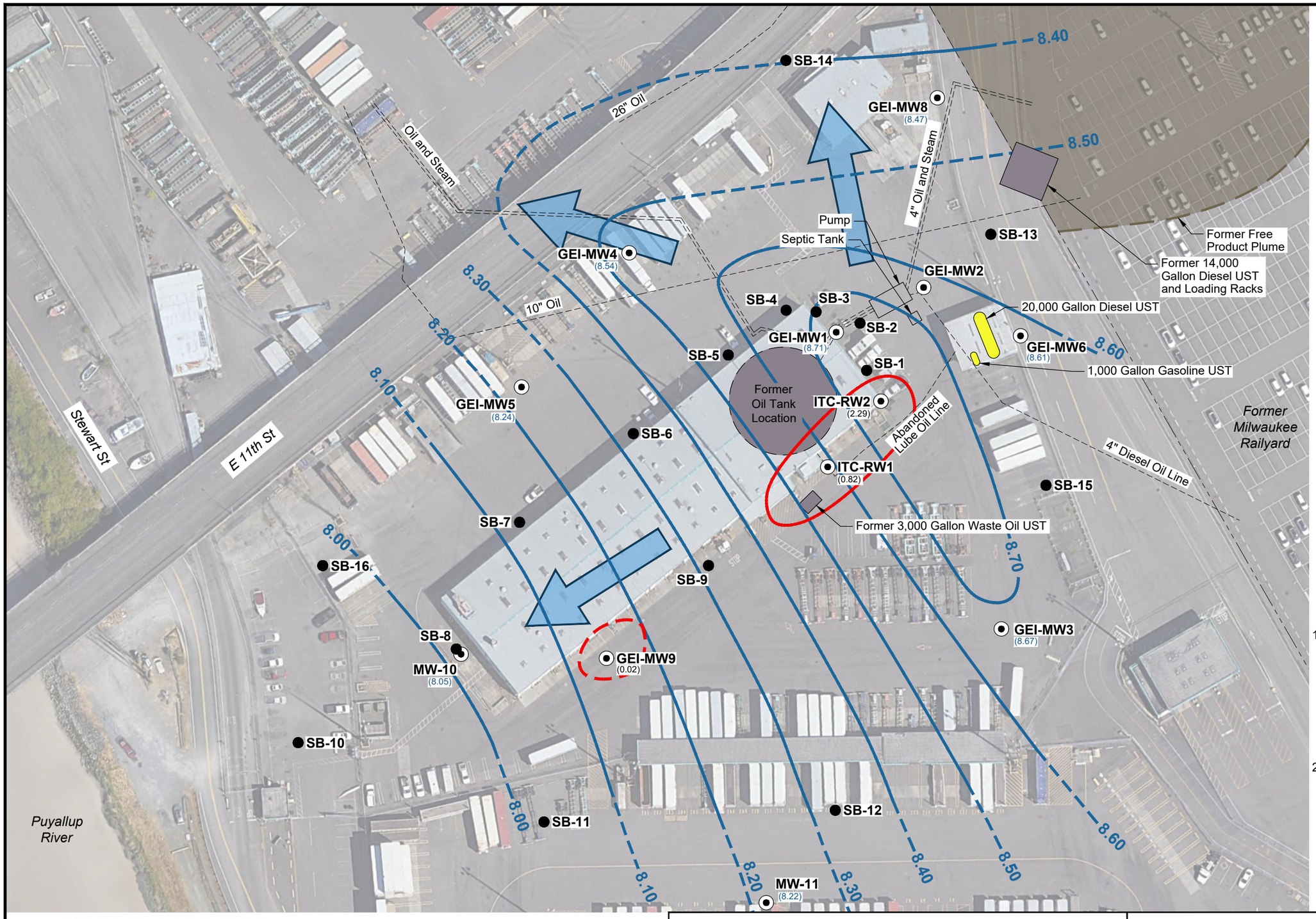
11/8/20 0:00
MW-1
Tides



CRETE CONSULTING, INC.

Port of Tacoma - Parcel 40
Tacoma, Washington
June 10, 2021

Figure F-3
Net Groundwater Flow