Calhoun's Service Station

Cleanup Action Report

Prepared for

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List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
CUL	Cleanup level
DRO	Diesel-range organics
Ecology	Washington State Department of Ecology
EDB	1,2-Dibromoethane
GRO	Gasoline-range organics
JEM	Johnson and Ettinger Model
µg/m^3	Micrograms per cubic meter
mg/kg	Milligram per kilogram
MTCA	Model Toxics Control Act
NFA	No Further Action
ORO	Oil-range organics
TEE	Terrestrial Ecological Evaluation
TPH	Total petroleum hydrocarbon
USEPA	U.S. Environmental Protection Agency
UST	Underground storage tank
WAC	Washington Administrative Code

1.0 Site Description, Background, and Characterization

Floyd|Snider has prepared this Cleanup Action Report at the request of the Calhoun Estate, and all activities detailed in this report were performed under Washington State Department of Ecology's (Ecology) Voluntary Cleanup Program (VCP). The cleanup action activities were completed at the site, which is the former Calhoun's Service Station located at 4540 Pacific Avenue in Tacoma, Washington (Figure 1.1). The purpose of the activities was to remove all petroleum-contaminated soil that exceeded site-specific Model Toxics Control Act (MTCA) Method B cleanup levels (CULs) from the ground surface to 15 feet below ground surface (bgs). In addition, potential intrusion of soil vapors to indoor air was evaluated because soil exceeding MTCA Method A CULs were left in place after excavation.

All sampling and cleanup activities were performed in compliance with Ecology's Opinion on Proposed Cleanup Letter dated September 2, 2015, which is included as Appendix A (Ecology 2015a). Field activities and results are described in the following sections.

1.1 SITE DESCRIPTION, LOCATION, AND BACKGROUND

The property is located on the northwest corner of Pacific Avenue and South 46th Street in Tacoma, Washington (Figure 1.1). Under Pierce County Assessor's Building and Land Use records, the parcel (No. 7470024730) is zoned for commercial use only. The property has been used as a service station since at least 1926, and is currently leased to a tire sales and automotive repair shop, Llantera Sinaloa Tire Sales & Service. The site is located within a mixed-use commercial and residential area of Tacoma. Residential housing is adjacent to the west, east, and north of the property, and commercial businesses are located to the south and southeast. A public bus stop is located on Pacific Avenue on the east side of the property.

According to existing reports, the property was initially known as the Melvin Tveten Gasoline Station, but by 1951 the station was redeveloped and reconfigured as Calhoun's Service Station (Aerotech 2011). The 1951 redevelopment consisted of demolishing the existing building, reconfiguring the service station facilities, constructing the current building with hydraulic hoists, and installing new underground storage tanks (USTs). In 1991, the station was decommissioned and all four USTs were removed (two 4,000-gallon gasoline tanks, one 6,000-gallon gasoline tank, and one 50- to 200-gallon waste oil tank). Menotti Excavating performed excavation activities that removed approximately 250 cubic yards of petroleum-contaminated soil from the UST basin and stockpiled it within the southwestern corner of the property. Sidewall samples were not collected during the 1991 excavation activities. The excavation was subsequently backfilled. Five stockpile samples were collected in April 1993 and all results were less than laboratory reporting limits. The stockpiled soil was transported off-site to be used as fill at an off-site location. In 2005, the fuel pumps were removed. Petroleum fuel is no longer stored on-site. (Menotti 1993).

In July of 2011, the site entered into Ecology's VCP. Ecology requested additional characterization. In December 2011, a Limited Phase II Investigation was conducted and 17 soil borings (SB-1 through SB-17) were advanced within the approximate locations of the former

waste oil UST, gasoline USTs, hydraulic hoists, and fuel dispensers, and within the footprint where the stockpiled soil was located (Aerotech 2011). Soil analytical data indicate no petroleum-contaminated impacts in borings located within the former waste oil UST, former hydraulic hoists, and the former stockpile area. However, soil data from soil boring SB-16 indicated petroleum-impacted soil at the base of the 1991 UST excavation at 12 feet bgs. All other soil samples collected within the former UST basin contained concentrations less than their respective MTCA Method A CULs. Petroleum hydrocarbon impacts were also encountered within the vicinity of the fuel dispensers. In addition, groundwater screening samples were able collected from three boring locations within the vicinity of the former fuel dispenser (SB-9, SB-10, and SB-11) because thin, isolated lenses of wet soil were encountered. Groundwater data from these three borings indicate gasoline-range organics (GRO) and/or benzene detections at concentrations exceeding their respective MTCA Method A CULs (Aerotech 2011). Diesel-range organics (DRO) and oil-range organics (ORO) were not detected in any of the samples that were submitted for analysis. Water bearing zones were not encountered in the remaining boring locations.

In February 2012, a Limited and Targeted Phase III Subsurface Investigation was completed by Aerotech in order to further delineate soil and groundwater impacts. This investigation consisted of an additional 12 soil borings (SB-18 through SB-29) located within the vicinity of the former tank basin and former fuel dispenser, and within the southeastern portion of the property between the former tank basin and Pacific Avenue. GRO was detected at concentrations exceeding MTCA Method A CULs in soil. In addition, thin lenses of wet soil were encountered in 4 of the 12 soil borings within the vicinity of the fuel dispensers and fuel lines. Water samples were collected from four borings, and GRO and/or benzene were detected at concentrations exceeding their respective MTCA Method A CULs in borings SB-23, SB-25, and SB-28 (Aerotech 2012).

In December 2014, Floyd|Snider completed additional site investigation activities in order to determine if any USTs associated with service stations remain on the property and to fully delineate residual hydrocarbon impacts on property soil. A ground penetrating radar study was conducted on the entire property that indicated that no other USTs were present. Twenty-five soil borings (SB-30 through SB-54) were advanced using a direct-push drill rig by Environmental Services Network of Olympia, Washington, between December 10 and 11, 2014. The results from the soil analytical data were used to calculate a site-specific MTCA Method B CUL of 3,240 milligrams per kilogram (mg/kg) for total petroleum hydrocarbons (TPH). Floyd|Snider prepared and submitted a Request for No Further Action Likely Letter, which requested Ecology provide the likelihood of receiving a "No Further Action" (NFA) determination if this Method B CUL for TPH was used to remove remaining soil impacts (Floyd|Snider 2015). An Ecology opinion letter was received on September 2, 2015 that approved the proposed cleanup activities using MTCA Method B CULs (Appendix A). Additionally, Ecology recommended installing three soil vapor points, further delineating soil that exceeds MTCA Method A CULs adjacent to boring SB-54, analyzing for 1,2-dibromoethane (EDB) using U.S. Environmental Protection Agency (USEPA) Method 8260 Selective Ion Monitoring (SIM), and completing a Terrestrial Ecological Evaluation (TEE).

1.2 GEOLOGY

The geology of the surrounding area is characterized by a thick sequence of Quaternary glacial and interglacial deposits that consist of till, outwash sands and gravels, and fine-grained interglacial deposits. The subsurface lithology beneath the property typically consists of 0.5 to 1 foot of silty, sandy, gravelly fill that overlies stiff to hard silt with low to high plasticity, up to 40 percent fine to medium sand, and occasionally organic debris and rounded gravel. The sandy silt is up to 14 feet thick and is occasionally interbedded with non-continuous lenses of silty sand. The silt layer overlies an olive gray to brown, silty, fine to medium sand with up to 40 percent silt and up to 10 percent fine to medium, rounded gravel. The silty sand layer is up to at least 9 feet in thickness and interpreted to be post-recessional lake bed deposits. Till is encountered beneath the silty sand layer at a depth of at least 17 feet bgs. The till consists of dry, very dense, silty, gravelly, fine- to coarse-grained sand. As described in Section 1.3, the till is extremely dense and serves to limit contaminant migration.

1.3 SOIL IMPACTS TO GROUNDWATER

The December 2014 borings were advanced to depths up to 20 feet bgs, and evidence of groundwater was not encountered, including at the locations where water samples were able to be collected during the previous Aerotech sampling activities. Boring logs show that thin lenses of wet soil were occasionally encountered in silty sand layers overlying stiff, silt layers but were not present in all boring locations. These wet zones are randomly distributed, thin, and non-continuous, and were encountered at inconsistent depths ranging between 2 to 15 feet bgs. During the 2016 excavations activities, groundwater was not encountered. Based on field observations, these wet zones are likely transitory (i.e., seasonal) and do not produce a substantial amount of water (saturated with enough recharge) to be classified as potable under the Washington Administrative Code (WAC) Chapter 173-340-720(2). It is likely that groundwater first occurs much deeper within the sandier outwash deposits that underlie the till. According to Ecology's well database, the regional groundwater aquifer is encountered at approximately 125 feet bgs and groundwater is generally not encountered within the upper 35 feet within the vicinity of the site. Ecology's opinion letter determined that groundwater is not a potential exposure pathway at the site.

Based upon this evidence, Ecology determined in their opinion letter that soil leaching to groundwater and drinking of site groundwater are not potential exposure pathways for the following reasons:

- The shallow wet zones are random, discontinuous, and do not produce a substantial amount of water to set a well screen and capture.
- There was an absence of groundwater during the 1991 excavation activities.[1]
- There has been an absence of sufficient extractable volume, as observed during field activities.

[1] The absence of groundwater was confirmed during the 2016 excavation activities as well.

- It is unlikely that impacted, shallow, wet zones will vertically migrate through the impermeable till layer to the aquifer lying 125 feet bgs.
- The thin lenses of wet soil do not represent potable groundwater.

1.4 CONTAMINANTS OF CONCERN

The primary contaminants detected in soil at the site are GRO, benzene, toluene, ethylbenzene, and total xylenes (BTEX). These contaminants of concern are associated with release of gasoline fuel from former gasoline service station activities. Direct contact with soil is the main concern; however, indoor air is a secondary media of concern for the current business occupants and any hypothetical future commercial building constructed over the remaining soil impacts.

1.5 CLEANUP LEVELS

The MTCA Method B approach is the universal method for determining CULs at any site. The Method B approach meets MTCA criteria for evaluating and selecting a cleanup action under WAC 173-340-360(2)(a), which includes protection of human health and the environment, compliance with cleanup standards, and compliance with applicable state and federal laws. Removing soil that exceeds MTCA Method B CULs is a permanent solution, provides a reasonable restoration timeframe, and does not rely on institutional controls.

In addition, the Site is a suitable candidate for Model Remedy 4 under Ecology's *Model Remedies for Sites with Petroleum Contaminated Soils Guidance* (Ecology 2015b). Sites that are eligible for Model Remedies have had an adequate characterization, the only impacted media is soil, there is no soil leaching to groundwater pathway, and the vapor intrusion pathway has been investigated (addressed later in this report).

Under Ecology's Model Remedies guidance, when establishing a MTCA Method B direct contact CUL there are two options. The first option is to calculate a direct contact TPH CUL using fractional data, and the second option is to apply a generic TPH CUL of 1,500 mg/kg for direct contact. For this site, MTCA Method B CULs were developed using an unrestricted land use soil direct contact exposure pathway that used analytical data from three soil samples collected at the site and Ecology's *Workbook Tools for Calculating Soil and Groundwater Cleanup Levels under the MTCA Cleanup Regulation* (Ecology 2007). The average of the three results was used as a site-specific MTCA Method B CUL for total TPH. MTCA Method B CULs for BTEX and naphthalene were obtained from Ecology's Cleanup Levels and Risk Calculation (CLARC; Ecology 2014) database. Site-specific MTCA Method B CULs are listed in Table 1.1.

Table 1.1
Soil—Unrestricted Land Uses

Hazardous Substance	Direct Contact MTCA Method B (mg/kg)	Protection of Groundwater
GRO	3,240 Calculated for Total TPH[1]	NA
DRO		NA
ORO		NA
Benzene	18	NA
Ethylbenzene	8,000	NA
Total Xylenes	16,000	NA
Naphthalene	1,600	NA

Note:
1 Refer to Floyd|Snider's Request for No Further Action Likely Letter for calculation of site-specific TPH MTCA Method B CUL (Floyd|Snider 2015).

Abbreviation:
NA Not applicable

2.0 Cleanup Action Activities

In 2016, the following remedial cleanup actions and additional investigations occurred at the site in order to meet Ecology's requests and obtain a NFA determination.

2.1 PERMITS AND UTILITY LOCATE

Prior to initiating cleanup actions, a grading permit was obtained and a short form stormwater pollution prevention plan (SWPPP) was prepared. Both were submitted and approved by the City of Tacoma. In addition, public and private utility locates were conducted on the property.

2.2 EXCAVATION AND OFF-SITE DISPOSAL

The only two soil borings that contained concentrations that exceeded the site-specific TPH MTCA Method B CUL were SB-25 and SB-35. Therefore, excavation activities were conducted within the vicinity of these borings to remove all MTCA Method B exceedances in soil (Figure 2.1). Excavation activities were performed between February 29 and March 3, 2016, by Clearcreek Contractors of Everett, Washington. The ground surface consisted of concrete, and once removed, all soil from directly beneath the concrete to 15 feet bgs was removed with the excavator and placed directly into intermodal containers on trucks for off-site disposal. Stockpiles were not needed during excavation activities. All excavated soil was transported and offloaded at Roosevelt Regional Landfill (Republic Services [Allied Waste]) for disposal and was managed as "contaminated soils" consistent with the Solid Waste Handling Standards (WAC 173-350). In total, 244 tons of petroleum-contaminated soil was removed and transported off-site for disposal.

2.3 EXCAVATION CONFIRMATION SAMPLES

In conjunction with soil analytical data from the 2014 investigation, confirmation samples were collected along the sidewalls and at the base of the excavation. Generally, one soil sample was collected from each sidewall approximately every 15 feet laterally and at depths where previous adjacent analytical data or field observations encountered contamination. Samples from the base of the excavation were collected approximately every 100 square feet and within areas where previous analytical data indicated elevated hydrocarbon concentrations. All soil samples were field screened for the presence of volatile hydrocarbons using a photoionization detector (PID) and sheen pan. Samples with the greatest presence of impacts via field screening were analyzed for the following:

- GRO by NWTPH-Gx
- DRO and ORO by NWTPH-Dx
- BTEX by USEPA Method 8021B

In addition, two soil samples were analyzed for EDB using USEPA Method 8260 SIM. Soil samples were delivered to Freidman & Bruya, Inc. on a daily basis and were submitted with a 24-hour turn-around-time. Sample labels consisted of the excavation sample number (EX-2) and corresponding depth (e.g., EX-2-15').

The lateral extent of the excavation was determined by previous investigations and sidewall samples. The extent of the excavation was first bounded by confirmation sidewall samples to the south, west, north, and southeast. However, the northeastern sidewall sample, EX-8-8'-9', contained TPH concentrations that exceeded the MTCA Method B CULs. The zone of contamination appeared to be within a thin lens of sandy silt that was encountered between 8 and 9 feet bgs. Therefore, additional soil removal was performed in the northeastern portion of the excavation to remove this lens. The excavation was extended laterally to the east up to the sidewalk and then resampled between 8 and 9 feet bgs to ensure that the elevated TPH concentrations had been removed.

The final maximum dimensions of the excavation were approximately 25 feet by 20 feet, and the excavation extended to a depth of 15 feet bgs. The final limits of the excavation, confirmation sample locations, and remaining soil data are shown on Figure 2.2.

2.4 EXCAVATION SAMPLING RESULTS

The remedial excavation was completed to a depth of 15 feet bgs. Analytical results for all sidewall confirmation samples collected along the maximum lateral extents of the excavation confirmed that soils containing TPH or BTEX at concentrations exceeding their respective site-specific MTCA Method B CULs had been removed. Soil samples collected from the base of the excavation confirmed that all soil with residual hydrocarbon concentrations exceeding their respective MTCA Method B CULs had been removed. In addition, the two selected soil samples that were analyzed for EDB resulted in concentrations less than the MTCA Method A CUL, as required in Ecology's opinion letter. Confirmation sampling results are summarized in Table 2.1, remaining soil data are presented in Table 2.2, and confirmation sample locations are shown on Figure 2.2. Laboratory analytical reports are included as Appendix B.

2.5 SOIL DISPOSAL

Contaminated soil was loaded directly into intermodal containers and transported off-site for disposal. In total, 244 tons of petroleum-contaminated soil was ultimately removed and transported to Roosevelt Regional Landfill (Republic Services [Allied Waste]) for disposal. Trucking tickets are included as Appendix C.

2.6 BACKFILL AND COMPACTION

Following review of the analytical data and confirmation that all contaminated soil exceeding site-specific CULs had been removed, backfill and compaction activities were performed. Due to heavy overnight rains, approximately 2 to 3 inches of standing water was in the bottom of the excavation. Therefore, quarry spalls were imported and used to fill the bottom of the excavation in order to achieve sufficient compaction. Although there were no compaction requirements, approximately 100 cubic yards of imported fill up to 1.25-inches in diameter was backfilled over the quarry spall and compacted every 3 to 4 feet up to 1 foot below the original grade. Approximately 10 cubic yards of 5/8-minus fill was used in the upper foot, and the surface was repaved with asphalt up to 6 inches.

3.0 Supplemental Investigation

After excavation activities, a supplemental investigation was conducted in accordance with Ecology's opinion letter. In order to receive an NFA determination, Ecology requested the following:

- Soil that exceeded MTCA Method A CULs in soil boring SB-54 needed to be delineated to the east.
- EDB was to be analyzed using USEPA Method 8260 SIM.
- Three soil vapor points needed to be installed and sampled.

3.1 MTCA METHOD A DELINEATION

GRO was detected in soil boring SB-54 at 5.5 feet bgs with a concentration of 330 mg/kg, which exceeds the MTCA Method A CUL. Ecology's opinion letter (Ecology 2015a) required that the extent of GRO concentrations exceeding Method A CULs must be delineated to the east of SB-54. During the excavation activities, an apparent thin lens of contaminated soil was present along the eastern sidewall within the vicinity of SB-54 at a depth of 5.5 feet bgs. A hand auger was used to collect soil east of soil boring SB-54 at approximately 5.5 feet bgs in order to delineate the extent of soil that exceeds MTCA Method A CULs. The soil sample, SB-55, was analyzed for the same constituents as the excavation samples, and soil analytical data indicated that all constituents were at concentrations less than their respective MTCA Method A CULs. Soil results for SB-55 are summarized in Table 2.1, and the sample location is shown on Figure 2.2. Laboratory analytical reports are included as Appendix B.

3.2 1,2-DIBROMOETHANE ANALYSIS

Two excavation soil samples, EX-1-15' and EX-3-9'-10', with obvious signs of contamination, via field screening, were analyzed for EDB using USEPA Method 8260 SIM. Results indicate that EDB was not present at concentrations greater than the laboratory detection limit (Table 2.1) for either sample.

3.3 SOIL VAPOR ASSESSMENT

USEPA's 2015 technical guidance for addressing petroleum vapor intrusion states that the lateral inclusion zone and separation must be defined to determine if current buildings are threatened by potential vapor intrusion (USEPA 2015). In addition, Ecology has recently updated their vapor intrusion guidance to include lateral and vertical separation distances and lateral inclusion zones in their memorandum, "*Updated Process for Initially Assessing the Potential for Petroleum Vapor Intrusion*" (Ecology 2016).

The current commercial building has a lateral separation distance of approximately 26 and 27 feet from locations SB-53 and SVP-3, respectively. Soil analytical data indicate that only a small area of benzene is present in soil around the vicinity of soil boring SB-53. Furthermore, data

indicate that contaminated soil is not present in borings adjacent to the building. There is lateral separation between benzene concentrations detected in SB-53 but it is less than 30 feet, which is within Ecology's defined lateral inclusion zone. The adjacent residential dwellings are not within the lateral inclusion zone because they are further than 30 feet away from the remaining residual hydrocarbons in soil. Therefore, the residential dwellings do not have to be assessed for vapor risk. However, vapor risk into the current commercial building must be evaluated, as it is within the lateral inclusion zone. In accordance with Ecology's vapor intrusion guidance (Ecology 2009 and 2015c), a Tier I vapor intrusion assessment was conducted for the current building and for any future commercial building that may be constructed over SB-53 (Ecology 2009).

Three soil vapor probes were installed on the property on March 9, 2016. The soil borings were advanced using a geoprobe drill rig and completed as soil vapor probes SVP-1, SVP-2, and SVP-3 at locations presented on Figures 2.1 and 2.2. These three soil vapor probes were located within the vicinity of borings that contain the greatest petroleum concentrations in soil remaining at the site. SVP-1 and SVP-2 are located outside the excavation but within the vicinity of SB-32. SVP-1 and SVP-2 were installed at depths of 15.25 and 6.75 feet bgs, respectively. SVP-3 is located outside the excavation, within the vicinity of SB-53, and was installed at a total depth of 5.75 feet bgs. Each vapor point was installed at depths that contained the greatest hydrocarbon concentrations within 5 and 15 feet bgs in accordance to the Ecology-reviewed work plan.

Boring logs are included in Appendix D and installation and sampling details are presented in a vapor sampling memorandum, which is included in Appendix E.

Soil gas samples were analyzed for the following:

- BTEX and naphthalenes using USEPA Modified Method TO-15 low level
- Helium using ASTM D 1946

3.3.1 Soil Gas Analytical Results

Benzene was detected in SVP-3 at a concentration of 220 micrograms per cubic meter ($\mu g/m^3$), which exceeds the MTCA Method B soil gas screening levels present in the updated Table B-1 of the Ecology vapor intrusion guidance (Ecology 2015c; Table 3.1). Per the Ecology vapor intrusion guidance, if concentrations are greater than the screening levels during the Tier I assessment, proceed to the Tier II assessment, which includes using the Johnson and Ettinger Model (JEM) to predict indoor air concentrations and risk. Two separate JEMs (the USEPA online JEM and an Excel™ JEM that uses default commercial exposure scenarios programmed by USEPA) were used to predict a range of minimum to maximum benzene concentrations into indoor air. Model results were then compared to indoor air CULs, presented in the updated Table B-1 of Ecology's vapor intrusion guidance (Ecology 2009 and 2015c).

Details of the soil vapor sampling activities, JEMs, and results are included in Appendix E. Results and CULs are summarized in Table 3.2.

Table 3.2
Summary of JEM Results

Hazardous Substance	JEM-Predicted Benzene Concentration to Indoor Air						MTCA Method B Indoor Air Cleanup Level (µg/m³)
	Low Prediction (µg/m³)	Cancer Risk[1]	Best Estimate (µg/m³)	Cancer Risk[1]	High Prediction (µg/m³)	Cancer Risk[1]	
Benzene (USEPA Online JEM tool)	0.04115	$1.319E^{-7}$	0.1563	$5.009E^{-7}$	0.2929	$9.388E^{-7}$	0.321
2014 Excel Default Commercial JEM	NA	NA	0.099	$2.3E^{-7}$	NA	NA	

Note:
1 Target cancer risk is $1.0E^{-6}$.

Abbreviation:
NA Not applicable

3.3.2 JEM Results Discussion

The soil vapor memorandum (Appendix E) details the conservative approach that was taken using the online JEM and the results. Both the online and excel JEM results for default commercial parameters and exposure rates confirm that benzene concentrations in soil vapor into indoor air is not a risk to the existing or future commercial buildings at the property. In addition, results from both JEM predicted cancer risks at levels less than the target cancer risk of $1.0E^{-6}$. The JEM that uses default commercial exposure scenarios indicates a lower risk and is more representative of actual and future site conditions. In conjunction with these results and using Ecology's lateral inclusion zone definition, there is no soil gas vapor risk to the current commercial building and adjacent residential dwellings.

3.4 TERRESTRIAL ECOLOGICAL EVALUATION

MTCA requires that a TEE be completed following the release of hazardous substances to soil in order to determine the potential impacts to terrestrial organisms at the site (WAC 173-340-7490). However, a TEE can be excluded if certain criteria are met (WAC 173-340-7491). The site meets the exclusion criteria because there are less than 1.5 acres of contiguous undeveloped land on the site or within 500 feet of any area of the site.

4.0 Conclusions

In total, 244 tons of soil containing petroleum hydrocarbons at concentrations exceeding the site-specific MTCA Method B CULs were excavated and transported off-site for disposal between February 29, 2016 and March 4, 2016. The final maximum lateral dimensions of the excavation were approximately 25 feet by 20 feet, and the excavation extended down to 15 feet bgs. Soil analytical results from samples collected from the excavation sidewalls and bottom, along with soil analytical data from the 2014 investigation, confirm that the remedial excavation activities meet the MTCA criteria under WAC 173-340-360(2)(a). Confirmation soil samples indicate that all soil containing petroleum hydrocarbon concentrations exceeding the site-specific MTCA Method B CULs have been removed between the ground surface and 15 feet bgs.

Soil vapor probes were installed within the vicinity of the greatest remaining impacts. Soil vapor concentrations from soil vapor probes SVP-1 and SVP-2 were less than the screening levels presented in the updated Table B-1 of Ecology's vapor intrusion guidance (Ecology 2009 and 2015c), and JEM results, using concentrations from SVP-3, indicate that predicted benzene concentrations in indoor air are less than the MTCA Method B CUL. Therefore, soil vapor intrusion into indoor air is not an incremental risk to occupants within the current or future commercial building on the property. Furthermore, using Ecology's lateral inclusion zone definition, there is no soil gas vapor risk to the adjacent residential dwellings.

Confirmation sampling results, in conjunction with results from previous investigations and Tier II vapor intrusion assessment results, confirm that soil beneath the site is now in compliance with the cleanup standards established in WAC 173-340-700 through 173-340-760 and applicable state and federal laws and no longer poses a threat to human health or the environment.

Following submittal of this Cleanup Action Report, and pending review and acceptance by Ecology, Floyd|Snider, on behalf of the Calhoun Estate, would like to request a NFA determination for the site.

5.0 References

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Tables

Table 2.1
2016 Soil Confirmation Analytical Data – GRO, DRO, ORO, BTEX, and EDB

			Analysis Method	NWTPH-Gx	NWTPH-Dx		Total Petroleum Hydrocarbons[1]	USEPA 8021B				USEPA 8260C-SIM
			Analyte									
Location	Sample ID	Sample Date	Depth (ft bgs)	GRO (mg/kg)	DRO (mg/kg)	ORO (mg/kg)	(mg/kg)	Benzene (mg/kg)	Ethylbenzene (mg/kg)	Toluene (mg/kg)	Xylenes (total) (mg/kg)	EDB (mg/kg)
EX-1	EX-1-15'	03/01/2016	15–15.5	19	50 U	250 U	19	0.02 U	0.092	0.02 U	0.15	0.005 U
EX-2	EX-2-9'-10'	03/01/2016	9–10	100 U	50 U	250 U	250 U	1 U	1 U	1 U	3 U	NA
EX-3	EX-3-9'-10'	03/01/2016	9–10	710	360 JM	250 U	1,100 J	1 U	2.6	1 U	8	0.005 U
EX-4	EX-4-9'-10'	03/01/2016	9–10	100 U	50 U	250 U	250 U	1 U	1 U	1 U	3 U	NA
EX-5	EX-5-15'	03/01/2016	15–15.5	640	1,100 JM	250 U	1,700 J	0.2 U	2.7	0.2 U	6.1	NA
EX-6	EX-6-15'	03/01/2016	15–15.5	160	59 JM	250 U	220 J	0.2 U	0.62	0.2 U	1.4	NA
EX-7	EX-7-15'	03/01/2016	15–15.5	2 U	50 U	250 U	250 U	0.02 U	0.02 U	0.02 U	0.06 U	NA
EX-8[2]	EX-8-8'-9'	03/01/2016	8–9	5,400	3,800 JM	250 U	9,200 J	1 U	23	1 U	67	NA
EX-9	EX-9-8'-9'	03/01/2016	8–9	40	50 U	250 U	40	0.02 U	0.16	0.1 U	0.39	NA
EX-10	EX-10-8'-9'	03/01/2016	8–9	350	98 JM	250 U	450 J	1 U	1.2	1 U	3 U	NA
EX-11	EX-11-8'-9'	03/02/2016	8–9	220	50 U	250 U	220	0.02 U	0.63	0.1 U	1.5	NA
SB-55	SB-55-5.5'	03/03/2016	5.5	3	50 U	250 U	3	0.02 U	0.02 U	0.02 U	0.06 U	NA
	SB-55-5.5' D	03/03/2016	5.5	2.6	50 U	250 U	2.6	0.02 U	0.02 U	0.02 U	0.06 U	NA

Notes:

1 Total petroleum hydrocarbons is a sum of GRO, DRO, and ORO.

2 Soil sample was over-excavated and removed for off-site disposal.

Abbreviations:

bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
DRO	Diesel-range organics
EDB	1,2-Dibromoethane
ft	feet
GRO	Gasoline-range organics
mg/kg	Milligram per kilogram
NA	Not analyzed
ORO	Oil-range organics

Qualifiers:

J	Analyte was detected, concentration given is considered an estimate.
JM	Analyte was detected, concentration given is considered an estimate due to poor match to the chromatographic standard used for quantitation.
U	Analyte was not detected, concentration given is the reporting limit.

Table 2.2
Remaining Soil Analytical Data – GRO and BTEX

Analysis Method				NWTPH-Gx	USEPA 8021B			
			Analyte	GRO (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (total) (mg/kg)
MTCA Method B Cleanup Level				3,240[1]	18	6,400	8,000	16,000
Location	Sample ID	Sample Date	Depth (ft bgs)					
SB-30	SB-30-4.5	12/10/2014	4.5	19	0.02 U	0.02 U	0.02 U	0.06 U
SB-32	SB-32-14	12/10/2014	14	2,000 J	0.03 U[2]	0.05 U[2]	0.76[2]	0.1 U[2]
SB-32	SB-32-17	12/10/2014	17	6.7	0.02 U	0.02 U	0.022	0.06 U
SB-33	SB-33-9	12/10/2014	9	2,700 J	0.14[2]	0.24[2]	6.6[2]	14[2]
SB-34	SB-34-17	12/10/2014	17	2 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-34	SB-34-6.5	12/10/2014	6.5	26	0.02 U	0.02 U	0.068	0.11
SB-36	SB-36-8	12/10/2014	8	2 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-37	SB-37-7.5	12/10/2014	7.5	2 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-38	SB-38-14	12/10/2014	14	2 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-38	SB-38-8	12/10/2014	8	250	0.02 U	0.45	0.02 U	1.2
SB-39	SB-39-12	12/10/2014	12	330	0.02 U	0.94	0.02 U	2.6
SB-39	SB-39-14	12/10/2014	14	2 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-40	SB-40-7	12/10/2014	7	2 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-41	SB-41-6	12/10/2014	6	43	0.02 U	0.02 U	0.02 U	0.37
SB-41	SB-41-6D	12/10/2014	6	9.2	0.02 U	0.02 U	0.02 U	0.074
SB-42	SB-42-13	12/10/2014	13	1,400	0.15	3.1	9.8	5.9
SB-42	SB-42-15	12/10/2014	15	2 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-43	SB-43-2	12/11/2014	2	190	0.02 U	0.2	0.02 U	1.6
SB-44	SB-44-12.5	12/11/2014	12.5	90	0.02 U	0.02 U	0.32	0.64
SB-45	SB-45-9.5	12/11/2014	9.5	2 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-46	SB-46-15	12/11/2014	15	2,400	0.84	0.1 U	15	59
SB-46	SB-46-19.5	12/11/2014	19.5	2 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-47	SB-47-7.5	12/11/2014	7.5	590	0.02 U	0.1 U	3.3	5.1

Table 2.2
Remaining Soil Analytical Data – GRO and BTEX

Analysis Method				NWTPH-Gx	USEPA 8021B			
Analyte				GRO (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (total) (mg/kg)
MTCA Method B Cleanup Level				3,240[1]	18	6,400	8,000	16,000
Location	Sample ID	Sample Date	Depth (ft bgs)					
SB-48	SB-48-8.5	12/11/2014	8.5	2 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-49	SB-49-13.5	12/11/2014	13.5	2 U	0.02 U	0.02 U	0.02 U	0.06 U
SB-50	SB-50-13	12/11/2014	13	380	0.11	0.02 U	2.3	4.5
SB-51	SB-51-7.5	12/11/2014	7.5	56	0.02 U	0.02 U	0.85	0.54
SB-52	SB-52-7.5	12/11/2014	7.5	6.5	0.02 U	0.031	0.04	0.06 U
SB-53	SB-53-10	12/11/2014	10	2,600	1.7	0.1 U	21	36
SB-54	SB-54-5.5	12/11/2014	5.5	330 J	0.02 U	0.02 U	2 J	3.2 J

Notes:

1 The site-specific MTCA Method B cleanup level of 3,240 mg/kg for TPH is used as a screening level for GRO because diesel has never been used at the site and has not been detected in previous samples.

2 Analyzed by USEPA Method 8260C.

Abbreviations:

BTEX Benzene, toluene, ethylbenzene, and total xylenes
ft bgs Feet below ground surface
GRO Gasoline-range organics
mg/kg Milligrams per kilogram
MTCA Model Toxics Control Act
TPH Total petroleum hydrocarbons

Qualifiers:

J Analyte was detected, concentration given is considered an estimate.
U Analyte was not detected, concentration given is the reporting limit.

Table 3.1
2016 Soil Gas Analytical Data

Analysis Method				USEPA Method TO-15 modified low-level						ASTM D 1946
Location	Sample ID	Date	Depth (feet)	Benzene ($\mu g/m^3$)	Toluene ($\mu g/m^3$)	Ethylbenzene ($\mu g/m^3$)	m,p-Xylene ($\mu g/m^3$)	O-Xylene ($\mu g/m^3$)	Naphthalene ($\mu g/m^3$)	Helium (%)
March 2016 Sampling Event										
SVP-1	SVP-1-031116	3/11/2016	15.25	3.3	8.8	1.7	5.6	2.2	1.3	0.5 U
SVP-2	SVP-2-031116	3/11/2016	6.75	5.0	6.8	11	6.7	2.3	1.8	0.5 U
SVP-3	SVP-3-031116	3/11/2016	5.75	**220 J**	150 J	750	870 U	430 U	520 U	0.79
SVP-3	SVP-3-031116 D	3/11/2016	5.75	**210 J**	140 J	740	870 U	430 U	520 U	0.53
MTCA Method B Soil Gas Screening Levels for Default Residential Setting			**Sub-slab**	**10.7**	**76,200**	**15,200**	**1,520**	**1,520**	**2.54**	**NA**

Note:

RED BOLD Analytical results in bold indicate concentrations exceeding MTCA Method B soil gas screening levels adjusted for depth.

Abbreviations:

$\mu g/m^3$ micrograms per cubic meter
MTCA Model Toxics Control Act
NA Not applicable

Qualifiers:

J Analyte was detected, concentration given is considered an estimate.
U Analyte was not detected, concentration given is the reporting limit.

Calhoun's Service Station

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Figures

Note:
Topographic map provided by The National Map, 2016.

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Calhoun's Service Station
Tacoma, Washington

Figure 1.1
Vicinity Map

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7/13/2016

Legend

- Drain
- Light Pole
- Electrical Utility
- Sewer Utility
- Water Utility
- Floyd|Snider Soil Vapor Probe
- Floyd|Snider Soil Boring Location
- Aerotech Soil Boring Location
- 2016 Excavation Extent
- Property Boundary

All concentrations are less than MTCA Method A cleanup levels for soil.

Concentrations exceed MTCA Method A cleanup levels for soil, but are less than MTCA Method B cleanup levels.

Sample location removed during excavation activities.

MTCA Cleanup Level	TPH (mg/kg)	Benzene (mg/kg)
MTCA Method A	30	0.03
MTCA Method B	3,240	18

Notes:
1. Concentrations in bold exceed MTCA Method A cleanup levels for soil, but are less than MTCA Method B cleanup levels.
· Boring locations SB-1 through SB-9 are not included because all analytes were not detected and were not in relevant locations.
· Aerotech boring locations are approximate.
· Orthoimagery provided by NearMap, September 28, 2015.

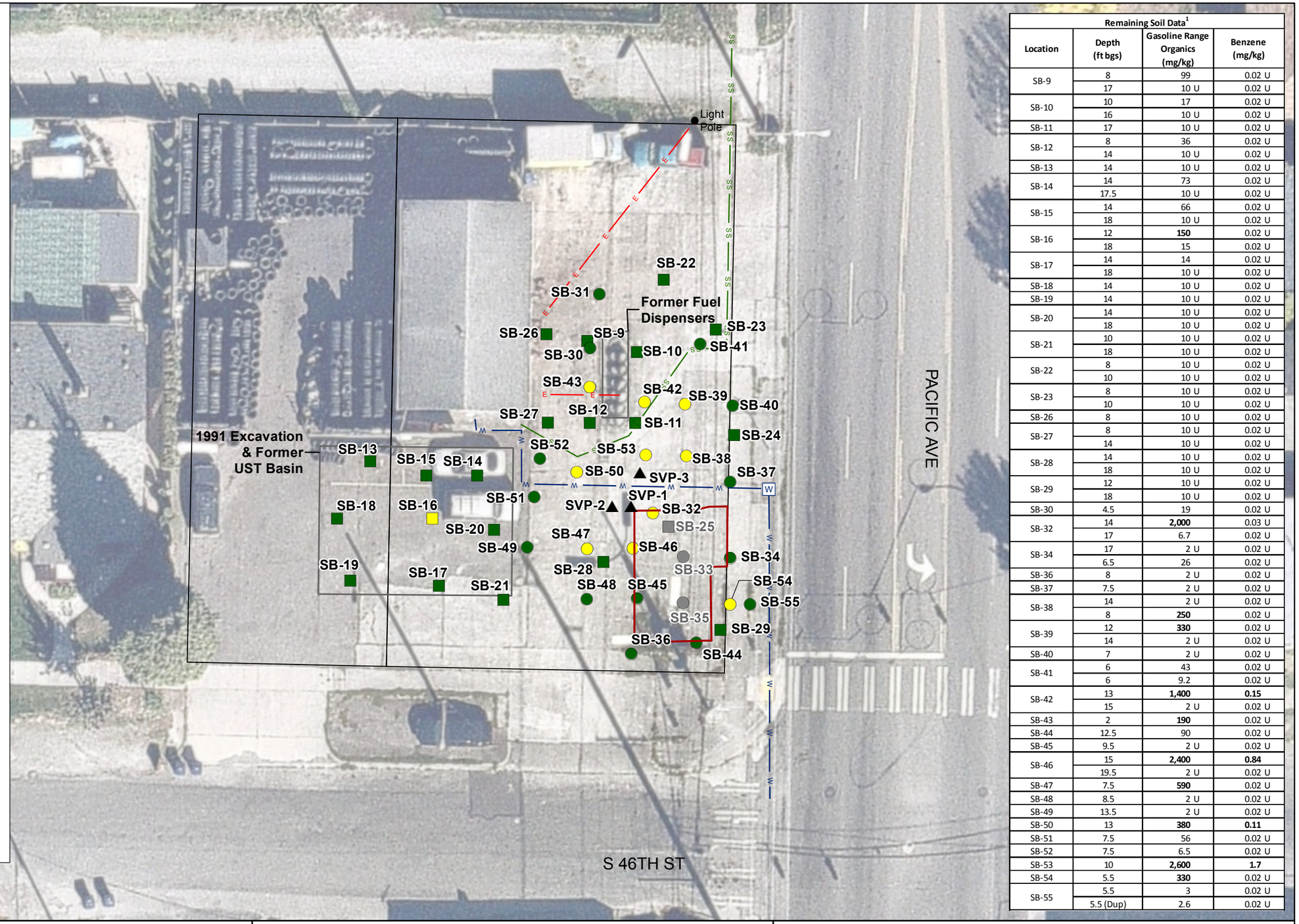
Abbreviations:
· bgs = Below ground surface
· ft = Feet
· GRO = Gasoline-Range Organics
· mg/kg = Micrograms per kilogram
· MTCA = Model Toxics Control Act
· TPH = Total petroleum hydrocarbons
· UST = Underground storage tank

Qualifier:
U = Analyte was not detected, concentration given is the reporting limit.

N

0 10 20 40

Scale in Feet



Remaining Soil Data[1]			
Location	Depth (ft bgs)	Gasoline Range Organics (mg/kg)	Benzene (mg/kg)
SB-9	8	99	0.02 U
	17	10 U	0.02 U
SB-10	10	17	0.02 U
	16	10 U	0.02 U
SB-11	17	10 U	0.02 U
SB-12	8	36	0.02 U
	14	10 U	0.02 U
SB-13	14	10 U	0.02 U
SB-14	14	73	0.02 U
	17.5	10 U	0.02 U
SB-15	14	66	0.02 U
	18	10 U	0.02 U
SB-16	12	**150**	0.02 U
	18	15	0.02 U
SB-17	14	14	0.02 U
	18	10 U	0.02 U
SB-18	14	10 U	0.02 U
SB-19	14	10 U	0.02 U
SB-20	14	10 U	0.02 U
	18	10 U	0.02 U
SB-21	10	10 U	0.02 U
	18	10 U	0.02 U
SB-22	8	10 U	0.02 U
	10	10 U	0.02 U
SB-23	8	10 U	0.02 U
	10	10 U	0.02 U
SB-26	8	10 U	0.02 U
SB-27	8	10 U	0.02 U
	14	10 U	0.02 U
SB-28	14	10 U	0.02 U
	18	10 U	0.02 U
SB-29	12	10 U	0.02 U
	18	10 U	0.02 U
SB-30	4.5	19	0.02 U
SB-32	14	**2,000**	0.03 U
	17	6.7	0.02 U
SB-34	17	2 U	0.02 U
	6.5	26	0.02 U
SB-36	8	2 U	0.02 U
SB-37	7.5	2 U	0.02 U
SB-38	14	2 U	0.02 U
	8	**250**	0.02 U
SB-39	12	**330**	0.02 U
	14	2 U	0.02 U
SB-40	7	2 U	0.02 U
SB-41	6	43	0.02 U
	6	9.2	0.02 U
SB-42	13	**1,400**	**0.15**
	15	2 U	0.02 U
SB-43	2	**190**	0.02 U
SB-44	12.5	90	0.02 U
SB-45	9.5	2 U	0.02 U
SB-46	15	**2,400**	**0.84**
	19.5	2 U	0.02 U
SB-47	7.5	**590**	0.02 U
SB-48	8.5	2 U	0.02 U
SB-49	13.5	2 U	0.02 U
SB-50	13	**380**	**0.11**
SB-51	7.5	56	0.02 U
SB-52	7.5	6.5	0.02 U
SB-53	10	**2,600**	**1.7**
SB-54	5.5	**330**	0.02 U
SB-55	5.5	3	0.02 U
	5.5 (Dup)	2.6	0.02 U

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Tacoma, Washington

Figure 2.1
Site Map, Excavation, and Remaining Soil Data

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7/13/2016

Legend

- Water Utility
- Floyd|Snider Excavation Confirmation Sample (2016)
- Floyd|Snider Soil Boring Location
- Aerotech Soil Boring Location
- Floyd|Snider Soil Vapor Probe
- 2016 Excavation Extent
- Property Boundary

- All concentrations are less than MTCA Method A cleanup levels for soil.
- Concentrations exceed MTCA Method A cleanup levels for soil, but are less than MTCA Method B cleanup levels.
- Confirmation samples with a concentration less than MTCA Method B cleanup level for soils.
- Sample location removed during excavation activities.

MTCA Cleanup Level	TPH (mg/kg)	Benzene (mg/kg)
MTCA Method A	30	0.03
MTCA Method B	3,240	18

Notes:
1. Sum of detected concentrations of gasoline-range organics, diesel-range organics, and oil-range organics rounded to two significant figures. When all concentrations are non-detect, the greatest reporting limit is given.
2. Sample location was over-excavated and removed.

· Aerotech boring locations are approximate.
· Orthoimagery provided by NearMap, September 28, 2015.
· Soil at locations SB-25, SB-33, SB-36, and EX-8 were removed during excavation activities.

Abbreviations:
· bgs = Below ground surface
· ft = Feet
· mg/kg = Micrograms per kilogram
· MTCA = Model Toxics Control Act
· TPH = Total petroleum hydrocarbons

Qualifiers:
J = Analyte was detected, concentration given is considered an estimate.
U = Analyte was not detected, concentration given is the reporting limit.

N

0 2.5 5 10

Scale in Feet

SB-50 SVP-3 SB-37 SVP-2 SVP-1 SB-32 EX-9-8'-9' EX-10-8'-9' SB-25 EX-7-15' EX-8-8'-9' EX-11-8'-9' SB-47 SB-46 SB-28 SB-34 EX-6-15' EX-5-15' SB-48 SB-45 SB-35 EX-1-15' EX-4-9'-10' SB-54 SB-55 EX-2-9'-10' SB-29 EX-3-9'-10' SB-44 SB-36

Excavation Confirmation Samples			
Location	Depth (ft bgs)	Total Petroleum Hydrocabons [1] (mg/kg)	Benzene (mg/kg)
EX-1	15–15.5	19	0.02 U
EX-2	9–10	250 U	1 U
EX-3	9–10	1,100 J	1 U
EX-4	9–10	250 U	1 U
EX-5	15–15.5	1,700 J	0.2 U
EX-6	15–15.5	220 J	0.2 U
EX-7	15–15.5	250 U	0.02 U
~~EX-8~~ [2]	~~8–9~~	~~9,200 J~~	~~1 U~~
EX-9	8–9	40	0.02 U
EX-10	8-9	450 J	1 U
EX-11	8–9	220	0.02 U
SB-55	5.5	3	0.02 U
	5.5 (Dup.)	2.6	0.02 U

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Figure 2.2
2016 Excavation Extent and Confirmation Sample Locations

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7/13/2016

Calhoun's Service Station

Cleanup Action Report

Appendix A
Ecology Opinion Letter

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

September 2, 2015

Ms. Karen Calhoun
Calhoun Family LLC
PO Box 928
Tacoma, WA 98401

Re: Opinion on Proposed Cleanup of the following Site:

- **Site Name:** Calhouns Service Station
- **Site Address:** 4540 Pacific Avenue, Tacoma, Pierce County
- **Facility/Site No.:** 1324
- **Cleanup Site ID No.:** 5011
- **VCP Project No.:** SW1180

Dear Ms. Calhoun:

The Washington State Department of Ecology (Ecology) received your request for an opinion on your proposed independent cleanup of the Calhouns Service Station facility (Site). This letter provides our opinion. We are providing this opinion under the authority of the Model Toxics Control Act (MTCA), Chapter 70.105D RCW.

Issue Presented and Opinion

Upon completion of the proposed cleanup, will further remedial action likely be necessary to clean up contamination at the Site?

YES. Ecology has determined that, upon completion of your proposed cleanup, further remedial action will likely be necessary to clean up contamination at the Site.

This opinion is based on an analysis of whether the remedial action meets the substantive requirements of MTCA, Chapter 70.105D RCW, and its implementing regulations, Chapter 173-340 WAC (collectively "substantive requirements of MTCA"). The analysis is provided below.

Description of the Site

This opinion applies only to the Site described below. The Site is defined by the nature and extent of contamination associated with the following release:

- Gasoline-range Hydrocarbons, Benzene, Ethylbenzene, Total Xylenes, and Naphthalenes in the Soil and potentially Air.

Enclosure A includes a detailed description and diagram of the Site, as currently known to Ecology.

Please note a parcel of real property can be affected by multiple sites. At this time, we have no information that the parcel(s) associated with this Site are affected by other sites.

Basis for the Opinion

This opinion is based on the information contained in the following documents:

1. Aerotech Environmental Consulting. *Limited Phase II: Limited and Targeted Subsurface Investigation Performed at Calhoun's Service Station.* December 12, 2011.

2. Ecology. *Further Action Opinion Letter.* November 2, 2011.

3. Aerotech Environmental Consulting. *Limited Phase III: Limited and Targeted Subsurface Investigation Performed at Calhoun's Service Station.* February 27, 2012.

4. Floyd Snider. *Request for No Further Action Likely Letter.* July 30, 2015.

Those documents are kept in the Central Files of the Southwest Regional Office of Ecology (SWRO) for review by appointment only. You can make an appointment by calling the SWRO resource contact at (360) 407-6365.

This opinion is void if any of the information contained in those documents is materially false or misleading.

Analysis of the Cleanup

Ecology has concluded that, upon completion of your proposed cleanup, **further remedial action** will likely be necessary to clean up contamination at the Site. That conclusion is based on the following analysis:

1. Characterization of the Site.

Ecology has determined your characterization of the Site is not sufficient to establish cleanup standards and select a cleanup action. The Site is described above and in **Enclosure A.**
The Site is a former Arco gasoline service station located at 4540 Pacific Avenue, Tacoma, Pierce County, Washington. The Site reportedly operated as a gasoline service station from approximately 1926 through 1991.

The Site had four underground storage tanks (USTs) all of which were situated in a nest in the eastern area of the Site:

- Two 4000-gallon unleaded-regular gasoline USTs.
- One 6000-gallon unleaded regular and premium (two compartment) gasoline UST.
- One 50 to 200-gallon waste oil UST.

Menotti Excavating was contracted in April 1991 to decommission all four USTs by removal. Petroleum contaminated soils (PCS) were noted surrounding the fill end of the UST nest although it is unclear as to which tank was being specifically referenced. Approximately 250 yd^3 of PCS was stockpiled on the Site. Soil analytical data collected from the gasoline UST excavation, were in excess of the MTCA Method A Cleanup Levels (CULs) for benzene, toluene, ethylbenzene, xylenes (BTEX), and gasoline-range total petroleum hydrocarbons (TPH-Gx) in soil. Two soil samples collected from the waste oil UST also contained TPH-Gx concentrations in excess of the MTCA Method A CULs. Groundwater was reportedly not encountered during the 1991 UST excavation and decommissioning activities.

The stockpiled soils generated from the April 1991 UST excavation were reportedly stored at the southwest corner of the property parcel for approximately 2 years. Soil samples were collected from the stockpile in April 1993. A total of five samples were collected and tested for TPH-Gx and metals. None of the samples exceeded the applicable MTCA Method A CULs, and the stockpiled material was reportedly used as off Site fill.

The Site entered the Ecology Voluntary Cleanup Program (VCP) in July 2011. In December 2011, a Limited Phase II Investigation was conducted by Aerotech. Seventeen soil borings (SB-1 to SB-17) were advanced in areas of the Site which posed an environmental concern (i.e. hydraulic hoists, fuel dispensers, UST excavations, and within the former footprint/location of the aforementioned stockpiled soil). PCS was identified in the vicinity of the former fuel dispensers and in the 1991 gasoline UST excavation. Groundwater samples collected were reportedly from thin saturated lenses of "wet soil" in the vicinity of the fuel dispenser. Groundwater samples indicated concentrations of TPH-Gx in excess of MTCA Method A CULs. This layer was only encountered in three of the seventeen soil borings advanced during the December 2011 investigation.

In February 2012, a Limited and Targeted Phase III Subsurface Investigation was conducted by Aerotech. This investigation consisted of advancing an additional twelve soil borings (SB-18 through SB-29) in the vicinity of the former UST nest and the fuel dispenser island. TPH-Gx concentrations in soil were reportedly detected above the respective MTCA Method A CULs. Thin lenses of "wet soil" were encountered in four of the twelve soil borings. Groundwater samples were collected and exhibited TPH-Gx detections above MTCA Method A CULs.

In December 2014, Floyd Snider conducted an additional subsurface investigation to further characterize soil and groundwater conditions on Site. A total of 25 soil borings (SB-30 through SB-54) were advanced to depths ranging between 15 to 20 feet below ground surface (bgs). Soils were analyzed for the following constituents:

- BTEX - EPA Method 8021B.
- TPH-Gx - Method NWTPH-Gx.
- Three of the 25 soil samples with conspicuous field evidence of impacts were additionally analyzed for:
    - BTEX, methyl tert-butyl ether (MTBE), hexane, ethylene dibromide (EDB), and ethylene dichloride (EDC) - EPA Method 8260C.
    - Semi-volatile organic compounds (sVOCs) - EPA Method 8270D SIM.
    - Extractable petroleum hydrocarbons (EPH) - Method NWEPH.
    - Volatile petroleum hydrocarbons (VPH) - Method NWVPH.

In addition, Floyd Snider conducted a ground-penetrating radar survey, which did not reveal any additional subsurface anomalies inclusive of a UST or UST excavation on Site.

Soils encountered during the December 2014 Site characterization effort are described as a mixture of sands, gravels, and clays. Approximately 1 foot of fill material is underlain by sandy-silt with trace organics up to 14 feet in thickness with intermittent lenses of silty-sand ("wet soil"). Underlying the sandy-silt is a silty-sand up to 9 feet in thickness. Glacial till underlies the Site at depths greater than 17 feet bgs. The till is reportedly comprised of a dry, very dense, compact, gravelly, silty, fine to coarse-grained sand. This till layer is believed to serve as an aquatard, impeding downward transport of contaminants.

During the December 2014 Floyd Snider subsurface investigation, soil borings were advanced to depths of approximately 20 feet bgs into the aforementioned glacial till. Groundwater was reportedly not encountered, even in the areas where groundwater was sampled by Aerotech in 2011 and 2012. Thin wet zones of soil were reportedly encountered beneath the Site in the silty-sand layers that immediately overlie the sandy-silt layers. This wet zone is randomly distributed, discontinuous, thin, and encountered at variable depths throughout the Site. During the December 2014 investigation, the wet soil zone did not produce an extractable volume of water, as such, samples were not obtained.

As addressed previously, groundwater was not encountered in any of the soil borings and is reported to be present at depths greater than 125 feet bgs in the area (Floyd Snider, July 2015). Floyd Snider conducted a beneficial well use survey for the Site vicinity which indicated multiple borings advanced to depths greater than 35 feet bgs, all of which were determined to be dry (no groundwater encountered) or were decommissioned dry wells.

Ecology does not consider groundwater a potential exposure pathway at the Site for the following reasons:

- The discontinuous nature of the wet soil zone.
- Reported absence of groundwater in the 1991 UST excavations.
- Absence of sufficient extractable volume.
- The unlikelihood that impacted shallow groundwater will vertically migrate through the above-referenced impermeable till layer.
- Groundwater is not potable nor do we consider it a potential exposure pathway at the Site.

Based on a review of the Floyd Snider July 30, 2015 report and previous documents in the Site file, Ecology has the following comments:

1. Ecology recommends conducting a Tier I Vapor Intrusion Assessment as outlined in Ecology Publication no. 09-09-047, *Guidance for Evaluating Vapor Intrusion in Washington State: Investigation and Remedial Action*, October 2009 http://www.ecy.wa.gov/programs/tcp/policies/VaporIntrusion/vig.html. Please refer to the new vapor screening levels found in the MTCA Cleanup Levels and Risk Calculation (CLARC), and reference the Interstate Technology Regulatory Council (ITRC) publication *Petroleum Vapor Intrusion Fundamentals of Screening, Investigation, and Management*, October 2014 for additional guidance. Below is a hyperlink to the above-referenced ITRC publication: http://www.itrcweb.org/PetroleumVI-Guidance/Content/Resources/PVIPDF.pdf.

   The Environmental Protection Agency (EPA) Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites (June 2015) recommends a vertical separation distance of 15 feet for TPH greater than 250 mg/Kg (weathered gasoline) and 6 feet for TPH less than 250 mg/Kg TPH. Therefore, the Site needs additional vapor intrusion assessment unless you modify the proposed cleanup to incorporate the above vertical separation distances. Please also consider lateral separation distances. Please see the hyperlink to the above-referenced EPA publication below: http://www.itrcweb.org/PetroleumVI-Guidance/#Welcome.htm%3FTocPath%3D_____1.

2. Ecology recommends you perform soil analysis for EDB using US EPA Method 8011 or US EPA Method 8260 SIM. EPA Method 8260B alone will not resolve down to the MTCA Method A CUL. You should collect soil samples from the proposed excavation exhibiting the highest CoC concentrations.

3. In accordance with WAC 173-340-7490, you must complete a TEE for the Site. Please fill out the TEE form and submit it to Ecology (along with supporting information, as appropriate). You can find the form on our website at http://www.ecy.wa.gov/biblio/ecy090300.html.

4. As referenced in the Floyd Snider *Request for No Further Action Likely Letter* (July 30, 2015), additional investigation is required to define the extent of impacts in excess of MTCA Method A CULs on the Site to the east of SB-54 prior to completing the final cleanup action.

5. In accordance with WAC 173-340-840(5) and Ecology Toxics Cleanup Program Policy 840 (Data Submittal Requirements), data generated for Independent Remedial Actions shall be submitted simultaneously in both a written and electronic format. For additional information regarding electronic format requirements, see the website http://www.ecy.wa.gov/eim. Be advised that according to the policy, any reports containing sampling data that are submitted for Ecology review are considered incomplete until the electronic data has been entered. Please ensure that data generated during on-site activities is submitted pursuant to this policy. **Data must be submitted to Ecology in this format for Ecology to issue a No Further Action determination.** Please be sure to submit all soil and groundwater data collected to date, as well as any future data, in this format. Data collected prior to August 2005 (effective date of this policy) is not required to be submitted; however, you are encouraged to do so if it is available. Be advised that Ecology requires up to two weeks to process the data once it is received.

6. Please provide Ecology with electronic copies of all reports and investigations. This includes all reports to date and future submittals.

2. Establishment of cleanup standards.

Ecology has determined the CULs and points of compliance you established for the Site do not meet the substantive requirements of MTCA, since the vapor pathway has yet to be assessed.

Floyd Snider used a Site-specific MTCA Method B soil CUL for total TPH for the Site, incorporating the unrestricted land use scenario under the soil direct contact pathway. Floyd Snider used analytical data from three representative soil samples to calculate the Site-

specific MTCA Method B CUL. Floyd Snider inputted the data into the Ecology MTCATPH11.1 workbook (Ecology, 2007).

MTCA Method B soil CULs for benzene, ethyl-benzene, total xylenes, and naphthalene were obtained from the Ecology CLARC database.

The proposed soil MTCA Method B CULs are:

TPH	3,240 mg/Kg
Benzene	18 mg/Kg
Ethyl-benzene	8,000 mg/Kg
Total Xylenes	16,000 mg/Kg
Naphthalenes	1,600 mg/Kg

Ecology concurs with the above CULs, however they only apply to the soil direct contact pathway.

The proposed points of compliance for each potential exposure pathway are:

Soil - Direct Contact: For soil cleanup levels based on human exposure via direct contact, the point of compliance is: "*...throughout the Site from ground surface to 15 feet below the ground surface.*"

Indoor Air/Vapor: *Ambient and indoor air throughout the Site.*

Soil concentrations protective of the vapor intrusion pathway have not been established.

As noted in Section 1, additional data collection is required. As a result, points of compliance have not been fully established.

3. Selection of cleanup action.

Ecology has determined the cleanup action you proposed for the Site does not meet the substantive requirements of MTCA. As referenced in Section 1 of this letter, additional assessment work is needed before cleanup action can be completed, including:

- Tier I Vapor Intrusion assessment.
- Analysis of soil samples for EDB using US EPA Method 8011 or US EPA Method 8260 SIM.
- Additional subsurface characterization east of SB-54.
- Conduct a TEE.

Cleanup actions conducted at the Site to date have included UST removal, soil excavation, and stockpiling/disposal of impacted soils.

Floyd Snider proposed the excavation and off Site disposal of PCS characterized as exceeding the site-specific MTCA Method B CUL of 3,240 mg/Kg. Figure 1 illustrates the approximate extent of the proposed excavation. Figure 2 depicts the location of soil borings that exceeded MTCA Method A and Method B CULs. Figure 3 illustrates a cross-section transect through the characterized PCS as exceeding MTCA Method A and MTCA Method B CULs.

Limitations of the Opinion

1. Opinion does not settle liability with the state.

Liable persons are strictly liable, jointly and severally, for all remedial action costs and for all natural resource damages resulting from the release or releases of hazardous substances at the Site. This opinion **does not**:

- Resolve or alter a person's liability to the state.
- Protect liable persons from contribution claims by third parties.

To settle liability with the state and obtain protection from contribution claims, a person must enter into a consent decree with Ecology under RCW 70.105D.040(4).

2. Opinion does not constitute a determination of substantial equivalence.

To recover remedial action costs from other liable persons under MTCA, one must demonstrate that the action is the substantial equivalent of an Ecology-conducted or Ecology-supervised action. This opinion does not determine whether the action you proposed will be substantially equivalent. Courts make that determination. *See* RCW 70.105D.080 and WAC 173-340-545.

3. Opinion is limited to proposed cleanup.

This letter does not provide an opinion on whether further remedial action will actually be necessary at the Site upon completion of your proposed cleanup. To obtain such an opinion, you must submit a report to Ecology upon completion of your cleanup and request an opinion under the VCP.

4. State is immune from liability.

The state, Ecology, and its officers and employees are immune from all liability, and no cause of action of any nature may arise from any act or omission in providing this opinion. *See* RCW 70.105D.030(1)(i).

Contact Information

Thank you for choosing to clean up your Property under the Voluntary Cleanup Program (VCP). After you have addressed our concerns, you may resubmit your proposal for our review. Please do not hesitate to request additional services as your cleanup progresses. We look forward to working with you.

For more information about the VCP and the cleanup process, please visit our web site: www.ecy.wa.gov/programs/tcp/vcp/vcpmain.htm. If you have any questions about this opinion, please contact me by phone at (360) 407-6528 or e-mail at ASCO461@ecy.wa.gov.

Sincerely,

J.G. Cook, LG
SWRO Toxics Cleanup Program

JGC: knf

Enclosures (1): A – Description and Diagrams of the Site

By certified mail: 91710821333939704186 41

cc: Mr. Gabe Cisneros, Floyd Snyder
Ms. Sharon Bell, Tacoma-Pierce County Health Department
Ms. Richelle Perez, Ecology
Ms. Carol Johnston, Ecology
Mr. Steve Teel, Ecology
Mr. Nnamdi Madakor, Ecology
Ms. Dolores Mitchell, Ecology

Enclosure A

Description and Diagrams of the Site

Site Description & Diagrams

The Site is located at 4540 Pacific Avenue in Pierce County, Tacoma, Washington, and situated in Tax Parcel no. 7470024730. The Site is currently utilized as a tire sales and automobile repair facility (Llantora Sinaloa Tire Sales & Service), and is improved with a 1,008 square-foot, single-story, wood frame commercial structure, constructed in 1963.

The Site was used as a gasoline station and automobile repair facility from 1926 until 1991. In 1951, the Site was reportedly reconfigured, including the demolition of the former structure, construction of the existing structure, installation of hydraulic hoists, and installation of four USTs, pump islands, and associated ancillary equipment. The four USTs on Site contained gasoline-range fuel and waste oil. Two of the USTs were 4,000-gallons in size, one was 6,000-gallons—all of which contained gasoline-range fuel—and the remaining UST was 50 to 200-gallons in size and reportedly contained waste oil.

In 1991, the aforementioned USTs were decommissioned by removal. Approximately 250 yd^3 of PCS was excavated from the UST nest and stockpiled on Site in the southwest corner of the property parcel. The stockpile was sampled in April 1993 for TPH, exhibiting non-detect results. Reportedly, the stockpile was subsequently used as fill off Site.

Soils underlying the Site are comprised of approximately 1 foot of silty, sandy, gravelly fill material, underlain by a soft to hard sandy-silt with trace gravels and organics up to 14 feet in thickness. The sandy-silt layer contains intermittent and non-continuous lenses of silty-sand. The sandy-silt sequence is underlain by a silty-sand with trace gravels up to 9 feet in thickness. A dense, consolidated glacial till underlies the above silty-sand at approximately 17 feet bgs. The dense glacial till material serves as an aquatard, preventing down-profile illuviation.

Area well logs indicate the regional groundwater aquifer is located at a depth of approximately 125 feet bgs. Discontinuous, marginally-wet zones have been encountered in a few of the soil borings in the silty-sand layers that overlie stiff sandy-silt layers as described above (Floyd Snider, December 2014).

Legend

- ○ Soil Boring Location Sampled in December 2014
- □ Soil Boring Location Sampled 2011–2012
- Property Boundary
- ■ All concentrations are less than MTCA Method A cleanup levels for soil.
- Concentrations exceed MTCA Method A cleanup levels for soil.
- ■ Concentrations exceed MTCA Method B cleanup levels for soil.

MTCA Cleanup Level	GRO mg/kg	Benzene mg/kg
MTCA Method A	100	0.03
MTCA Method B	3,240	18

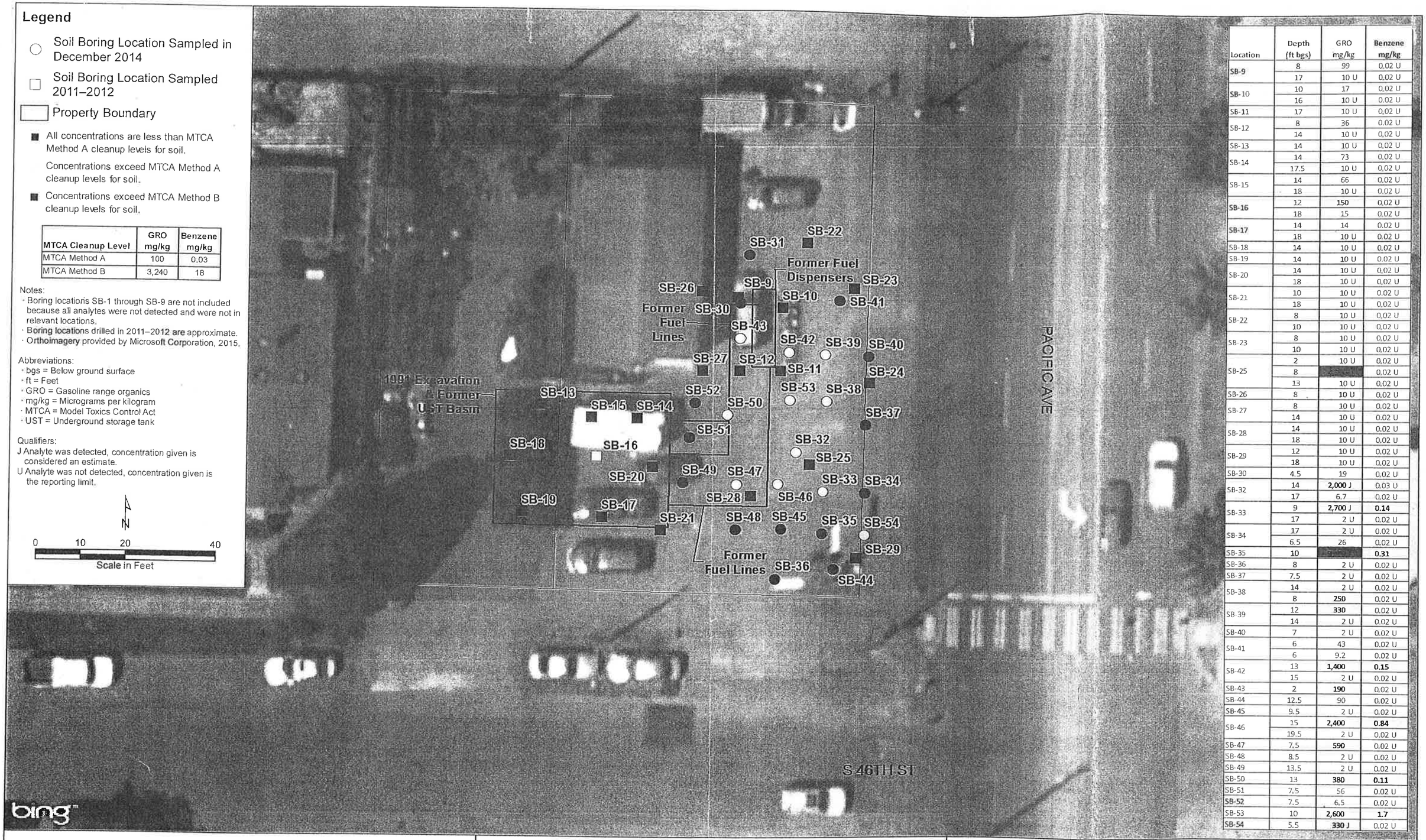
Notes:
- Boring locations SB-1 through SB-9 are not included because all analytes were not detected and were not in relevant locations.
- Boring locations drilled in 2011–2012 are approximate.
- Orthoimagery provided by Microsoft Corporation, 2015.

Abbreviations:
- bgs = Below ground surface
- ft = Feet
- GRO = Gasoline range organics
- mg/kg = Micrograms per kilogram
- MTCA = Model Toxics Control Act
- UST = Underground storage tank

Qualifiers:
J Analyte was detected, concentration given is considered an estimate.
U Analyte was not detected, concentration given is the reporting limit.

N

0 10 20 40
Scale in Feet



Location	Depth (ft bgs)	GRO mg/kg	Benzene mg/kg
SB-9	8	99	0.02 U
	17	10 U	0.02 U
SB-10	10	17	0.02 U
	16	10 U	0.02 U
SB-11	17	10 U	0.02 U
SB-12	8	36	0.02 U
	14	10 U	0.02 U
SB-13	14	10 U	0.02 U
SB-14	14	73	0.02 U
	17.5	10 U	0.02 U
SB-15	14	66	0.02 U
	18	10 U	0.02 U
SB-16	12	150	0.02 U
	18	15	0.02 U
SB-17	14	14	0.02 U
	18	10 U	0.02 U
SB-18	14	10 U	0.02 U
SB-19	14	10 U	0.02 U
SB-20	14	10 U	0.02 U
	18	10 U	0.02 U
SB-21	10	10 U	0.02 U
	18	10 U	0.02 U
SB-22	8	10 U	0.02 U
	10	10 U	0.02 U
SB-23	8	10 U	0.02 U
	10	10 U	0.02 U
SB-25	2	10 U	0.02 U
	8	[redacted]	0.02 U
	13	10 U	0.02 U
SB-26	8	10 U	0.02 U
SB-27	8	10 U	0.02 U
	14	10 U	0.02 U
SB-28	14	10 U	0.02 U
	18	10 U	0.02 U
SB-29	12	10 U	0.02 U
	18	10 U	0.02 U
SB-30	4.5	19	0.02 U
SB-32	14	2,000 J	0.03 U
	17	6.7	0.02 U
SB-33	9	2,700 J	0.14
	17	2 U	0.02 U
SB-34	17	2 U	0.02 U
	6.5	26	0.02 U
SB-35	10	[redacted]	0.31
SB-36	8	2 U	0.02 U
SB-37	7.5	2 U	0.02 U
SB-38	14	2 U	0.02 U
	8	250	0.02 U
SB-39	12	330	0.02 U
	14	2 U	0.02 U
SB-40	7	2 U	0.02 U
SB-41	6	43	0.02 U
	6	9.2	0.02 U
SB-42	13	1,400	0.15
	15	2 U	0.02 U
SB-43	2	190	0.02 U
SB-44	12.5	90	0.02 U
SB-45	9.5	2 U	0.02 U
SB-46	15	2,400	0.84
	19.5	2 U	0.02 U
SB-47	7.5	590	0.02 U
SB-48	8.5	2 U	0.02 U
SB-49	13.5	2 U	0.02 U
SB-50	13	380	0.11
SB-51	7.5	56	0.02 U
SB-52	7.5	6.5	0.02 U
SB-53	10	2,600	1.7
SB-54	5.5	330 J	0.02 U

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Request for No Further Action Likely Letter
Calhoun's Service Station
Tacoma, Washington

Figure 1
Gasoline-Range Organics and Benzene in Soil
2011–2014

I:\GIS\Projects\GTH-Calhoun\MXD\Site Investigation Report and Cleanup\Figure 1 GRO and Benzene.mxd
7/29/2015

Legend

- ○ Soil Boring Location Sampled in December 2014
- □ Soil Boring Location Sampled 2011–2012

Utilities

- E —— Electrical
- SS —— Sewer
- W —— Water
- Property Boundary

Approach A: Estimated area of soil impacts greater than MTCA Method A cleanup levels between the ground surface and 15 feet bgs. The volume of petroleum-contaminated soil is approximately 670 cubic yards or 1,000 tons.

B Approach B: Estimated area of soil impacts greater than MTCA Method B cleanup levels between the ground surface and 15 feet bgs. The volume is approximately 150 cubic yards or 225 tons.

A—A' Cross Section Transect

- All concentrations are less than MTCA Method A cleanup levels for soil.
- Concentrations exceed MTCA Method A cleanup levels for soil.
- Concentrations exceed MTCA Method B cleanup levels for soil.

· Boring locations drilled in 2011–2012 are approximate.
· Orthoimagery provided by Microsoft Corporation, 2015.

Abbreviations:
· bgs = Below ground surface
· MTCA = Model Toxics Control Act

N

0 10 20 40
Scale in Feet

Light Pole
SB-31
SB-22
SB-23
SB-26
SB-9
SB-10
SB-41
SB-30
SB-43
SB-42
SB-39
SB-40
SB-27
SB-12
SB-11
SB-24
SB-13
SB-52
SB-53
SB-38
SB-15
SB-14
SB-50
SB-37
SB-51
SB-32
SB-18
SB-16
SB-25
SB-49
SB-47
SB-20
SB-33
SB-34
SB-28
SB-46
SB-19
SB-17
SB-21
SB-48
SB-45
SB-35
SB-54
SB-29
SB-36
SB-44
A
A'
B
PACIFIC AVE
S 46TH ST
bing™

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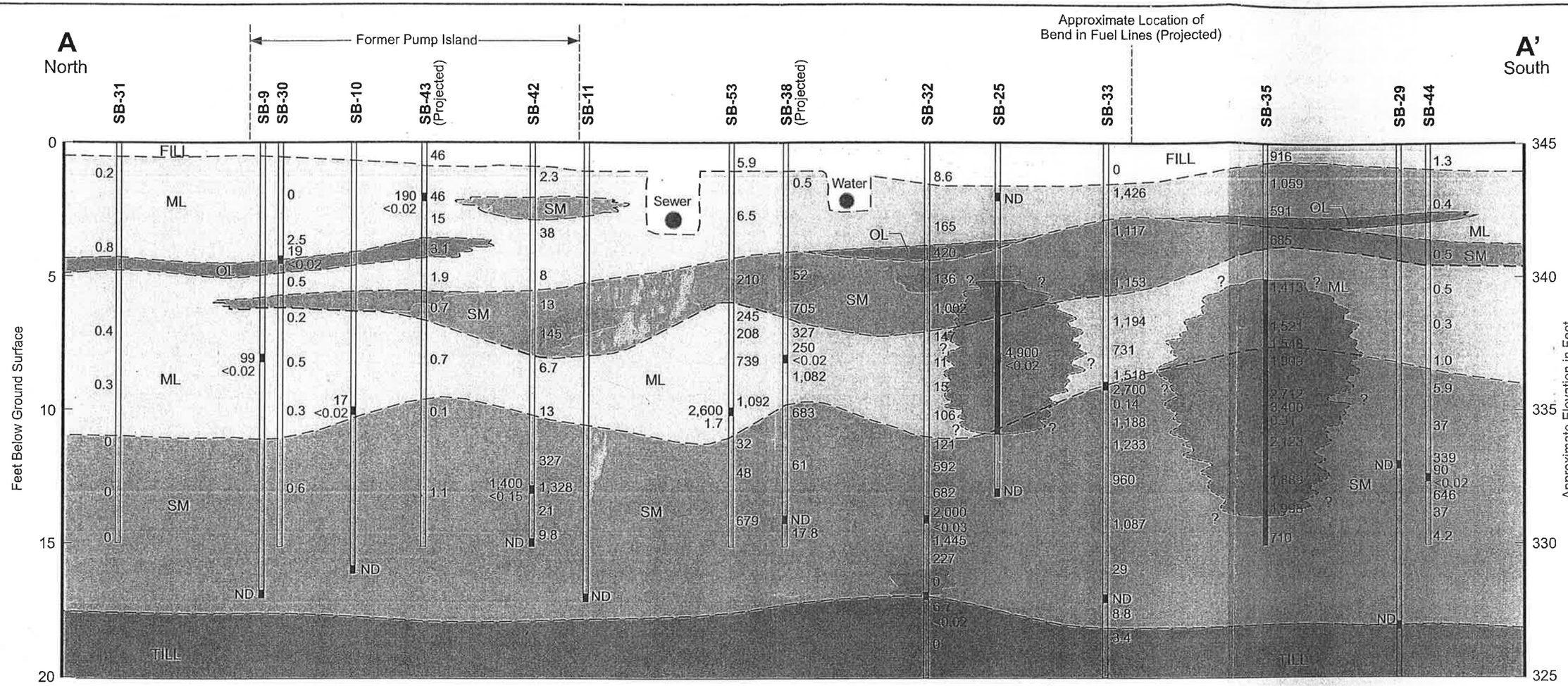
Request for No Further Action Likely Letter
Calhoun's Service Station
Tacoma, Washington

Figure 2
Approximate Excavation Extents

I:\GIS\Projects\GTH-Calhoun\MXD\Site Investigation Report and Cleanup\Figure 2 Excavation Extent.mxd
7/29/2015



LEGEND

Photoionization detector reading in parts per million (ppm) — 136

Boring Location

Sample Location

4,900 Gasoline-Range Organics Concentration in milligrams per kilogram (mg/kg)

<0.02 Benzene Concentration in milligrams per kilogram (mg/kg)

Approximate vertical and lateral extent of TPH impacts exceeding MTCA Method B cleanup levels (dashed where inferred)

Vertical extent of Total Petroleum Hydrocarbon (TPH) impacts exceeding Model Toxics Control Act (MTCA) Method B cleanup level

ND No analyte detected at or greater than laboratory detection limit

<10 Analyte not detected at or greater than given laboratory detection limit

FILL	Silty, sandy, gravelly FILL
ML	Light brown to olive gray and brown, soft to stiff SILT with up to 30% sand, 10% rounded gravel, and low to moderate plasticity
SM	Brown to dark brown and gray to olive gray, silty, very fine to medium SAND with up to 40% silt and 15% rounded gravel
OL	Dark brown, soft to firm, organic SILT with woody debris
TILL	Brown, very dense, silty, gravelly, fine to coarse SAND (TILL); dry
	Indicates wet soil

Horizontal Scale in Feet
0 6 12
0 4 8
Vertical Scale in Feet
Vertical Exaggeration x 1.5

MTCA Method B Cleanup Level
TPH (Gasoline-Range Organics) = 3,240 mg/kg
Benzene = 18 mg/kg

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Request for No Further Action Likely Letter
Calhoun's Service Station
Tacoma, Washington

Figure 3
Cross Section A-A'

G:Project\Clients\Floyd Snider\GTH Calhoun\Figure X.X

Calhoun's Service Station

Cleanup Action Report

Appendix B
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.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

March 4, 2016

Gabriel Cisneros, Project Manager
Floyd-Snider
Two Union Square, Suite 600
601 Union St
Seattle, WA 98101

Dear Mr. Cisneros:

Included are the results from the testing of material submitted on March 2, 2016 from the GTH- Calhoun, F&BI 603034 project. There are 6 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. 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
FDS0304R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on March 2, 2016 by Friedman & Bruya, Inc. from the Floyd-Snider GTH- Calhoun, F&BI 603034 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Floyd-Snider
603034 -01	EX-11-8'-9'

All quality control requirements were acceptable.

Date of Report: 03/04/16
Date Received: 03/02/16
Project: GTH- Calhoun, F&BI 603034
Date Extracted: 03/02/16
Date Analyzed: 03/02/16

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)
EX-11-8'-9' 603034-01 1/5	<0.02 j	<0.1	0.63	1.5	220	98
Method Blank 06-363 MB	<0.02	<0.02	<0.02	<0.06	<2	84

Date of Report: 03/04/16
Date Received: 03/02/16
Project: GTH- Calhoun, F&BI 603034
Date Extracted: 03/02/16
Date Analyzed: 03/02/16

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)
EX-11-8'-9' 603034-01	<50	<250	103
Method Blank 06-409 MB2	<50	<250	113

Date of Report: 03/04/16
Date Received: 03/02/16
Project: GTH- Calhoun, F&BI 603034

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: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Benzene	mg/kg (ppm)	0.5	79	82	69-120	4
Toluene	mg/kg (ppm)	0.5	88	88	70-117	0
Ethylbenzene	mg/kg (ppm)	0.5	89	89	65-123	0
Xylenes	mg/kg (ppm)	1.5	89	87	66-120	2
Gasoline	mg/kg (ppm)	20	100	100	71-131	0

Date of Report: 03/04/16
Date Received: 03/02/16
Project: GTH- Calhoun, F&BI 603034

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 603022-01 (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	111	101	63-146	9

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	108	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 compound 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. Compounds in the sample matrix interfered with the quantitation of the analyte.

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.

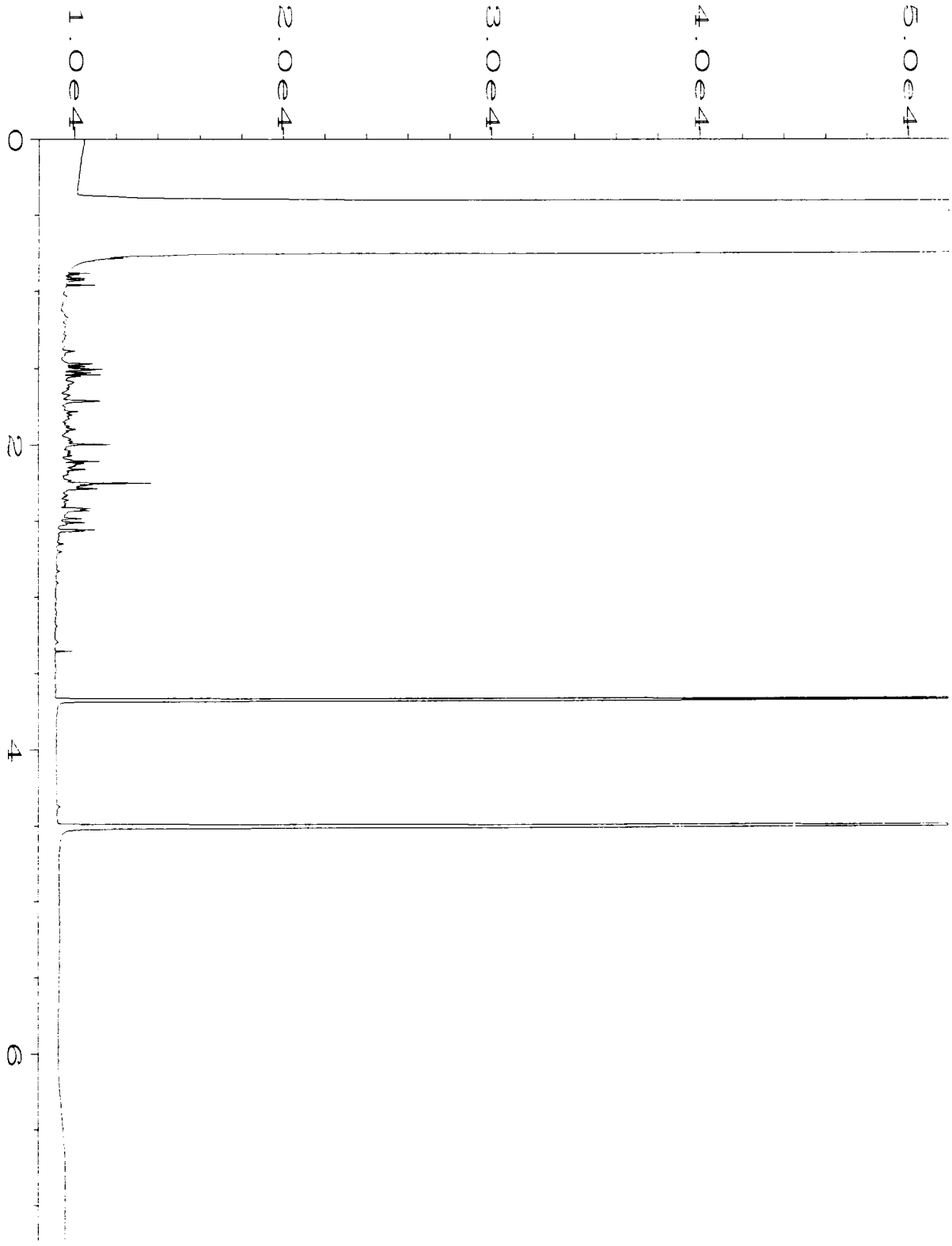
nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

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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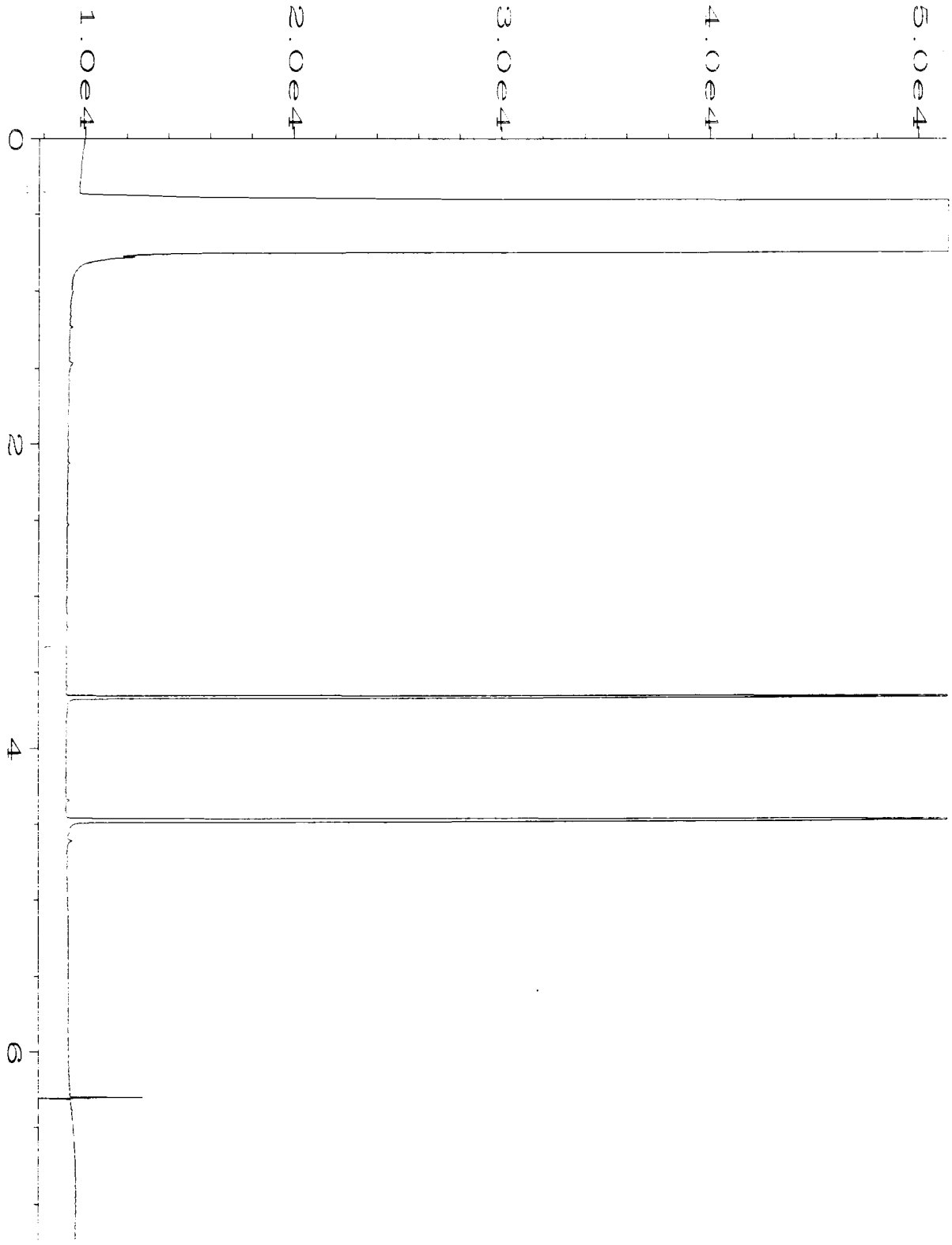
Operator : mwdl
Instrument : GC1
Sample Name : 603034-01
Run Time Bar Code:
Acquired on : 02 Mar 16 01:28 PM
Report Created on: 03 Mar 16 09:14 AM

Page Number : 1
Vial Number : 14
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DX.MTH



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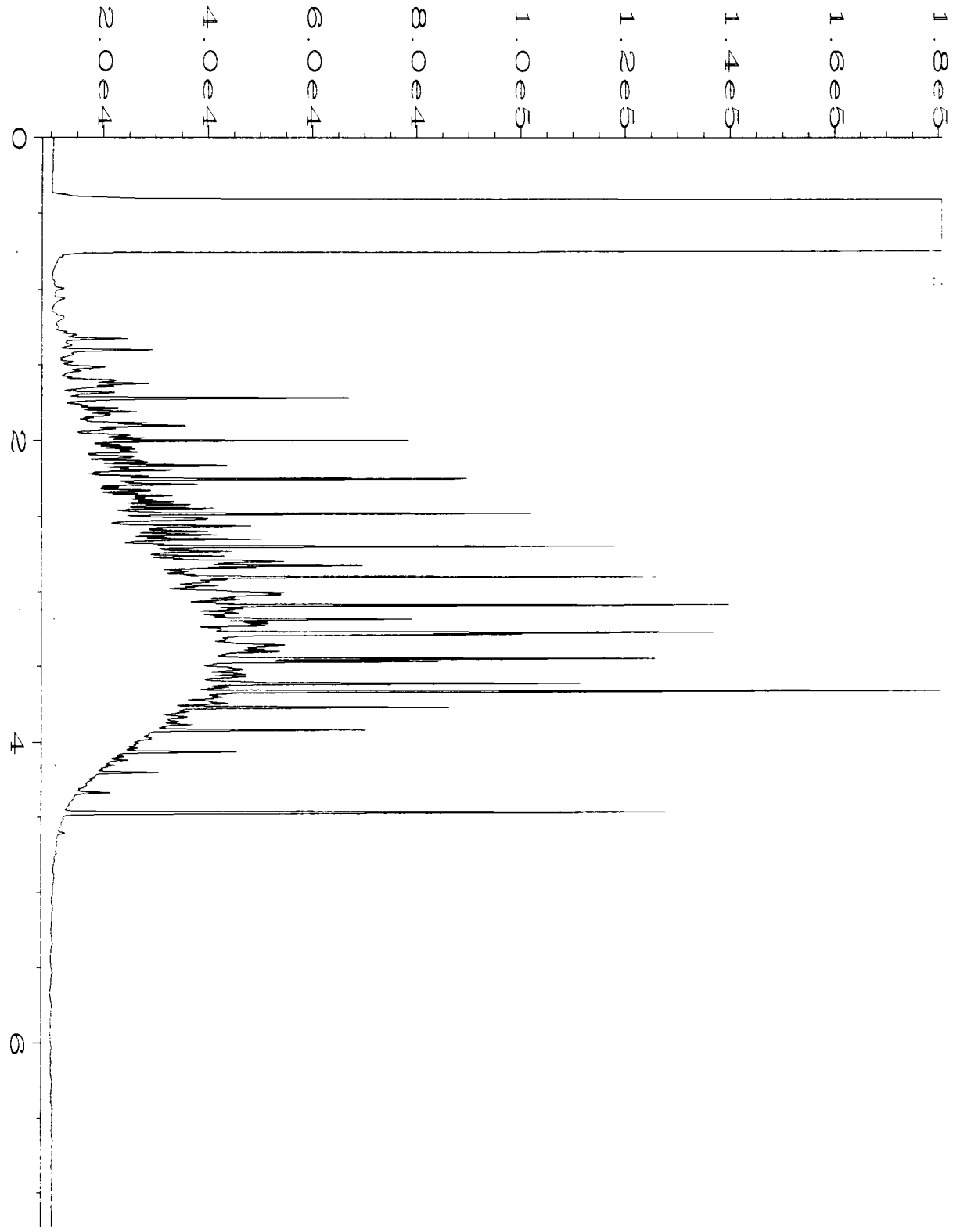
Instrument : GC1
Sample Name : 06-409 mb2
Run Time Bar Code:
Acquired on : 02 Mar 16 01:37 PM
Report Created on: 03 Mar 16 09:14 AM

Page Number : 1
Vial Number : 15
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DX.MTH



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Instrument : GC1
Sample Name : 500 Dx 45-182D
Run Time Bar Code:
Acquired on : 02 Mar 16 07:27 AM
Report Created on: 03 Mar 16 09:15 AM

Page Number : 1
Vial Number : 3
Injection Number : 1
Sequence Line : 2
Instrument Method: DX.MTH
Analysis Method : DX.MTH

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

March 8, 2016

Gabriel Cisneros, Project Manager
Floyd-Snider
Two Union Square, Suite 600
601 Union St
Seattle, WA 98101

Dear Mr. Cisneros:

Included are the results from the testing of material submitted on March 1, 2016 from the 6th-Calhoun, F&BI 603022 project. There are 11 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. 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
FDS0308R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on March 1, 2016 by Friedman & Bruya, Inc. from the Floyd-Snider 6th-Calhoun, F&BI 603022 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Floyd-Snider
603022 -01	EX-1-15
603022 -02	EX-2-9-10
603022 -03	EX-3-9-10
603022 -04	EX-4-9-10
603022 -05	EX-5-15'
603022 -06	EX-6-15'
603022 -07	EX-7-15'
603022 -08	EX-8-8-9'
603022 -09	EX-9-8'-9'
603022 -10	EX-10-8'-9'

All quality control requirements were acceptable.

Date of Report: 03/08/16
Date Received: 03/01/16
Project: 6th-Calhoun, F&BI 603022
Date Extracted: 03/01/16 and 03/02/16
Date Analyzed: 03/01/16 and 03/02/16

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)
EX-1-15 603022-01	<0.02	<0.02	0.092	0.15	19	92
EX-2-9-10 603022-02 1/50	<1	<1	<1	<3	<100	82
EX-3-9-10 603022-03 1/50	<1	<1	2.6	8.0	710	91
EX-4-9-10 603022-04 1/50	<1	<1	<1	<3	<100	82
EX-5-15' 603022-05 1/10	<0.2	<0.2	2.7	6.1	640	101
EX-6-15' 603022-06 1/10	<0.2	<0.2	0.62	1.4	160	93
EX-7-15' 603022-07	<0.02	<0.02	<0.02	<0.06	<2	90
EX-8-8-9' 603022-08 1/50	<1	<1	23	67	5,400	103
EX-9-8'-9' 603022-09 1/5	<0.02 j	<0.1	0.16	0.39	40	93

Date of Report: 03/08/16
Date Received: 03/01/16
Project: 6th-Calhoun, F&BI 603022
Date Extracted: 03/01/16 and 03/02/16
Date Analyzed: 03/01/16 and 03/02/16

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)
EX-10-8'-9' 603022-10 1/50	<1	<1	1.2	<3	350	92
Method Blank 06-361 MB	<0.02	<0.02	<0.02	<0.06	<2	88
Method Blank 06-361 MB2	<0.02	<0.02	<0.02	<0.06	<2	91

Date of Report: 03/08/16
Date Received: 03/01/16
Project: 6th-Calhoun, F&BI 603022
Date Extracted: 03/01/16
Date Analyzed: 03/01/16

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)
EX-1-15 603022-01	<50	<250	93
EX-2-9-10 603022-02	<50	<250	98
EX-3-9-10 603022-03	360 x	<250	95
EX-4-9-10 603022-04	<50	<250	105
EX-5-15' 603022-05	1,100 x	<250	104
EX-6-15' 603022-06	59 x	<250	103
EX-7-15' 603022-07	<50	<250	93
EX-8-8-9' 603022-08	3,800 x	<250	109
EX-9-8'-9' 603022-09	<50	<250	100
EX-10-8'-9' 603022-10	98 x	<250	96
Method Blank 06-409 MB	<50	<250	99

Analysis For Volatile Compounds By EPA Method 8260C SIM

Client Sample ID:	EX-1-15	Client:	Floyd-Snider
Date Received:	03/01/16	Project:	6th-Calhoun, F&BI 603022
Date Extracted:	03/02/16	Lab ID:	603022-01
Date Analyzed:	03/02/16	Data File:	030211.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	95	50	150
Toluene-d8	101	50	150
4-Bromofluorobenzene	101	50	150

Compounds:	Concentration mg/kg (ppm)
1,2-Dibromoethane (EDB)	<0.005

Analysis For Volatile Compounds By EPA Method 8260C SIM

Client Sample ID:	EX-3-9-10	Client:	Floyd-Snider
Date Received:	03/01/16	Project:	6th-Calhoun, F&BI 603022
Date Extracted:	03/02/16	Lab ID:	603022-03
Date Analyzed:	03/02/16	Data File:	030212.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	90	50	150
Toluene-d8	110	50	150
4-Bromofluorobenzene	69	50	150

Compounds:	Concentration mg/kg (ppm)
1,2-Dibromoethane (EDB)	<0.005

Analysis For Volatile Compounds By EPA Method 8260C SIM

Client Sample ID:	Method Blank	Client:	Floyd-Snider
Date Received:	Not Applicable	Project:	6th-Calhoun, F&BI 603022
Date Extracted:	03/02/16	Lab ID:	06-378 mb2
Date Analyzed:	03/02/16	Data File:	030210.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	82	50	150
Toluene-d8	90	50	150
4-Bromofluorobenzene	100	50	150

Compounds:	Concentration mg/kg (ppm)
1,2-Dibromoethane (EDB)	<0.005

Date of Report: 03/08/16
Date Received: 03/01/16
Project: 6th-Calhoun, F&BI 603022

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: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Benzene	mg/kg (ppm)	0.5	88	88	66-121	0
Toluene	mg/kg (ppm)	0.5	90	91	72-128	1
Ethylbenzene	mg/kg (ppm)	0.5	92	92	69-132	0
Xylenes	mg/kg (ppm)	1.5	89	89	69-131	0
Gasoline	mg/kg (ppm)	20	95	95	61-153	0

Date of Report: 03/08/16
Date Received: 03/01/16
Project: 6th-Calhoun, F&BI 603022

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 603022-01 (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	111	101	63-146	9

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	108	79-144

Date of Report: 03/08/16
Date Received: 03/01/16
Project: 6th-Calhoun, F&BI 603022

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR VOLATILES BY EPA METHOD 8260C SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 0.20)
1,2-Dibromoethane (EDB)	mg/kg (ppm)	0.2	92	90	70-130	2

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 compound 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. Compounds in the sample matrix interfered with the quantitation of the analyte.

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.

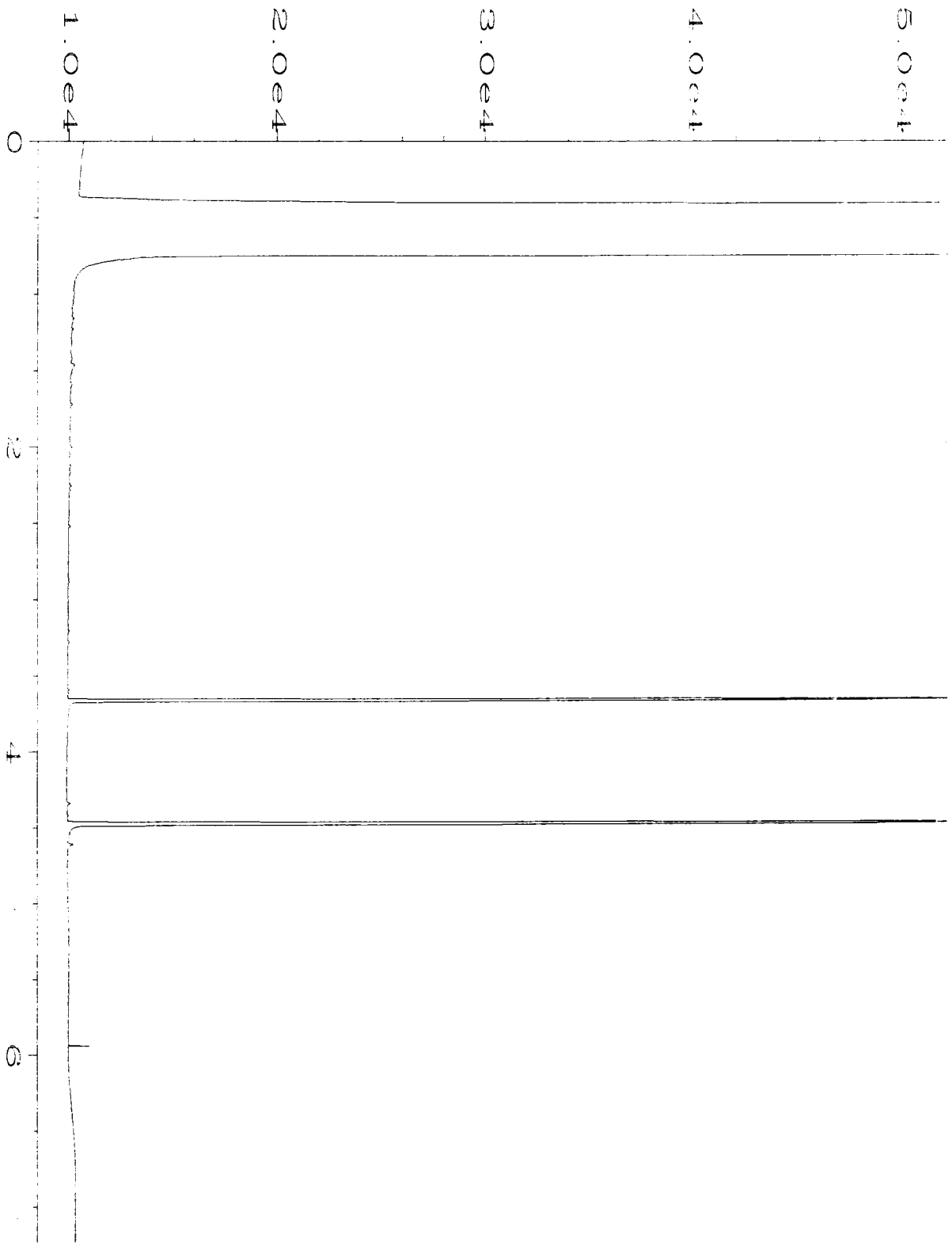
nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

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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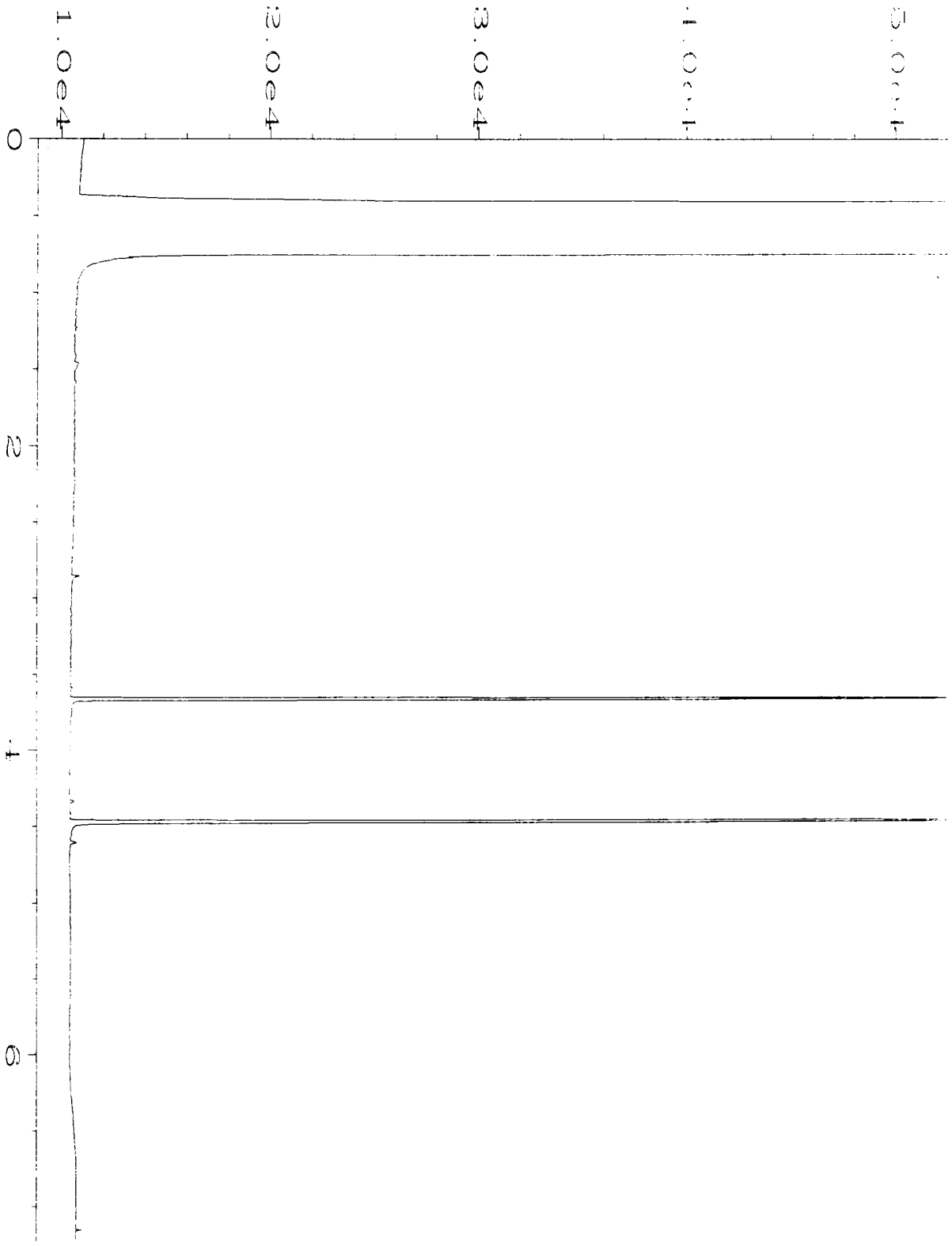
Operator : mwdl
Instrument : GC1
Sample Name : 603022-01
Run Time Bar Code:
Acquired on : 01 Mar 16 05:58 PM
Report Created on: 02 Mar 16 09:10 AM

Page Number : 1
Vial Number : 37
Injection Number : 1
Sequence Line : 8
Instrument Method: DX.MTH
Analysis Method : DX.MTH



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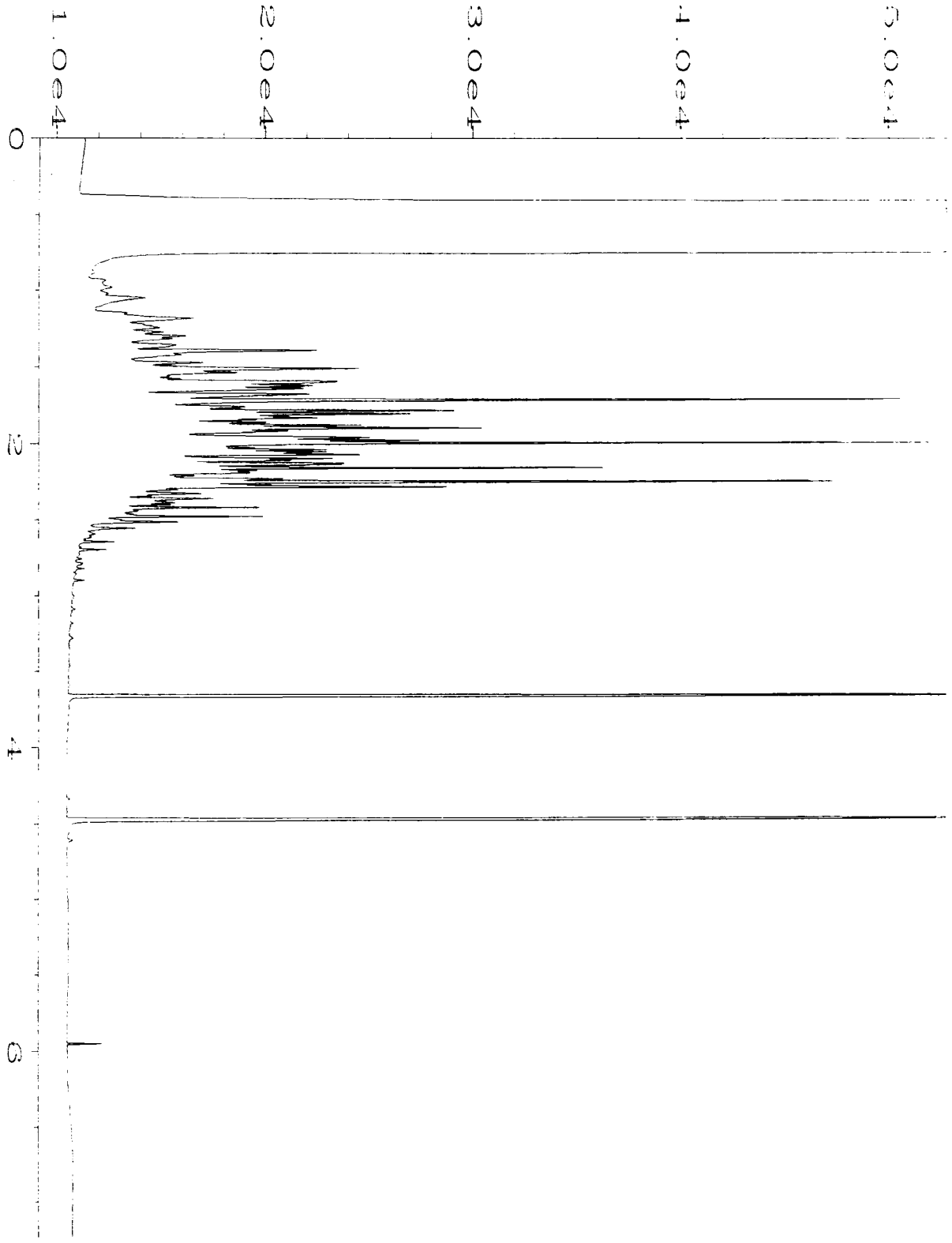
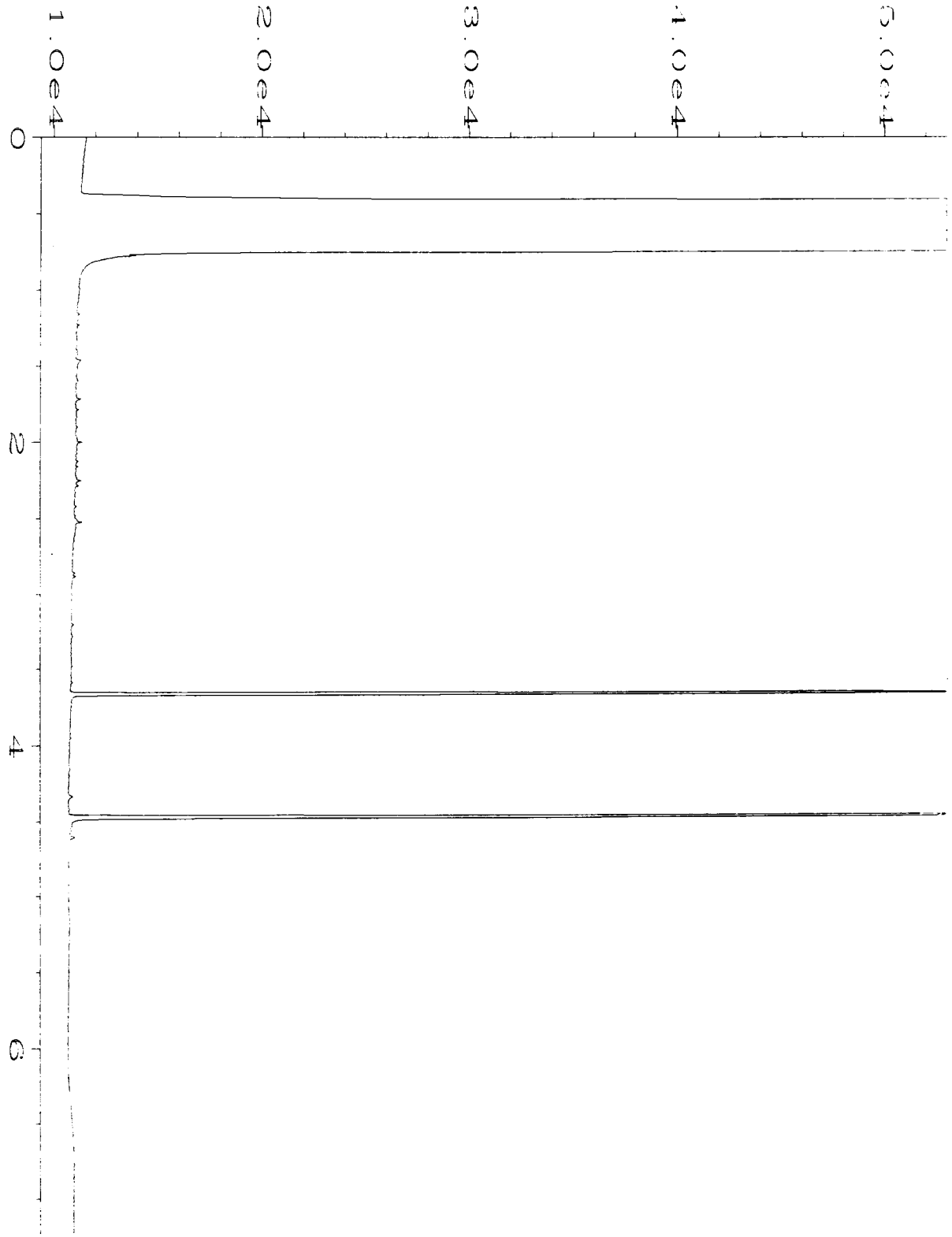
Operator : mwdl
Instrument : GC1
Sample Name : 603022-02
Run Time Bar Code:
Acquired on : 01 Mar 16 06:09 PM
Report Created on: 02 Mar 16 09:10 AM

Page Number : 1
Vial Number : 38
Injection Number : 1
Sequence Line : 8
Instrument Method: DX.MTH
Analysis Method : DX.MTH

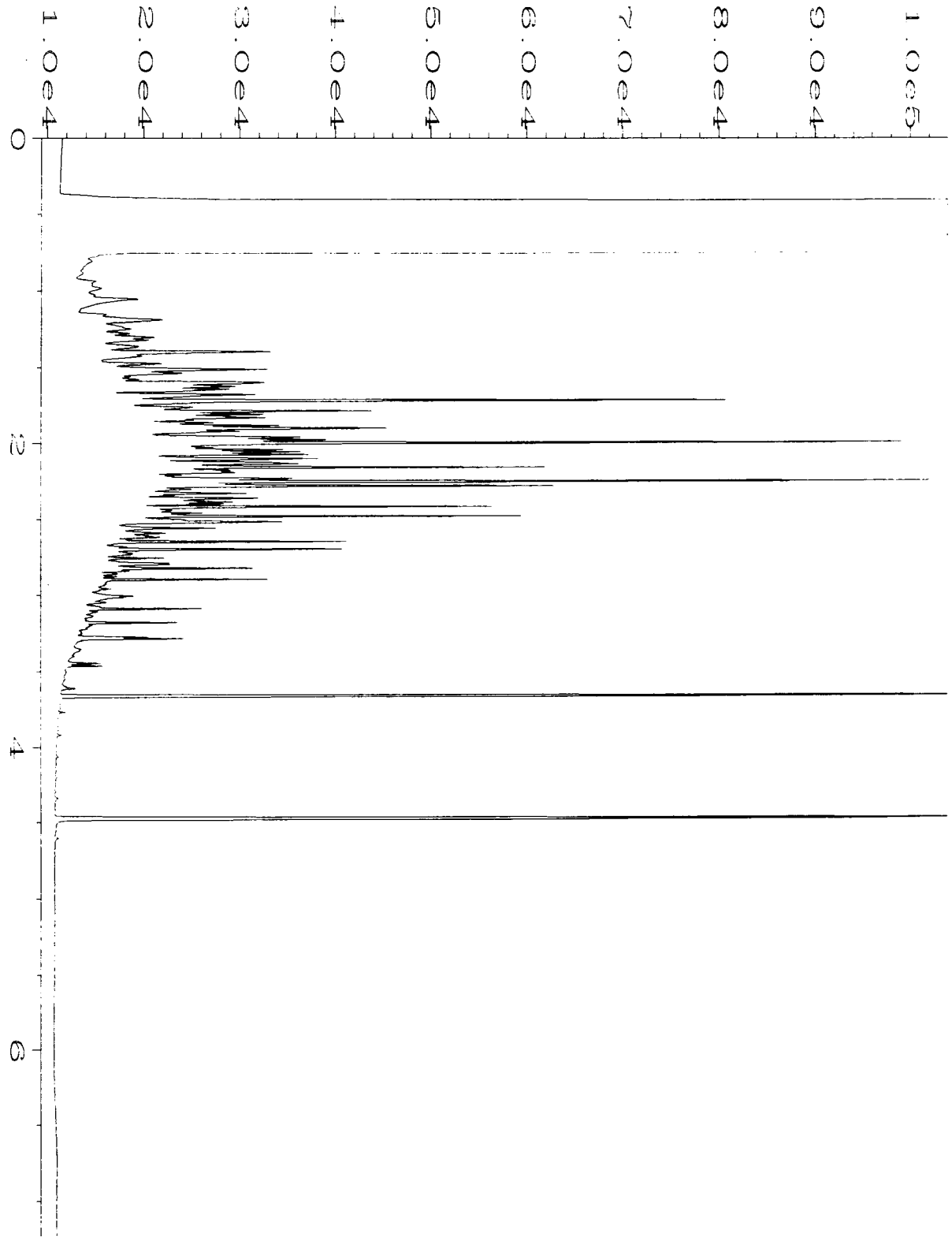


Data File Name	: C:\HPCHEM\1\DATA\03-01-16\039F0801.D		
Operator	: mwdl	Page Number	: 1
Instrument	: GC1	Vial Number	: 39
Sample Name	: 603022-03	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 8
Acquired on	: 01 Mar 16 06:20 PM	Instrument Method	: DX.MTH
Report Created on	: 02 Mar 16 09:10 AM	Analysis Method	: DX.MTH



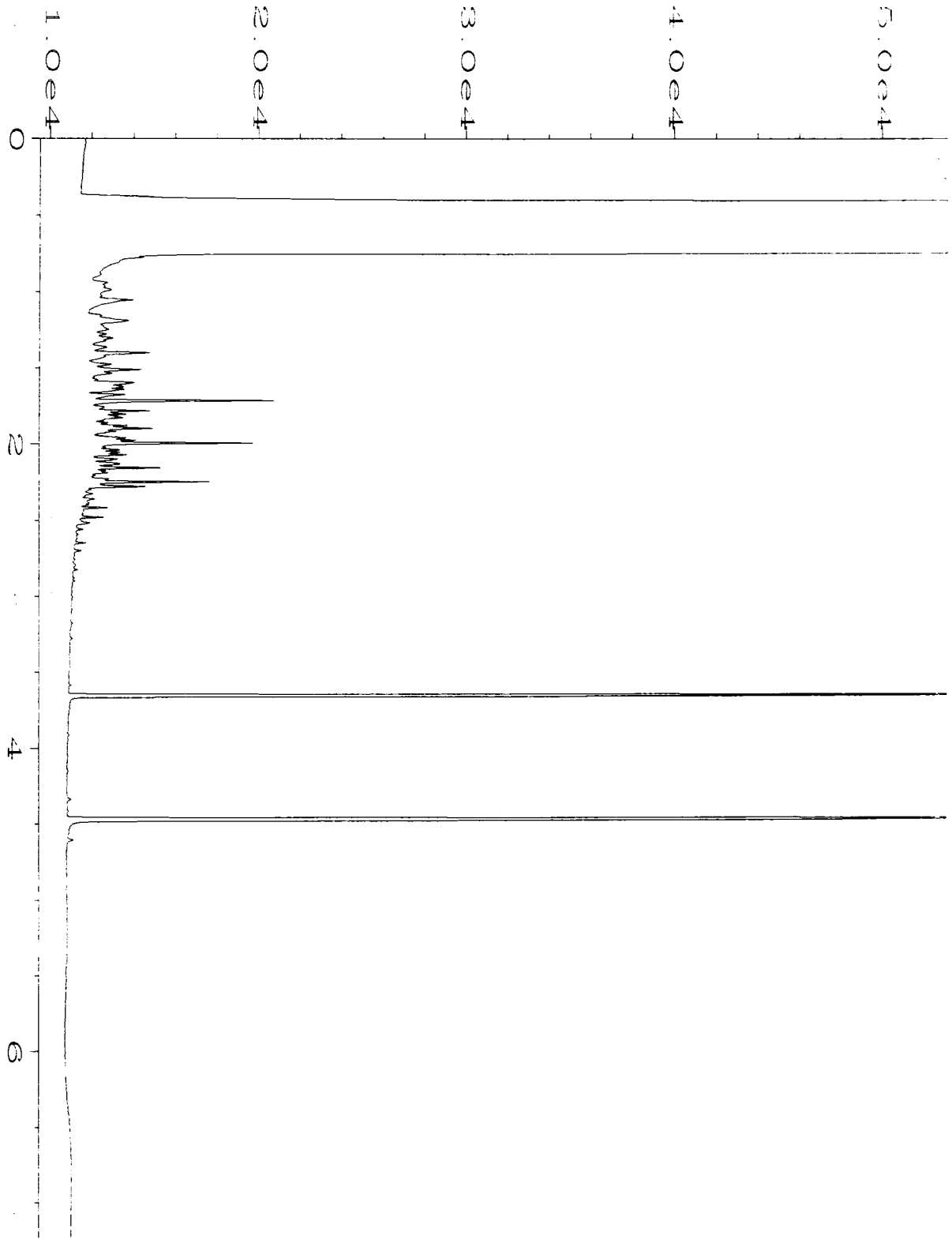
Data File Name : C:\HPCHEM\1\DATA\03-01-16\040F0801.D
Operator : mwdl
Instrument : GC1
Sample Name : 603022-04
Run Time Bar Code:
Acquired on : 01 Mar 16 06:32 PM
Report Created on: 02 Mar 16 09:10 AM

Page Number : 1
Vial Number : 40
Injection Number : 1
Sequence Line : 8
Instrument Method: DX.MTH
Analysis Method : DX.MTH



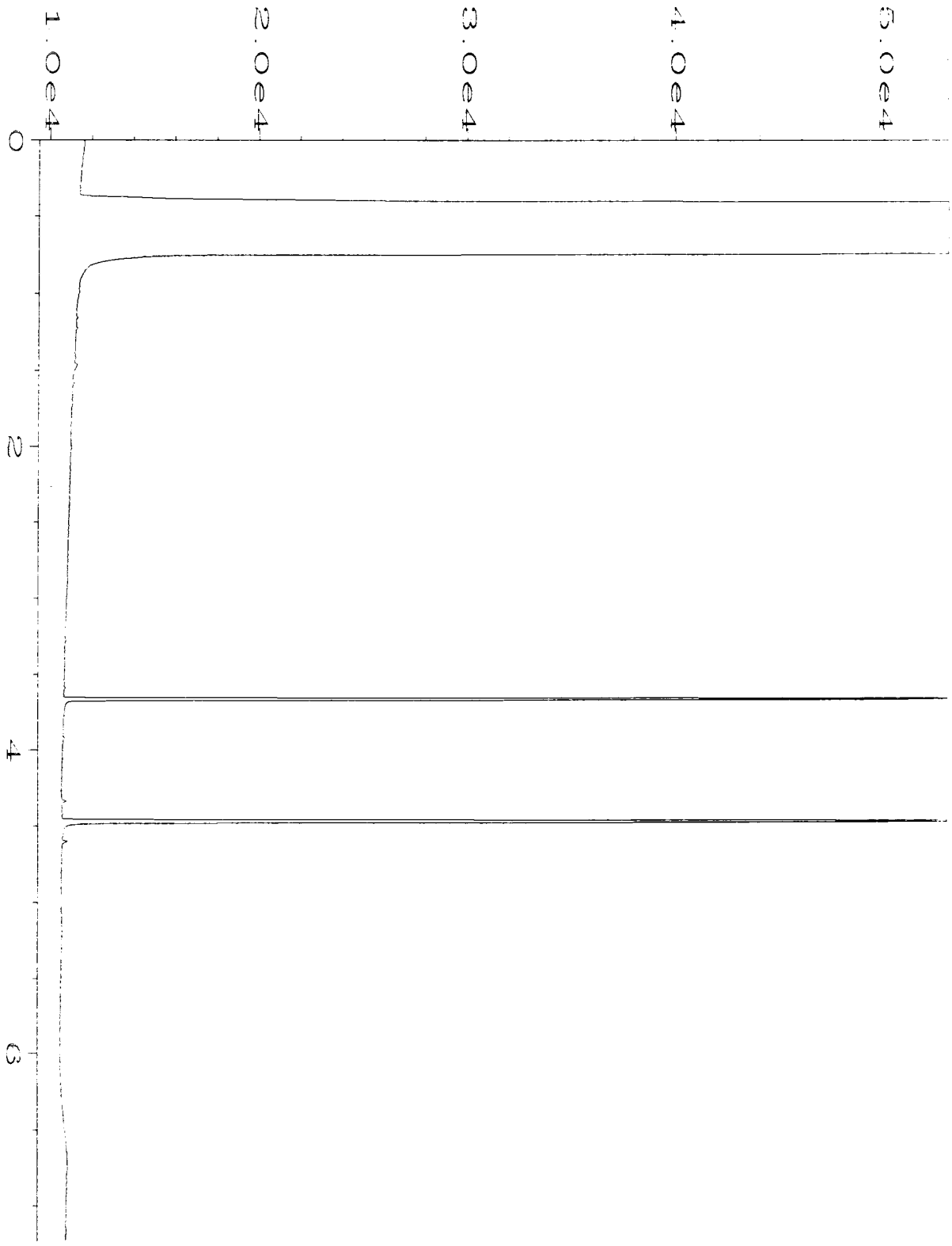
Data File Name : C:\HPCHEM\1\DATA\03-01-16\041F0801.D
Operator : mwdl
Instrument : GC1
Sample Name : 603022-05
Run Time Bar Code:
Acquired on : 01 Mar 16 06:43 PM
Report Created on: 02 Mar 16 09:11 AM

Page Number : 1
Vial Number : 41
Injection Number : 1
Sequence Line : 8
Instrument Method: DX.MTH
Analysis Method : DX.MTH



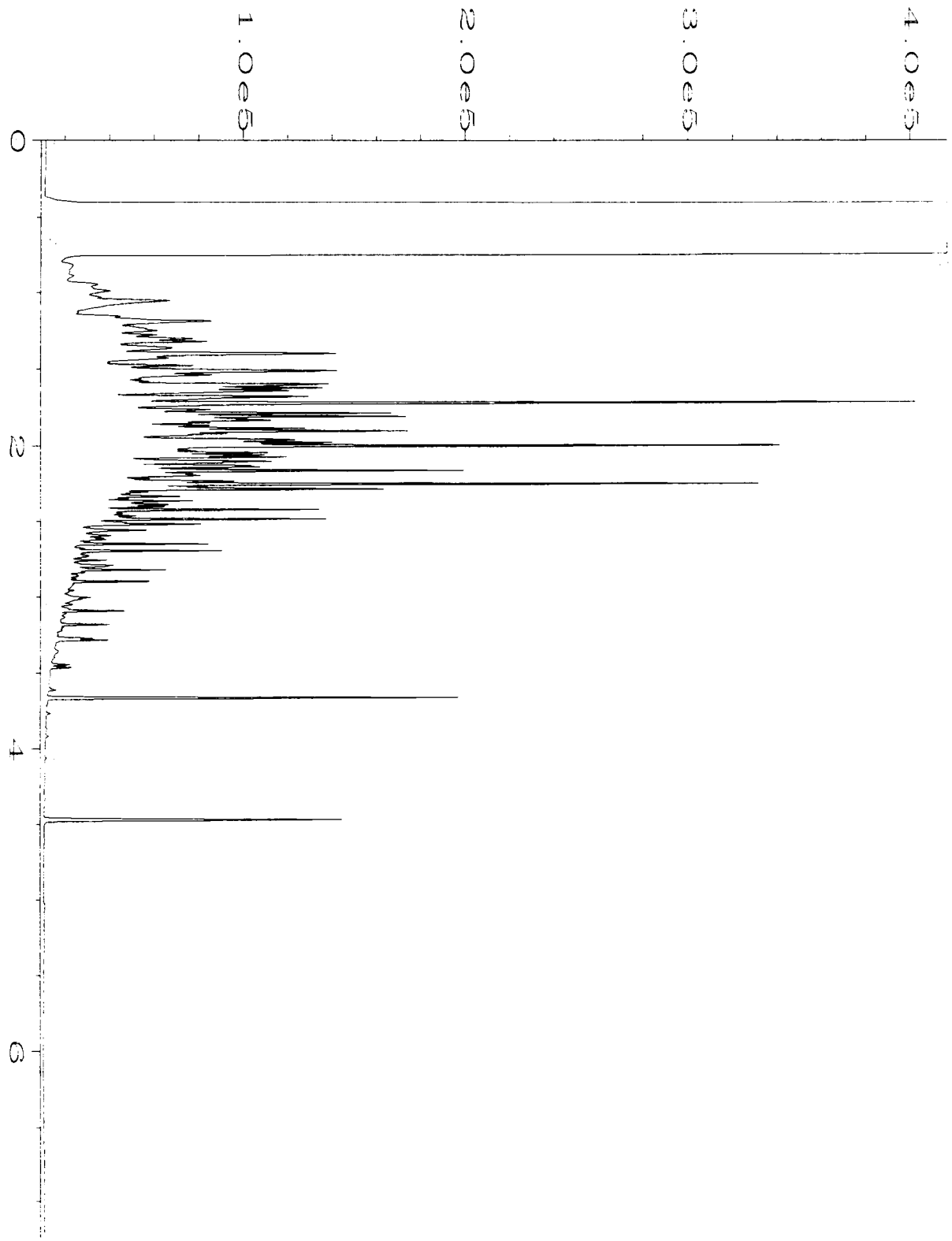
Data File Name : C:\HPCHEM\1\DATA\03-01-16\042F0801.D
Operator : mwdl
Instrument : GC1
Sample Name : 603022-06
Run Time Bar Code:
Acquired on : 01 Mar 16 06:54 PM
Report Created on: 02 Mar 16 09:11 AM

Page Number : 1
Vial Number : 42
Injection Number : 1
Sequence Line : 8
Instrument Method: DX.MTH
Analysis Method : DX.MTH

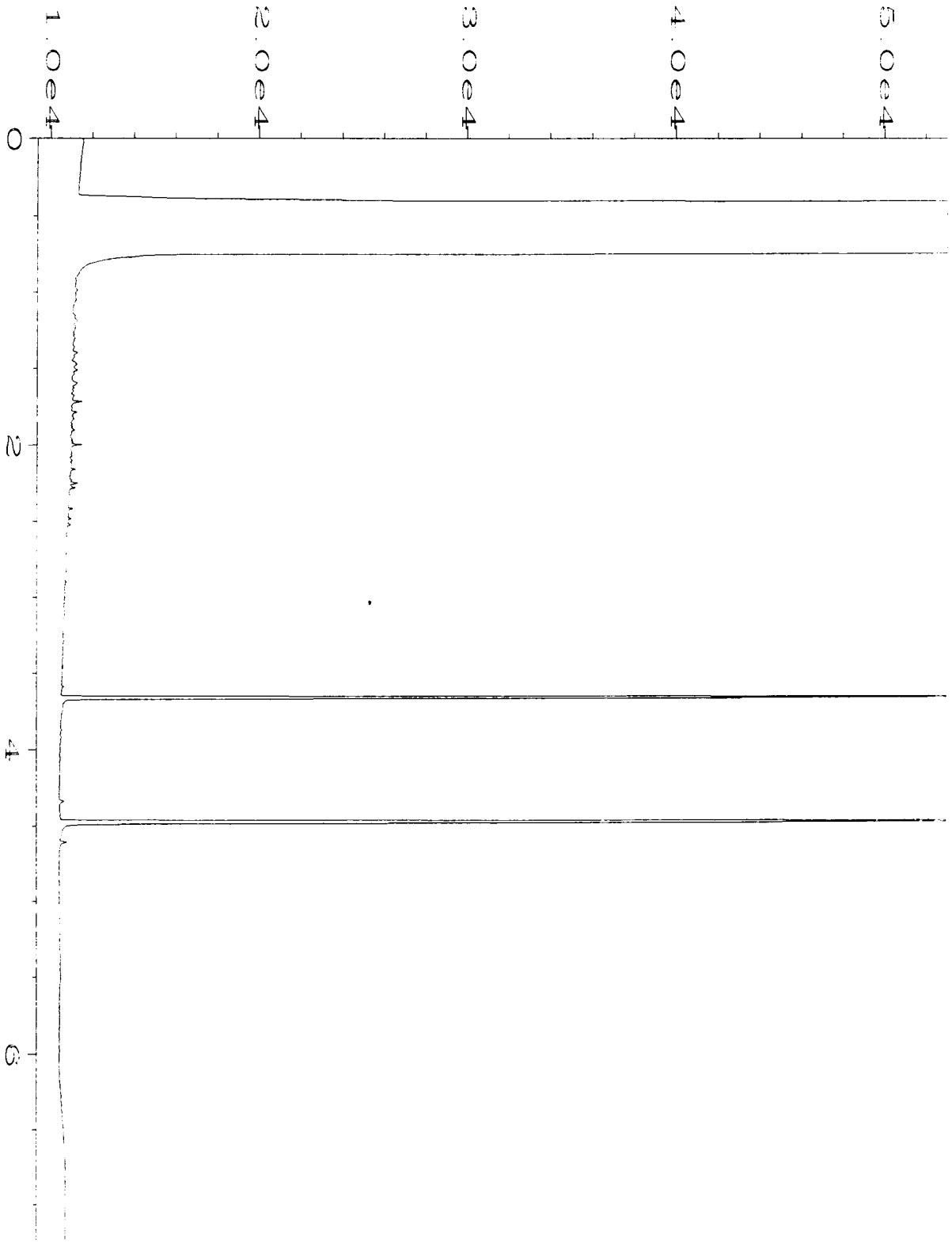


Data File Name : C:\HPCHEM\1\DATA\03-01-16\043F0801.D
Operator : mwdl
Instrument : GC1
Sample Name : 603022-07
Run Time Bar Code:
Acquired on : 01 Mar 16 07:05 PM
Report Created on: 02 Mar 16 09:11 AM

Page Number : 1
Vial Number : 43
Injection Number : 1
Sequence Line : 8
Instrument Method: DX.MTH
Analysis Method : DX.MTH

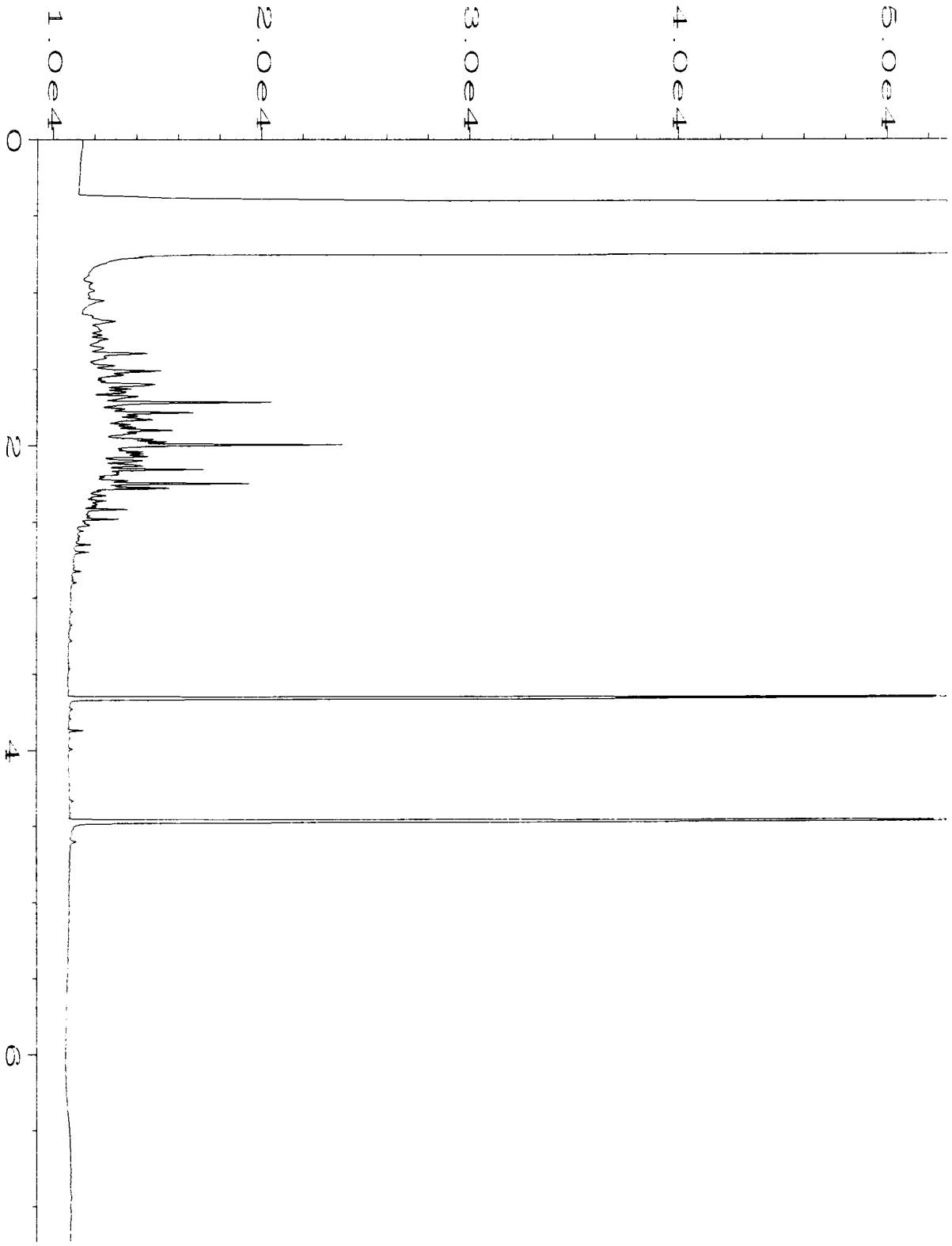


Data File Name	: C:\HPCHEM\1\DATA\03-01-16\044F0801.D		
Operator	: mwdl	Page Number	: 1
Instrument	: GC1	Vial Number	: 44
Sample Name	: 603022-08	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 8
Acquired on	: 01 Mar 16 07:16 PM	Instrument Method	: DX.MTH
Report Created on	: 02 Mar 16 09:11 AM	Analysis Method	: DX.MTH



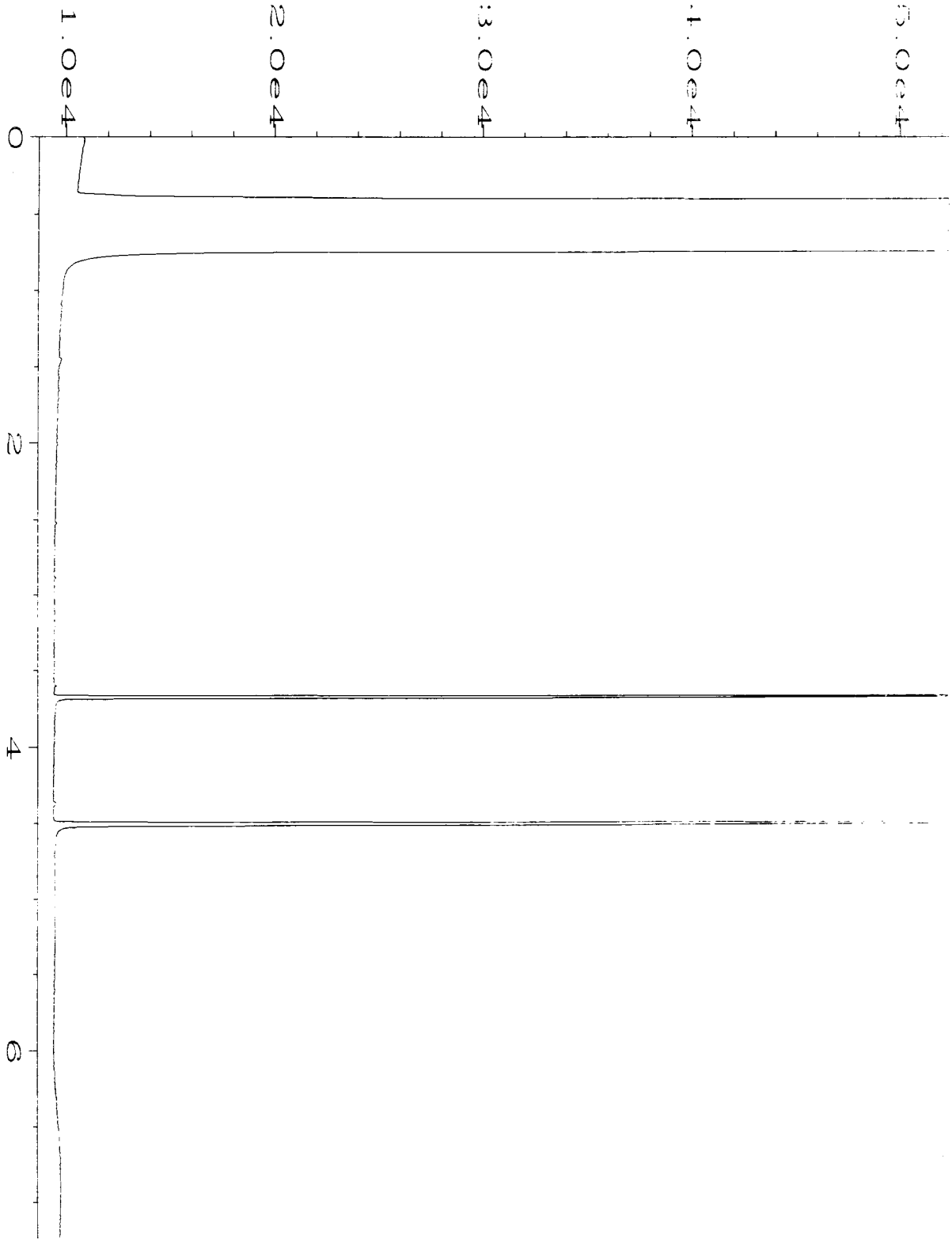
Data File Name : C:\HPCHEM\1\DATA\03-01-16\045F0801.D
Operator : mwdl
Instrument : GC1
Sample Name : 603022-09
Run Time Bar Code:
Acquired on : 01 Mar 16 07:27 PM
Report Created on: 02 Mar 16 09:11 AM

Page Number : 1
Vial Number : 45
Injection Number : 1
Sequence Line : 8
Instrument Method: DX.MTH
Analysis Method : DX.MTH



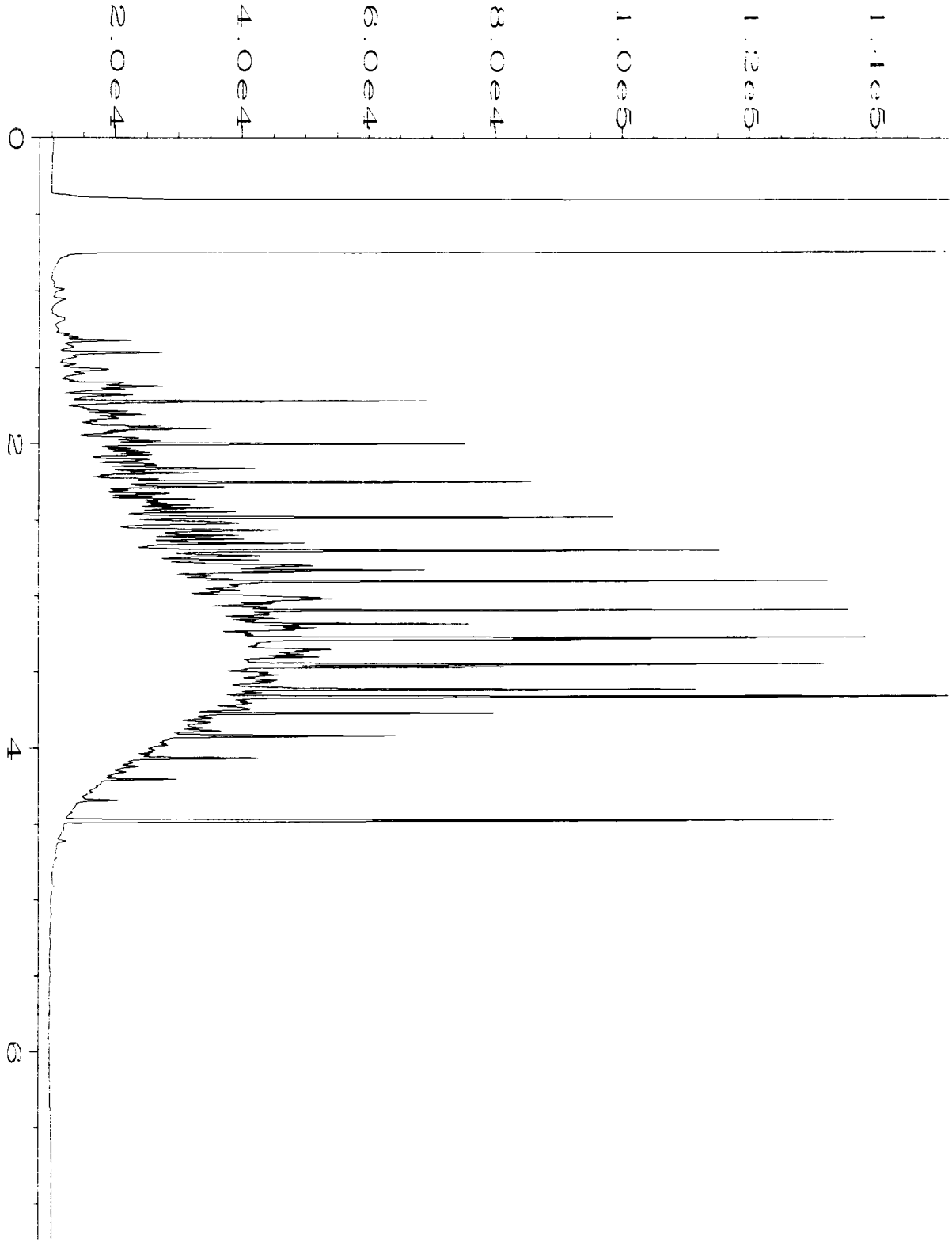
Data File Name : C:\HPCHEM\1\DATA\03-01-16\046F0801.D
Operator : mwdl
Instrument : GC1
Sample Name : 603022-10
Run Time Bar Code:
Acquired on : 01 Mar 16 07:38 PM
Report Created on: 02 Mar 16 09:11 AM

Page Number : 1
Vial Number : 46
Injection Number : 1
Sequence Line : 8
Instrument Method: DX.MTH
Analysis Method : DX.MTH



Data File Name : C:\HPCHEM\1\DATA\03-01-16\035F0801.D
Operator : mwdl
Instrument : GC1
Sample Name : 06-409 mb
Run Time Bar Code:
Acquired on : 01 Mar 16 05:38 PM
Report Created on: 02 Mar 16 09:12 AM

Page Number : 1
Vial Number : 35
Injection Number : 1
Sequence Line : 8
Instrument Method: DX.MTH
Analysis Method : DX.MTH



Data File Name : C:\HPCHEM\1\DATA\03-01-16\003F0201.D
Operator : mwdl
Instrument : GC1
Sample Name : 500 Dx 45-182D
Run Time Bar Code:
Acquired on : 01 Mar 16 07:31 AM
Report Created on: 02 Mar 16 09:12 AM

Page Number : 1
Vial Number : 3
Injection Number : 1
Sequence Line : 2
Instrument Method: DX.MTH
Analysis Method : DX.MTH

603022

SAMPLE CHAIN OF CUSTODY

ME 03/1/16 VSZ/DO2

Page # 1 of 1

Send Report To Gabe Cisneros
Company Floyd | Snider
Address 601 Union St., Ste. 600
City, State, ZIP Seattle, WA 98101
Phone # 206-292-2078 Fax #

SAMPLERS (signature)

PROJECT NAME/NO.: 6TH-Calhoun

PO#:

REMARKS 24hr TAT or 1 hr TAT ASAP, Call Gabe when results are ready. 206-582-8223

TURNAROUND TIME
- ☐ Standard (2 Weeks)
- ☒ RUSH ASAP

Rush charges authorized by

SAMPLE DISPOSAL
- ☐ Dispose after 30 days
- ☐ Return samples
- ☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	ANALYSES REQUESTED: TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS	EDB by USEPA 8011						Notes
EX-1-15	01	3/1/16	1120	Soil	5	X	X	X				X						Call Gabe
EX-2-9-10	02		1130		5	X	X	X										@ 206-582-
EX-3-9-10	03		1140		5	X	X	X				X						8223
EX-4-9-10	04		1150		5	X	X	X										
EX-5-15'	05		1305		5	X	X	X										
EX-6-15'	06		1315		5	X	X	X										
EX-7-15'	07		1400		5	X	X	X										
EX-8-8'-9'	08		1410		5	X	X	X										
EX-9-8'-9'	09		1420		5	X	X	X										
EX-10-8'-9'	10		1430		5	X	X	X										Received at 4 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Gabriel Cisneros	Floyd | Snider	3/1/16	1553
Received by:	VINH	FBI	3/1/16	1553
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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3012 16th Avenue West
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fbi@isomedia.com
www.friedmanandbruya.com

March 8, 2016

Gabriel Cisneros, Project Manager
Floyd-Snider
Two Union Square, Suite 600
601 Union St
Seattle, WA 98101

Dear Mr. Cisneros:

Included are the results from the testing of material submitted on March 3, 2016 from the Calhoun, F&BI 603064 project. There are 6 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. 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
FDS0308R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on March 3, 2016 by Friedman & Bruya, Inc. from the Floyd-Snider Calhoun, F&BI 603064 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Floyd-Snider
603064 -01	SB-55-5.5'
603064 -02	SB-55-5.5' D

All quality control requirements were acceptable.

Date of Report: 03/08/16
Date Received: 03/03/16
Project: Calhoun, F&BI 603064
Date Extracted: 03/04/16
Date Analyzed: 03/04/16

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-55-5.5' 603064-01	<0.02	<0.02	<0.02	<0.06	3.0	92
SB-55-5.5' D 603064-02	<0.02	<0.02	<0.02	<0.06	2.6	90
Method Blank 06-366 MB	<0.02	<0.02	<0.02	<0.06	<2	89

Date of Report: 03/08/16
Date Received: 03/03/16
Project: Calhoun, F&BI 603064
Date Extracted: 03/04/16
Date Analyzed: 03/04/16

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)
SB-55-5.5' 603064-01	<50	<250	98
SB-55-5.5' D 603064-02	<50	<250	95
Method Blank 06-416 MB2	<50	<250	101

Date of Report: 03/08/16
Date Received: 03/03/16
Project: Calhoun, F&BI 603064

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: 603077-01 (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)	<2	<2	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	92	72-128
Ethylbenzene	mg/kg (ppm)	0.5	94	69-132
Xylenes	mg/kg (ppm)	1.5	90	69-131
Gasoline	mg/kg (ppm)	20	100	61-153

Date of Report: 03/08/16
Date Received: 03/03/16
Project: Calhoun, F&BI 603064

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 603060-01 (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	113	100	64-133	12

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	112	58-147

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 compound 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. Compounds in the sample matrix interfered with the quantitation of the analyte.

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.

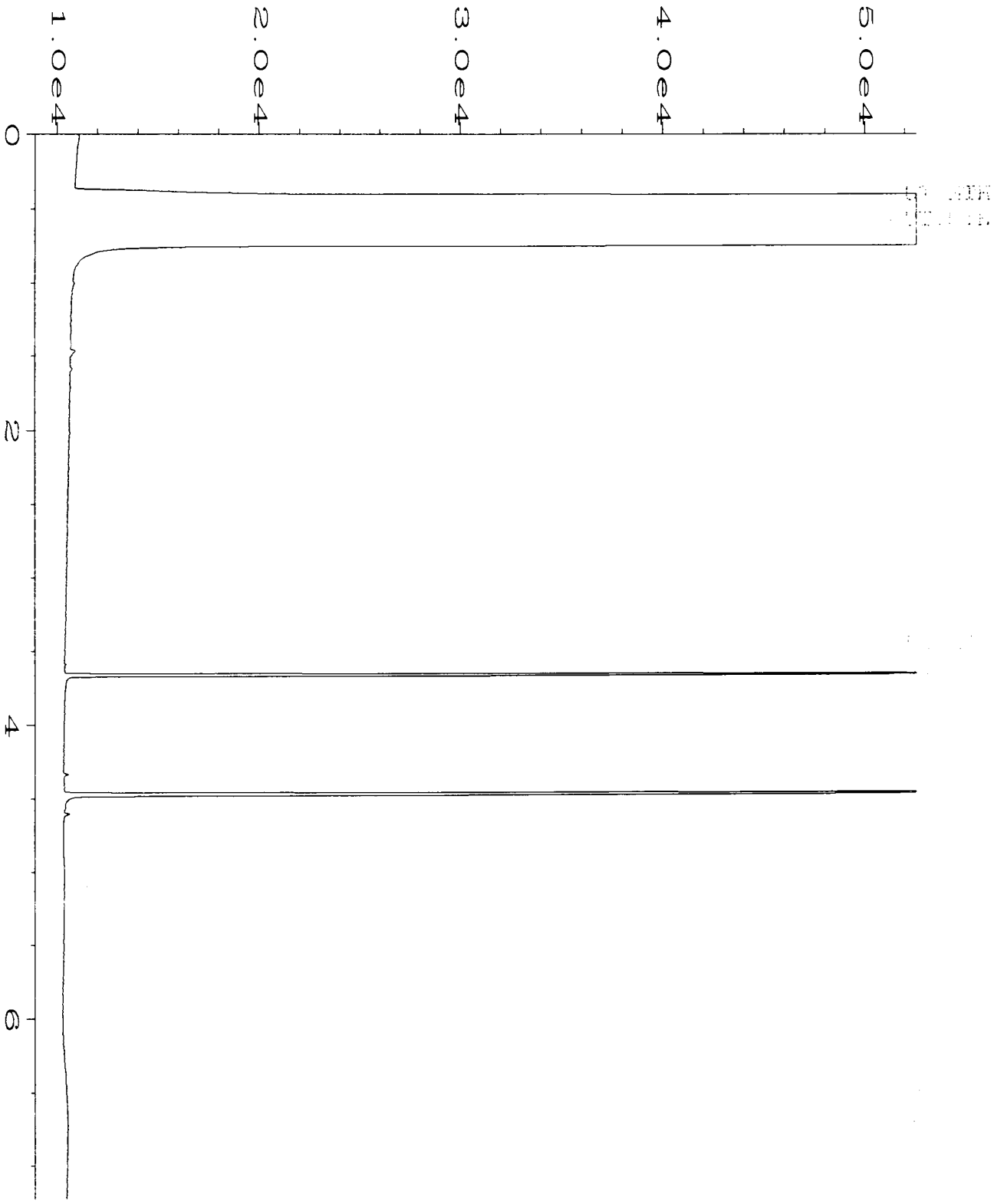
nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

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.

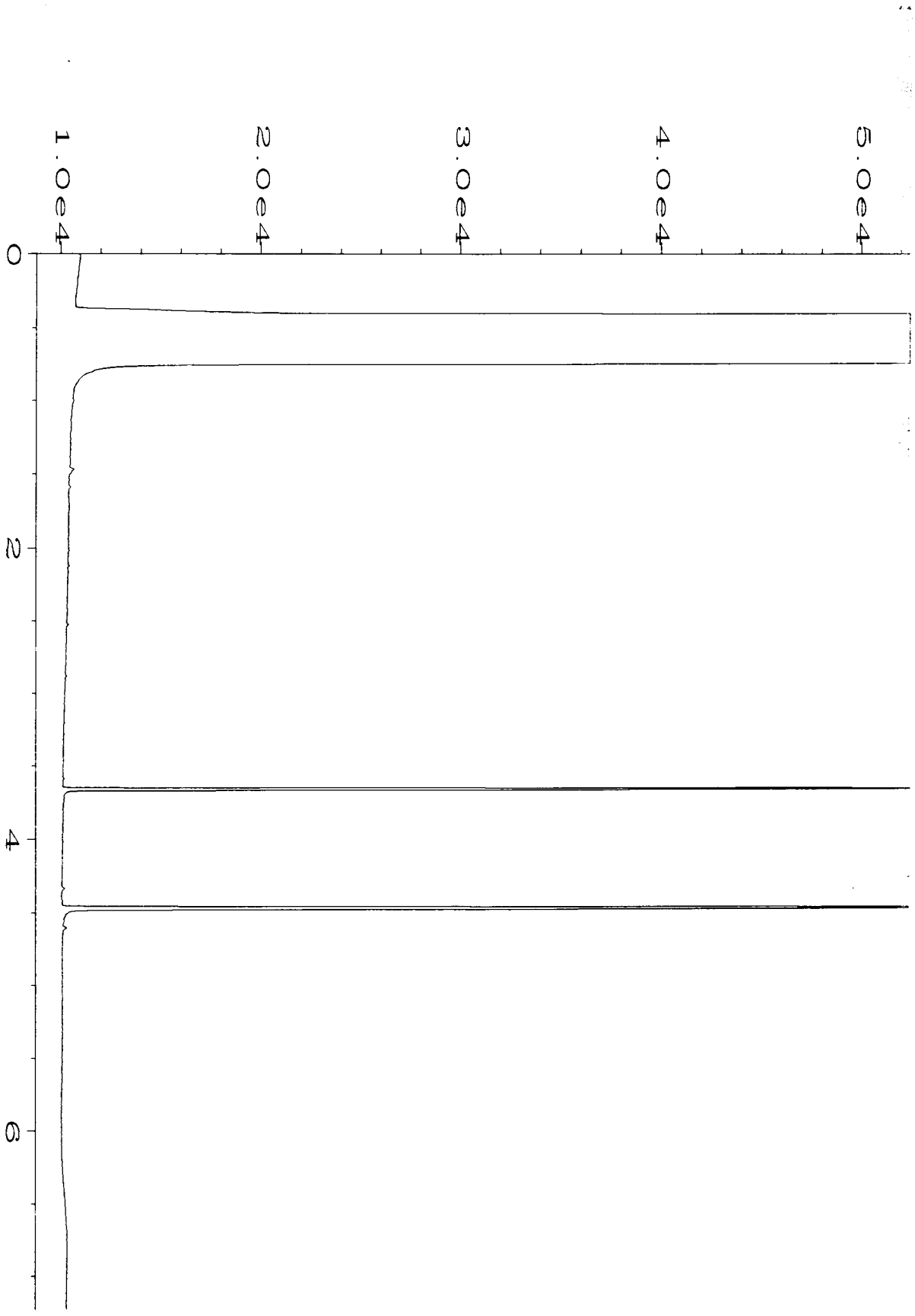
ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

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.

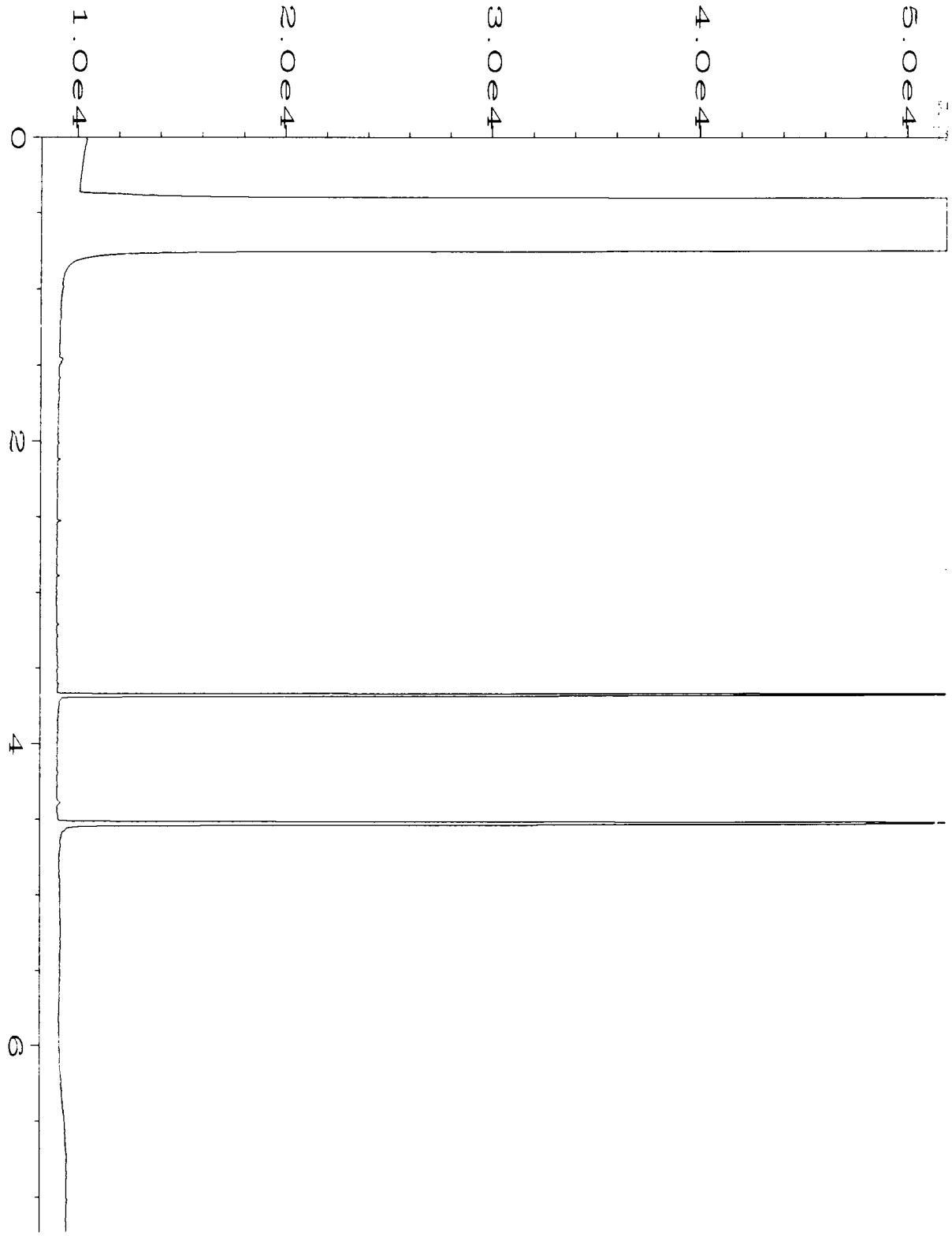


Data File Name	: C:\HPCHEM\1\DATA\03-04-16\019F0301.D		
Operator	: mwdl	Page Number	: 1
Instrument	: GC1	Vial Number	: 19
Sample Name	: 603064-01	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 3
Acquired on	: 04 Mar 16 11:24 AM	Instrument Method	: DX.MTH
Report Created on	: 07 Mar 16 11:53 AM	Analysis Method	: DX.MTH



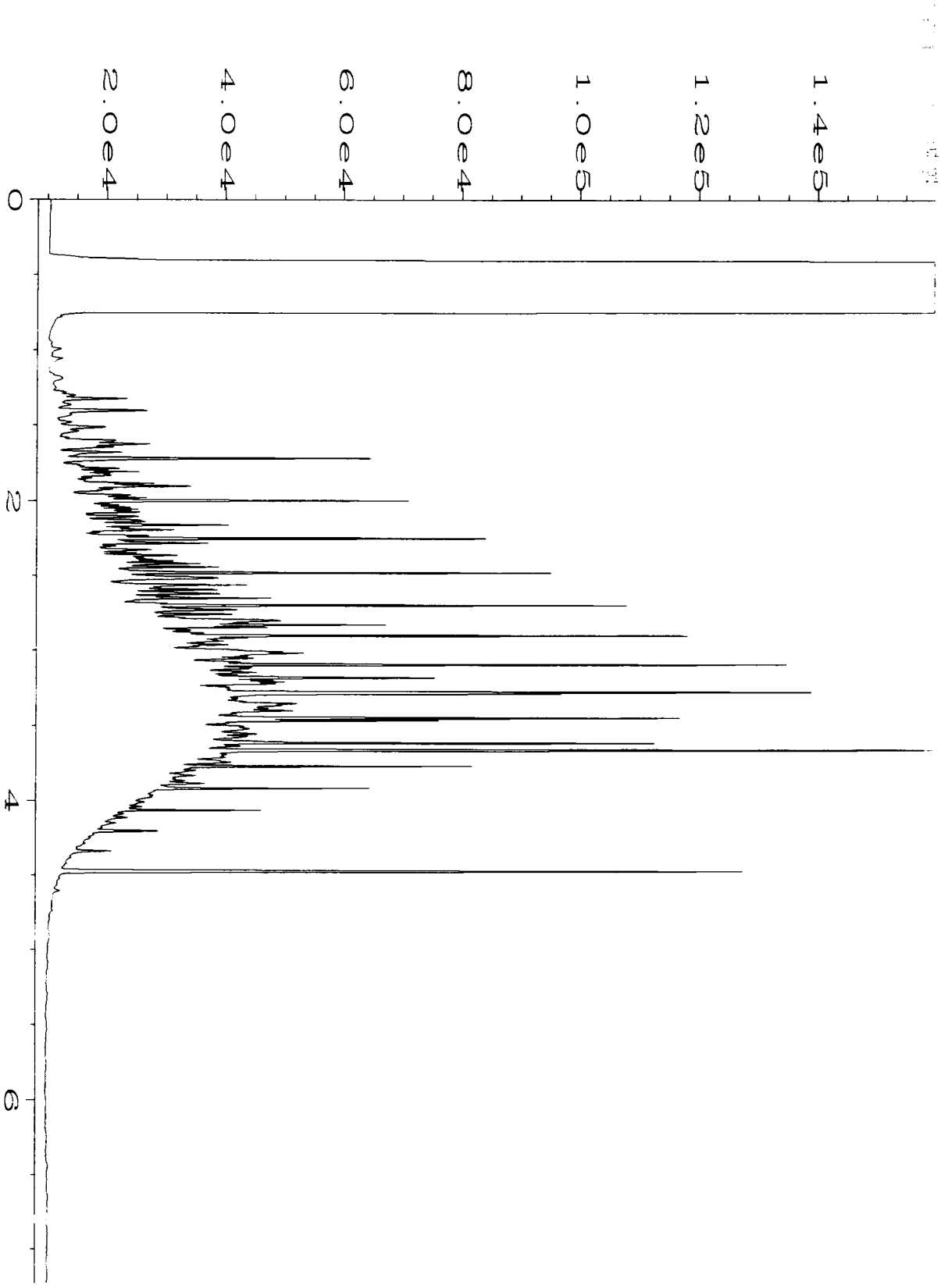
Data File Name : C:\HPCHEM\1\DATA\03-04-16\020F0301.D
Operator : mwdl
Instrument : GC1
Sample Name : 603064-02
Run Time Bar Code:
Acquired on : 04 Mar 16 11:35 AM
Report Created on: 07 Mar 16 11:53 AM

Page Number : 1
Vial Number : 20
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DX.MTH



Data File Name : C:\HPCHEM\1\DATA\03-04-16\006F0301.D
Operator : mwdl
Instrument : GC1
Sample Name : 06-416 mb2
Run Time Bar Code:
Acquired on : 04 Mar 16 09:03 AM
Report Created on: 07 Mar 16 11:53 AM

Page Number : 1
Vial Number : 6
Injection Number : 1
Sequence Line : 3
Instrument Method: DX.MTH
Analysis Method : DX.MTH



Data File Name	: C:\HPCHEM\1\DATA\03-04-16\003F0201.D		
Operator	: mwdl	Page Number	: 1
Instrument	: GC1	Vial Number	: 3
Sample Name	: 500 Dx 45-182D	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 2
Acquired on	: 04 Mar 16 07:07 AM	Instrument Method	: DX.MTH
Report Created on	: 07 Mar 16 11:53 AM	Analysis Method	: DX.MTH

603064

SAMPLE CHAIN OF CUSTODY

ME 03-03-16

D01 / V81

Page # 1 of 1

Send Report To Gabe Cisneros

Company Floyd | Snider

Address 601 Union Street, Ste. 600

City, State, ZIP Seattle, WA 98101

Phone # _____ Fax # _____

SAMPLERS *(signature)*

PROJECT NAME/NO. Carlton

PO#

REMARKS

TURNAROUND TIME
- [x] Standard (2 Weeks)
- [ ] RUSH
- Rush charges authorized by

SAMPLE DISPOSAL
- [ ] Dispose after 30 days
- [ ] Return samples
- [ ] Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
						ANALYSES REQUESTED												
SB-55-5.5'	01 A B	3/3/16	1015	Soil	5	X	X	X										
SB-55-5.5'D	02 T	3/3/16	1020	Soil	5	X	X	X										

Samples received at 4 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Gabriel Cisneros	Floyd/Snider	3/3/16	1500
Received by:	Nhan Phan	FCB_I	3/3/16	1500
Relinquished by:				
Received by:				

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

FORMS\COC\COC.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

March 25, 2016

Gabriel Cisneros, Project Manager
Floyd-Snider
Two Union Square, Suite 600
601 Union St
Seattle, WA 98101

Dear Mr. Cisneros:

Included are the results from the testing of material submitted on March 11, 2016 from the 6th-Calhoun, F&BI 603213 project. There are 10 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. 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
FDS0325R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on March 11, 2016 by Friedman & Bruya, Inc. from the Floyd-Snider 6th-Calhoun, F&BI 603213 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Floyd-Snider
603213 -01	SVP-3-031116
603213 -02	SVP-3-031116 D
603213 -03	SVP-2-031116
603213 -04	SVP-1-031116

All quality control requirements were acceptable.

Date of Report: 03/25/16
Date Received: 03/11/16
Project: 6th-Calhoun, F&BI 603213
Date Extracted: N/A
Date Analyzed: 03/24/16

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR AIR USING METHOD ASTM D-1946

Sample ID Laboratory ID	Helium (%)
SVP-3-031116 603213-01	0.79
SVP-3-031116 D 603213-02	0.53
SVP-2-031116 603213-03	<0.5
SVP-1-031116 603213-04	<0.5

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SVP-3-031116 1/1000	Client:	Floyd-Snider
Date Received:	03/11/16	Project:	6th-Calhoun, F&BI 603213
Date Collected:	03/11/16	Lab ID:	603213-01 1/1000
Date Analyzed:	03/19/16	Data File:	031736.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	117	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	220 j	69 j
Toluene	150 j	40 j
Ethylbenzene	750	170
m,p-Xylene	<870	<200
o-Xylene	<430	<100
Naphthalene	<520	<100

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SVP-3-031116 D 1/1000		Client: Floyd-Snider
Date Received:	03/11/16	Project:	6th-Calhoun, F&BI 603213
Date Collected:	03/11/16	Lab ID:	603213-02 1/1000
Date Analyzed:	03/18/16	Data File:	031735.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	117	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	210 j	67 j
Toluene	140 j	37 j
Ethylbenzene	740	170
m,p-Xylene	<870	<200
o-Xylene	<430	<100
Naphthalene	<520	<100

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SVP-2-031116	Client:	Floyd-Snider
Date Received:	03/11/16	Project:	6th-Calhoun, F&BI 603213
Date Collected:	03/11/16	Lab ID:	603213-03
Date Analyzed:	03/21/16	Data File:	032108.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	202	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	5.0	1.6
Toluene	6.8	1.8
Ethylbenzene	11	2.6
m,p-Xylene	6.7	1.5
o-Xylene	2.3	0.53
Naphthalene	1.8	0.35

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SVP-1-031116	Client:	Floyd-Snider
Date Received:	03/11/16	Project:	6th-Calhoun, F&BI 603213
Date Collected:	03/11/16	Lab ID:	603213-04
Date Analyzed:	03/21/16	Data File:	032107.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	100	70	130

Compounds:	Concentration ug/m3	ppbv
Benzene	3.3	1.0
Toluene	8.8	2.3
Ethylbenzene	1.7	0.38
m,p-Xylene	5.6	1.3
o-Xylene	2.2	0.50
Naphthalene	1.3	0.25

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Floyd-Snider
Date Received:	Not Applicable	Project:	6th-Calhoun, F&BI 603213
Date Collected:	03/11/16	Lab ID:	06-465 mb
Date Analyzed:	03/18/16	Data File:	031728.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	VM

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

Compounds:	Concentration ug/m3	ppbv
Benzene	<0.32	<0.1
Toluene	<0.38	<0.1
Ethylbenzene	<0.43	<0.1
m,p-Xylene	<0.87	<0.2
o-Xylene	<0.43	<0.1
Naphthalene	<0.52	<0.1

Date of Report: 03/25/16
Date Received: 03/11/16
Project: 6th-Calhoun, F&BI 603213

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF AIR SAMPLES FOR HELIUM BY METHOD ASTM D-1946

Laboratory Code: 603213-04 (Duplicate)

Analyte	Sample Result	Duplicate Result	Relative Percent Difference	Acceptance Criteria
Helium (%)	<0.5	<0.5	nm	0-20

Date of Report: 03/25/16
Date Received: 03/11/16
Project: 6th-Calhoun, F&BI 603213

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ppbv	10	104	70-130
Toluene	ppbv	10	102	70-130
Ethylbenzene	ppbv	10	103	70-130
m,p-Xylene	ppbv	20	101	70-130
o-Xylene	ppbv	10	102	70-130
Naphthalene	ppbv	10	111	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 compound 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. Compounds in the sample matrix interfered with the quantitation of the analyte.

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.

603213

SAMPLE CHAIN OF CUSTODY

ME 03/11/16

Report To Gabe Cisneros
Company Floyd Snider
Address 601 Union Street
City, State, ZIP Seattle, WA 98101
Phone 206-292-2078 Email gabe.cisneros@floydsnider.com

SAMPLERS (signature)
PROJECT NAME GTH - Calhoun
PO #
REMARKS Low-level
INVOICE TO

Page # _____ of _____

TURNAROUND TIME
☐ Standard
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Archive Samples
☐ Other

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Full Scan	Low-level TO-15 BTEXN	TO-15 cVOCs	ASTM D1946 Helium	Notes
SVP-3-031116	01	20549	FB31	3/11/16	30	0823	5"	0902		X		X	
SVP-3-031116D	02	18576	FB35	3/11/16	30	0823	5"	0900		X		X	
SVP-2-031116	03	18563	FB17	3/11/16	28.5	0925	~~5"~~ 5"	0959		X		X	
SVP-1-031116	04	20543	FB01	3/11/16	29	1022	5"	1057		X		X	

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:	Gabriel Cisneros	Floyd Snider	3/11/16	1205
Received by:	Matt Layton	FBInc	3/11/16	1205
Relinquished by:				
Received by:		Samples received at 19 °C		

Calhoun's Service Station

Cleanup Action Report

Appendix C
Trucking Hauling Receipts

SITE
Roosevelt Landfill-Tacoma (MSW)
500 Roosevelt Grade Road
ROOSEVELT, WA --

CUSTOMER
014755
Clearcreek Contractors Inc.
3919 80th St NE
Marysville, WA 98270
LW-16038

215005

SITE	TICKET #	CELL
TA	269888	

WEIGHMASTER VICKY R.

DATE/TIME IN	DATE/TIME OUT
03-07-2016 9:41 am	03-7-2016 10:03 am

VEHICLE	CONTAINER
5833	TOLU156702

REFERENCE INVOICE

BILL OF LADING BNSF230129

SCALE IN	GROSS WEIGHT	102,600	NET TONS	27.29	
SCALE OUT	TARE WEIGHT	48,020	NET WEIGHT	54,580	INBOUND

QUANTITY	UNIT	DESCRIPTION	RATE		TAX	TOTAL
28.00	YD	TRACKING QTY				
27.29	TN	PCS 34 Tacoma				
1.00		CONTAINER/CHASIS RENTAL				

NET AMOUNT
TENDERED
CHANGE
CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

RS-F042UPR (07/12)

SIGNATURE _____

SITE
Roosevelt Landfill-Tacoma (MSW)
500 Roosevelt Grade Road
ROOSEVELT, WA --

CUSTOMER
014755
Clearcreek Contractors Inc.
3919 88th St NE
Marysville, WA 98270
LW-16038

SITE	TICKET #	CELL
7A	269898	

WEIGHMASTER
VICKY R.

DATE/TIME IN	DATE/TIME OUT
03-07-2016 9:54 am	03-7-2016 10:26 am

VEHICLE	CONTAINER
8648	RBSU200416

REFERENCE INVOICE

BILL OF LADING RMSP230179

SCALE IN	GROSS WEIGHT	97,980	NET TONS	24.20	
SCALE OUT	TARE WEIGHT	49,580	NET WEIGHT	48,400	INBOUND

QTY	UNIT	DESCRIPTION	RATE	EXTENSION	TAX
28.00	YD	TRACKING QTY			
24.20	TN	PCS 34 Tacoma			
1.00		CONTAINER/CHASIS RENTAL			

NET AMOUNT
TENDERED
CHANGE
CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

RS-F042UPR (07/12)

SIGNATURE _____

SITE	
Roosevelt Landfill-Tacoma (XSW) 500 Roosevelt Grade Road ROOSEVELT, WA --	

CUSTOMER
014755 Clearcreek Contractors Inc. 3919 88th St NE Marysville, WA 98270 LW-16038

SITE	TICKET #	CELL
7A	269900	

WEIGHMASTER	
VICKY R.	
DATE/TIME IN	DATE/TIME OUT
03-07-2016 10:01 am	03-7-2016 10:31 am
VEHICLE	CONTAINER
1454	BBOU201181
REFERENCE	INVOICE
BILL OF LADING	
BNSF235129	

SCALE IN	GROSS WEIGHT	109,260	NET TONS	29.95
SCALE OUT	TARE WEIGHT	49,360	NET WEIGHT	59,900

INBOUND

QUANT	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
28.00	YD	TRACKING QTY				
29.95	TN	PCB 34 Tacoma				
1.00		CONTAINER/CPASTS RENTAL				

NET AMOUNT
TENDERED
CHANGE
CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

RS-F042UPR (07/12)

SIGNATURE _____

SITE
Roosevelt Landfill-Tacoma (MSW)
500 Roosevelt Grade Road
ROOSEVELT, WA --

CUSTOMER
014755
Clearcreek Contractors Inc.
3979 88th St NE
Marysville, WA 98270
TW-16038

SITE	TICKET #	CELL
7A	269901	

WEIGHMASTER
VICKY R.

DATE/TIME IN	DATE/TIME OUT
03-07-2016 10:07 am	03-7-2016 10:31 am

VEHICLE	CONTAINER
0331	RRSU280323

REFERENCE INVOICE

BILL OF LADING
BNSF230129

SCALE IN	GROSS WEIGHT	88,980	NET TONS	20.44	
SCALE OUT	TARE WEIGHT	48,100	NET WEIGHT	40,880	INBOUND

QTY			
28.00	YD	TRACKING QTY	
20.44	TN	FCS 34	Tacoma
1.00		CONTAINER/CHASIS RENTAL	

NET AMOUNT

TENDERED

CHANGE

CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

RS-F042UPR (07/12)

SIGNATURE _____

SITE	TICKET #	CELL
Roosevelt Landfill-Tacoma (MSW) 500 Roosevelt Grade Road ROOSEVELT, WA --	WA 269899	

WEIGHMASTER: VICKY R.

CUSTOMER
C14755
Clearcreek Contractors Inc.
3919 88th St NE
Marysville, WA 98270
LW-16038

DATE/TIME IN	DATE/TIME OUT
03-07-2016 10:02 am	03-7-2016 10:29 am

VEHICLE	CONTAINER
0329	BB50200434

REFERENCE: INVOICE

BILL OF LADING: RSF230129

SCALE IN	GROSS WEIGHT	102,700	NET TONS	26.98	
SCALE OUT	TARE WEIGHT	48,740	NET WEIGHT	53,960	INBOUND

QTY.	UNIT	DESCRIPTION	RATE	EXTENSION	TAX	NET
28.00	YD	TRACKING QTY				
26.98	TN	PCS 34 Tacoma				
1.00		CONTAINER/CHASIS RENTAL				

NET AMOUNT

TENDERED

CHANGE

CHECK#

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RS-F042UPR (07/12)

SIGNATURE _____

SITE: Roosevelt Landfill - Tacoma (YSW)
500 Roosevelt Grade Road
ROOSEVELT, WA --

CUSTOMER: C14755
Clearcreek Contractors Inc.
3919 88th St NE
Marysville, WA 98270
TW-16038

SITE	TICKET #	CELL
TA	970040	215005

WEIGHTMASTER: Gail H.

DATE/TIME IN	DATE/TIME OUT
03-17-2016 2:03 pm	03-17-2016 2:40 pm

VEHICLE	CONTAINER
7328	GCEU425021

REFERENCE: INVOICE

BILL OF LADING: 97

SCALE IN	GROSS WEIGHT	113,320	NET TONS	33.32	
SCALE OUT	TARE WEIGHT	46,680	NET WEIGHT	66,640	INBOUND

QTY	UOM	DESCRIPTION	RATE	EXTENSION	TAX	TOTAL
~~20.00~~	~~TN~~	~~TRACKING QTY~~				
33.32	TN	PCS 34 Tacoma				
1.00		CONTAINER/CHASIS RENTAL				

NET AMOUNT

TENDERED

CHANGE

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SIGNATURE _____

RS-F042UPR (07/12)

SITE
Roosevelt Landfill-Tacoma (MSW)
500 Roosevelt Grade Road
ROOSEVELT, WA --

CUSTOMER
014755
Clearcreek Contractors Inc.
3919 88th St NE
Marysville, WA 98270
IW-16036

SITE	TICKET #	CELL
7A	269903	

WEIGHMASTER
VICKY R.

DATE/TIME IN	DATE/TIME OUT
03-07-2016 10:07 am	03-7-2016 10:36 am

VEHICLE	CONTAINER
7331	BBSU200293

REFERENCE INVOICE

BILL OF LADING
BNSF230129

SCALE IN	GROSS WEIGHT	99,720	NET TONS	25.78	
SCALE OUT	TARE WEIGHT	48,160	NET WEIGHT	51,560	INBOUND

QTY.	UNIT		RATE	EXTENSION	TAX	TOTAL
28.00	YD	TRACKING QTY				
25.78	TN	FCS 34 Tacoma				
1.00		CONTAINER/CHASIS RENTAL				

NET AMOUNT
TENDERED
CHANGE
CHECK#

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RS-F042UPR (07/12)

SIGNATURE _____

SITE	
Roosevelt Landfill-Tacoma (MSW) 500 Roosevelt Grade Road ROOSEVELT, WA --	

CUSTOMER
014755 Clearcreek Contractors Inc. 3919 88th St NE Marysville, WA 98270 EW-16038

SITE	TICKET #	CELL
WA	269922	

WEIGHMASTER	
Gail E.	
DATE/TIME IN: 03-08-2016 2:05 pm	DATE/TIME OUT: 03-8-2016 2:26 pm
VEHICLE: 1565	CONTAINER: GCEU430669
REFERENCE:	INVOICE
BILL OF LADING: CLRK27619	

SCALE IN	GROSS WEIGHT	105,100	NET TONS	29.03
SCALE OUT	TARE WEIGHT	47,040	NET WEIGHT	58,060

INBOUND

QTY.	UNIT	DESCRIPTION	RATE	EXTENSION	TOTAL
28.00	YD	TRACKING QTY			
29.03	TN	FCS 34 Tacoma			
1.00		CONTAINER/CHASIS RENTAL			

NET AMOUNT
TENDERED
CHANGE
CHECK#

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RS-F042UPR (07/12)

SIGNATURE _____

SITE	
	Roosevelt Landfill-Tacoma (WSW) 500 Roosevelt Grade Road ROOSEVELT, WA --

CUSTOMER
014755 Clearcreek Contractors Inc. 3919 83rd St NE Marysville, WA 98270 LW-16038

SITE	TICKET #	CELL
7A	269978	

WEIGHMASTER
TN - Gail H. OTT - VICKY B

DATE/TIME IN	DATE/TIME OUT
03-09-2016 3:52 pm	03-9-2016 4:22 pm

VEHICLE	CONTAINER
0329	SCEU426670

REFERENCE	
	INVOICE

BILL OF LADING
BN:1231197

SCALE IN	GROSS WEIGHT	102,060	NET TONS	26.68	
SCALE OUT	TARE WEIGHT	48,700	NET WEIGHT	53,360	INBOUND

QTY.	UNIT	DESCRIPTION	RATE	TAX	TOTAL
28.00	YD	TRACKING QTY			
26.68	TN	PCS 34 Tacoma			
1.00		CONTAINER/CHASIS RENTAL			

NET AMOUNT
TENDERED
CHANGE
CHECK#

The undersigned individual signing this document on behalf of Customer acknowledges that he or she has read and understands the terms and conditions on the reverse side and that he or she has the authority to sign this document on behalf of the customer.

RS-F042UPR (07/12)

SIGNATURE _____

Calhoun's Service Station

Cleanup Action Report

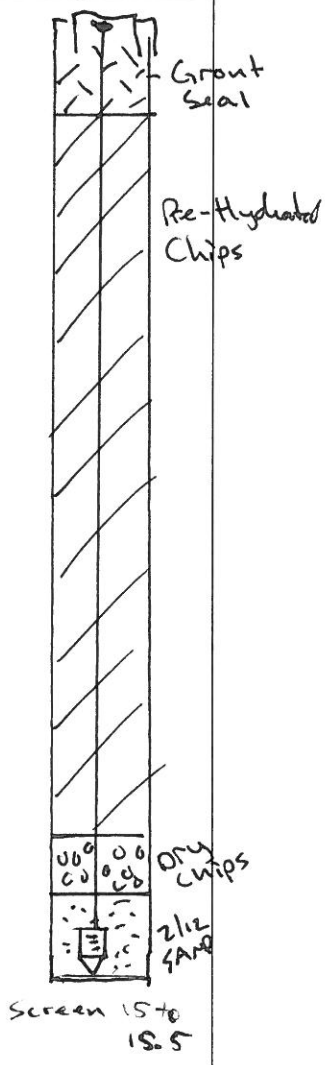
Appendix D
Soil Vapor Probe Boring Logs

Log of Soil Boring and Well Installation X

FLOYD | SNIDER
strategy • science • engineering

Floyd Snider
Boring SVP-1 Date 3/9/16 Sheet 1 of 1
Job GTH-Calhoun Job No.
Logged By G. Cisneros Weather Cloudy
Drilled By Cascade
Drill Type/Method Geoprobe
Sampling Method 5' liners Continuous
Bottom of Boring 15.5 ATD Water Level Depth N/A
Obs. Well Install. ~~Yes~~ No Ground Surface Elevation

PID ~~SAMPLE ID~~	Blow Count	DEPTH From	DEPTH To	SAMPLE RECOVERY (FT)	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
0.0	N/A	0	1		AS	Asphalt w/ 2 inches of Roadbase
553		1	2		ML	Olive, stiff to hard SILT w/ <5% sand and 5% gravel; moderate odor; sheen; moist (moderate to high plasticity)
298		2	3			
269		3	4			
		4	5		OL	Dark brown, organic SILT; moderate odor
37.8		5	6			Olive green, hard, SILT w/ 5%
945		6	7		ML	fine sand; slight odor; no sheen; moist to slightly wet. (moderate to high plasticity)
2,260		7	8			SAA; brown to olive, stiff to hard SILT; slight odor; moist
2130		8	9			
		9	10			
		10	11			SAA; strong odor; moist
1939		11	12		SM	Olive gray, dense, silty, fine SAND w/ moderate odor; slight sheen; moist
2105		12	13			
		13	14			SAA; moderate odor; moist.
		14	15			
		15	16			Ecology Well ID BIX 343
		16	17			
		17	18			
		18	19			
		19	20			



Recovery
Subsample for Analysis
Driven Interval
Groundwater Observed At Time of Drilling
Potentially Contaminated Soil

Log of Soil Boring and Well Installation X

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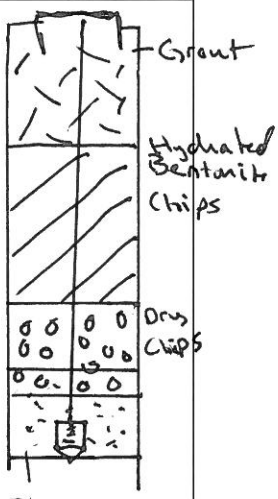
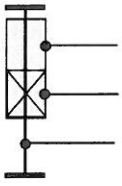
Floyd Snider
Boring SVP-2 Date 3/9/16 Sheet 1 of 1
Job GTH-Calhoun Job No.
Logged By G. Cisneros Weather Cloudy
Drilled By Cascade Drilling (Frank)
Drill Type/Method Geoprobe
Sampling Method Cont. 5' liners
Bottom of Boring 7 ATD Water Level Depth N/A
Obs. Well Install. ~~Yes~~ No Ground Surface Elevation N/A

PID ~~SAMPLE ID~~	Blow Count	DEPTH From	DEPTH To	SAMPLE RECOVERY (FT)		USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
682					0	AS	Asphalt
303					1	ML	Olive green, hard to stiff SILT w/ 5% sand & <5% gravel; slight odor, no sheen; dry (moderate to high plasticity)
2,040					2		SAA, moderate odor, slight sheen moist
1,906					3	OL	Brown, organic SILT; slight odor; no sheen moist to wet
1,803					4	SM	- Olive silty SAND w/ moderate odor, strong sheen; moist to wet
					5	ML	Olive green, hard SILT; slight odor; no sheen; moist (moderate to high plasticity)
					6		
					7		
					8		
					9		
					10		
					11		
					12		
					13		
					14		
					15		
					16		
					17		
					18		
					19		
					20		



Screen 6.5 to 7.0'

Ecology Well ID
BIX342



▽ Groundwater Observed At Time of Drilling

Potentially Contaminated Soil

Log of Soil Boring and Well Installation X

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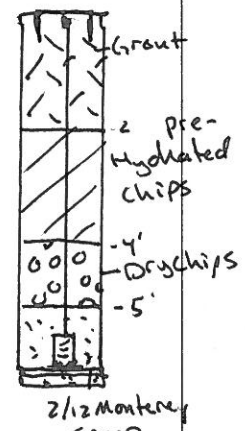
Floyd Snider
Boring SVP-3 Date 3/9/16 Sheet 1 of 1
Job GTH-Calhoun Job No.
Logged By G. Cisneros Weather Cloudy
Drilled By Cascade Drilling (Frank)
Drill Type/Method Geoprobe
Sampling Method Cont. 5' liners
Bottom of Boring ~~5.5~~ 6' ATD Water Level Depth N/A
Ground Surface Elevation

Obs. Well Install. ~~Yes~~ No

PID ~~SAMPLE ID~~	Blow Count	DEPTH From	DEPTH To	SAMPLE RECOVERY (FT)	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
28.3	N/A				AS	Asphalt to 6 inches
120.5						Brown to Olive, stiff to hard SILT with <5% sand & <5% gravel; no odor; no sheen, moist (moderate to high plasticity)
2,511						Olive, stiff to hard SILT; NO sand or gravel; moderate odor; slight sheen; moist (moderate to high plasticity)
1,384					ML	
					OL	Dark brown, stiff organic SILT; moderate odor; slight sheen; moist to wet.



Ecology well ID BIX-344

Recovery
Subsample for Analysis
Driven Interval

Groundwater Observed At Time of Drilling

Potentially Contaminated Soil

Calhoun's Service Station

Cleanup Action Report

Appendix E
Soil Vapor Memorandum

20 YEARS FLOYD | SNIDER
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Two Union Square
601 Union Street, Suite 600
Seattle, WA 98101
tel: 206.292.2078 fax: 206.682.7867

Memorandum

To: Carol Johnston, Washington State Department of Ecology

Copies: Karen Calhoun, Calhoun Estate

From: Gabriel Cisneros

Date: July 15, 2016

Project No: GTH-Calhoun

Re: **Soil Vapor Installation and Sampling Details**

SOIL VAPOR INSTALLATION

Three soil vapor probes were installed on the property on March 9, 2016. The soil borings were advanced using a geoprobe drill rig and completed as soil vapor probes SVP-1, SVP-2, and SVP-3. These three soil vapor probes were located within the vicinity of borings where the greatest petroleum concentrations in soil remain at the site. SVP-1 and SVP-2 are located outside the excavation but within the vicinity of soil boring SB-32. SVP-1 and SVP-2 were installed at depths of approximately 15.5 feet and 7 feet bgs, respectively. SVP-3 is located outside the excavation, within the vicinity of soil boring SB-53, and was installed at a total depth of 5.75 feet bgs. Each vapor point was installed at depths that displayed the greatest hydrocarbon concentrations within 5 and 15 feet bgs in accordance with the Washington State Department of Ecology (Ecology)-reviewed work plan.

Each pair of soil vapor probes were completed with a 6-inch-long by 0.75-inch-diameter stainless steel screen with a pore diameter of 0.0057 inches. The screened section of each vapor sampling probe was capped on one end and fitted with a Swagelok fitting connected on the other end. A length of 0.25-inch outer diameter rigid wall nylon tubing was attached to the probe. The above-grade end of each probe casing was fitted with a Teflon on/off control valve, to prevent short-circuiting of ambient air into the probes.

Each 6-inch-long screen tip was vertically centered within a 1-foot-thick interval of a standard sand pack, resulting in 3 inches of sand above and below the screen. The sand pack was covered with a 1-foot interval of dry granular bentonite, which was then covered with at least 2 feet of hydrated granular bentonite. The dry granular bentonite was emplaced immediately above the sand pack to ensure that hydrated granular bentonite slurry did not flow down to the probe screen and seal it. The remainder of the borehole was filled with hydrated granular bentonite slurry (mixed at the surface and poured in) to approximately 12 inches bgs. The top portion was

completed with a 1-foot-thick cement cap. An 8-inch-long flush-mounted well box was installed to protect the nylon tubing and on/off control valve.

SOIL VAPOR SAMPLE COLLECTION AND ANALYSIS

Vapor sampling activities were conducted on March 11, 2016. Field conditions including temperature, barometric pressure, wind direction and speed, and humidity were recorded in the field notebook. In addition, names of field personnel, dates and times of sampling, purge volumes and purge rate, sampling volume, and leak testing description were included in the field notebook. Sampling sheets are included as Attachment 1.

Weather on the day of the sampling event consisted of no precipitation with temperatures between 35 and 50 degrees Fahrenheit. Barometric pressure trends show atmospheric pressure dropping steadily on the day of the sampling event. Cumulative rain records indicate that there was no heavy precipitation on the day of the sampling event, or within the preceding 24 hours.

Weather data plots generated using the University of Washington website, http://www-k12.atmos.washington.edu/k12/grayskies/nw_weather.html, are included as Attachment 2.

The soil gas sampling equipment was setup at each location and a closed valve test was performed. The sampling train was checked for leaks by capping the ends and closing the control valve at the vapor well, then opening the summa canister for a period of 5 minutes to see if vacuum was maintained. All sampling trains maintained their initial vacuum for at least 5 minutes.

After conducting closed valve tests, three tubing volumes were purged. Purging was completed using a Summa® canister with a flow rate less than 200 milliliters per minute (ml/min). After the sampling train was purged, soil gas samples were collected over a 10-minute period at a flow rate of less than 167 ml/min. Soil vapor samples were collected in 100-percent certified and pre-evacuated 6-liter Summa® canisters supplied by Friedman & Bruya, Inc. laboratory.

Soil vapor samples were collected per the following steps: (1) Open the valve on the top of the Summa® canister and record the time in the log book; (2) Observe the vacuum gauge on the sampling train to ensure that the vacuum in the canister is decreasing over time; and (3) Shut off the valve once the vacuum gage reads between 4.5 and 5.5 inches of mercury (in. Hg).

In addition to soil gas sampling activities, leak testing was performed at all sampling locations using the following soil gas sampling set-up procedures: (1) A large plastic bag was sealed around the Summa® canister, sampling apparatus, and vapor probe; (2) A small hole was cut in the bag to allow tubing to be inserted through it to introduce helium and to subsequently fill the plastic bag; and (3) Helium was maintained at a concentration of 10 percent or greater within the plastic shroud. Detections of helium in the soil gas samples would indicate that the canister, valves, or connection to the sample probe had potentially leaked ambient air into the sample.

Once the sampling period was completed and the final vacuum was recorded, the sampling train was removed from the canister, and a Swagelok® cap was tightly fitted to the inlet port of the canister. A PID was used to record vapor readings from the manifold connection, and the readings were logged in the notebook and soil vapor sampling sheet. The initial canister vacuums, vacuum testing times, purging times, purged volumes, helium readings, sampling starts and times, final vacuum readings, and PID readings were recorded on a soil vapor sampling sheet, which is included in Attachment 1.

Soil gas samples were analyzed for the following:

- BTEX and naphthalenes using USEPA Modified Method TO-15 low level
- Helium using ASTM D 1946

SOIL GAS ANALYTICAL RESULTS

Benzene was detected in SVP-3 at a concentration that exceeds the residential MTCA Method B soil gas screening levels presented in the updated Ecology's vapor intrusion guidance(Ecology 2009 and 2015). Per the Ecology vapor intrusion guidance, if concentrations are greater than the screening levels during the Tier I vapor intrusion assessment, the reviewer will proceed to the Tier II assessment, which includes using the Johnson and Ettinger Model (JEM) to predict indoor air concentrations and risk. Two separate JEMs were used to predict a range of minimum to maximum benzene concentrations in indoor air. Model results were then compared to indoor air cleanup levels, presented in the updated Table B-1 of the Ecology vapor intrusion guidance (Ecology 2009 and 2015). Specific recommendations regarding the use of the JEM in this capacity are presented in Appendix D of the Ecology vapor intrusion guidance, and JEM inputs and modeling results are included as Attachment 3.

The parcel is zoned for commercial use and future site use plans will not change in the foreseeable future; therefore, the JEM uses commercial building properties but with default residential exposure parameters. The one difference between the default residential parameters and commercial building parameters is the indoor air exchange rate, which is 0.25 exchanges per hour (hr^{-1}) for residential and 1.0 hr^{-1} for commercial. The JEM uses 0.5 hr^{-1} for an indoor air exchange rate and the greatest detected benzene concentration to yield conservative results. JEM results indicate that predicted concentrations of benzene into indoor air range from 0.04115 micrograms per cubic meters ($\mu g/m^3$) to 0.2929 $\mu g/m^3$, with a best estimate of 0.1563 $\mu g/m^3$ and a cancer risk of $5.009E^{-7}$. The range of predicted benzene concentrations in indoor air is less than accepted cancer risk of $1.00E^{-6}$ and the MTCA Method B cleanup level presented in the updated Table B-1 of 0.321 $\mu g/m^3$.

As an extra measure, an additional JEM, which is consistent with the USEPA's vapor intrusion technical guidance (USEPA 2015) and exposure levels, was used to predict indoor air concentrations and cancer risk for default commercial exposure scenarios. The USEPA programmed the JEM into Microsoft Excel™ and added a human health risk component that

calculates the risk associated with the inhalation of a specific contaminant at the estimated indoor air concentration. The greatest benzene concentration and default commercial exposure scenarios were used. The Excel™ JEM resulted in a predicted concentration of benzene in indoor air of 0.099 µg/m^3 and a cancer risk of 2.3E^{-7}. The predicted benzene concentration into indoor air is less than the accepted cancer risk of 1.00E^{-6} and the MTCA Method B cleanup level presented in the updated Table B-1 of the Ecology vapor intrusion guidance of 0.321 µg/m^3.

Details of both JEM and the modeling results are included as attachments to this memorandum, and the results and cleanup levels are summarized below.

Hazardous Substance	JEM-Predicted Benzene Concentration to Indoor Air						MTCA Method B Indoor Air Cleanup Levels (µg/m^3)
	Low Prediction (µg/m^3)	Cancer Risk[1]	Best Estimate (µg/m^3)	Cancer Risk[1]	High Prediction (µg/m^3)	Cancer Risk[1]	
Benzene (USEPA Online JEM tool)	0.04115	1.319E^{-7}	0.1563	5.009E^{-7}	0.2929	9.388E^{-7}	0.321
2014 Excel Default Commercial JEM	NA	NA	0.099	2.3E^{-7}	NA	NA	

Note:
1 Target cancer risk is 1.0E^{-6}.

Abbreviation:
NA Not applicable

JEM RESULTS DISCUSSION

A conservative approach was taken, with the online USEPA JEM, by using default residential inputs for slab-on-grade floor thickness, crack width, average vapor flow rate into the building, average time for carcinogens and noncarcinogens, exposure duration, and exposure frequency. The property is zoned for commercial use under Pierce County Assessor's Building and Land Use records, and an indoor air exchange rate of 0.5 hr^{-1} was used to yield a conservative result. The dimensions for the building uses the default residential dimensions of 100 square meters and a height of 2.5 meters.

As indicated, these assumptions yielded conservative results for risk modeling. Additional assumptions, when using USEPA's online JEM, include that the soil is continuously contaminated at the greatest level of contamination detected on-site, across the entire footprint of the building. In actuality, soil gas analytical data indicate that all concentrations were less than their respective screening levels for vapor probes SVP-1 and SVP-2. Benzene in soil is only present around the

vicinity of SVP-3 and SB-53. In addition, the JEM assumes that the soil lithology beneath the hypothetical building is loam; however, boring logs for SVP-1, SVP-2, and SVP-3 indicate that soil consists of stiff to hard silt with moderate to high plasticity (Attachment 4), which has less pore space than a loam lithology and would reduce the upward migration of soil gas into a building.

The default residential average time for carcinogens and noncarcinogens and the exposure frequency were used in the model. In actuality, the property is zoned as commercial and occupants would not spend 70 years working in a future commercial building 350 days a year.

In addition to the conservative assumptions, the Excel™ JEM results for default commercial parameters and exposure rates confirm that benzene concentrations in soil vapor in indoor air is not a risk to any future commercial building at the property, which is more representative of actual and future site conditions. In conjunction with these results, and using Ecology's lateral inclusion zone definition, there is no soil gas vapor risk to the current commercial building nor to adjacent residential dwellings.

REFERENCES

Washington State Department of Ecology (Ecology). 2009. *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action*. Review Draft. Prepared by the Toxics Cleanup Program. Publication No. 09-09-047. October.

_____. 2015. *Vapor Intrusion Table Update.* (Replaces Table B-1 of Ecology's Guidance for Evaluating Soil Vapor Intrusion in Washington State) http://www.ecy.wa.gov/programs/tcp/policies/VaporIntrusion/Vapor%20Intrusion%20Table%20update%20April%206%202015.xlsx. 6 April.

U.S. Environmental Protection Agency (USEPA). 2015. *Technical Guidance for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites*. Prepared by the Office of Underground Storage Tanks. EPA 510-R-15-001. June.

LIST OF ATTACHMENTS

Attachment 1 Field Sampling Forms

Attachment 2 Rain and Pressure Graphs

Attachment 3 JEM Inputs and Results

Attachment 4 Soil Vapor Boring Logs

Attachment 1
Field Sampling Form

Soil Vapor Sampling Sheet

Site Reference: Calhoun
Address: 4540 Pacific Ave Tacoma, WA

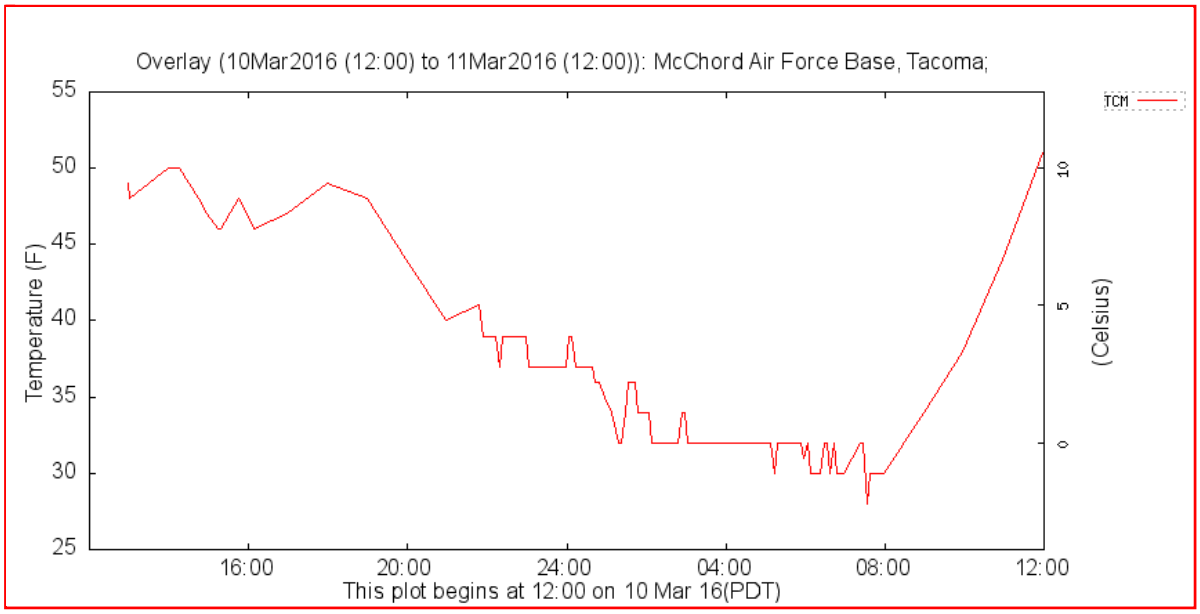
Date: 3/11/16
Personnel: G. GIBNEY

Soil Vapor Sampling Point ID	Vacuum Test		Purging				Helium		Sampling				PID		
	Time Start Vacuum Testing	Time Stop Vacuum Testing	Time Start Purging	Time Stop Purging	Purging Rate (ml/min)	Total Volume Purged (ml)	Time of Helium Reading	Helium Reading (%)	Time Start Sampling	Time Stop Sampling	Canister Vacuum Before Sampling (in Hg)	Canister Vacuum After Sampling (in Hg)	Time of PID Reading	PID Reading	Notes: Canister and Flow Restrictor ID No.
SVP-3-031116	0736	0742	0818	0820	150 ~~167~~	120	0820	11-20	0823	0902	30	5	0915	~~320~~ 560	PN: 29-10622 SN: 20549 FB-31
SVP-3-031116 D	0736	0742	0818	0820	150 ~~167~~	120	0820	11-20	0823	0900	30	5	—	398 ~~520~~	29-10621 18576 FB-35
SVP-2-03116	0911	0916	0917	0920	150	125	0920	11-~~20~~ 14%	0925	0959	28.5	5	1001	41.5	29-10621 18563 FB-17
SUP-1-031116	1008	1013	1014	1017	150	~300	1020	11%	1022	1057	29"	5	1100	10.8	20543 FB 01

Notes: Sunny No downpour in last 24 hours

Attachment 2
Rain and Pressure Graphs

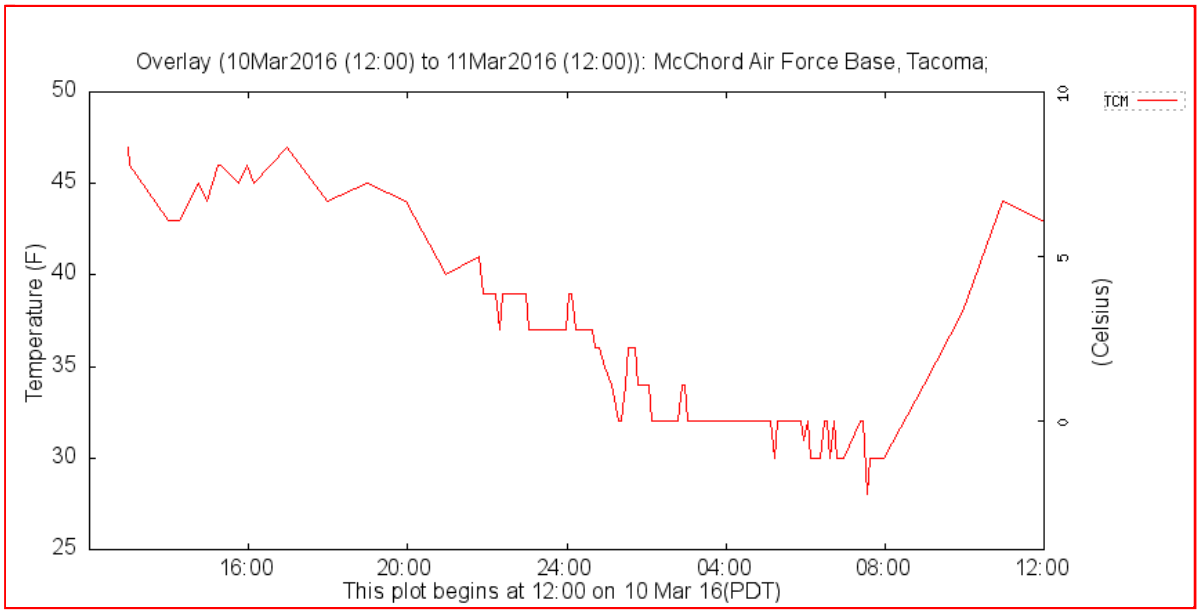
Air Temperature (Fahrenheit)



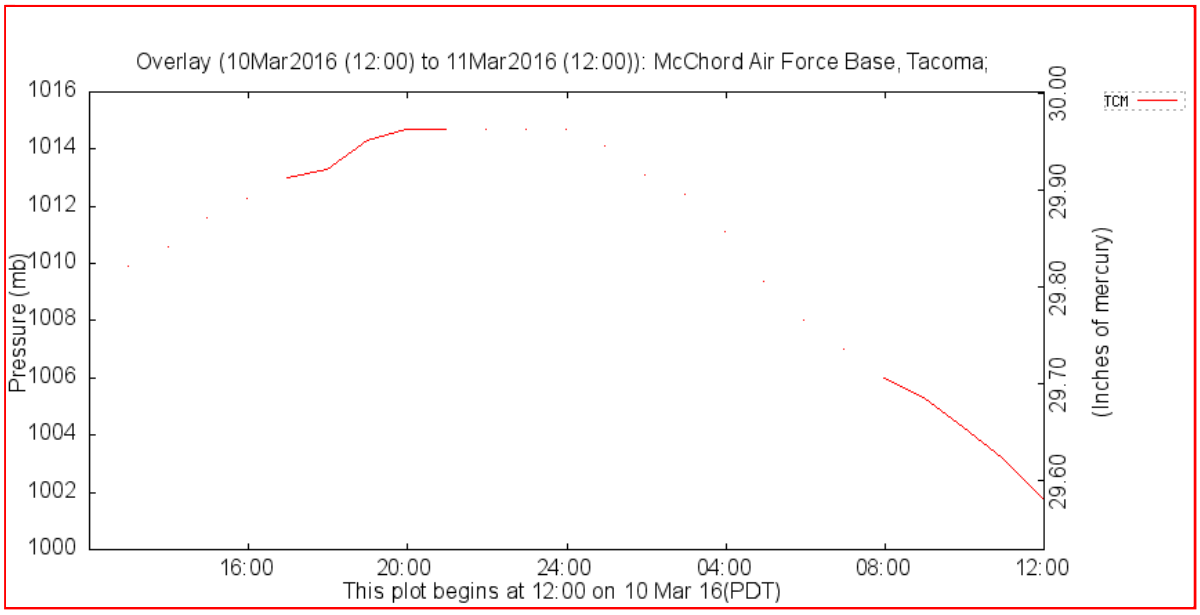
Created by:
Rich Edgerton
Harry Edmon
Neal Johnson
Jim Tillman
David Warren
Fred Weller

University of Washington
Seattle, Washington USA

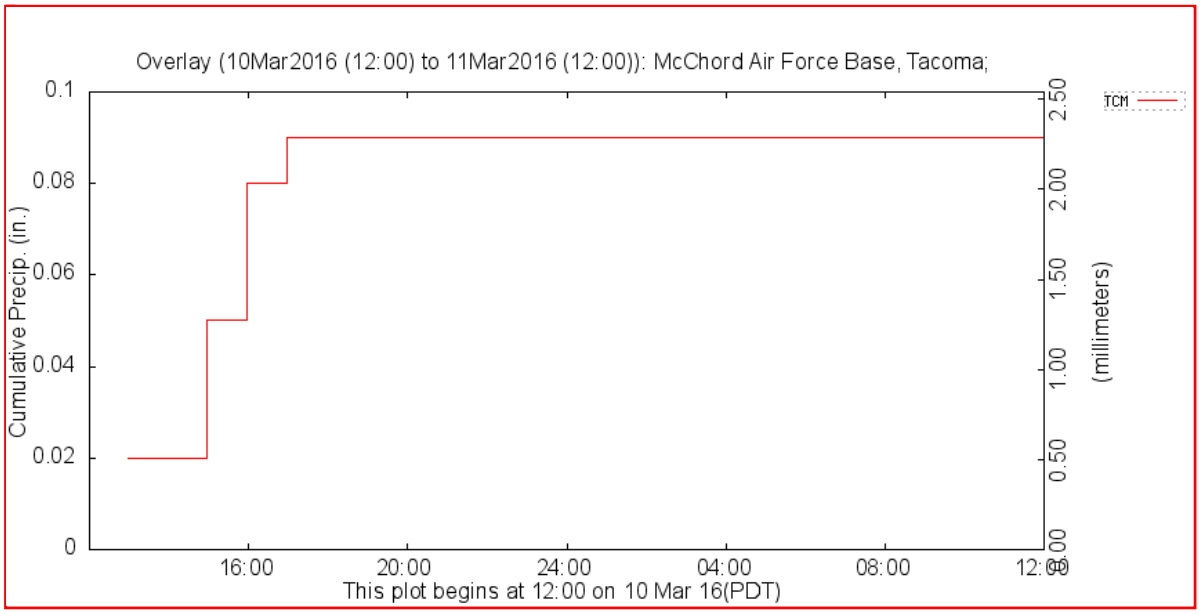
Dewpoint Temperature (Fahrenheit)



Pressure (millibars)



Cumulative Rain



Clicking on a plot brings up the data file that was used to create that plot and available station information.

Current time GMT/UTC Mon Mar 28 22:39:12 2016
Local (Pacific Daylight Time) Mon Mar 28 15:39:12 2016

Attachment 3
JEM Inputs and Results

INDOOR AIR SIMULATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name:
Report Date: Tue Apr 05 2016 14:15:08 GMT-0700 (Pacific Daylight Time)
Report Generated From: https://www3.epa.gov/ceampubl/learn2model/part-two/onsite/JnE_lite_forward.htm
Type of sample: SOIL GAS Concentration = 220[µg/m^3]
Depth of soil gas sample: 5.5ft +/- 0.5ft
Average soil/ground water temperature: 55F

CHEMICAL PROPERTIES
Chemical of Concern: Benzene CAS Number: 71432
Molecular Weight: 78.11 [g/mole] Henrys Constant: 0.1316031 [unitless]
Diffusivity in Air: 8.800e-2 [cm^2/sec] Diffusivity in Water: 9.800e-6 [cm^2/sec]
Unit Risk Factor: 0.0000078 [(µg/m^3)$^{-1}$] Reference Concentration: 0 [mg/m^3]

SOIL PROPERTIES
Soil Type: Loam Total Porosity: 0.399
Unsaturated Zone Moisture Content:
low= 0.061 best estimate= 0.148 high= 0.24
Capillary Zone Moisture Content: 0.332 Height of Capillary Rise: 0.375 [m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 0.5[hr^{-1}]
Building Mixing Height: 2.5[m] Building Footprint Area: 100[m^2]
Subsurface Foundation Area: 106[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 365 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficient (D_{eff}): 0.00554[cm^2/s]
Soil Gas to Indoor Air Attenuation Factor (α_{SG}) = 0.0007103

[1]Low Indoor Air Prediction: 0.04115 [µg/m^3] or 0.01289 [ppbv]
Cancer Risk of this concentration: 1.319e-7 Hazard Risk of this concentration: 0.

Best Estimate Indoor Air Prediction: 0.1563[µg/m^3] or 0.04895 [ppbv]
Cancer Risk of this concentration: 5.009e-7 Hazard Risk of this concentration: 0.

[2]High Indoor Air Prediction: 0.2929[µg/m^3] or 0.09173 [ppbv]
Cancer Risk of this concentration: 9.388e-7 Hazard Risk of this concentration: 0.

Based on parameter analysis: Advection is the dominant mechanism across foundation.

[1]"Low Prediction" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.
[2]"High Prediction" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

USEPA SG-SCREEN
Version 2.0, 04/2003

DTSC Modification
December 2014

Department of Toxic Substances Control
Vapor Intrusion Screening Model - Soil Gas

DATA ENTRY SHEET

Scenario: Commercial
Chemical: Benzene

Results Summary

Soil Gas Conc. ($\mu g/m^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu g/m^3$)	Cancer Risk	Noncancer Hazard
2.20E+02	4.5E-04	9.9E-02	2.3E-07	7.5E-03

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	2.20E+02			Benzene

MESSAGE: See VLOOKUP table comments on chemical properties and/or toxicity criteria for this chemical.

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15.24	168	24	SI		

Depth to bottom of enclosed space floor must be = 15 or 200 cm.

MORE ↓

Lookup Soil Parameters

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, $\rho_b{}^A$ (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, $\theta_w{}^V$ (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SI	1.35	0.489	0.167	5

MORE ↓

Lookup Receptor Parameters

	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Exposure Time ET (hrs/day)	ENTER Air Exchange Rate ACH $(hour)^{-1}$
NEW=> Commercial	70	25	25	250	8 (NEW)	1 (NEW)

END

Attachment 4
Soil Vapor Boring Logs

Log of Soil Boring and Well Installation X

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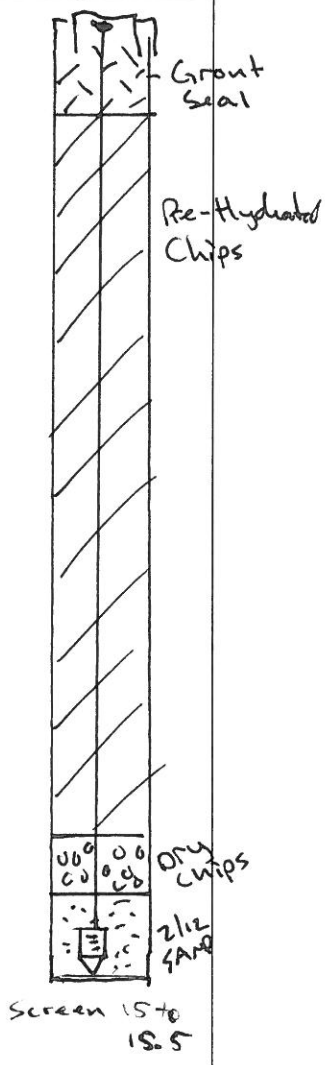
Floyd Snider
Boring SVP-1 Date 3/9/16 Sheet 1 of 1
Job GTH-Calhoun Job No.
Logged By G. Cisneros Weather Cloudy
Drilled By Cascade
Drill Type/Method Geoprobe
Sampling Method 5' liners Continuous
Bottom of Boring 15.5 ATD Water Level Depth N/A
Obs. Well Install. ~~Yes~~ No Ground Surface Elevation

PID ~~SAMPLE ID~~	Blow Count	DEPTH From	DEPTH To	SAMPLE RECOVERY (FT)	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
0.0	N/A	0	1		AS	Asphalt w/ 2 inches of Roadbase
553		1	2		ML	Olive, stiff to hard SILT w/ <5% sand and 5% gravel; moderate odor; sheen; moist (moderate to high plasticity)
298		2	3			
269		3	4			
		4	5		OL	Dark brown, organic SILT; moderate odor
37.8		5	6			Olive green, hard, SILT w/ 5%
945		6	7		ML	fine sand; slight odor; no sheen; moist to slightly wet. (moderate to high plasticity)
2,260		7	8			SAA; brown to olive, stiff to hard SILT; slight odor; moist
2130		8	9			
		9	10			
		10	11			SAA; strong odor; moist
1939		11	12		SM	Olive gray, dense, silty, fine SAND w/ moderate odor; slight sheen; moist
2105		12	13			
		13	14			SAA; moderate odor; moist.
		14	15			
		15	16			Ecology Well ID BIX 343
		16	17			
		17	18			
		18	19			
		19	20			



Recovery
Subsample for Analysis
Driven Interval
Groundwater Observed At Time of Drilling
Potentially Contaminated Soil

Log of Soil Boring and Well Installation X

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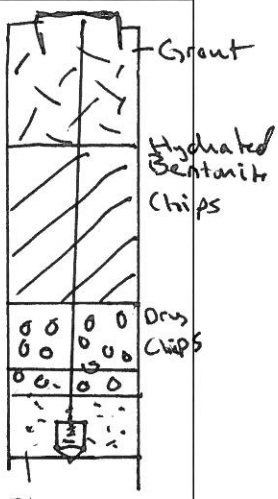
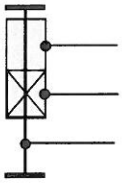
Floyd Snider
Boring SVP-2 Date 3/9/16 Sheet 1 of 1
Job GTH-Calhoun Job No.
Logged By G. Cisneros Weather Cloudy
Drilled By Cascade Drilling (Frank)
Drill Type/Method Geoprobe
Sampling Method Cont. 5' liners
Bottom of Boring 7 ATD Water Level Depth N/A
Obs. Well Install. ~~Yes~~ No Ground Surface Elevation N/A

PID ~~SAMPLE ID~~	Blow Count	DEPTH From	DEPTH To	SAMPLE RECOVERY (FT)		USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
682					0	AS	Asphalt
303					1	ML	Olive green, hard to stiff SILT w/ 5% sand & <5% gravel; slight odor, no sheen; dry (moderate to high plasticity)
2,040					2		SAA, moderate odor, slight sheen moist
1,906					3	OL	Brown, organic SILT; slight odor; no sheen moist to wet
1,803					4	SM	- Olive silty SAND w/ moderate odor, strong sheen; moist to wet
					5	ML	Olive green, hard SILT; slight odor; no sheen; moist (moderate to high plasticity)
					6		
					7		
					8		
					9		
					10		
					11		
					12		
					13		
					14		
					15		
					16		
					17		
					18		
					19		
					20		



Screen 6.5 to 7.0'

Ecology Well ID
BIX342



▽ Groundwater Observed At Time of Drilling

Potentially Contaminated Soil

Log of Soil Boring and Well Installation X

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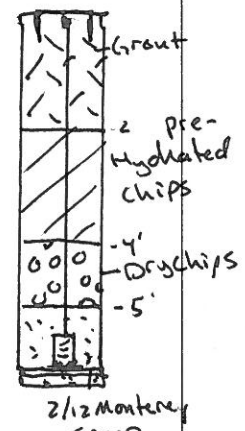
Floyd Snider
Boring SVP-3 Date 3/9/16 Sheet 1 of 1
Job GTH-Calhoun Job No.
Logged By G. Cisneros Weather Cloudy
Drilled By Cascade Drilling (Frank)
Drill Type/Method Geoprobe
Sampling Method Cont. 5' liners
Bottom of Boring ~~5.5~~ 6' ATD Water Level Depth N/A
Ground Surface Elevation

Obs. Well Install. ~~Yes~~ No

PID ~~SAMPLE ID~~	Blow Count	DEPTH From	DEPTH To	SAMPLE RECOVERY (FT)	USCS Symbol	DESCRIPTION: color, texture, moisture MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc.
28.3	N/A				AS	Asphalt to 6 inches
120.5						Brown to Olive, stiff to hard SILT with <5% sand & <5% gravel; no odor; no sheen, moist (moderate to high plasticity)
2,511						Olive, stiff to hard SILT; NO sand or gravel; moderate odor; slight sheen; moist (moderate to high plasticity)
1,384					ML	
					OL	Dark brown, stiff organic SILT; moderate odor; slight sheen; moist to wet.



Ecology well ID BIX-344

Recovery
Subsample for Analysis
Driven Interval

Groundwater Observed At Time of Drilling

Potentially Contaminated Soil