2024 ANNUAL REPORT

Remedy Implementation
Crownhill Elementary School Site

Prepared for: Bremerton School District

Project No. AS100094J-013 • January 28, 2025 FINAL

Aspect
A Geosyntec Company

earth + water

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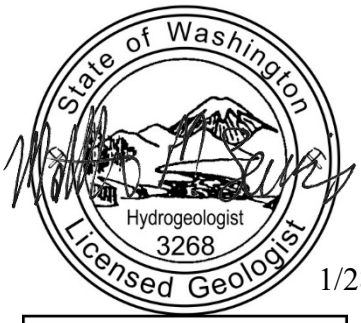

1/28/25

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1 Introduction

Historical landfill activities at the Bremerton School District (BSD) Crownhill Elementary School site (Site) have resulted in soil and groundwater contamination, including the presence of light nonaqueous-phase liquid (LNAPL) floating on the water table. The Washington State Department of Ecology (Ecology) and BSD entered into two Agreed Orders (AOs) to provide for remedial action at the Site. The first AO (No. DE7916) required BSD to conduct a Remedial Investigation (RI) and Feasibility Study (FS) in accordance with the Washington State Model Toxics Control Act (MTCA) Cleanup Regulation (Washington Administrative Code [WAC] 173-340). Upon completion of those activities in 2014, Ecology selected a cleanup remedy and prepared a Cleanup Action Plan (CAP) for the Site (Ecology, 2014). As documented in the CAP, requirements of the selected remedy include the following:

- Periodic monitoring of groundwater quality and LNAPL layer thickness.
- Periodic removal and off-Site recycling/disposal of LNAPL from existing wells.
- Periodic inspection and maintenance of the existing cover system to prevent direct contact exposures to landfilled materials and impacted soils.
- Running the HVAC system in the main school building continuously during the school day (to address the soil vapor intrusion pathway).
- Periodic subslab soil vapor and/or indoor air sampling to reconfirm that vapor intrusion is not a concern[1].
- Defining requirements for performing invasive work in soil[2].

The second AO (No. DE11107) required BSD to develop Site-specific work plans addressing the above requirements, and to implement the cleanup remedy in accordance with those work plans. The following remedy implementation work plans were prepared by BSD and approved by Ecology in 2015:

- "Groundwater/LNAPL Monitoring and Contingency Plan" (Plan; Aspect, 2015a)
- "LNAPL Removal Work Plan" (Aspect, 2015b)
- "Cover System Inspection and Maintenance Plan" (Aspect, 2015c)

[1] Requirements for sampling subslab soil vapor are specified in the Cover System Inspection and Maintenance Plan (Aspect, 2015c). Subslab soil vapor sampling was last conducted in November 2020 and is next required in November 2025. If subslab sampling indicates a potential vapor intrusion concern, then follow-up indoor air sampling may be warranted.

[2] Requirements for performing invasive work in soil are specified in Appendix A of the Cover System Inspection and Maintenance Plan (Aspect, 2015c).

In October 2018, Ecology provided a letter to BSD (Ecology, 2018) stating that,

> *…no further remedial action is necessary to clean up contamination at the Site, other than further operation and maintenance of the final remedy (including removal of LNAPL, continuous operation of the HVAC system during school hours, and institutional controls and monitoring), and periodically reviewing conditions at the Site.*

In September 2024, Ecology provided a letter to BSD (Ecology, 2024) stating that due to trichloroethylene (TCE) concentrations at MW-9 exceeding the Method B groundwater screening level for vapor intrusion,

> *Ecology request that the PLP install additional monitoring wells between MW-9 and the north and east fence lines…* to *…better delineate TCE contamination at the Site and determine whether environmental contamination at the site has resulted in TCE concentrations from vapor intrusion above the short-term indoor air action levels off-Property.*

However, in cooperation with Ecology, Aspect (now Geosyntec) has developed an alternative sampling and analysis plan utilizing shallow soil gas vapor probes. The issue is ongoing as of the writing of this report.

Annual reports documenting remedy implementation activities completed by BSD for the calendar year are submitted to Ecology in January of the following year. Annual reports for 2015 through 2023 (Aspect, 2016 through Aspect, 2022b) are referenced in Section 6 of this report. This report documents activities completed in 2024.

1.1 Project Background

Located in Bremerton, Washington, the Site includes both the Crownhill Elementary School (School) property at 1500 Rocky Point Road and the northern portion of the Bremerton United Methodist Church (BUMC) property at 1150 Marine Drive. A Site Plan is provided as Figure 1. The Site was used for sand and gravel mining up to the 1930s, and the mined area was backfilled with municipal and industrial wastes in the 1930s and 1940s. The original school building was constructed in 1956, and partially burned down in 1993. A series of environmental investigations were conducted during the period between that fire and construction of the current school building, which was completed in 1996. Additional investigations were conducted beginning in 2009, culminating in preparation of the "Remedial Investigation Report" (Aspect, 2014a; herein referred to as the RI report).

The purpose of the RI was to collect data necessary to adequately characterize the nature and extent of Site contamination. Using multiple lines of evidence (e.g., historical photographs, Site assessment activity, construction observations), the RI identified two generalized areas of landfill accumulation, designated the 'north' and 'south' landfill areas. Figure 1 shows the interpreted boundaries of these two areas. Landfilled materials were found at up to 40-foot depth in the north landfill area, and at up to 20-foot depth in the south landfill area. Extensive sampling identified the following constituents of potential concern (COPCs) in Site soils:

- Total petroleum hydrocarbon (TPH) in the diesel and motor-oil ranges

- Trichloroethene (TCE)
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs)
- The metals/metalloids antimony, arsenic, chromium III, copper, lead, and zinc

Three monitoring wells (MW-1 through MW-3) were installed at the Site in December 1994/January 1995, and another 13 wells (MW-4 through MW-16) during the RI (between March 2011 and October 2012; refer to Figure 1 for well locations). This network of 2-inch-diameter wells was used to periodically monitor groundwater, which is encountered beneath the Site at roughly 110-foot depth, for a wide range of contaminants. Monitoring identified TPH in the diesel and motor oil ranges, TCE, arsenic, and lead as COPCs dissolved in groundwater in the northern portion of the Site.

In addition to dissolved contaminants, separate-phase oil was observed floating on the groundwater table (as LNAPL) in well MW-8, which is installed in the north landfill area. The primary reason for installing the last five RI monitoring wells (MW-12 through MW-16) was to investigate the areal extent and thickness of the LNAPL accumulation. LNAPL was observed in three of these wells (MW-13, MW-14, and MW-16), and periodic removal of LNAPL via bailing began in November 2012. At the recommendation of Ecology, a 4-inch-diameter well designed specifically for LNAPL extraction (EW-17) was installed in October 2015.

Site cleanup alternatives were developed and comparatively evaluated with respect to MTCA-specified criteria in the "Feasibility Study" report (FS; Aspect, 2014b). Based on the information provided in the RI report and on the FS evaluation, the CAP (Ecology, 2014) then established Site-specific cleanup levels (CULs) for constituents of concern (COCs) in Site soil, groundwater, and air, and selected a cleanup remedy for implementation. Figure 1 shows the estimated TPH, TCE, and arsenic plumes[3] (i.e., areas where concentrations in groundwater exceed the respective groundwater CULs) as depicted in the CAP. Refer to the CAP for a full description of the selected cleanup remedy for the Site.

In April 2022, the total arsenic threshold of 40 micrograms per liter (µg/L) was exceeded at MW-6, triggering a response memo (Aspect, 2022c) detailing how BSD would address the arsenic exceedance. As a result of this response, Aspect submitted an addendum to the Groundwater/LNAPL Monitoring and Contingency Plan (Addendum; Aspect, 2022d) adding turbidity to the list of required field parameters to be collected during sampling procedures, additional analytes to the project list of COCs (Table 1), and procedures for conducting a soil-gas survey, if warranted. These additional measures will better support potential arsenic cleanup activities in the future. Although total arsenic concentrations in groundwater have not exceeded the threshold since April 2022, the observed groundwater chemistry and trends in total arsenic concentrations at MW-6 support completing the investigation as described.

[3] Lead is also a COC in groundwater. However, as discussed in the "Groundwater/LNAPL Monitoring and Contingency Plan" (Aspect, 2015a), compliance with the groundwater cleanup level for lead has been demonstrated. Therefore, lead is not included in the groundwater monitoring program.

2 Routine Activities Completed in 2024

This section documents routine cleanup-related activities completed by BSD during the 2024 calendar year. Periodic monitoring of groundwater and LNAPL thickness is documented in Section 2.1, LNAPL removal in Section 2.2, and Site inspections in Section 2.3.

2.1 Periodic Monitoring Activities

The Plan (Aspect, 2015b) requires periodic monitoring activities during the second and fourth quarters of the year and specifies contingency actions that will be taken if total arsenic is detected above 40 µg/L at MW-6 or above 4.5 µg/L at MW-10. Following exceedance of the threshold at MW-6 in 2021, the Addendum (Aspect, 2022d) was prepared that requires additional groundwater monitoring during the first and third quarters of the year, and sample collection to support a better understanding of groundwater conditions leading to arsenic mobilization.

Locations of groundwater monitoring wells and LNAPL monitoring/recovery wells are shown on Figure 1. Table 1 lists which Site wells are included in the monitoring program, which of those wells contain LNAPL, and the updated COCs analyzed in groundwater samples collected from the wells that do not contain LNAPL.

2.1.1 Groundwater Sampling Results and Interpretation

Semiannual groundwater monitoring was conducted by Aspect on April 4, 2024, and October 14, 2024, in accordance with the Plan and Addendum. Additional groundwater monitoring was conducted at MW-6 and MW-10 on January 15, 2024, and July 2, 2024, in accordance with the Addendum. MW-15 could not be sampled during the October round due to low water levels, despite attempting to collect a sample using both the dedicated pump and an Aspect-owned pump. This happens occasionally at MW-15, and we expect groundwater levels to rise enough to collect a sample during the April 2025 sampling event.

Samples were collected in laboratory-supplied containers and submitted for analysis to analytical laboratory Friedman and Bruya, Inc under chain-of-custody procedures. Results for the 2024 groundwater monitoring are discussed below and historical groundwater sampling results since 2013 are summarized in Table 2. Refer to the RI report for results prior to December 2013 and for information on Site wells not included in the monitoring program. Laboratory reports for groundwater samples submitted for analysis are provided in Appendix C.

Diesel-range TPHs were detected in groundwater at concentrations above the Site CUL of 500 µg/L at monitoring wells MW-5 (1,900 µg/L) and MW-12 (1,800 µg/L). Diesel-range TPHs were detected at concentrations below the Site CUL at MW-10 (73 µg/L in October). The laboratory qualified all diesel-range TPH detections with "sample chromatographic pattern does not resemble the fuel standard used for quantitation."

MW-15, located immediately downgradient of the LNAPL area, is the conditional point of compliance for LNAPL migration and serves as a sentinel well for TPH plume

migration[4]. Although, a sample could not be collected from MW-15 due to seasonally low water levels, no indication of LNAPL was observed on the electric water tape, indicating that the LNAPL plume has not migrated into the well. See Table 2 for a summary of historical detections.

Motor Oil-range TPHs were detected in groundwater at concentrations above the Site CUL of 500 µg/L at monitoring wells MW-5 (950 µg/L) and MW-12 (690 µg/L). The laboratory qualified all diesel-range TPH detections with "sample chromatographic pattern does not resemble the fuel standard used for quantitation." Consistent with previous years, motor oil-range TPHs were not detected at above the reporting limit (250 µg/L) at MW-10. MW-15 could not be sampled as noted above.

TCE was detected in groundwater at a concentration above the Site CUL of 5 µg/L at monitoring well MW-9 (8.8 µg/L in April and 9.7 µg/L in October). TCE was not detected at the reporting limit (0.5 µg/L) at MW-10 or the McKinney domestic well.

MW-9 is the only well with TCE CUL exceedances. TCE concentrations measured at this well remained consistent from 2023 to 2024 and remained within the range of previous measurements.

Water samples collected from the McKinney domestic well (sampled twice in 2024) are analyzed for TCE only. As shown in Table 2, TCE has never been detected in any of the water samples collected from the McKinney well.

Total Arsenic was detected in groundwater at a concentration above the Site cleanup level of 5 µg/L at monitoring well MW-6 (31.8 µg/L in January, 31.0 µg/L in April, 24.0 µg/L in July, and 22.0 µg/L in October), but did not exceed the 40 µg/L threshold in 2024. Total arsenic was detected in groundwater below the Site CUL at MW-10 (1.7 µg/L in January, 1.9 µg/L in April, 1.6 µg/L in July, and 1.7 in October), and MW-12 (1.6 µg/L in October). MW-15 could not be sampled (discussed above). Total arsenic was not detected at the reporting limit (1.0 µg/L) at MW-5 and MW-9 in 2024.

Figure 2 shows arsenic concentrations measured at MW-6 and MW-10 since those wells were installed. Well MW-6 is located approximately 130 feet upgradient of MW-10 and serves as a sentinel well for dissolved contaminant plume migration. Through 2021, concentrations at MW-6 exhibited a fluctuating and generally increasing trend, thought to be caused by local, complex geochemical mechanisms mobilizing naturally occurring arsenic in aquifer materials. Since 2021, total arsenic concentrations at MW-6 have continued to fluctuate, however the overall trend seems to be leveling off.

The total arsenic concentrations at MW-10 have been below the contingency action level of 4.5 µg/L since 2012 and appear to have stabilized around 2 µg/L. Therefore, total arsenic concentrations have met the cleanup level within the Site.

Dissolved Arsenic was detected above CULs in MW-6 (between 22.0 and 32.3 µg/L), below CULs in MW-10 (between 1.6 and 1.9 µg/L), and slightly above the reporting limit in MW-12 (1.6 µg/L). Dissolved arsenic concentrations are similar to or below the

[4] Well MW-15 is also the conditional point of compliance for LNAPL migration.

total arsenic concentrations at each respective well. This indicates that using low-flow sampling protocols has minimized sample turbidity, thereby providing reliable total arsenic results.

Dissolved Iron was detected across a range of concentrations, supporting the conceptual model of local, complex geochemical mechanisms mobilizing metals that occur naturally in the aquifer. Dissolved iron is listed as a secondary contaminant (WAC 173-200), and concentrations were observed above the groundwater standards[5] of 0.30 milligrams per liter (mg/L) (300 µg/L) in both semi-annual sampling events at MW-5, MW-6, MW-10, and MW-12, as indicated by results in Table 2 with bold format. Dissolved iron was detected below secondary groundwater standards in April and October at MW-9.

Dissolved Manganese was also detected across a range of concentrations, again supporting the conceptual model of local, complex geochemical mechanisms mobilizing metals that occur naturally in the aquifer. Dissolved manganese is listed as a secondary contaminant (WAC 173-200), and concentrations were observed above the groundwater standard of 0.05 mg/L (50 µg/L) in MW-5 (April), MW-6 (January, April, July, and October), MW-10 (January, April, July, and October), and MW-12 (October). Dissolved manganese was not detected above reporting limits (2 µg/L) at MW-9 in 2024. See Table 2 for specific concentration values.

Total Alkalinity is a measure of groundwater buffering changes in acidity, one of the geochemical mechanisms. At this Site, groundwater acidity is affected by dissolved carbon dioxide which is generated by waste decomposition. The lowest concentrations of total alkalinity were detected in MW-9 (220 to 285 mg/L as CaCO3 [calcium carbonate]), upgradient of the LNAPL plume and the wells showing exceedances of dissolved metals. Total alkalinity in downgradient wells was detected at higher concentrations in wells within and downgradient of the LNAPL plume, as shown in Table 2.

In the event that additional contingency actions are triggered, these total alkalinity data may be used in conjunction with other groundwater and soil gas monitoring data to design an appropriate remedial response. Aspect recommends continuing to monitor groundwater in accordance with the Plan and Addendum (see Table 1).

2.1.2 NAPL Thickness Monitoring

LNAPL thickness monitoring was conducted on April 4, 2024, and October 14, 2024. Consistent with previous monitoring rounds, LNAPL was detected in five wells (MW-8, MW-13, MW-14, MW-16, and EW-17). Table 3 summarizes LNAPL thicknesses measured in these wells since they were installed. Thicknesses measured in 2024 ranged from 0.1 feet in MW-14 to 3.12 feet in EW-17.

2.2 LNAPL Removal

Bottom-filling bailers are used to periodically remove LNAPL from Site wells. LNAPL removal is attempted whenever an LNAPL layer thickness of at least 0.3 foot is measured

[5] The criteria for metals as primary and secondary contaminants are defined according in WAC 173-200-040 and are applicable to total metals concentrations only. Based on the use of low-flow sampling protocols at this Site, dissolved metals concentrations are considered approximate proxies for the total metals concentrations.

in a well (prior to bailing). In 2024, LNAPL removal was conducted concurrent with the two LNAPL thickness/groundwater monitoring rounds discussed above, in general accordance with the requirements of the LNAPL Removal Work Plan (Aspect, 2015b). Bailing was attempted from all five LNAPL-containing wells (MW-8, MW-13, MW-14, MW-16, and EW-17) in both the April and October rounds. Table 3 shows estimated LNAPL volumes bailed from each well during each removal event, and Figure 3 plots cumulative LNAPL removal on an annual basis. An estimated total of 2.9 liters of LNAPL was bailed in 2024. Since bailing began in 2012, an estimated total of about 43 liters of LNAPL have been removed.

2.3 Site Inspections

Semiannual Site inspections were conducted on June 20 and December 23, 2024, in accordance with the requirements of the Cover System Inspection and Maintenance Plan (Aspect, 2015c). The completed inspection records are provided in Appendices A and B, along with photos taken during the inspections. The photos were taken from four specific vantage points, identified on Figure 1, to provide photo-documentation of the following cover features:

- **Photo Location 1 –** Pavement in the parking area along Bertha Avenue NW, where an RI soil sample collected from beneath the pavement (composite sample to 3-foot depth) contained lead at a concentration exceeding the cleanup level.
- **Photo Locations 2 and 4 –** Soil/sod covers next to the portable classroom building and in the southeast corner of the School property, where lead cleanup level exceedances were identified in soil samples collected from the 1- to 3-foot depth range. In summer 2013, these two areas were covered with a geotextile fabric (placed directly on the undisturbed ground surface) and an additional 1-foot thickness of fill soil was imported and hydroseeded to supplement the pre-existing clean soil cover layer.
- **Photo Location 3 –** A soil/sod cover in the northwest corner of the BUMC property (and extending approximately 10 feet onto the School property), where an interim action was completed in spring 2012 in which contaminated surface soils were removed to a 1-foot depth, a geotextile fabric was placed on remaining contaminated soils, and a 1-foot thickness of fill soil was imported and hydroseeded.

In July 2018, asphalt repairs were completed at three locations in the Bertha Avenue NW parking area (Photo Location 1) after potholes were observed (documented in Aspect, 2019). The parking area appeared to be in good condition, except for the pothole observed in December 2024 has not been repaired. The soil/sod cover (Photo Locations 2 through 4) appeared to be in excellent condition during both 2024 inspection events. The 2024 inspections did not identify any cover system deficiencies in other areas of the Site or other action items.

3 Nonroutine Activities Completed in 2024

3.1 Vapor Intrusion Assessment Sampling and Analysis Plan

In September 2024, Ecology provided a letter to BSD (Ecology, 2024) requesting that BSD perform a vapor intrusion evaluation at the northeast property boundary. The request was triggered by TCE concentrations at upgradient monitoring well MW-9 exceeding the MTCA Method B groundwater screening level for vapor intrusion (1.4 µg/L) and the short-term screening level for residential receptors (8 µg/L). The request included developing a sampling and analysis plan detailing the installation of two groundwater monitoring wells at the property boundary and a groundwater sampling event to assess the risk of TCE vapor intrusion at residences within 100 lateral feet of the impacted groundwater. However, during discussion with Ecology, Aspect, suggested an alternative approach of installing and sampling shallow soil gas vapor probes for TCE in soil vapor to more directly address the risk assessment. As of the writing of this report, Aspect has prepared a draft work plan describing the soil vapor assessment that is being reviewed by clients before being submitted to Ecology.

4 Statement of Compliance

On behalf of BSD, Aspect certifies that the remedy implementation activities completed at the Site in 2024 complied with the requirements of the CAP, Agreed Order No. DE11107, and the remedy implementation work plans approved by Ecology.

5 Plans for 2025

The following remedy implementation activities are planned for 2025:

- Conduct semiannual rounds of groundwater/LNAPL monitoring and LNAPL removal (scheduled for April and October 2024)[6]
- Continue sampling MW-6 and MW-10 on a quarterly basis (January and July 2025)
- Conduct semiannual Site inspections (scheduled for June and December 2025)
- Continue to remove the well caps on select project wells during the dry season and retain for replacement in October

[6] If an LNAPL thickness greater than 4 feet is measured in the April monitoring round, an LNAPL removal round will also be required in July 2025.

- Support Ecology as needed with the 5-year review report
- Conduct the TCE vapor intrusion assessment (details still in development) as requested by Ecology

In addition to the above activities, Aspect recommends:

- The pothole in the parking area along Bertha Avenue NW (and any that occur after this writing) be patched up by BSD as soon as practical.

Other activities, as specified in the remedy implementation work plans, may also be required based on monitoring and/or inspection results.

6 References

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Aspect Consulting, LLC (Aspect), 2024, 2023 Annual Report, Remedy Implementation, Crownhill Elementary School Site, prepared for Bremerton School District, March 21, 2024.

Washington State Department of Ecology (Ecology), 2014, Cleanup Action Plan, Bremerton School District, Crownhill Elementary School Site, December 10, 2014.

Washington State Department of Ecology (Ecology), 2018, Letter to D. Herrington, Bremerton School District, regarding Status of Agreed Order No. DE11107 and No Further Action to complete Cleanup of the Crownhill Elementary School Site, October 15, 2018.

Washington State Department of Ecology (Ecology), 2024, Letter to John Fisher, Bremerton School District, regarding Request for Evaluation of Trichloroethylene Risks at Crownhill Elementary, September 30, 2024.

7 Limitations

Work for this project was performed for the Bremerton School District (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

Please refer to Appendix E titled "Report Limitations and Guidelines for Use" for additional information governing the use of this report.

TABLES

Table 1. 2024 Well Monitoring Program Summary

Project No. AS100094J, Crownhill Elementary, Bremerton, Washington

Well Included in Monitoring Program[1]	LNAPL Present in Well[3]	Groundwater Samples Collected for Analysis of COCs[1]			Additional Diagnostic Analytes[2]		Additional Notes
		TPH[4]	Total Arsenic[5]	TCE[6]	Dissolved As, Fe, Mn	Alkalinity	
MW-5		spring	spring		spring	spring	
MW-6			quarterly		quarterly	quarterly	7
MW-8	X						
MW-9			spring/fall	spring/fall	spring/fall	spring/fall	
MW-10		quarterly	quarterly	quarterly	quarterly	quarterly	8
MW-12		fall	fall		fall	fall	
MW-13	X						
MW-14	X						
MW-15		spring/fall	spring/fall		spring/fall	spring/fall	9
MW-16	X						
EW-17	X						
McKinney				spring/fall			10

COC	constituent of concern
LNAPL	light non-aqueous-phase liquid
TCE	trichloroethene
TPH	total petroleum hydrocarbon

Notes:

1) The *Groundwater/LNAPL Monitoring and Contingency Plan* (Aspect, 2015a) provides the rationale for including a well in the monitoring program, and for selecting well-specific COC analytes. Refer to Table 2 for groundwater monitoring results.

2) The *Addendum to the Groundwater/LNAPL Monitoring and Contingency Plan* (Aspect, 2022c) provides the rationale for adding these analytes to the list of project COCs.

3) All wells except McKinney are monitored for LNAPL. If LNAPL is detected, its thickness is measured (refer to Table 3) and groundwater samples are not collected for analysis.

4) TPH is analyzed for using Method NWTPH-Dx. Both diesel-range TPH and motor-oil-range TPH are COCs.

5) Analyzed for using EPA Method 6010.

6) TCE is analyzed for using EPA Method 8260.

7) Well MW-6 provides early warning of potential arsenic migration.

8) Well MW-10 is the conditional point of compliance for achieving groundwater cleanup levels.

9) Well MW-15 is the conditional point of compliance for LNAPL migration.

10) The McKinney domestic well water sample is collected from the outdoor faucet on the north side of the residence at 1724 Dora Ave NW.

Table 2. Groundwater Monitoring Data Summary

Project No. AS100094J, Crownhill Elementary, Bremerton, Washington

Well ID and Top-of-Casing Elevation[1,2]	Top-of-Casing Elevation (feet)	Date	Depth to Water (feet below top-of-casing)	Groundwater Elevation (feet)[2]	Constituent of Concern/Concentration[3]				Additional Diagnostic Analytes			
					Diesel-Range TPH	Motor-Oil-Range TPH	TCE	Total Arsenic	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Total Alkalinity (as CaCO3) in mg/L
MW-5 136.95 ft	136.95	12/18/13	117.36	19.59	**2,100 x**	**750 x**	1.8	1.0	na	na	na	na
		04/03/14	117.17	19.78	**2,400 x**	**770 x**	na	1.2	na	na	na	na
		07/01/14	116.23	20.72	**2,000 x**	490 x	na	1.0	na	na	na	na
		10/13/14	117.56	19.39	**1,300**	260 x	na	1.0	na	na	na	na
		04/07/15	116.49	20.46	**2,000**	430 x	na	na	na	na	na	na
		04/05/16	113.41	23.54	**1,800**	**600 x**	na	na	na	na	na	na
		04/04/17	112.13	24.82	**2,200 x**	**750 x**	na	na	na	na	na	na
		04/05/18	113.16	23.79	**2,600 x**	**1,100 x**	na	na	na	na	na	na
		04/04/19	116.24	20.71	**1,600 x**	**520 x**	na	na	na	na	na	na
		04/10/20	117.97	18.98	**2,400 x**	**660 x**	na	na	na	na	na	na
		04/14/21	116.92	20.03	**1,300 x**	490 x	na	na	na	na	na	na
		04/27/22	115.35	21.60	**1,000 x**	310 x	na	na	1 U	**487**	**4,090**	794
		04/04/23	116.39	20.56	**3,000 x**	**2,100** x	na	1 U	1 U	**384**	**4,860**	802
		04/04/24	115.47	21.48	**1,900 x**	**950** x	na	1 U	1 U	**420**	**4,300**	732
MW-6 133.87 ft	133.87	12/18/13	124.36	9.51	50 U	250 U	1 U	**16.6**	na	na	na	na
		04/03/14	124.70	9.17	50 U	250 U	na	**20.5**	na	na	na	na
		07/01/14	124.40	9.47	50 U	250 U	na	**19.9**	na	na	na	na
		10/13/14	124.54	9.33	50 U	250 U	na	**20.4**	na	na	na	na
		04/07/15	124.61	9.26	na	na	na	**26.7**	na	na	na	na
		10/28/15	124.84	9.03	na	na	na	**22.8**	na	na	na	na
		04/05/16	124.54	9.33	na	na	na	**29.1**	na	na	na	na
		10/28/16	123.70	10.17	na	na	na	**23.3**	na	na	na	na
		04/04/17	123.21	10.66	na	na	na	**12.5**	na	na	na	na
		10/27/17	122.79	11.08	na	na	na	**29.3**	na	na	na	na
		04/05/18	123.31	10.56	na	na	na	**29.7**	na	na	na	na
		10/26/18	123.71	10.16	na	na	na	**23.0**	na	na	na	na
		04/04/19	124.14	9.73	na	na	na	**19.4**	na	na	na	na
		10/14/19	124.77	9.10	na	na	na	**21.9**	na	na	na	na
		04/10/20	125.10	8.77	na	na	na	**28.5**	na	na	na	na
		10/15/20	125.45	8.42	na	na	na	**35.3**	na	na	na	na
		04/14/21	125.13	8.74	na	na	na	**28.6**	na	na	na	na
		11/22/21	125.15	8.72	na	na	na	**37.1**	na	na	na	na
		04/27/22	124.70	9.17	na	na	na	**40.6**	**28.0**	**10,400**	**1,760**	342
		07/25/22	124.22	9.65	na	na	na	**24.2**	**23.5**	**9,800**	**1,700**	322
		10/11/22	124.47	9.40	na	na	na	**23.6**	**10.0**	**2,730**	**459**	315
		01/30/23	124.74	9.13	na	na	na	**20.0**	**19.4**	**7,580**	**2,030**	350
		04/04/23	124.67	9.20	na	na	na	**22.5**	**23.5**	**7,440**	**1,980**	357
		07/11/23	124.53	9.34	na	na	na	**20.3**	**21.2**	**6,030**	**1,820**	334
		10/26/23	124.93	8.94	na	na	na	**25.7**	**23.9**	**8,770**	**1,940**	327
		01/15/24	125.09	8.78	na	na	na	**31.8**	**32.3**	**9,490**	**1,880**	309
		04/04/24	124.55	9.32	na	na	na	**31.0**	**28.0**	**9,100**	**2,000**	298
		07/02/24	124.52	9.35	na	na	na	**24.0**	**23.0**	**6,400**	**2,000**	304
		10/14/24	124.53	9.34	na	na	na	**22.0**	**22.0**	**7,700**	**1,900**	356
MW-9 134.39 ft	134.39	12/17/13	114.49	19.90	110 x	250 U	**11**	1 U	na	na	na	na
		04/03/14	114.35	20.04	210 x	280 x	**11**	1 U	na	na	na	na
		07/01/14	113.44	20.95	180 x	250 U	**12**	1 U	na	na	na	na
		10/13/14	114.71	19.68	180 x	250 U	**10**	1 U	na	na	na	na
		04/07/15	114.50	19.89	na	na	**11**	na	na	na	na	na
		10/28/15	115.30	19.09	na	na	**10**	na	na	na	na	na
		04/05/16	110.60	23.79	na	na	**11**	na	na	na	na	na
		10/28/16	112.35	22.04	na	na	**8.6**	na	na	na	na	na
		04/04/17	109.23	25.16	na	na	**9.5**	na	na	na	na	na
		10/27/17	110.58	23.81	na	na	**6.8**	na	na	na	na	na
		05/02/18	110.35	24.04	na	na	**7.1**	na	na	na	na	na
		10/26/18	112.98	21.41	na	na	**7.9**	na	na	na	na	na
		04/04/19	113.39	21.00	na	na	**9.7**	na	na	na	na	na
		10/14/19	nm[4]	--	na	na	**8.0**	na	na	na	na	na
		04/10/20	nm[4]	--	na	na	**7.1**	na	na	na	na	na
		10/15/20	nm[4]	--	na	na	**5.0**	na	na	na	na	na
		04/21/21	114.00	20.39	na	na	**7.2**	na	na	na	na	na
		11/11/21	nm[4]	--	na	na	**5.4**	na	na	na	na	na
		04/27/22	112.50	21.89	na	na	**11.0**	na	1 U	95	3.1	113
		10/11/22	113.55	20.84	na	na	**8.2**	1 U	1 U	100 U	1.8 U	137
		04/04/23	113.54	20.85	na	na	**8.8**	1 U	1 U	179	1 U	273
		10/26/23	113.54	20.85	na	na	**9.5**	1 U	1 U	177	2.0	257
		04/04/24	113.11	21.28	na	na	**8.8**	1 U	1 U	290	2 U	285
		10/14/24	nm[4]	--	na	na	**9.7**	1 U	1 U	210	2 U	250
MW-10 132.33 ft	132.33	12/18/13	120.87	11.46	50 U	250 U	1 U	3.3	na	na	na	na
		04/03/14	121.21	11.12	50 U	250 U	1 U	3.9	na	na	na	na
		07/01/14	120.55	11.78	50 U	250 U	1 U	3.0	na	na	na	na
		10/13/14	121.48	10.85	50 U	250 U	1 U	3.0	na	na	na	na
		04/07/15	120.60	11.73	50 U	250 U	1 U	2.8	na	na	na	na
		10/28/15	121.30	11.03	80 U	400 U	1 U	2.7	na	na	na	na
		04/05/16	119.33	13.00	50 U	250 U	1 U	2.6	na	na	na	na
		10/28/16	120.35	11.98	50 U	250 U	1 U	2.6	na	na	na	na
		04/04/17	118.58	13.75	50 U	250 U	1 U	2.2	na	na	na	na
		10/27/17	119.30	13.03	50 U	250 U	1 U	2.1	na	na	na	na
		04/05/18	122.04	10.29	50 U	250 U	1 U	1.9	na	na	na	na
		10/26/18	120.62	11.71	50 U	250 U	1 U	1.8	na	na	na	na
		04/04/19	120.85	11.48	50 U	250 U	1 U	2.0	na	na	na	na
		10/14/19	121.79	10.54	50 U	250 U	1 U	2.1	na	na	na	na
		04/10/20	121.68	10.65	50 U	250 U	1 U	2.0	na	na	na	na
		10/15/20	121.66	10.67	50 U	250 U	1 U	2.4	na	na	na	na
		04/14/21	120.80	11.53	50 U	250 U	1 U	2.0	na	na	na	na
		11/11/21	121.20	11.13	55 x	250 U	0.5 U	1.9	na	na	na	na
		04/27/22	120.07	12.26	50 U	250 U	0.5 U	1.3	1.7	**1,850**	**1,080**	196
		07/25/22	120.15	12.18	50 U	250 U	0.5 U	1.5	1.4	**2,280**	**1,230**	241
		10/11/22	120.71	11.62	50 U	250 U	0.5 U	2.0	1.7	**1,990**	**1,280**	218
		01/30/23	120.74	11.59	50 U	250 U	0.5 U	1.8	1.7	**2,420**	**1,430**	253
		04/04/23	120.96	11.37	50 U	250 U	0.5 U	1.6	1.6	**2,520**	**1,360**	261
		07/11/23	120.81	11.52	50 U	250 U	0.5 U	1.6	1.6	**2,240**	**1,440**	249
		10/26/23	121.46	10.87	58 x	250 U	0.5 U	1.6	1.5	**2,530**	**1,410**	237
		01/15/24	121.28	11.05	50 U	250 U	0.5 U	1.7	1.9	**2,360**	**1,310**	241
		04/04/24	120.56	11.77	50 U	250 U	0.5 U	1.9	1.7	**2,100**	**1,300**	241
		07/02/24	120.44	11.89	50 U	250 U	0.5 U	1.6	1.6	**2,800**	**1,300**	244
		10/14/24	121.62	10.71	73 x	250 U	0.5 U	1.7	1.6	**1,900**	**1,300**	262

Table 2. Groundwater Monitoring Data Summary

Project No. AS100094J, Crownhill Elementary, Bremerton, Washington

Well ID and Top-of-Casing Elevation[1,2]	Top-of-Casing Elevation (feet)	Date	Depth to Water (feet below top-of-casing)	Groundwater Elevation (feet)[2]	Constituent of Concern/Concentration[3]				Additional Diagnostic Analytes			
					Diesel-Range TPH	Motor-Oil-Range TPH	TCE	Total Arsenic	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Total Alkalinity (as CaCO3) in mg/L
MW-12 133.87 ft	133.87	12/17/13	114.24	19.63	**2,000 x**	**800 x**	1.0 U	1.5	na	na	na	na
		04/03/14	114.11	19.76	**2,800 x**	**850 x**	na	1.4	na	na	na	na
		07/01/14	113.17	20.70	**1,800 x**	420 x	na	1.7	na	na	na	na
		10/13/14	114.45	19.42	**1,600**	250 U	na	1.7	na	na	na	na
		10/28/15	115.02	18.85	**2,400 x**	**620 x**	na	na	na	na	na	na
		10/28/16	112.19	21.68	**1,500 x**	**680 x**	na	na	na	na	na	na
		10/27/17	110.40	23.47	**1,700 x**	**570 x**	na	na	na	na	na	na
		10/26/18	112.76	21.11	**2,200 x**	**510 x**	na	na	na	na	na	na
		10/14/19	115.37	18.50	**1,900 x**	**1,200 x**	na	na	na	na	na	na
		10/15/20	116.54	17.33	**1,600 x**	**1,400 x**	na	na	na	na	na	na
		11/11/21	115.60	18.27	**1,900 x**	**990 x**	na	na	na	na	na	na
		10/11/22	113.33	20.54	**1,600 x**	430 **x**	na	2.0	2.2	**309**	**5,340**	725
		10/26/23	114.86	19.01	**2,100 x**	**880 x**	na	1.9	1.6	**613**	**5,260**	759
		10/14/24	114.51	19.36	**1,800 x**	**690 x**	na	1.6	1.6	**820**	**5,100**	900
MW-15 133.37 ft	133.37	12/17/13	nm[4]	--	50 U	250 U	1 U	4.6	na	na	na	na
		04/03/14	nm[4]	--	50 U	250 U	na	1.2	na	na	na	na
		07/01/14	nm[4]	--	50 U	250 U	na	1 U	na	na	na	na
		10/13/14	nm[4]	--	50 U	250 U	na	1.1	na	na	na	na
		04/07/15	nm[4]	--	50 U	250 U	na	na	na	na	na	na
		10/28/15	nm[4]	--	50 U	250 U	na	na	na	na	na	na
		04/05/16	109.88	23.49	50 U	250 U	na	na	na	na	na	na
		10/28/16	111.65	21.72	50 U	250 U	na	na	na	na	na	na
		04/04/17	109.61	23.76	50 U	250 U	na	na	na	na	na	na
		10/27/17	109.90	23.47	50 U	250 U	na	na	na	na	na	na
		04/05/18	109.65	23.72	53 x	250 U	na	na	na	na	na	na
		10/26/18	nm[4]	--	60 U	300 U	na	na	na	na	na	na
		04/04/19	nm[4]	--	61 x	250 U	na	na	na	na	na	na
		10/14/19	nm[4]	--	50 U	250 U	na	na	na	na	na	na
		04/10/20	nm[4]	--	64 x	260 U	na	na	na	na	na	na
		10/15/20	nm[4]	--	nm[6]	nm[6]	na	na	na	na	na	na
		04/14/21	nm[4]	--	50 x	250 U	na	na	na	na	na	na
		11/11/21	nm[4]	--	95 U	480 U	na	na	na	na	na	na
		04/27/22	110.70	22.67	53 x	250 U	na	na	1 U	126	1 U	307
		10/11/22	nm[4]	--	87 x	250 U	na	1 U	1.2	100 U	1.8 U	308
		04/04/23	nm[4]	--	50 U	250 U	na	1 U	1 U	142	1 U	351
		10/26/23	nm[4]	--	67 x	250 U	na	1 U	1 U	129	1 U	313
		04/04/24	nm[4]	--	170 x	300 U	na	1	1	190	2 U	286
		10/14/24	113.95	19.42	na[6]	na[6]	na[6]	na[6]	na[6]	na[6]	na[6]	na[6]
McKinney (domestic well)		10/6/14[5]	nm	--	100 U	200 U	0.2 U	0.4	na	na	na	na
		2/19/15[5]	nm	--	100 U	200 U	0.2 U	0.4	na	na	na	na
		6/1/2015[5]	nm	--	100 U	200 U	0.2 U	0.3	na	na	na	na
		10/28/15	nm	--	na	na	1.0 U	na	na	na	na	na
		04/05/16	nm	--	na	na	1.0 U	na	na	na	na	na
		10/28/16	nm	--	na	na	1.0 U	na	na	na	na	na
		04/04/17	nm	--	na	na	1.0 U	na	na	na	na	na
		10/27/17	nm	--	na	na	1.0 U	na	na	na	na	na
		04/04/18	nm	--	na	na	1.0 U	na	na	na	na	na
		10/26/18	nm	--	na	na	1.0 U	na	na	na	na	na
		04/04/19	nm	--	na	na	1.0 U	na	na	na	na	na
		10/14/19	nm	--	na	na	1.0 U	na	na	na	na	na
		04/10/20	nm	--	na	na	1.0 U	na	na	na	na	na
		10/15/20	nm	--	na	na	1.0 U	na	na	na	na	na
		04/14/21	nm	--	na	na	1.0 U	na	na	na	na	na
		11/11/21	nm	--	na	na	0.5 U	na	na	na	na	na
		04/27/22	nm	--	na	na	0.5 U	na	na	na	na	na
		10/11/22	nm	--	na	na	0.5 U	na	na	na	na	na
		04/04/23	nm	--	na	na	0.5 U	na	na	na	na	na
		10/26/23	nm	--	na	na	0.5 U	na	na	na	na	na
		04/04/24	nm	--	na	na	0.5 U	na	na	na	na	na
		10/14/24	nm	--	na	na	0.5 U	na	na	na	na	na

na not analyzed
nm not measured
TCE trichloroethene
TPH total petroleum hydrocarbons
U analyte not detected at or above the reported result
x sample chromatographic pattern does not resemble the fuel standard used for quantitation

Notes:

1) Only wells included in the current monitoring program that do not contain LNAPL are shown in this table. Refer to Table 3 for wells containing LNAPL. Refer to the *Remedial Investigation Report* (Aspect, 2014a) for data prior to December 2013 and for information on other wells.

2) Elevations are based on NAVD88 vertical datum.

3) All concentrations are in micrograms per liter (µg/L) unless otherwise noted. Cleanup levels are 500 µg/L for diesel- and motor-oil-range TPH, and 5 µg/L for TCE and total arsenic. Cleanup level exceedances are bolded.

4) Water level was below top of pump and could not be measured.

5) Samples from McKinney well were initially collected for analysis by the Kitsap Public Health District and analyzed by Analytical Resources, Inc.

6) Water level was below pump intake and sample could not be collected.

Table 3. LNAPL Thickness Measurements and Removal Summary

Project No. AS100094J, Crownhill Elementary, Bremerton, Washington

Well ID	Date	Initial Thickness in ft[1]	LNAPL Removal in Liters[2]	Notes
MW-8	10/26/12	0.20		Well installed on 12/20/11.
	11/21/12	#N/A		
	01/31/13	0.10		
	05/03/13	0.03		
	08/07/13	0.23		
	12/17/13	0.86		
	04/02/14	0.39	0.18	(Note 5)
	05/23/14	0.38	0.11	(Note 4)
	07/01/14	0.23		
	10/13/14	0.28		
	04/07/15	0.27		Not bailed because initial thickness was <0.3 feet.
	10/28/15	0.90	0.36	(Note 4)
	01/18/16	0.10		Not bailed because initial thickness was <0.3 feet.
	04/05/16	0.01		Not bailed because initial thickness was <0.3 feet.
	10/28/16	0.40	0.01	(Note 4)
	04/04/17	0.13		Not bailed because initial thickness was <0.3 feet.
	10/27/17	0.15		Not bailed because initial thickness was <0.3 feet.
	04/03/18	#N/A	0.02	(Note 4), (Note 6)
	10/26/18	1.70	0.75	(Note 4)
	04/04/19	0.40	0.23	(Note 4)
	10/14/19	1.15	0.18	(Note 4)
	04/10/20	0.95	0.38	(Note 4)
	10/15/20	1.08	0.16	(Note 4)
	04/15/21	1.20	0.19	(Note 4)
	11/11/21	1.20	0.34	(Note 4)
	04/27/22	1.00	0.57	(Note 4)
	10/11/22	1.70	1.78	(Note 4)
	04/04/23	0.34	0.35	(Note 4)
	10/26/23	0.89	0.25	(Note 4)
	04/04/24	0.16	0.21	(Note 4)
	10/14/24	1.32	0.28	(Note 4)
Cumulative LNAPL Removal			6.34	
MW-13	11/01/12	1.46		Well installed on 10/25/12.
	11/21/12	0.99	0.90	(Note 4)
	01/31/13	0.10		
	05/03/13	0.31		
	08/07/13	0.49		
	12/17/13	4.90		
	04/02/14	1.35	0.02	Water detected above LNAPL. (Note 4)
	05/23/14	2.08	0.18	Water detected above LNAPL. (Note 4)
	07/01/14	0.84		
	10/13/14	3.39		
	04/07/15	1.00	0.17	(Note 4)
	10/28/15	4.15	0.02	(Note 4)
	01/18/16	1.39	0.52	(Note 4)
	04/05/16	1.31	0.26	(Note 4)
	10/28/16	0.05		Not bailed because initial thickness was <0.3 feet.
	04/04/17	0.20		Not bailed because initial thickness was <0.3 feet.
	10/27/17	0.04		Not bailed because initial thickness was <0.3 feet.
	04/03/18	1.70	0.35	(Note 4)
	10/26/18	2.00	1.05	(Note 4)
	04/04/19	1.70	0.22	(Note 4)
	10/14/19	1.10	0.10	(Note 4)
	04/10/20	2.95	0.13	(Note 4)
	10/15/20	1.22	0.38	(Note 4)
	04/15/21	1.00	0.33	(Note 4)
	11/11/21	1.80	0.37	(Note 4)
	04/27/22	1.76	0.00	Bailing attempt abandoned, obstruction in well.
	10/11/22	0.42	0.40	(Note 4)
	04/04/23	1.20	0.57	(Note 4)
	10/26/23	0.13	0.00	Not bailed because initial thickness was <0.3 feet.
	04/04/24	1.93	0.53	(Note 4)
	10/14/24	0.12		Not bailed because initial thickness was <0.3 feet.
Cumulative LNAPL Removal			6.48	
MW-14	11/01/12	nd		Well installed on 10/26/12.
	01/31/13	nd		
	05/03/13	nd		
	08/07/13	0.12		
	12/17/13	0.10		
	04/02/14	0.08		Not bailed because initial thickness was <0.1 feet.
	05/23/14	0.09		Not bailed because initial thickness was <0.1 feet.
	07/01/14	0.46		
	10/13/14	0.71		
	04/07/15	0.23		Not bailed because initial thickness was <0.3 feet.
	10/28/15	1.48	0.35	(Note 4)
	01/18/16	0.32	0.20	(Note 4)
	04/05/16	0.01	0.00	Not bailed because initial thickness was <0.3 feet.
	10/28/16	0.37	0.03	(Note 5)
	04/04/17	0.77	0.32	(Note 4)
	10/27/17	0.60	0.64	(Note 5)
	04/03/18	0.70	0.06	(Note 5)
	10/26/18	2.40	1.65	(Note 5)
	04/04/19	1.20	0.71	(Note 4)
	10/14/19	2.90	0.27	(Note 4)
	04/10/20	0.15	0.00	Not bailed because initial thickness was <0.3 feet.
	10/15/20	0.45	0.24	(Note 4)
	04/15/21	0.90	0.39	(Note 4)
	11/11/21	0.80	0.34	(Note 4)
	04/27/22	1.30	0.70	(Note 4)
	10/11/22	1.78	0.85	(Note 4)
	04/04/23	0.10	0.04	(Note 4)
	10/26/23	1.33	1.10	(Note 4)
	04/04/24	0.05	0.07	(Note 4)
	10/14/24	nd	0.05	(Note 6)
Cumulative LNAPL Removal			7.99	

Table 3. LNAPL Thickness Measurements and Removal Summary

Project No. AS100094J, Crownhill Elementary, Bremerton, Washington

Well ID	Date	Initial Thickness in ft[1]	LNAPL Removal in Liters[2]	Notes
MW-16	11/01/12	nd		Well installed on 10/26/12.
	01/31/13	0.50		
	05/03/13	0.48		
	08/07/13	2.61		
	12/17/13	2.83		
	04/02/14	3.02	0.85	(Note 5)
	05/23/14	4.25	2.06	(Note 5)
	07/01/14	3.79		
	10/13/14	3.25		
	04/07/15	2.64	1.19	(Note 5)
	10/28/15	2.18	0.35	(Note 4)
	01/18/16	0.45	0.17	Bailing was stopped after measuring <0.01 foot LNAPL thickness.
	04/05/16	0.39	0.00	Four bailing attempts recovered only a trace of LNAPL.
	10/28/16	0.87	0.10	Third bailing attempt recovered only 20 ml of LNAPL.
	04/04/17	0.24		Not bailed because initial thickness was <0.3 feet.
	10/27/17	2.15	1.35	(Note 4)
	04/03/18	#N/A	0.30	(Note 4), (Note 6)
	10/26/18	3.25	1.55	(Note 5)
	04/04/19	2.30	0.27	(Note 4)
	10/14/19	1.10	0.15	(Note 4)
	04/10/20	2.30	0.16	(Note 4)
	10/15/20	2.46	0.40	(Note 4)
	04/15/21	0.80	0.60	(Note 4)
	11/11/21	0.80	0.40	(Note 4)
	04/27/22	0.69	0.85	(Note 4)
	10/11/22	2.92	0.27	(Note 4)
	04/04/23	0.26	0.10	(Note 4)
	10/26/23	0.24	0.33	(Note 4)
	04/04/24	0.29	0.17	(Note 4)
	10/14/24	0.26		Not bailed because initial thickness was <0.3 feet.
Cumulative LNAPL Removal			11.61	
EW-17	10/28/15	0.45	0.03	Well installed on 10/13/15.
	01/18/16	0.40	0.21	LNAPL observed to be much more viscous (sludge-like) than in other wells. (Note 4)
	04/05/16	0.44	1.66	LNAPL appears to be less viscous than in previous rounds. (Note 4)
	10/28/16	0.47	0.11	Fourth bailing attempt recovered only 5 ml of LNAPL.
	04/04/17	1.95	0.52	Initial thickness measurements ranged from 0.23 to 3.45 ft. (Note 4)
	10/27/17	0.85	0.12	(Note 4)
	04/03/18	#N/A	0.60	(Note 4), (Note 6)
	10/26/18	1.90	1.11	(Note 5)
	04/04/19	3.00	0.18	(Note 4)
	10/14/19	1.30	0.14	(Note 4)
	04/10/20	0.40	0.13	(Note 4)
	10/15/20	0.60	0.32	(Note 4)
	04/15/21	0.50	0.25	(Note 4)
	11/11/21	0.60	0.23	(Note 4)
	04/27/22	1.60	0.50	(Note 4)
	10/11/22	4.08	2.45	(Note 4)
	04/04/23	0.67	0.17	(Note 4)
	10/26/23	2.88	0.53	(Note 4)
	04/04/24	1.12	0.95	(Note 4)
	10/14/24	3.12	0.63	(Note 4)
Cumulative LNAPL Removal			10.82	
TOTAL LNAPL REMOVED			**43.2**	**(ALL WELLS)**

LNAPL = light non-aqueous-phase liquid nd = no detectable LNAPL thickness nm = not measured

Notes:

1) The viscous, sticky nature of the LNAPL results in inconsistent readings of the interface probe (used to measure depth-to-LNAPL and depth-to-water). Therefore, the reported LNAPL thicknesses can only be regarded as estimates.

2) Water has been observed to separate out from LNAPL samples over a period of months. Therefore, actual volumes of non-aqueous-phase liquid removed from the subsurface are likely less than the LNAPL volumes reported in this table.

3) Well EW-17 (4-inch ID) has a unit volume of approximately 2.5 liters per vertical foot of well casing. All other wells are 2-inch ID and have unit volumes of approximately 0.62 liter per vertical foot of well casing.

4) Bailing was stopped after bailer retrieved a relatively large volume of water with little or no LNAPL.

5) Bailing was stopped because bailer would no longer go down well due to LNAPL buildup on inside well casing.

6) Unable to determine initial thickness of LNAPL. Bailing was attempted.

FIGURES

1724 Dora Avenue NW (Note 2)

North Landfill Area

MW-2

Estimated Extent of TPH Cleanup Level Exceedance

MW-9

Estimated Extent of TCE Cleanup Level Exceedance

BERTHA AVE NW

MW-16 (Note 1) MW-14

EW-17 MW-13

MW-12

MW-8

MW-15 MW-5

Geotextile at 1 Foot Below Ground Surface (Summer 2013 Interim Action)

Estimated Extent of Arsenic Cleanup Level Exceedance

ROCKY POINT RD

PORTABLE CLASSROOM BUILDING

Bertha Ave NW Parking Area

MW-4

MW-6

MAIN SCHOOL BUILDING

MW-3

MW-10

South Landfill Area

MW-1

Geotextile at 1 Foot Below Ground Surface (Summer 2013 Interim Action)

MW-7

Geotextile at 1 Foot Below Ground Surface (Spring 2012 Interim Action)

MW-11

MARINE DR

DORA AVE

0 100 200 Feet

Well Locations:

- Extraction Well Included in Monitoring Program
- Monitoring Well Included in Monitoring Program
- Monitoring Well Not Included in Monitoring Program
- McKinney Domestic Well (Note 2)
- Approximate photo location & orientation for semiannual cover system inspections

Other Site Features and Interpretation:

- Interpreted Extent of Landfill Activity
- Estimated Extent of Groundwater Cleanup Level Exceedances in 2014 (Ecology, 2014)
- Bremerton School District Property Boundary
- Bremerton United Methodist Church Property Boundary
- Inferred Direction of Groundwater Flow

Note:

(1) LNAPL has been observed in Wells EW-17, MW-8, MW-13, MW-14, and MW-16.
(2) The McKinney well water sample is collected from the outdoor faucet on the north side of the residence at 1724 Dora Avenue NW.

Site Plan

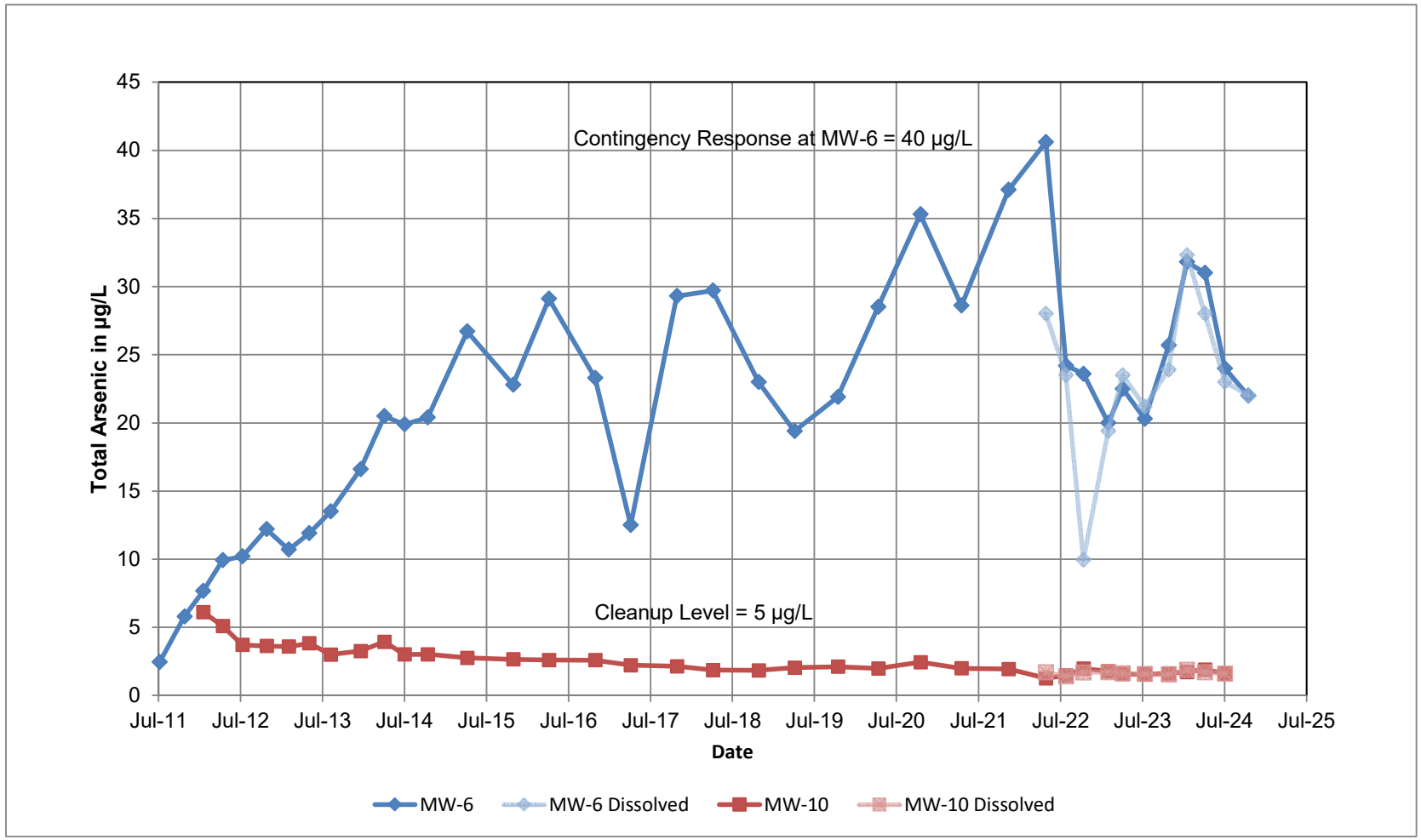
2023 Annual Report
Crownhill Elementary
Bremerton, Washington

Aspect Consulting	JAN-2020	BY: DLH / PPW	FIGURE NO. 1
	PROJECT NO. 100094	REVISED BY: EAC	

GIS Path: T:\projects_8\CrownHillElementary\Delivered\Annual Report 2019\01-Site Plan.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 1/10/2020 || User: ecrumbaker || Print Date: 1/10/2020

Figure 2. Arsenic in Wells MW-6 and MW-10

Project No. AS100094J-12, Crownhill Elementary, Bremerton, Washington



Notes:

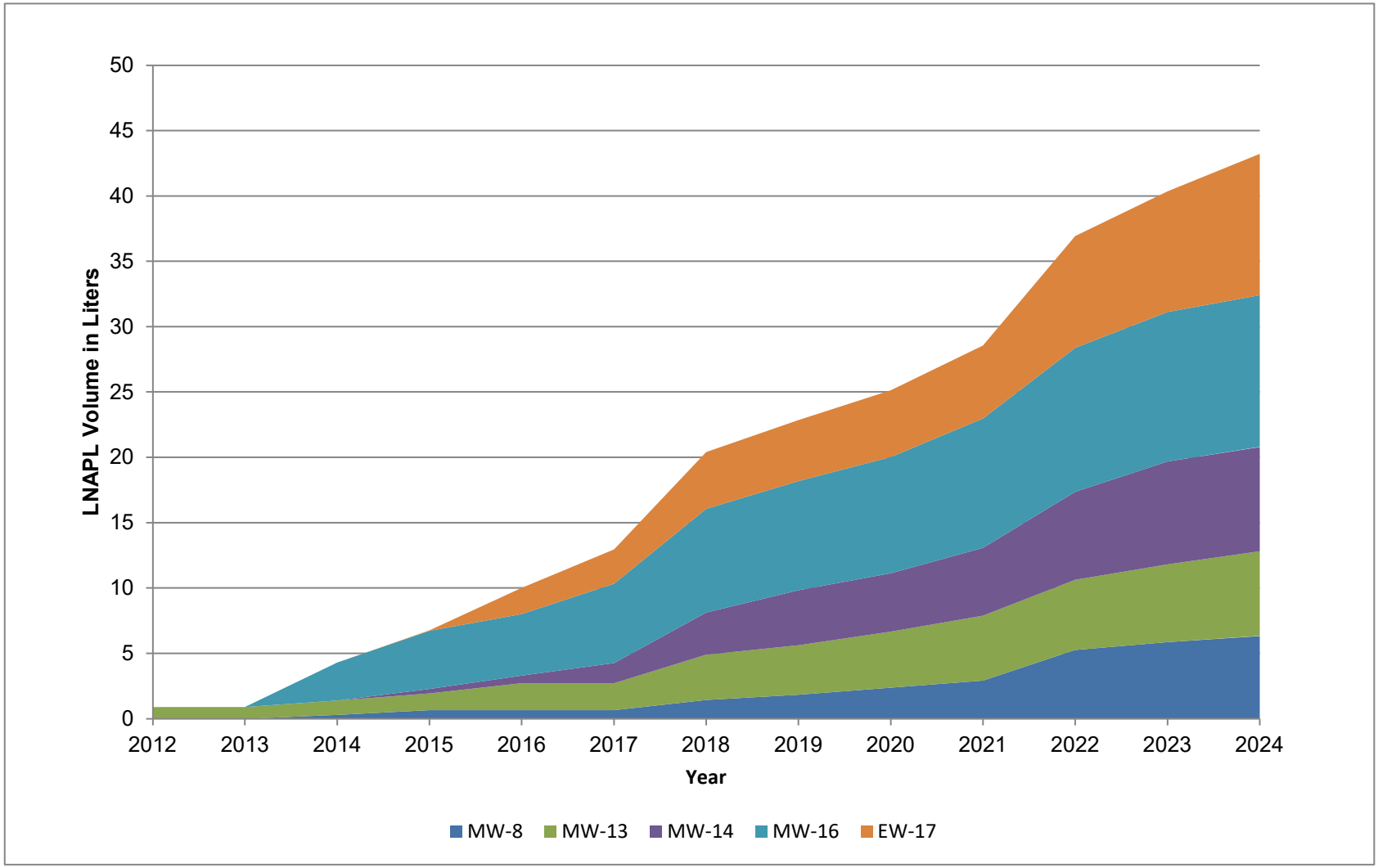
1) Well MW-6, installed in March 2011, provides early warning of potential arsenic migration.

2) Well MW-10, installed in December 2011, is the conditional point of compliance for arsenic in groundwater.

3) Dissolved Arsenic was added to the constituents of concern in 2022 in response to the April 2022 arsenic exceedance in MW-6.

Figure 3. Cumulative LNAPL Removal Over Time

Project No. AS100094J, Crownhill Elementary, Bremerton, WA



APPENDIX A

June 2024 Inspection Record and Photos

Aspect CONSULTING

Project Name: **Crownhill Elementary School**

Project No.: ~~1007~~ AS100094

Date: 6/20/24

Inspector's Name: Matthew Lewis

Inspector's Signature: Matthew M Lewis

Weather Conditions: Sunny, Low 70°F

Inspector's Title/Affiliation: Project Hydrogeologist (Aspect)

FORM 1 - INSPECTION RECORD

INSPECTION ITEM	YES	NO	COMMENTS/NOTES
1. North Environmental Covenant Area			
a. Building or pavement modifications since last inspection?		X	
b. Pavement deterioration/damage along Bertha Ave NW?[1]	X		The pothole noted in Dec is still there.
c. Evidence of soil disturbance?		X	
d. Geotextile fabric visible in interim action area?		X	
2. South Environmental Covenant Area			
a. Building or pavement modifications since last inspection?		X	
b. Evidence of soil disturbance?		X	
c. Geotextile fabric visible in interim action areas?		X	
3. Other Inspection Items			
a. Are all wells (MW-1 through EW-17) accessible?	X		
b. Evidence of well monument damage/tampering?		X	
c. HVAC system operates continuously during school day?[2]	X		Heating & cooling as necessary. Confirmed with school staff.

Deficient Action Items & Other Comments:

Notes

1. Item 1b refers to the paved parking area described in Section 1.3.
2. The inspector should describe under COMMENTS/NOTES how the determination is made regarding HVAC system operation.

Revision: December 2015

Photo Location 1. 6/20/2024 site inspection

Photo Location 2. 6/20/2024 site inspection

Photo Location 3. 6/20/2024 site inspection

Photo Location 4. 6/20/2024 site inspection

APPENDIX B

December 2024 Inspection Record and Photos

Aspect CONSULTING

Project Name: **Crownhill Elementary School**

Project No.: AS1000944J

Date: 12/23/2024

Inspector's Name: Matthew M. Lewis

Inspector's Signature: Matthew M Lewis

Weather Conditions: Partly cloudy, 50°F's

Inspector's Title/Affiliation: Project Hydrogeologist

FORM 1 - INSPECTION RECORD

INSPECTION ITEM	YES	NO	COMMENTS/NOTES
1. North Environmental Covenant Area			
a. Building or pavement modifications since last inspection?		X	
b. Pavement deterioration/damage along Bertha Ave NW?[1]	X		Pothole noted in December 2023 still there.
c. Evidence of soil disturbance?		X	
d. Geotextile fabric visible in interim action area?		X	
2. South Environmental Covenant Area			
a. Building or pavement modifications since last inspection?		X	
b. Evidence of soil disturbance?		X	
c. Geotextile fabric visible in interim action areas?		X	
3. Other Inspection Items			
a. Are all wells (MW-1 through EW-17) accessible?	X		
b. Evidence of well monument damage/tampering?		X	
c. HVAC system operates continuously during school day?[2]	X		Confirmed with staff.

Deficient Action Items & Other Comments:

Notes

Revision: December 2015

1. Item 1b refers to the paved parking area described in Section 1.3.
2. The inspector should describe under COMMENTS/NOTES how the determination is made regarding HVAC system operation.

Photo Location 1. 12/23/2024 site inspection, pothole circled.

Photo Location 1. 12/23/2024 site inspection, pothole in photo above.

Photo Location 2. 12/23/2024 site inspection

Photo Location 3. 12/23/2024 site inspection

Photo Location 4. 12/23/2024 site inspection

APPENDIX C

Laboratory Reports,
2024 Groundwater Sampling

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

5500 4th Avenue South
Seattle, WA 98108
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

January 24, 2024

Matthew Lewis, Project Manager
Aspect Consulting, LLC
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Mr Lewis:

Included are the results from the testing of material submitted on January 16, 2024 from the Crownhill Elementary 100094, F&BI 401191 project. There are 17 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data
ASP0124R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on January 16, 2024 by Friedman & Bruya, Inc. from the Aspect Consulting, LLC Crownhill Elementary 100094, F&BI 401191 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting, LLC
401191 -01	MW-6-240115
401191 -02	MW-10-240115
401191 -03	Trip Blank

Samples MW-6-240115 and MW-10-240115 were sent to Fremont Analytical for alkalinity analysis. The report is enclosed.

The NWTPH-Dx diesel calibration standard for sample MW-10-240115 exceeded the acceptance criteria. No material was detected in that range, therefore the data were acceptable and has been noted with a "k" qualifier.

All other quality control requirements were acceptable.

Date of Report: 01/24/24
Date Received: 01/16/24
Project: Crownhill Elementary 100094, F&BI 401191
Date Extracted: 01/16/24
Date Analyzed: 01/16/24

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 50-150)
MW-10-240115 401191-02	<50 k	<250	95
Method Blank 04-140 MB2	<50	<250	84

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-6-240115	Client:	Aspect Consulting, LLC
Date Received:	01/16/24	Project:	Crownhill Elementary 100094
Date Extracted:	01/18/24	Lab ID:	401191-01
Date Analyzed:	01/18/24	Data File:	401191-01.051
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	32.3

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-6-240115	Client:	Aspect Consulting, LLC
Date Received:	01/16/24	Project:	Crownhill Elementary 100094
Date Extracted:	01/18/24	Lab ID:	401191-01 x10
Date Analyzed:	01/18/24	Data File:	401191-01 x10.043
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	9,490
Manganese	1,880

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-10-240115	Client:	Aspect Consulting, LLC
Date Received:	01/16/24	Project:	Crownhill Elementary 100094
Date Extracted:	01/18/24	Lab ID:	401191-02
Date Analyzed:	01/18/24	Data File:	401191-02.054
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.87
Iron	2,360

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-10-240115	Client:	Aspect Consulting, LLC
Date Received:	01/16/24	Project:	Crownhill Elementary 100094
Date Extracted:	01/18/24	Lab ID:	401191-02 x10
Date Analyzed:	01/18/24	Data File:	401191-02 x10.046
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Manganese	1,310

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	NA	Project:	Crownhill Elementary 100094
Date Extracted:	01/18/24	Lab ID:	I4-40 mb
Date Analyzed:	01/18/24	Data File:	I4-40 mb.077
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Iron	<50
Manganese	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-6-240115	Client:	Aspect Consulting, LLC
Date Received:	01/16/24	Project:	Crownhill Elementary 100094
Date Extracted:	01/16/24	Lab ID:	401191-01
Date Analyzed:	01/16/24	Data File:	401191-01.082
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	31.8

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-10-240115	Client:	Aspect Consulting, LLC
Date Received:	01/16/24	Project:	Crownhill Elementary 100094
Date Extracted:	01/16/24	Lab ID:	401191-02
Date Analyzed:	01/16/24	Data File:	401191-02.085
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.72

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	NA	Project:	Crownhill Elementary 100094
Date Extracted:	01/16/24	Lab ID:	I4-37 mb
Date Analyzed:	01/16/24	Data File:	I4-37 mb.080
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	MW-10-240115	Client:	Aspect Consulting, LLC
Date Received:	01/16/24	Project:	Crownhill Elementary 100094
Date Extracted:	01/18/24	Lab ID:	401191-02
Date Analyzed:	01/18/24	Data File:	011816.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	95	71	132
Toluene-d8	98	68	139
4-Bromofluorobenzene	103	62	136

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<0.5

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	Crownhill Elementary 100094
Date Extracted:	01/18/24	Lab ID:	04-0103 mb
Date Analyzed:	01/18/24	Data File:	011808.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	94	71	132
Toluene-d8	98	68	139
4-Bromofluorobenzene	101	62	136

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<0.5

Date of Report: 01/24/24
Date Received: 01/16/24
Project: Crownhill Elementary 100094, F&BI 401191

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	100	112	65-151	11

Date of Report: 01/24/24
Date Received: 01/16/24
Project: Crownhill Elementary 100094, F&BI 401191

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 6020B

Laboratory Code: 401191-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	32.3	92 b	100 b	75-125	8 b
Iron	ug/L (ppb)	100	8,380	0 b	0 b	75-125	nm
Manganese	ug/L (ppb)	20	1,660	0 b	0 b	75-125	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	104	80-120
Iron	ug/L (ppb)	100	83	80-120
Manganese	ug/L (ppb)	20	94	80-120

Date of Report: 01/24/24
Date Received: 01/16/24
Project: Crownhill Elementary 100094, F&BI 401191

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 401191-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	31.8	113 b	101 b	75-125	11 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	100	80-120

Date of Report: 01/24/24
Date Received: 01/16/24
Project: Crownhill Elementary 100094, F&BI 401191

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

Laboratory Code: 401159-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Trichloroethene	ug/L (ppb)	10	<0.5	108	43-133

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Trichloroethene	ug/L (ppb)	10	95	95	70-130	0

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria, biased low; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the standard reporting limit. 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.

k – The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

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.

401191

SAMPLE CHAIN OF CUSTODY

01/16/24

C2/VW1/J2

Page # 1 of 1

Report To Matthew Lewis

Company Aspect Consulting

Address 710 2nd Ave #550

City, State, ZIP Seattle, WA, 98104

Phone 404-210-6437 Email Matthew.Lewis@aspectconsulting.com

SAMPLERS (*signature*)

PROJECT NAME: Crownhill Elementary

PO #: 100094

REMARKS

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME

☒ Standard turnaround

☐ RUSH

Rush charges authorized by:

SAMPLE DISPOSAL

☐ Archive samples

☐ Other

Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	TCE	Total Arsenic	Dissolved As, Fe, Mn	Alkalinity	Notes
MW-6-240115	01 A-C	1/15/24	0910	W	3									X	X	X	
MW-10-240115	02 A-G	↓	1020	↓	7	X							X	X	X	X	
Trip Blank	03 A-B	—	—	water	2												Added at lab AP 01/16/24
							Samples received at 0 °C										

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Carmen Tappero	Aspect Consulting	1/15/24	1330
Received by:	ANH PHAN	FSB	01/16/24	09:49
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
Ph. (206) 285-8282

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Friedman & Bruya
Michael Erdahl
5500 4th Ave S
Seattle, WA 98108

RE: 401191
Work Order Number: 2401308

January 23, 2024

Attention Michael Erdahl:

Fremont Analytical, Inc. received 2 sample(s) on 1/16/2024 for the analyses presented in the following report.

Total Alkalinity by SM 2320B

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *01/23/2024*

CLIENT: Friedman & Bruya
Project: 401191
Work Order: 2401308

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2401308-001	MW-6-240115	01/15/2024 9:10 AM	01/16/2024 1:40 PM
2401308-002	MW-10-240115	01/15/2024 10:20 AM	01/16/2024 1:40 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Case Narrative

WO#: **2401308**
Date: **1/23/2024**

CLIENT: Friedman & Bruya
Project: 401191

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **2401308**
Date Reported: **1/23/2024**

CLIENT: Friedman & Bruya
Project: 401191

Lab ID: 2401308-001 **Collection Date:** 1/15/2024 9:10:00 AM
Client Sample ID: **MW-6-240115** **Matrix:** Water

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R89118		Analyst: ME
Alkalinity, Total (As CaCO3)	309	2.50		mg/L	1	1/19/2024 3:25:13 PM

Lab ID: 2401308-002 **Collection Date:** 1/15/2024 10:20:00 AM
Client Sample ID: **MW-10-240115** **Matrix:** Water

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R89118		Analyst: ME
Alkalinity, Total (As CaCO3)	241	2.50		mg/L	1	1/19/2024 3:25:13 PM

Work Order: 2401308
CLIENT: Friedman & Bruya
Project: 401191

QC SUMMARY REPORT

Total Alkalinity by SM 2320B

Sample ID: **MB-R89118**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **1/19/2024**	RunNo: **89118**
Client ID: **MBLKW**	Batch ID: **R89118**		Analysis Date: **1/19/2024**	SeqNo: **1861619**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	ND	2.50									

Sample ID: **LCS-R89118**	SampType: **LCS**	Units: **mg/L**	Prep Date: **1/19/2024**	RunNo: **89118**
Client ID: **LCSW**	Batch ID: **R89118**		Analysis Date: **1/19/2024**	SeqNo: **1861620**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	104	2.50	100.0	0	104	86.2	126.2				

Sample ID: **2401308-001ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **1/19/2024**	RunNo: **89118**
Client ID: **MW-6-240115**	Batch ID: **R89118**		Analysis Date: **1/19/2024**	SeqNo: **1861622**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	308	2.50						308.8	0.364	20	

Fremont Analytical
An Alliance Technical Group Company

Sample Log-In Check List

Client Name:	FB	Work Order Number:	2401308
Logged by:	Clare Griggs	Date Received:	1/16/2024 1:40:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☑	No ☐	NA ☐
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	6.0

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 5500 4th Ave S

City, State, ZIP Seattle, WA 98108

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER	
Fremont	
PROJECT NAME/NO.	PO #
401191	D-631
REMARKS	
Aspect EDD	

TURNAROUND TIME

☒ Standard TAT

RUSH 2401308

Rush charges authorized by:

SAMPLE DISPOSAL

Dispose after 30 days

Return samples

Will call with instructions

						ANALYSES REQUESTED										
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Alkalinity	Nitrate	Nitrite	Sulfate	RSK-175						Notes
MW-6-240115		1/15/2024	910	water	1	x										
MW-10-240115		1/15/2024	1020	water	1	x										

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

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	1/16/24	1016
Received by:		Nathan Kottkes	FAI	1/16/24	1340
Relinquished by:					
Received by:					

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

5500 4th Ave South
Seattle, WA 98108-2419
(206) 285-8282
office@friedmanandbruya.com
www.friedmanandbruya.com

April 17, 2024

Matthew Lewis, Project Manager
Aspect Consulting
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Mr Lewis:

Included are the results from the testing of material submitted on April 5, 2024 from the Crownhill Elementary 100094, F&BI 404105 project. There are 23 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data
ASP0417R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on April 5, 2024 by Friedman & Bruya, Inc. from the Aspect Consulting Crownhill Elementary 100094, F&BI 404105 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting
404105 -01	MW-6-040424
404105 -02	MW-10-040424
404105 -03	MW-15-040424
404105 -04	MW-5-040424
404105 -05	MW-9-040424
404105 -06	McKinney-040424
404105 -07	Trip Blank

Samples MW-6-040424, MW-10-040424, MW-15-040424, MW-5-040424, and MW-9-040424 were sent to Fremont Analytical for alkalinity analysis. The report is enclosed.

All quality control requirements were acceptable.

Date of Report: 04/17/24
Date Received: 04/05/24
Project: Crownhill Elementary 100094, F&BI 404105
Date Extracted: 04/08/24
Date Analyzed: 04/09/24

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 50-150)
MW-10-040424 404105-02	<50	<250	100
MW-15-040424 404105-03 1/1.2	170 x	<300	78
MW-5-040424 404105-04	1,900 x	950 x	102
Method Blank 04-826 MB	<50	<250	96

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-6-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-01
Date Analyzed:	04/09/24	Data File:	404105-01.075
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	28

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-10-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-02
Date Analyzed:	04/09/24	Data File:	404105-02.076
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.7

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-15-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-03
Date Analyzed:	04/09/24	Data File:	404105-03.077
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.2

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-5-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-04
Date Analyzed:	04/09/24	Data File:	404105-04.078
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-9-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-05
Date Analyzed:	04/09/24	Data File:	404105-05.134
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Aspect Consulting
Date Received:	NA	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	I4-282 mb
Date Analyzed:	04/09/24	Data File:	I4-282 mb.070
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-6-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/08/24	Lab ID:	404105-01
Date Analyzed:	04/08/24	Data File:	404105-01.123
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	31

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-10-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/08/24	Lab ID:	404105-02
Date Analyzed:	04/08/24	Data File:	404105-02.126
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.9

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-15-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/08/24	Lab ID:	404105-03
Date Analyzed:	04/08/24	Data File:	404105-03.134
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.1

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-5-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/08/24	Lab ID:	404105-04
Date Analyzed:	04/08/24	Data File:	404105-04.135
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-9-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/08/24	Lab ID:	404105-05
Date Analyzed:	04/08/24	Data File:	404105-05.136
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Aspect Consulting
Date Received:	NA	Project:	Crownhill Elementary 100094
Date Extracted:	04/08/24	Lab ID:	I4-279 mb
Date Analyzed:	04/08/24	Data File:	I4-279 mb.058
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	MW-10-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-02
Date Analyzed:	04/09/24	Data File:	040913.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	71	132
Toluene-d8	94	68	139
4-Bromofluorobenzene	103	62	136

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<0.5

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	MW-9-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-05
Date Analyzed:	04/09/24	Data File:	040914.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	93	71	132
Toluene-d8	97	68	139
4-Bromofluorobenzene	103	62	136

Compounds:	Concentration ug/L (ppb)
Trichloroethene	8.8

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	McKinney-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-06
Date Analyzed:	04/09/24	Data File:	040915.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	95	71	132
Toluene-d8	94	68	139
4-Bromofluorobenzene	103	62	136

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<0.5

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Method Blank	Client:	Aspect Consulting
Date Received:	Not Applicable	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	04-0777 mb
Date Analyzed:	04/09/24	Data File:	040908.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	97	71	132
Toluene-d8	96	68	139
4-Bromofluorobenzene	106	62	136

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<0.5

Date of Report: 04/17/24
Date Received: 04/05/24
Project: Crownhill Elementary 100094, F&BI 404105

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	84	84	65-151	0

Date of Report: 04/17/24
Date Received: 04/05/24
Project: Crownhill Elementary 100094, F&BI 404105

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 6020B

Laboratory Code: 404105-05 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	<1	95	95	75-125	0

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	92	80-120

Date of Report: 04/17/24
Date Received: 04/05/24
Project: Crownhill Elementary 100094, F&BI 404105

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 404105-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	30.9	92 b	96 b	75-125	4 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	91	80-120

Date of Report: 04/17/24
Date Received: 04/05/24
Project: Crownhill Elementary 100094, F&BI 404105

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

Laboratory Code: 404104-04 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Trichloroethene	ug/L (ppb)	10	<0.5	90	43-133

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Trichloroethene	ug/L (ppb)	10	87	88	70-130	1

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, biased low; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the standard reporting limit. 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.

k – The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

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.

404105

SAMPLE CHAIN OF CUSTODY

04/05/24 VW3/C2/ | J5

Page # 1 of 1

Report To Matthew Lewis

Company Aspect Consulting

Address 710 2nd Ave # 550

City, State, ZIP Seattle, WA, 98104

Phone 316.617.0499 Email matthew.lewis@aspectconsulting.com

SAMPLERS (*signature*)

PROJECT NAME: Crownhill Elementary

PO #: 100094

REMARKS: Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME
- [x] Standard turnaround
- [ ] RUSH
- Rush charges authorized by:

SAMPLE DISPOSAL
- [ ] Archive samples
- [ ] Other
- Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Total Arsenic	Dissolved Arsenic	Alkalinity	TCE	Notes
						ANALYSES REQUESTED											
MW-6-040424	01 A-C	4/4/24	1005	W	3								X	X	X		
MW-10-040424	02 A-G	"	1100	"	7	X							X	X	X	X	
MW-15-040424	03 A-D	"	1215	"	4	X							X	X	X		
MW-5-040424	04 A-D	"	1340	"	4	X							X	X	X		
MW-9-040424	05 A-F	"	1450	"	6								X	X	X	X	
McKinney-040424	06 A-C	"	1530	"	3											X	
Trip Blank	07 A B	—	—	W	2												Added at lab (ND) 4/5/24
																	Samples received at 4 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Daniel Babcock	Aspect Consulting	4/5/24	12:05
Received by:	VINH	FBI	4-5-24	1205
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
Ph. (206) 285-8282

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Friedman & Bruya
Michael Erdahl
5500 4th Ave S
Seattle, WA 98108

RE: 404105
Work Order Number: 2404141

April 15, 2024

Attention Michael Erdahl:

Fremont Analytical, Inc, an Alliance Technical Group company, received 5 sample(s) on 4/8/2024 for the analyses presented in the following report.

Total Alkalinity by SM 2320B

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes
Project Manager

Date: *04/15/2024*

CLIENT: Friedman & Bruya
Project: 404105
Work Order: 2404141

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2404141-001	MW-6-040424	04/04/2024 10:05 AM	04/08/2024 2:30 PM
2404141-002	MW-10-040424	04/04/2024 11:00 AM	04/08/2024 2:30 PM
2404141-003	MW-15-040424	04/04/2024 12:15 PM	04/08/2024 2:30 PM
2404141-004	MW-5-040424	04/04/2024 1:40 PM	04/08/2024 2:30 PM
2404141-005	MW-9-040424	04/04/2024 2:50 PM	04/08/2024 2:30 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Case Narrative

WO#: **2404141**
Date: **4/15/2024**

CLIENT: Friedman & Bruya
Project: 404105

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

CLIENT: Friedman & Bruya
Project: 404105

Lab ID: 2404141-001 **Collection Date:** 4/4/2024 10:05:00 AM
Client Sample ID: **MW-6-040424** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R90967		Analyst: NR
Alkalinity, Total (As CaCO3)	298	2.50		mg/L	1	4/9/2024 11:30:00 AM

Lab ID: 2404141-002 **Collection Date:** 4/4/2024 11:00:00 AM
Client Sample ID: **MW-10-040424** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R90967		Analyst: NR
Alkalinity, Total (As CaCO3)	241	2.50		mg/L	1	4/9/2024 11:30:00 AM

Lab ID: 2404141-003 **Collection Date:** 4/4/2024 12:15:00 PM
Client Sample ID: **MW-15-040424** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R90967		Analyst: NR
Alkalinity, Total (As CaCO3)	286	2.50		mg/L	1	4/9/2024 11:30:00 AM

Lab ID: 2404141-004 **Collection Date:** 4/4/2024 1:40:00 PM
Client Sample ID: **MW-5-040424** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R90967		Analyst: NR
Alkalinity, Total (As CaCO3)	732	2.50		mg/L	1	4/9/2024 11:30:00 AM

Analytical Report

Work Order: **2404141**
Date Reported: **4/15/2024**

CLIENT: Friedman & Bruya
Project: 404105

Lab ID: 2404141-005
Client Sample ID: **MW-9-040424**
Collection Date: 4/4/2024 2:50:00 PM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R90967		Analyst: NR
Alkalinity, Total (As CaCO3)	285	2.50		mg/L	1	4/9/2024 11:30:00 AM

Work Order: 2404141
CLIENT: Friedman & Bruya
Project: 404105

QC SUMMARY REPORT

Total Alkalinity by SM 2320B

Sample ID: **MB-R90967**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **4/9/2024**	RunNo: **90967**
Client ID: **MBLKW**	Batch ID: **R90967**		Analysis Date: **4/9/2024**	SeqNo: **1896732**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	ND	2.50									

Sample ID: **LCS-R90967**	SampType: **LCS**	Units: **mg/L**	Prep Date: **4/9/2024**	RunNo: **90967**
Client ID: **LCSW**	Batch ID: **R90967**		Analysis Date: **4/9/2024**	SeqNo: **1896733**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	103	2.50	100.0	0	103	89.7	129.7				

Sample ID: **2404133-001CDUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **4/9/2024**	RunNo: **90967**
Client ID: **BATCH**	Batch ID: **R90967**		Analysis Date: **4/9/2024**	SeqNo: **1896735**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	ND	2.50						0		20	

Fremont Analytical
An Alliance Technical Group Company

Sample Log-In Check List

Client Name:	FB	Work Order Number:	2404141
Logged by:	Morgan Wilson	Date Received:	4/8/2024 2:30:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☑	No ☐	NA ☐
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	3.2

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

SUBCONTRACT SAMPLE CHAIN OF CUSTODY 2404141

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 5500 4th Ave S

City, State, ZIP Seattle, WA 98108

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER	
Fremont	
PROJECT NAME/NO.	PO #
404105	E-114
REMARKS	
Aspect EDD	

TURNAROUND TIME

☒ Standard TAT

RUSH

Rush charges authorized by:

SAMPLE DISPOSAL

Dispose after 30 days

Return samples

Will call with instructions

						ANALYSES REQUESTED										
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Alkalinity	Nitrate	Nitrite	Sulfate	RSK-175						Notes
MW-6-040424		4/4/2024	1005	water	1	x										
MW-10-040424		4/4/2024	1100	water	1	x										
MW-15-040424		4/4/2024	1215	water	1	x										
MW-5-040424		4/4/2024	1340	water	1	x										
MW-9-040424		4/4/2024	1450	water	1	x										

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

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	4/8/24	0821
Received by:		Briana Ballard	FAI	4/8	2:30PM
Relinquished by:					
Received by:					

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

5500 4th Ave South
Seattle, WA 98108-2419
(206) 285-8282
office@friedmanandbruya.com
www.friedmanandbruya.com

April 23, 2024

Matthew Lewis, Project Manager
Aspect Consulting
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Mr Lewis:

Included are the additional results from the testing of material submitted on April 5, 2024 from the Crownhill Elementary 100094, F&BI 404105 project. There are 11 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data
ASP0423R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on April 5, 2024 by Friedman & Bruya, Inc. from the Aspect Consulting Crownhill Elementary 100094, F&BI 404105 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting
404105 -01	MW-6-040424
404105 -02	MW-10-040424
404105 -03	MW-15-040424
404105 -04	MW-5-040424
404105 -05	MW-9-040424
404105 -06	McKinney-040424
404105 -07	Trip Blank

All quality control requirements were acceptable.

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-6-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-01 x50
Date Analyzed:	04/18/24	Data File:	404105-01 x50.070
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	9,100
Manganese	2,000

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-10-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-02
Date Analyzed:	04/09/24	Data File:	404105-02.076
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	2,100

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-10-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-02 x100
Date Analyzed:	04/18/24	Data File:	404105-02 x100.071
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Manganese	1,300

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-15-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-03
Date Analyzed:	04/09/24	Data File:	404105-03.077
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	190
Manganese	<2

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-5-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-04
Date Analyzed:	04/09/24	Data File:	404105-04.078
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	420

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-5-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-04 x100
Date Analyzed:	04/18/24	Data File:	404105-04 x100.072
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Manganese	4,300

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-9-040424	Client:	Aspect Consulting
Date Received:	04/05/24	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	404105-05
Date Analyzed:	04/09/24	Data File:	404105-05.134
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	290
Manganese	<2

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Aspect Consulting
Date Received:	Not Applicable	Project:	Crownhill Elementary 100094
Date Extracted:	04/09/24	Lab ID:	I4-282 mb
Date Analyzed:	04/09/24	Data File:	I4-282 mb.070
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	<50
Manganese	<2

Date of Report: 04/23/24
Date Received: 04/05/24
Project: Crownhill Elementary 100094, F&BI 404105

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 6020B

Laboratory Code: 404105-05 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Iron	ug/L (ppb)	100	248	89 b	94 b	75-125	5 b
Manganese	ug/L (ppb)	20	<1	95	93	75-125	2

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Iron	ug/L (ppb)	100	97	80-120
Manganese	ug/L (ppb)	20	96	80-120

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria, biased low; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the standard reporting limit. 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.

k – The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

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.

404105

SAMPLE CHAIN OF CUSTODY

04/05/24 VW3/C2/ 1 J5

Page # 1 of 1

Report To Matthew Lewis
Company Aspect Consulting
Address 710 2nd Ave # 550
City, State, ZIP Seattle, WA, 98104
Phone 316.617.0499 Email matthew.lewis@aspectconsulting.com

SAMPLERS (*signature*)

PROJECT NAME	PO #
Crownhill Elementary	100094
REMARKS Project specific RLs? - Yes / No	INVOICE TO

TURNAROUND TIME
☒ Standard turnaround
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Archive samples
☐ Other
Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	Dissolved Fe+Mn ~~PCBs EPA 8082~~	Total Arsenic	Dissolved Arsenic	Alkalinity	TCE	Notes
						ANALYSES REQUESTED											⊗ per PB
MW-6-040424	01 A-C	4/4/24	1005	W	3							⊗	X	X	X		4/17/24
MW-10-040424	02 A-G		1100		7	X						⊗	X	X	X	X	ME
MW-15-040424	03 A-D		1215		4	X						⊗	X	X	X		
MW-5-040424	04 A-D		1340		4	X						⊗	X	X	X		
MW-9-040424	05 A-F		1450		6							⊗	X	X	X	X	
McKinney-040424	06 A-C	↓	1530	↓	3											X	
Trip Blank	07 A-B	–	–	W	2												Added at lab (NA) 4/5/24
												Samples received at 4 °C					

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Dawei Babiarz	Aspect Consulting	4/5/24	12:05
Received by:	NINH	FBI	4-5-24	1205
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
Ph. (206) 285-8282

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Friedman & Bruya
Michael Erdahl
5500 4th Ave S
Seattle, WA 98108

RE: 404105
Work Order Number: 2404141

April 15, 2024

Attention Michael Erdahl:

Fremont Analytical, Inc, an Alliance Technical Group company, received 5 sample(s) on 4/8/2024 for the analyses presented in the following report.

Total Alkalinity by SM 2320B

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes
Project Manager

Date: *04/15/2024*

CLIENT: Friedman & Bruya
Project: 404105
Work Order: 2404141

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2404141-001	MW-6-040424	04/04/2024 10:05 AM	04/08/2024 2:30 PM
2404141-002	MW-10-040424	04/04/2024 11:00 AM	04/08/2024 2:30 PM
2404141-003	MW-15-040424	04/04/2024 12:15 PM	04/08/2024 2:30 PM
2404141-004	MW-5-040424	04/04/2024 1:40 PM	04/08/2024 2:30 PM
2404141-005	MW-9-040424	04/04/2024 2:50 PM	04/08/2024 2:30 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Case Narrative

WO#: **2404141**
Date: **4/15/2024**

CLIENT: Friedman & Bruya
Project: 404105

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

CLIENT: Friedman & Bruya
Project: 404105

Lab ID: 2404141-001 **Collection Date:** 4/4/2024 10:05:00 AM
Client Sample ID: **MW-6-040424** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R90967		Analyst: NR
Alkalinity, Total (As CaCO3)	298	2.50		mg/L	1	4/9/2024 11:30:00 AM

Lab ID: 2404141-002 **Collection Date:** 4/4/2024 11:00:00 AM
Client Sample ID: **MW-10-040424** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R90967		Analyst: NR
Alkalinity, Total (As CaCO3)	241	2.50		mg/L	1	4/9/2024 11:30:00 AM

Lab ID: 2404141-003 **Collection Date:** 4/4/2024 12:15:00 PM
Client Sample ID: **MW-15-040424** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R90967		Analyst: NR
Alkalinity, Total (As CaCO3)	286	2.50		mg/L	1	4/9/2024 11:30:00 AM

Lab ID: 2404141-004 **Collection Date:** 4/4/2024 1:40:00 PM
Client Sample ID: **MW-5-040424** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R90967		Analyst: NR
Alkalinity, Total (As CaCO3)	732	2.50		mg/L	1	4/9/2024 11:30:00 AM

Analytical Report

Work Order: **2404141**
Date Reported: **4/15/2024**

CLIENT: Friedman & Bruya
Project: 404105

Lab ID: 2404141-005
Client Sample ID: **MW-9-040424**
Collection Date: 4/4/2024 2:50:00 PM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R90967		Analyst: NR
Alkalinity, Total (As CaCO3)	285	2.50		mg/L	1	4/9/2024 11:30:00 AM

Work Order: 2404141
CLIENT: Friedman & Bruya
Project: 404105

QC SUMMARY REPORT

Total Alkalinity by SM 2320B

Sample ID: **MB-R90967**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **4/9/2024**	RunNo: **90967**
Client ID: **MBLKW**	Batch ID: **R90967**		Analysis Date: **4/9/2024**	SeqNo: **1896732**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	ND	2.50									

Sample ID: **LCS-R90967**	SampType: **LCS**	Units: **mg/L**	Prep Date: **4/9/2024**	RunNo: **90967**
Client ID: **LCSW**	Batch ID: **R90967**		Analysis Date: **4/9/2024**	SeqNo: **1896733**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	103	2.50	100.0	0	103	89.7	129.7				

Sample ID: **2404133-001CDUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **4/9/2024**	RunNo: **90967**
Client ID: **BATCH**	Batch ID: **R90967**		Analysis Date: **4/9/2024**	SeqNo: **1896735**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	ND	2.50						0		20	

Fremont Analytical
An Alliance Technical Group Company

Sample Log-In Check List

Client Name:	FB	Work Order Number:	2404141
Logged by:	Morgan Wilson	Date Received:	4/8/2024 2:30:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☑	No ☐	NA ☐
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	3.2

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

SUBCONTRACT SAMPLE CHAIN OF CUSTODY 2404141

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 5500 4th Ave S

City, State, ZIP Seattle, WA 98108

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER	
Fremont	
PROJECT NAME/NO.	PO #
404105	E-114
REMARKS	
Aspect EDD	

TURNAROUND TIME

☒ Standard TAT

RUSH

Rush charges authorized by:

SAMPLE DISPOSAL

Dispose after 30 days

Return samples

Will call with instructions

						ANALYSES REQUESTED										
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Alkalinity	Nitrate	Nitrite	Sulfate	RSK-175						Notes
MW-6-040424		4/4/2024	1005	water	1	x										
MW-10-040424		4/4/2024	1100	water	1	x										
MW-15-040424		4/4/2024	1215	water	1	x										
MW-5-040424		4/4/2024	1340	water	1	x										
MW-9-040424		4/4/2024	1450	water	1	x										

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

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	4/8/24	0821
Received by:		Briana Ballard	FAI	4/8	2:30PM
Relinquished by:					
Received by:					

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

5500 4th Ave South
Seattle, WA 98108-2419
(206) 285-8282
office@friedmanandbruya.com
www.friedmanandbruya.com

July 12, 2024

Matthew Lewis, Project Manager
Aspect Consulting, LLC
350 Madison Ave. N.
Bainbridge Island, WA 98110-1810

Dear Mr Lewis:

Included are the results from the testing of material submitted on July 3, 2024 from the Crownhill Elementary AS100094, F&BI 407039 project. There are 17 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data
ASP0712R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on July 3, 2024 by Friedman & Bruya, Inc. from the Aspect Consulting, LLC Crownhill Elementary AS100094, F&BI 407039 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting, LLC
407039 -01	MW-6-240702
407039 -02	MW-10-240702
407039 -03	Trip Blank

Samples MW-6-240702 and MW-10-240702 were sent to Alliance Technical Group for alkalinity analysis. The report is enclosed.

All quality control requirements were acceptable.

Date of Report: 07/12/24
Date Received: 07/03/24
Project: Crownhill Elementary AS100094, F&BI 407039
Date Extracted: 07/08/24
Date Analyzed: 07/08/24

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 50-150)
MW-10-240702 407039-02	<50	<250	88
Method Blank 04-1544 MB	<50	<250	75

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	MW-10-240702	Client:	Aspect Consulting, LLC
Date Received:	07/03/24	Project:	Crownhill Elementary AS100094
Date Extracted:	07/09/24	Lab ID:	407039-02
Date Analyzed:	07/09/24	Data File:	070914.D
Matrix:	Water	Instrument:	GCMS11
Units:	ug/L (ppb)	Operator:	IJL

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	78	126
Toluene-d8	104	84	115
4-Bromofluorobenzene	111	72	130

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<0.5

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	Crownhill Elementary AS100094
Date Extracted:	07/09/24	Lab ID:	04-1488 mb
Date Analyzed:	07/09/24	Data File:	070909.D
Matrix:	Water	Instrument:	GCMS11
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	78	126
Toluene-d8	99	84	115
4-Bromofluorobenzene	106	72	130

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<0.5

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-6-240702	Client:	Aspect Consulting, LLC
Date Received:	07/03/24	Project:	Crownhill Elementary AS100094
Date Extracted:	07/05/24	Lab ID:	407039-01
Date Analyzed:	07/05/24	Data File:	407039-01.168
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	24

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-10-240702	Client:	Aspect Consulting, LLC
Date Received:	07/03/24	Project:	Crownhill Elementary AS100094
Date Extracted:	07/05/24	Lab ID:	407039-02
Date Analyzed:	07/05/24	Data File:	407039-02.169
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.6

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	NA	Project:	Crownhill Elementary AS100094
Date Extracted:	07/05/24	Lab ID:	I4-554 mb
Date Analyzed:	07/05/24	Data File:	I4-554 mb.144
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-6-240702	Client:	Aspect Consulting, LLC
Date Received:	07/03/24	Project:	Crownhill Elementary AS100094
Date Extracted:	07/10/24	Lab ID:	407039-01
Date Analyzed:	07/10/24	Data File:	407039-01.138
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	23

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-6-240702	Client:	Aspect Consulting, LLC
Date Received:	07/03/24	Project:	Crownhill Elementary AS100094
Date Extracted:	07/10/24	Lab ID:	407039-01 x50
Date Analyzed:	07/10/24	Data File:	407039-01 x50.102
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	6,400
Manganese	2,000

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-10-240702	Client:	Aspect Consulting, LLC
Date Received:	07/03/24	Project:	Crownhill Elementary AS100094
Date Extracted:	07/10/24	Lab ID:	407039-02
Date Analyzed:	07/10/24	Data File:	407039-02.141
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.6

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-10-240702	Client:	Aspect Consulting, LLC
Date Received:	07/03/24	Project:	Crownhill Elementary AS100094
Date Extracted:	07/10/24	Lab ID:	407039-02 x50
Date Analyzed:	07/11/24	Data File:	407039-02 x50.059
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	2,800
Manganese	1,300

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	NA	Project:	Crownhill Elementary AS100094
Date Extracted:	07/10/24	Lab ID:	I4-561 mb
Date Analyzed:	07/10/24	Data File:	I4-561 mb.100
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Iron	<50
Manganese	<1

Date of Report: 07/12/24
Date Received: 07/03/24
Project: Crownhill Elementary AS100094, F&BI 407039

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	84	92	65-151	9

Date of Report: 07/12/24
Date Received: 07/03/24
Project: Crownhill Elementary AS100094, F&BI 407039

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

Laboratory Code: 407077-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Trichloroethene	ug/L (ppb)	10	<0.5	96	35-149

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Trichloroethene	ug/L (ppb)	10	91	96	70-130	5

Date of Report: 07/12/24
Date Received: 07/03/24
Project: Crownhill Elementary AS100094, F&BI 407039

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 407046-01 x10 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	<10	94	98	75-125	4

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	93	80-120

Date of Report: 07/12/24
Date Received: 07/03/24
Project: Crownhill Elementary AS100094, F&BI 407039

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 6020B

Laboratory Code: 407039-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	23.3	97 b	104 b	75-125	7 b
Iron	ug/L (ppb)	100	4,740	0 b	0 b	75-125	nm
Manganese	ug/L (ppb)	20	1,620	0 b	104 b	75-125	200 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	99	80-120
Iron	ug/L (ppb)	100	106	80-120
Manganese	ug/L (ppb)	20	97	80-120

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria, biased low; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the standard reporting limit. 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.

k – The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

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.

407039

SAMPLE CHAIN OF CUSTODY

07/03/24 C2/VW1/J2

Page # 1 of 1

Report To Matthew Lewis

Company Aspect Consulting

Address

City, State, ZIP

Phone 404-210-6437 Email Matthew.lewis@aspectconsulting.com

SAMPLERS (signature) Carmen Tappen

PROJECT NAME: Crownhill Elementary

PO #: AS100094

REMARKS

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME
- ☑ Standard turnaround
- ☐ RUSH
- Rush charges authorized by:

SAMPLE DISPOSAL
- ☐ Archive samples
- ☐ Other
- Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Total Arsenic EPA 6010	Diss. As, Fe, Mn EPA 6010	TCE by EPA 8260	Alkalinity	Notes
MW-6-240702	01A-C	7/2/24	0850	W	3								X	X		X	
MW-10-240702	02A-G	↓	0950	W	7	X							X	X	X	X	
Trip Blank	03A-B	–	–	Water	2												Added at lab AP 07/03
								Samples received at Ø °C									

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Carmen Tappen	Carmen Tappen	Aspect Consulting	7/2/24	1230
Received by:	ANH PHAN	FBI	07/03/24	08:56
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
Ph. (206) 285-8282

SAMPLE CONDITION UPON RECEIPT CHECKLIST

PROJECT # 407039 CLIENT ASP INITIALS/ DATE: AP 07/03/24

If custody seals are present on cooler, are they intact? ☑ NA ☐ YES ☐ NO

Cooler/Sample temperature Ø °C
Thermometer ID: Fluke 96312917

Were samples received on ice/cold packs? ☑ YES ☐ NO

How did samples arrive?
☐ Over the Counter ☐ Picked up by F&BI ☑ FedEx/UPS/GSO

Is there a Chain-of-Custody* (COC)? ☑ YES ☐ NO Initials/ Date: AP 07/03/24
*or other representative documents, letters, and/or shipping memos

Number of days samples have been sitting prior to receipt at laboratory 1 days

Are the samples clearly identified? (explain "no" answer below) ☑ YES ☐ NO

Were all sample containers received intact (i.e. not broken, leaking etc.)? (explain "no" answer below) ☑ YES ☐ NO

Were appropriate sample containers used? ☑ YES ☐ NO ☐ Unknown

If custody seals are present on samples, are they intact? ☑ NA ☐ YES ☐ NO

Are samples requiring no headspace, headspace free? ☐ NA ☑ YES ☐ NO

Is the following information provided on the COC, and does it match the sample label?
(explain "no" answer below)

Sample ID's	☑ Yes	☐ No	☐ Not on COC/label
Date Sampled	☑ Yes	☐ No	☐ Not on COC/label
Time Sampled	☑ Yes	☐ No	☐ Not on COC/label
# of Containers	☐ Yes	☑ No	Added TripBlank at lab.
Relinquished	☑ Yes	☐ No	
Requested analysis	☑ Yes	☐ On Hold	

Other comments (use a separate page if needed)

Air Samples: Were any additional canisters/tubes received? ☑ NA ☐ YES ☐ NO

Number of unused TO15 canisters _____ **Number of unused TO17 tubes** _____


ORIGIN ID:PWTA (404) 210-6437
GEOSYNTEC CONSULTANTS
710 2ND AVE STE 550
SEATTLE, WA 98104
UNITED STATES US
SHIP DATE: 02JUL24
ACTWGT: 16.20 LB
CAD: 6994833/SSFE2521
DIMS: 13x12x11 IN
BILL THIRD PARTY
TO FRIEDMAN AND BRUYA INC
5500 4TH AVE S
SEATTLE WA 98108
(206) 285-8282
REF: AS100094J-013-04
DEPT:
INV:
PO:
FedEx
Express
TRK# 0201 2766 1596 6317
WED - 03 JUL 10:30A
PRIORITY OVERNIGHT
AHS
98108
SEA
WA-US
85 BFIA

3600 Fremont Ave N
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Friedman & Bruya
Michael Erdahl
5500 4th Ave S
Seattle, WA 98108

RE: 407039,
Work Order Number: 2407076

July 11, 2024

Attention Michael Erdahl:

Fremont Analytical, Inc, an Alliance Technical Group company, received 2 sample(s) on 7/3/2024 for the analyses presented in the following report.

Total Alkalinity by SM 2320B

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes
Project Manager

Date: *07/11/2024*

CLIENT: Friedman & Bruya
Project: 407039
Work Order: 2407076

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2407076-001	MW-6-240702	07/02/2024 8:50 AM	07/03/2024 1:21 PM
2407076-002	MW-10-240702	07/02/2024 9:50 AM	07/03/2024 1:21 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Original

Case Narrative

WO#: **2407076**

Date: **7/11/2024**

CLIENT: Friedman & Bruya
Project: 407039

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Analytical Report

Work Order: **2407076**
Date Reported: **7/11/2024**

CLIENT: Friedman & Bruya
Project: 407039

Lab ID: 2407076-001 **Collection Date:** 7/2/2024 8:50:00 AM
Client Sample ID: **MW-6-240702** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R92953		Analyst: NR
Alkalinity, Total (As CaCO3)	304	2.50		mg/L	1	7/10/2024 4:20:37 PM

Lab ID: 2407076-002 **Collection Date:** 7/2/2024 9:50:00 AM
Client Sample ID: **MW-10-240702** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by SM 2320B				Batch ID: R92953		Analyst: NR
Alkalinity, Total (As CaCO3)	244	2.50		mg/L	1	7/10/2024 4:20:37 PM

Work Order: 2407076
CLIENT: Friedman & Bruya
Project: 407039

QC SUMMARY REPORT

Total Alkalinity by SM 2320B

Sample ID: **MB-R92953**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **7/10/2024**	RunNo: **92953**
Client ID: **MBLKW**	Batch ID: **R92953**		Analysis Date: **7/10/2024**	SeqNo: **1940288**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	ND	2.50									

Sample ID: **LCS-R92953**	SampType: **LCS**	Units: **mg/L**	Prep Date: **7/10/2024**	RunNo: **92953**
Client ID: **LCSW**	Batch ID: **R92953**		Analysis Date: **7/10/2024**	SeqNo: **1940289**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	106	2.50	100.0	0	106	84.5	124.5				

Sample ID: **2407041-001BDUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **7/10/2024**	RunNo: **92953**
Client ID: **BATCH**	Batch ID: **R92953**		Analysis Date: **7/10/2024**	SeqNo: **1940291**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	370	2.50						370.2	0.159	20	

Sample Log-In Check List

Client Name:	FB	Work Order Number:	2407076
Logged by:	Clare Griggs	Date Received:	7/3/2024 1:21:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Courier		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☑	No ☐	NA ☐
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

Item #	Temp ºC
Sample	14.1

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

2407076

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Page # _____ of _____

Send Report To Michael Erdahl

Company Friedman & Bruya.

Address 5500 4th Ave S

City, State, ZIP Seattle, WA 98108

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER
Fremont

PROJECT NAME/NO.	PO #
407039	E-281ng

REMARKS
EDD

TURNAROUND TIME
☒ Standard
RUSH _____
Rush charges authorized by: _____

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Alkalinity										Notes
MW-6-240702		7/2/2024	8:50	water	1	x										
MW-10-24702		7/2/2024	9:50	water	1	x										

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Mac Goldman	Friedman and Bruya	7/3	9:50
Received by:	Briana Ballard	ATG	7/3	1:21 PM
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

5500 4th Ave South
Seattle, WA 98108-2419
(206) 285-8282
office@friedmanandbruya.com
www.friedmanandbruya.com

October 24, 2024

Daniel Babcock, Project Manager
Aspect Consulting
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Mr Babcock:

Included are the results from the testing of material submitted on October 15, 2024 from the Crownhill AS100094, F&BI 410306 project. There are 25 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data, Matthew Lewis
ASP1024R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on October 15, 2024 by Friedman & Bruya, Inc. from the Aspect Consulting Crownhill AS100094, F&BI 410306 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting
410306 -01	MW-6-10142024
410306 -02	MW-10-10142024
410306 -03	MW-9-10142024
410306 -04	MW-12-10142024
410306 -05	McKinney-10142024
410306 -06	Trip Blank

Samples MW-6-10142024, MW-10-10142024, MW-9-10142024, and MW-12-10142024 were sent to Alliance Technical Group for alkalinity analysis. The report is enclosed.

The 6020B mangenese calibration standard exceeded the acceptance criteria for sample MW-9-10142024. The metal was not detected, therefore this did not represent an out of control condition, and the results are not considered estimates.

All other quality control requirements were acceptable.

Date of Report: 10/24/24
Date Received: 10/15/24
Project: Crownhill AS100094, F&BI 410306
Date Extracted: 10/16/24
Date Analyzed: 10/16/24

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 50-150)
MW-10-10142024 410306-02	73 x	<250	82
MW-12-10142024 410306-04	1,800 x	690 x	77
Method Blank 04-2540 MB3	<50	<250	84

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	MW-10-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/21/24	Lab ID:	410306-02
Date Analyzed:	10/21/24	Data File:	102112.D
Matrix:	Water	Instrument:	GCMS11
Units:	ug/L (ppb)	Operator:	IJL

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	78	126
Toluene-d8	98	84	115
4-Bromofluorobenzene	99	72	130

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<0.5

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	MW-9-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/21/24	Lab ID:	410306-03
Date Analyzed:	10/21/24	Data File:	102114.D
Matrix:	Water	Instrument:	GCMS11
Units:	ug/L (ppb)	Operator:	IJL

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	104	78	126
Toluene-d8	97	84	115
4-Bromofluorobenzene	101	72	130

Compounds:	Concentration ug/L (ppb)
Trichloroethene	9.7

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	McKinney-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/21/24	Lab ID:	410306-05
Date Analyzed:	10/21/24	Data File:	102113.D
Matrix:	Water	Instrument:	GCMS11
Units:	ug/L (ppb)	Operator:	IJL

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	104	78	126
Toluene-d8	99	84	115
4-Bromofluorobenzene	99	72	130

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<0.5

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Method Blank	Client:	Aspect Consulting
Date Received:	Not Applicable	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/21/24	Lab ID:	04-2516 mb
Date Analyzed:	10/21/24	Data File:	102109.D
Matrix:	Water	Instrument:	GCMS11
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	78	126
Toluene-d8	97	84	115
4-Bromofluorobenzene	105	72	130

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<0.5

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-6-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	410306-01
Date Analyzed:	10/18/24	Data File:	410306-01.291
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	22

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-10-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	410306-02
Date Analyzed:	10/18/24	Data File:	410306-02.292
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.7

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-9-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	410306-03
Date Analyzed:	10/18/24	Data File:	410306-03.293
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	MW-12-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	410306-04
Date Analyzed:	10/18/24	Data File:	410306-04.294
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.6

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Aspect Consulting
Date Received:	NA	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	I4-885 mb
Date Analyzed:	10/17/24	Data File:	I4-885 mb.096
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-6-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	410306-01
Date Analyzed:	10/17/24	Data File:	410306-01.248
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	22

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-6-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	410306-01 x50
Date Analyzed:	10/18/24	Data File:	410306-01 x50.077
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	7,700
Manganese	1,900

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-10-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	410306-02
Date Analyzed:	10/17/24	Data File:	410306-02.251
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.6

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-10-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	410306-02 x10
Date Analyzed:	10/18/24	Data File:	410306-02 x10.078
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	1,900
Manganese	1,300

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-9-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	410306-03
Date Analyzed:	10/17/24	Data File:	410306-03.252
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Manganese	<1 k

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-9-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	410306-03 x2
Date Analyzed:	10/22/24	Data File:	410306-03 x2.143
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	210

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-12-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	410306-04
Date Analyzed:	10/17/24	Data File:	410306-04.253
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.6

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-12-10142024	Client:	Aspect Consulting
Date Received:	10/15/24	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	410306-04 x10
Date Analyzed:	10/18/24	Data File:	410306-04 x10.080
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Iron	820
Manganese	5,100

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Aspect Consulting
Date Received:	NA	Project:	Crownhill AS100094, F&BI 410306
Date Extracted:	10/17/24	Lab ID:	I4-887 mb
Date Analyzed:	10/17/24	Data File:	I4-887 mb.109
Matrix:	Water	Instrument:	ICPMS3
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Iron	<50
Manganese	<1

Date of Report: 10/24/24
Date Received: 10/15/24
Project: Crownhill AS100094, F&BI 410306

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	92	88	72-139	4

Date of Report: 10/24/24
Date Received: 10/15/24
Project: Crownhill AS100094, F&BI 410306

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

Laboratory Code: 410353-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Trichloroethene	ug/L (ppb)	10	<0.5	97	35-149

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Trichloroethene	ug/L (ppb)	10	93	96	70-130	3

Date of Report: 10/24/24
Date Received: 10/15/24
Project: Crownhill AS100094, F&BI 410306

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 410324-03 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	4.17	99 b	99 b	75-125	0 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	98	80-120

Date of Report: 10/24/24
Date Received: 10/15/24
Project: Crownhill AS100094, F&BI 410306

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 6020B

Laboratory Code: 410306-01 x10 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	22.9	96 b	103 b	75-125	7 b
Iron	ug/L (ppb)	100	7,290	361 b	542 b	75-125	40 b
Manganese	ug/L (ppb)	20	1,790	578 b	629 b	75-125	8 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	101	80-120
Iron	ug/L (ppb)	100	105	80-120
Manganese	ug/L (ppb)	20	99	80-120

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria, biased low; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the standard reporting limit. 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.

k – The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

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.

410306

SAMPLE CHAIN OF CUSTODY

10/15/24 VW1/J3/C2

Page # 1 of 1

Report To Daniel Babcock + Matthew Lewis

Company Aspect

Address 3201 MLK jr way S

City, State, ZIP Seattle, WA 98114

Phone 206 838 5846 or 206 812 4745 Email Daniel.babcock@aspectconsulting.com or Matthew.lewis@aspectconsulting.com

SAMPLERS (*signature*) M. Ferry

PROJECT NAME: Crownhill

PO #:

REMARKS:

Project specific RLs? - Yes / No

INVOICE TO:

TURNAROUND TIME
- [x] Standard turnaround
- [ ] RUSH
- Rush charges authorized by:

SAMPLE DISPOSAL
- [ ] Archive samples
- [ ] Other
- Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	TCE VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Total Arsenic	Dissolved As, Fe, Mn	Alkalinity		Notes
MW-6-10142024	01 A-C	10/14/24	1100	GW	3								X	X	X		Dissolved = Field Filtered (FF)
MW-10-10142024	02 A-G	10/14/24	1250	GW	7	X				X			X	X	X		
MW-9-10142024	03 A-F	10/14/24	1643	GW	6					X			X	X	X		
MW-12-10142024	04 A-E	10/14/24	1740	GW	4	X							X	X	X		
McKinney-10142024	05 A-C	10/14/24	1809	GW	3					X							
Trip Blank	06 A-B	-	-	Water	2												Added at lab AP 10/15

10/14/24 M. Ferry

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: M. Ferry	Maddy Ferry	Aspect	10/15/24	1321
Received by:	Anh Phan	FBI	10/15/24	13:21
Relinquished by:		Samples received at 3 °C		
Received by:				

Friedman & Bruya, Inc.
5500 4th Ave S.
Seattle WA 98108
(206) 285-8282
office@friedmanandbruya.com

SAMPLE CONDITION UPON RECEIPT CHECKLIST

PROJECT # 410306 CLIENT Aspect INITIALS/ DATE: AP 10/15/24

If custody seals are present on cooler, are they intact? ☑ NA ☐ YES ☐ NO

Cooler/Sample temperature 3 °C
Thermometer ID: Fluke 96312917

Were samples received on ice/cold packs? ☑ YES ☐ NO

How did samples arrive?
☑ Over the Counter ☐ Picked up by F&BI ☐ FedEx/UPS/GSO

Is there a Chain-of-Custody* (COC)? ☑ YES ☐ NO Initials (NP) Date: 10/15/24
*or other representative documents, letters, and/or shipping memos

Number of days samples have been sitting prior to receipt at laboratory 1 days

Are the samples clearly identified? (explain "no" answer below) ☑ YES ☐ NO

Were all sample containers received intact (i.e. not broken, leaking etc.)? (explain "no" answer below) ☑ YES ☐ NO

Were appropriate sample containers used? ☑ YES ☐ NO ☐ Unknown

If custody seals are present on samples, are they intact? ☑ NA ☐ YES ☐ NO

Are samples requiring no headspace, headspace free? ☐ NA ☑ YES ☐ NO

Is the following information provided on the COC, and does it match the sample label?
(explain "no" answer below)

Sample ID's	☑ Yes	☐ No	☐ Not on COC/label
Date Sampled	☑ Yes	☐ No	☐ Not on COC/label
Time Sampled	☑ Yes	☐ No	☐ Not on COC/label
# of Containers	☐ Yes	☑ No	Added Trip Blank to COC
Relinquished	☑ Yes	☐ No	
Requested analysis	☐ Yes	☐ On Hold	

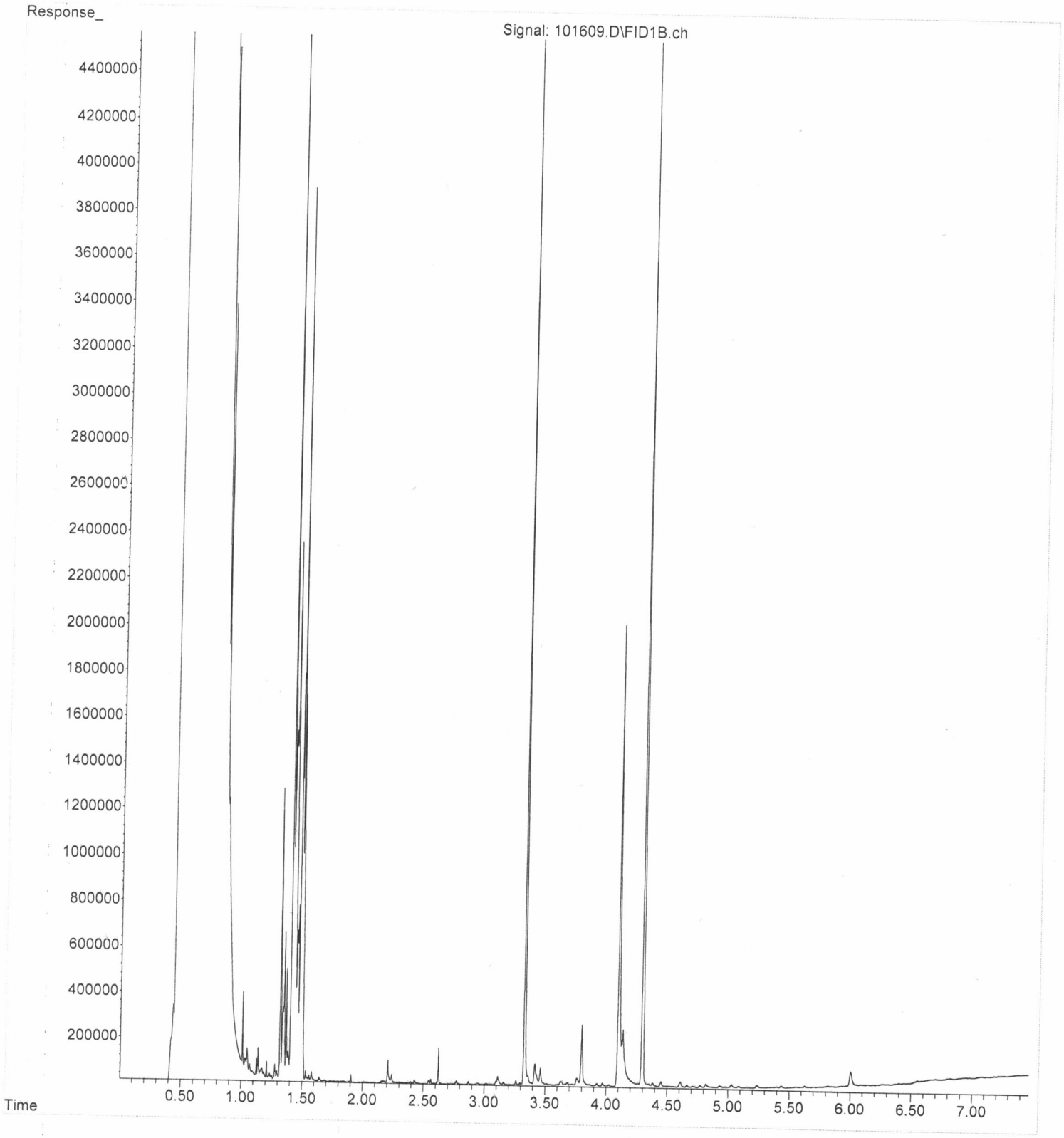
Other comments (use a separate page if needed)

Air Samples: Were any additional canisters/tubes received? ☑ NA ☐ YES ☐ NO

Number of unused TO15 canisters _____ **Number of unused TO17 tubes** _____

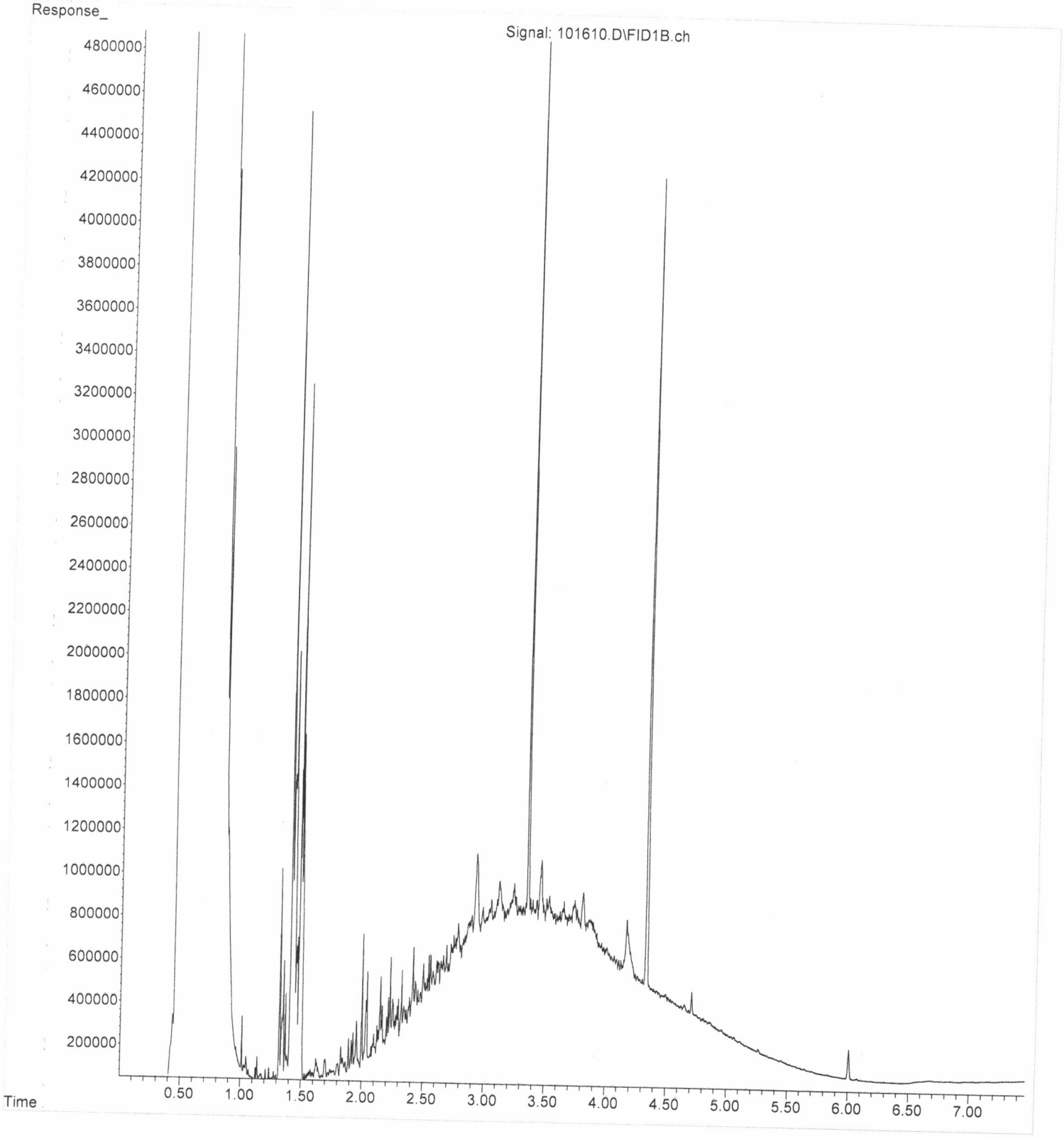
File :P:\Proc_GC14\10-16-24\101609.D
Operator : TL
Acquired : 16 Oct 2024 10:27 am using AcqMethod DX.M
Instrument : GC14
Sample Name: 410306-02
Misc Info :
Vial Number: 9

ERR



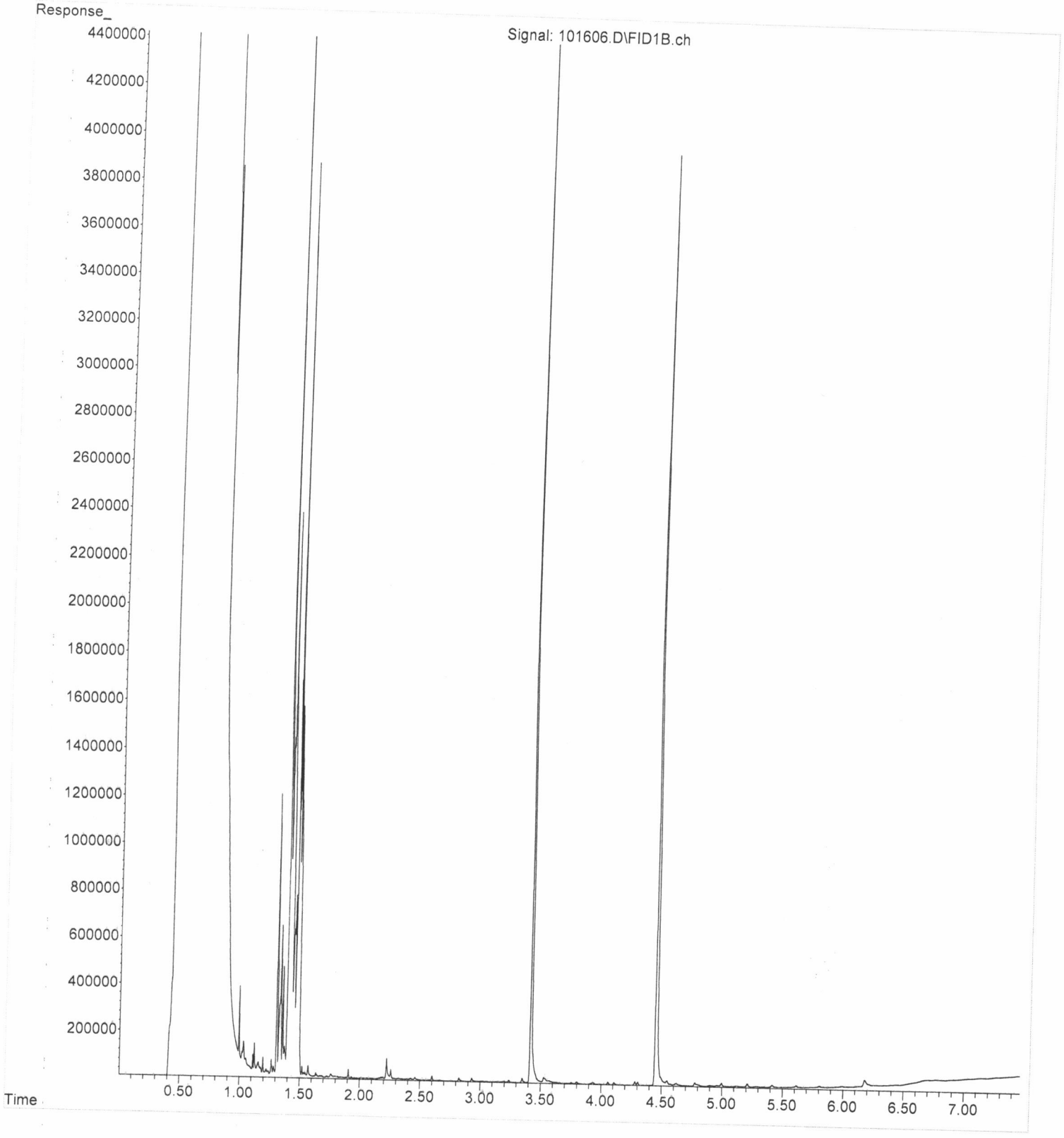
File :P:\Proc_GC14\10-16-24\101610.D
Operator : TL
Acquired : 16 Oct 2024 10:39 am using AcqMethod DX.M
Instrument : GC14
Sample Name: 410306-04
Misc Info :
Vial Number: 10

ERR



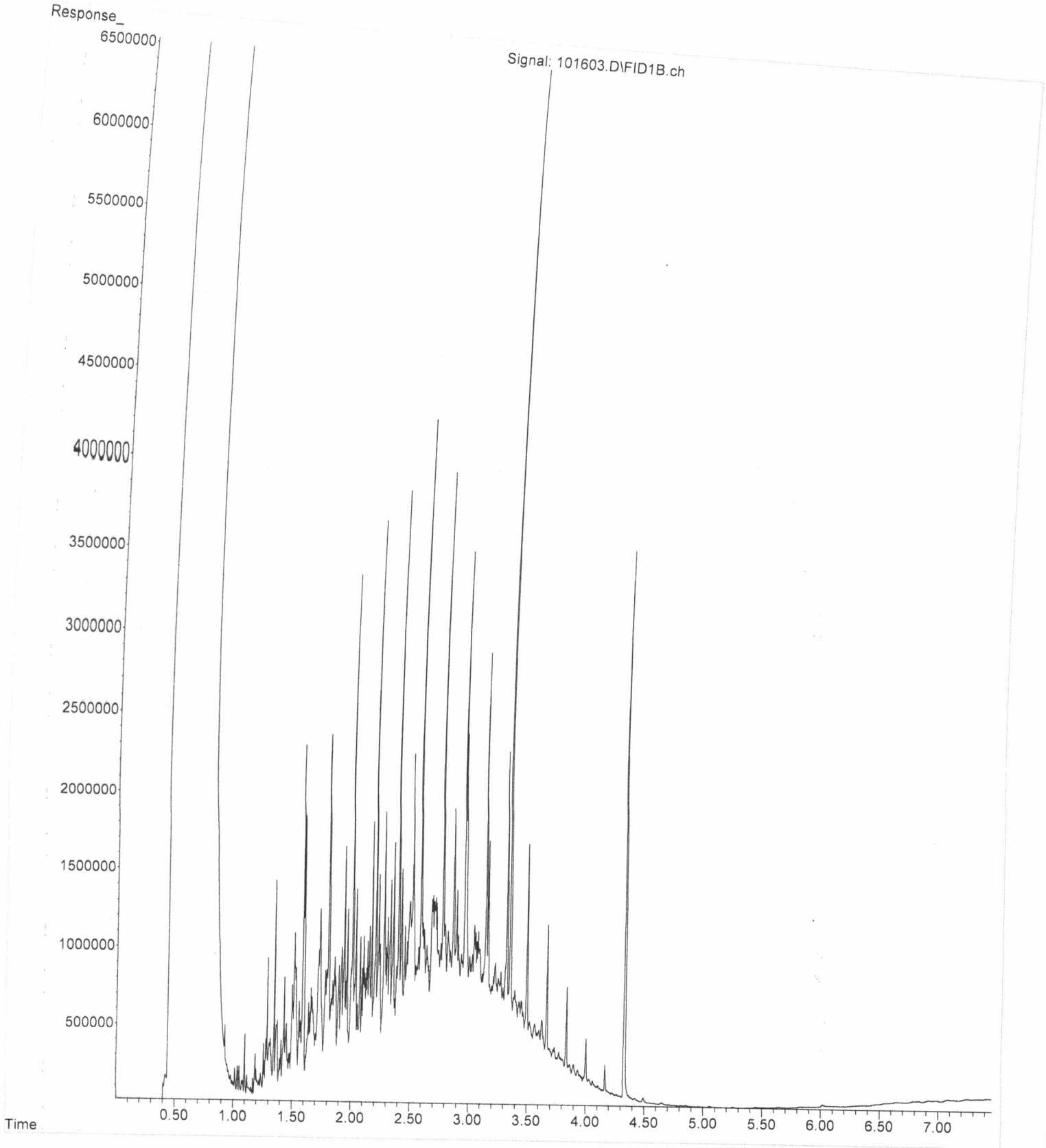
File :P:\Proc_GC14\10-16-24\101606.D
Operator : TL
Acquired : 16 Oct 2024 09:51 am using AcqMethod DX.M
Instrument : GC14
Sample Name: 04-2540 mb3
Misc Info :
Vial Number: 6

ERR



File :P:\Proc_GC14\10-16-24\101603.D
Operator : TL
Acquired : 16 Oct 2024 08:16 am using AcqMethod DX.M
Instrument : GC14
Sample Name: 500 Dx 73-88G
Misc Info :
Vial Number: 3

ERR



3600 Fremont Ave N
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Friedman & Bruya
Michael Erdahl
5500 4th Ave S
Seattle, WA 98108

RE: 410306,
Work Order Number: 2410310

October 22, 2024

Attention Michael Erdahl:

Fremont Analytical, Inc, an Alliance Technical Group company, received 4 sample(s) on 10/15/2024 for the analyses presented in the following report.

Total Alkalinity by EPA 310.2

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes
Project Manager

Date: *10/22/2024*

CLIENT: Friedman & Bruya
Project: 410306
Work Order: 2410310

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2410310-001	MW-6-10142024	10/14/2024 11:00 AM	10/15/2024 3:05 PM
2410310-002	MW-10-10142024	10/14/2024 12:50 PM	10/15/2024 3:05 PM
2410310-003	MW-9-10142024	10/14/2024 4:43 PM	10/15/2024 3:05 PM
2410310-004	MW-12-10142024	10/14/2024 5:40 PM	10/15/2024 3:05 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Case Narrative

WO#: **2410310**

Date: **10/22/2024**

CLIENT: Friedman & Bruya

Project: 410306

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
DUP - Sample Duplicate
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MCL - Maximum Contaminant Level
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
REP - Sample Replicate
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

CLIENT: Friedman & Bruya
Project: 410306

Lab ID: 2410310-001 **Collection Date:** 10/14/2024 11:00:00 AM
Client Sample ID: **MW-6-10142024** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by EPA 310.2				Batch ID: R95146		Analyst: NR
Alkalinity, Total (As CaCO3)	356	50.0	D	mg/L	20	10/21/2024 1:31:00 PM

Lab ID: 2410310-002 **Collection Date:** 10/14/2024 12:50:00 PM
Client Sample ID: **MW-10-10142024** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by EPA 310.2				Batch ID: R95146		Analyst: NR
Alkalinity, Total (As CaCO3)	262	25.0	D	mg/L	10	10/21/2024 1:04:00 PM

Lab ID: 2410310-003 **Collection Date:** 10/14/2024 4:43:00 PM
Client Sample ID: **MW-9-10142024** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by EPA 310.2				Batch ID: R95146		Analyst: NR
Alkalinity, Total (As CaCO3)	250	25.0	D	mg/L	10	10/21/2024 1:06:00 PM

Lab ID: 2410310-004 **Collection Date:** 10/14/2024 5:40:00 PM
Client Sample ID: **MW-12-10142024** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Total Alkalinity by EPA 310.2				Batch ID: R95146		Analyst: NR
Alkalinity, Total (As CaCO3)	900	100	D	mg/L	40	10/21/2024 1:39:00 PM

Work Order: 2410310
CLIENT: Friedman & Bruya
Project: 410306

QC SUMMARY REPORT

Total Alkalinity by EPA 310.2

Sample ID: **MB**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **10/21/2024**	RunNo: **95146**
Client ID: **MBLKW**	Batch ID: **R95146**		Analysis Date: **10/21/2024**	SeqNo: **1986311**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	ND	2.50									

Sample ID: **LCS**	SampType: **LCS**	Units: **mg/L**	Prep Date: **10/21/2024**	RunNo: **95146**
Client ID: **LCSW**	Batch ID: **R95146**		Analysis Date: **10/21/2024**	SeqNo: **1986312**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	25.3	2.50	25.00	0	101	83.8	121				

Sample ID: **2410310-004ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **10/21/2024**	RunNo: **95146**
Client ID: **MW-12-10142024**	Batch ID: **R95146**		Analysis Date: **10/21/2024**	SeqNo: **1986317**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	69.7	2.50						68.60	1.59	20	E

Sample Log-In Check List

Client Name:	FB	Work Order Number:	2410310
Logged by:	Morgan Wilson	Date Received:	10/15/2024 3:05:00 PM

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Courier		

Log In

3.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Present ☑
4.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
5.	Were all items received at a temperature of >2°C to 6°C *	Yes ☑	No ☐	NA ☐
6.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
7.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8.	Are samples properly preserved?	Yes ☑	No ☐	
9.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
11.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
12.	Does paperwork match bottle labels?	Yes ☑	No ☐	
13.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14.	Is it clear what analyses were requested?	Yes ☑	No ☐	
15.	Were all hold times (except field parameters, pH e.g.) able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

Item #	Temp °C
Sample	5.8

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

2410310

Send Report To Michael Erdahl
Company Friedman and Bruya, Inc.
Address 5500 4th Ave S
City, State, ZIP Seattle, WA 98108
Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER ATG	
PROJECT NAME/NO. 410306	PO # E-464
REMARKS Aspect EDD	

TURNAROUND TIME
☒ Standard TAT
RUSH____
Rush charges authorized by:

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Alkalinity										Notes
MW-6-10142024		10/14/2024	1100	water	1	x										
MW-10-10142024		10/14/2024	1250	water	1	x										
MW-9-10142024		10/14/2024	1643	water	1	x										
MW-12-101420224		10/14/2024	1740	water	1	x										

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

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	10/15/24	1410
Received by:		Nathan Kolber	ATG	10/15/24	1505
Relinquished by:					
Received by:					

APPENDIX D

Soil Gas Survey Field Forms

Electronic Copy

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Region Office
PO Box 330316, Shoreline, WA 98133-9716 • 206-594-0000

September 30, 2024

John Fisher
Bremerton School District
200 Bruenn Ave
Bremerton, WA 98312-3108
(john.fisher@bremertonschools.org)

RE: Request for Evaluation of Trichloroethylene Risks at the following Site:

- **Site Name:** Crownhill Elementary
- **Site Address:** 1500 Rocky Point Rd NW, Bremerton, 98312
- **Facility/Site No.:** 99722456
- **CSID No:** 4487

Dear John Fisher:

During Site review and evaluation associated with the five-year periodic review, Ecology found that TCE concentrations at well MW-9 have ranged from 5 to 12 µg/l, which exceeds the Method B groundwater screening level for vapor intrusion of 1.4 µg/l (CLARC, 2024). Adjacent residences may be located within 100 feet of the TCE impacted groundwater, which could indicate a vapor intrusion risk (See Site Figure, attached). TCE concentrations during the last four monitoring events have also exceeded the short-term groundwater screening level for vapor intrusion for residential receptors of 8 µg/l (per Ecology's Publication No. 09-09-047, Guidance for Evaluating Vapor Intrusion in Washington State, Appendix A, attached).

If TCE is present in indoor air, it can result in health impacts to building occupants, the most urgent of which are to pregnant women. U.S. EPA has concluded that brief exposures to TCE in air may affect women in the first trimester of pregnancy by increasing the risk of heart malformations to a developing fetus[1].

While TCE has not been detected above screening levels in sub-slab soil gas analytical results collected at the main school building, TCE extent does not appear to have been delineated to the north and east of MW-9. Ecology understands that this is the assumed upgradient direction with respect to MW-9 and the Site, but potential impacts to indoor air in the residences are unknown.

Next Steps:

To further characterize this impact and assess off-property risk, Ecology request that the PLP install additional monitoring wells between MW-9 and the north and east fence lines.

[1] See U.S. EPA August 2014, Office of Solid Waste and Emergency Response Memorandum: Compilation of Information Relating to Early/Interim Actions at Superfund Sites and the TCE IRIS Assessment.

Please submit a sampling and analysis plan for the TCE groundwater evaluation within 60 days to Ecology for review. The goal of your evaluation is to better delineate TCE contamination at the Site and determine whether environmental contamination at the site has resulted in TCE concentrations from vapor intrusion above the short-term indoor air action levels off-Property.

Within 90 days, conduct sampling and submit the results of your evaluation to Ecology. Include recommendations on what actions, if any, are necessary to reduce TCE concentrations to below the appropriate short-term indoor air action level.

Multiple rounds of sampling may be necessary to complete the short-term TCE investigation. If that is that case, we expect that the first round of sampling will be completed within 90 days, and that a schedule for any additional sampling will be included in the sampling and analysis plan.

Ecology's Next Steps:

Depending on the site-specific circumstances, Ecology may:

1. Continue to provide technical assistance as necessary for evaluating and/or remediating short-term TCE risks.
2. Notify appropriate local, state or Federal health agencies to discuss possible health risks and any necessary public notifications.
3. Identify potentially liable parties and require additional remedial action pursuant to RCW 70.105D, such as: a) issuing an enforcement order, b) pursuing an Ecology conducted cleanup with cost recovery, or c) seeking judicial review.
4. Pursue other options necessary to adequately cleanup contamination at the site.

Contact Information:

Ecology is committed to working with you to accomplish the prompt and effective actions necessary at the Site. If you have any questions about this request, please contact me at 425-324-1438 or vatk461@ecy.wa.gov.

Sincerely,

Vance Atkins, LG, LHG
Site Manager
Toxics Cleanup Program, NWRO

Enclosure:
1. Site Figure
2. Guidance for Evaluating Vapor Intrusion in Washington State, Appendix A

cc: Kara Tebeau, Attorney General's Office, (kara.tebeau@atg.wa.gov)
Matthew M. Lewis, Aspect Consulting LLC, (mlewis@aspectconsulting.com)

1724 Dora Avenue NW (Note 2)

North Landfill Area

MW-2

Estimated Extent of TPH Cleanup Level Exceedance

MW-9

Estimated Extent of TCE Cleanup Level Exceedance

BERTHA AVE NW

MW-16 (Note 1) MW-14

EW-17 MW-13

MW-12

MW-8

MW-15 MW-5

Geotextile at 1 Foot Below Ground Surface (Summer 2013 Interim Action)

Estimated Extent of Arsenic Cleanup Level Exceedance

ROCKY POINT RD

PORTABLE CLASSROOM BUILDING

Bertha Ave NW Parking Area

MW-4

MW-6

MAIN SCHOOL BUILDING

MW-3

MW-10

South Landfill Area

MW-1

Geotextile at 1 Foot Below Ground Surface (Summer 2013 Interim Action)

MW-7

Geotextile at 1 Foot Below Ground Surface (Spring 2012 Interim Action)

MW-11

MARINE DR

DORA AVE

0 100 200 Feet

Well Locations:

- Extraction Well Included in Monitoring Program
- Monitoring Well Included in Monitoring Program
- Monitoring Well Not Included in Monitoring Program
- McKinney Domestic Well (Note 2)
- Approximate photo location & orientation for semiannual cover system inspections

Other Site Features and Interpretation:

- Interpreted Extent of Landfill Activity
- Estimated Extent of Groundwater Cleanup Level Exceedances in 2014 (Ecology, 2014)
- Bremerton School District Property Boundary
- Bremerton United Methodist Church Property Boundary
- Inferred Direction of Groundwater Flow

Note:

(1) LNAPL has been observed in Wells EW-17, MW-8, MW-13, MW-14, and MW-16.
(2) The McKinney well water sample is collected from the outdoor faucet on the north side of the residence at 1724 Dora Avenue NW.

Site Plan

2023 Annual Report
Crownhill Elementary
Bremerton, Washington

Aspect Consulting	JAN-2020	BY: DLH / PPW	FIGURE NO. 1
	PROJECT NO. 100094	REVISED BY: EAC	

GIS Path: T:\projects_8\CrownHillElementary\Delivered\Annual Report 2019\01-Site Plan.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 1/10/2020 || User: ecrumbaker || Print Date: 1/10/2020

Appendix A: Vapor Intrusion (VI) Investigations and Short-term Trichloroethene (TCE) Toxicity

A-1 Introduction

Appendix A provides recommendations for addressing the VI pathway at sites contaminated with TCE and discusses:

- Indoor air action levels that are protective of short-term exposures to TCE.
- Default (non-site-specific) subsurface VI screening levels that are protective of the short-term indoor air TCE action levels.
- Options for effectively and rapidly responding to those situations where TCE concentrations in indoor air from VI are above action levels.
- A goal to keep indoor air TCE concentrations from VI below short-term action levels.
- Public notification and other outreach-related tasks that responsible parties should perform when VI may be resulting in indoor air concentrations that exceed action levels.

Information in this Appendix assumes that Ecology is directly involved at the site. Section A-5.2 provides recommended steps that should be followed by the parties performing independent site investigation and cleanup.[108]

A-2 Background

In 2014, EPA concluded that short-term inhalation exposures to TCE in indoor air have the potential to cause serious heart defects in a developing fetus.[109] The damage can occur early in a pregnancy, possibly before the pregnancy is recognized. This Appendix focuses on issues that are specific to situations where short-term TCE exposures are occurring or likely to be occurring. These issues are:

[108] In later portions of Appendix A, we use the term "responsible party" to refer to the party who is conducting remedial actions at the site. In many cases, the responsible party will be a person meeting the statutory definition of a "potentially liable person" (see RCW 70A.305.040).

[109] (USEPA 2014) *Memorandum: Compilation of Information Relating to Early/Interim Actions at Superfund Sites and the TCE IRIS Assessment*.

1. **Response speed.** Actions to protect a fetus from unacceptable TCE exposures should occur as rapidly as possible after discovering the contamination, usually within days or weeks, depending on the likelihood and degree of potential exposure.

2. **Focus on women of childbearing age (which includes pregnant women).** The developing fetus is sensitive to the effects of short-term TCE exposure, and preventing harm to the fetus relies on reducing the mother's exposure.

3. **Public outreach.** Promptly contacting people who live and work near TCE contamination is crucial for three reasons: 1) to identify women of childbearing age; 2) to explain the potential health hazards to building occupants and, 3) if warranted by site-specific conditions, to obtain permission to access buildings for property-specific investigation and exposure-reduction activities. Whenever possible, outreach activities should be conducted in collaboration with public health departments.

This degree of urgency, and the need for more intensive outreach to specific individuals, is not typical at most MTCA sites. These three issues are further discussed in Sections A-4 through A-6.

A-3 VI screening and action levels for TCE

A-3.1 Indoor air action levels for TCE

A **screening level** is the concentration of a hazardous substance derived from standardized equations that if exceeded may result in indoor air concentrations above the applicable cleanup level. A **cleanup level is** the concentration of a hazardous substance in soil, water, air, or sediment that is determined to be protective of human health and the environment under specified exposure conditions (WAC 173-340-200).[110] An **action level** is the concentration of a hazardous substance in indoor air that may pose short-term risks to potential receptors. Action levels are not MTCA Method B or C air cleanup levels.

Indoor air cleanup levels for TCE are provided in the CLARC Air data tables.[111] Cleanup levels are used during Tier 1 and Tier 2 evaluations to determine whether further sampling, interim actions, or cleanup actions are indicated. The concentrations for indoor air cleanup levels are the same as for standard cancer and non-cancer Method B and C air cleanup levels in CLARC's Air data tables.

Air cleanup levels for TCE are lower than indoor air action levels. Cleanup levels apply to long-term average air concentrations (over at least one year) for the entire population, all genders and ages. Short-term indoor air action levels, on the other hand, only apply to three-week average concentrations for women of childbearing age.

[110] https://apps.leg.wa.gov/WAC/default.aspx?cite=173-340-200 (Definitions.)
[111] Cleanup Levels and Risk Calculation (CLARC). https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables

The average indoor air TCE concentration due to vapor intrusion over **any** three-week interval should not exceed the applicable action level.

VI indoor air cleanup levels for long-term TCE exposures, and action levels for short-term exposures to women of childbearing age, are provided in Tables A-1 and A-2 below. The table's indoor air cleanup and action levels are compared to average indoor air TCE concentrations that result solely from VI. In some cases, this means that contributions to indoor air measurements from non-VI sources, such as outdoor or indoor sources, will need to be distinguished from contributions due solely to subsurface sources.

The short-term action levels for TCE in Table A-2 are based on values recommended by EPA Region 10 (memorandum dated December 13, 2012) and EPA Region 9 (memorandum dated July 9, 2014).[112] The Region 10 memorandum from 2012 states that, pursuant to an IRIS toxicological review, exposure to TCE can cause fetal cardiac malformations during a 21-day gestation window. To protect against the possibility of this occurring, the average concentration of TCE in residential indoor air should not exceed 2.0 µg/m^3 during any consecutive 21-day period in a given year. For commercial / industrial settings, where receptors of concern are workers, indoor air TCE should not exceed 8 µg/m^3. The Region 9 memorandum identifies "accelerated" and "urgent response action levels" for residents and workers. The "accelerated" levels range from 2 to 8 µg/m^3; the "urgent" levels vary from 6 to 24 µg/m^3. The range of levels for both categories accounts for the varied lengths of time that receptors are expected to be exposed.

Table A-1: Vapor intrusion TCE Indoor Air **Cleanup Levels,** chronic (mean long-term air concentration for RME receptor)*

Level of Concern	Concentration (µg/m^3)	Risk Basis
Method B (unrestricted land use)	**0.37**	Cancer risk 1E-6
Method B (unrestricted land use)	**0.91**	Hazard quotient 1
Method C (industrial land use)	**6.3**	Cancer risk 1E-5
Method C (industrial land use)	**2.0**	Hazard quotient 1

* These values are available in CLARC (Ecology 2018a).

Table A-2: Vapor intrusion TCE Indoor Air **Action Levels**, short-term (maximum 3-week mean concentration for women of childbearing age)

Level of Concern	Concentration (µg/m^3)	Risk Basis
Unrestricted (residential) land use	**2.0**	Noncarcinogenic effect based on 24 hours/day, 7 days/week
Workplace scenario (commercial or industrial)	**7.5**	Noncarcinogenic effect based on 45-hour work week

[112] For the Region 9 and 10 memoranda, see Ecology's Vapor Intrusion webpage at https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Vapor-intrusion-overview

A number of other EPA Regions and states, including Massachusetts, New Jersey, New Hampshire, Minnesota, Ohio, Alaska, and Connecticut, have also adopted short-term TCE levels and recommended responses. The levels and response timeframes vary.

Consistent with guidance from EPA Region 10, TCE action levels in Table A-2 are intended to be compared to the highest measured (or estimated) VI-caused indoor air levels averaged over any 21-day period. It is unknown whether potential fetal health effects from an exposure to action level concentrations could occur over a period less than three weeks, or whether shorter periods would only be harmful if TCE concentrations were significantly higher than action levels.

Given this uncertainty, Ecology recommends that, if any 24-hour or 8-hour measurements of average indoor air TCE concentrations exceed Table A-2's action levels (for residents or workers, respectively), **take prompt action**. This could include either reducing those concentrations or reducing the degree to which women of childbearing age are exposed. Ecology will revisit this recommendation as more information becomes available about the health effects attributable to short-term TCE exposures.

Table A-2 provides short-term TCE indoor air action levels for residential land use and commercial/industrial workers.

- The residential concentration is intended to protect women of childbearing age who reside in the building and are continuously exposed to indoor air contaminated by VI.
- The commercial/industrial concentration is protective of women of childbearing age who work full-time shifts up to 45 hours per week.[113]
- However, other women of childbearing age who occupy a building where VI is occurring may also be receptors of concern. For example, building visitors, part-time workers, and students could also be potentially be exposed to contaminated indoor air over extended periods of time.

Use the short-term action levels in Table A-2 to determine whether prompt and protective measures like interim actions should be implemented (see WAC 173-340-430).[114] Remember that **action levels are not MTCA Method B or C air cleanup levels** and that the MTCA cleanup regulations require that cleanup levels be established for one of two specific land uses: *unrestricted* or *industrial* site use.

[113] This paragraph refers to the protection of the developing fetus. Exposures to TCE can also potentially affect the health of women themselves and this should be assessed using the indoor air cleanup levels in the CLARC data tables, not the short-term action levels.

[114] https://app.leg.wa.gov/wac/default.aspx?cite=173-340-430

A-3.2 VI short-term screening levels for TCE in groundwater and soil gas

CLARC's data tables also provide groundwater and soil gas screening levels that can be used to assess the potential for chronic exposure threats posed by a subsurface source.

CLARC's groundwater screening levels are intended to be protective of corresponding indoor air cleanup levels, and assume there will be 1,000-times attenuation between groundwater VOC concentrations (in equilibrium with vapor concentrations) and indoor air levels.

CLARC's sub-slab soil gas screening levels are also expected to be protective of indoor air cleanup levels. They assume there will be 33-times attenuation between soil gas VOC concentrations just below a building's slab and indoor air levels. (For further discussion on attenuation factors, see the note box following Table A-4.)

VI groundwater and sub-slab soil gas screening levels protective of short-term TCE indoor air action levels are presented in Tables A-3 and A-4 below. These screening levels embody the same attenuation assumptions used to calculate the chronic subsurface screening levels provided in CLARC (as discussed above). In summary:

- The short-term VI screening levels for groundwater and soil gas are higher than CLARC's VI TCE cleanup levels, which are calculated for chronic indoor exposures.
- For residential buildings, the short-term screening level for groundwater is about twice as high as CLARC's chronic-based non-carcinogenic screening level (8 µg/L versus 3.8 µg/L, respectively), and approximately five times higher than CLARC's carcinogenic screening level (8 µg/L versus 1.6 µg/L).
- Similarly, the short-term screening level for TCE in soil gas is about twice as high as CLARC's chronic-based non-carcinogenic sub-slab screening level (67 µg/m³ versus 31 µg/m³), and a little more than five times higher than CLARC's carcinogenic sub-slab screening level (67 µg/m³ versus 12 µg/m³).

Table A-3: Vapor intrusion subsurface screening levels for **groundwater** for short-term exposures to TCE

Short-term TCE Subsurface Screening Levels	Concentration	Basis
residential short-term VI screening level for groundwater	**8 µg/L**	• TCE as a non-carcinogen • receptor of concern: women of childbearing age • residential indoor scenarios
non-residential short-term VI screening level for groundwater	**31 µg/L**	• TCE as a non-carcinogen • receptor of concern: women of childbearing age • commercial/industrial workplace scenarios

Table A-4: Vapor intrusion subsurface screening levels for **soil gas** for short-term exposures to TCE

Short-term TCE Subsurface Screening Levels	Concentration	Basis
residential short-term VI screening level for sub-slab soil gas	**67 µg/m³**	• TCE as a non-carcinogen • receptor of concern: women of childbearing age • residential indoor scenarios
non-residential short-term VI screening level for sub-slab soil gas	**250 µg/m³**	• TCE as a non-carcinogen • receptor of concern: women of childbearing age • commercial/industrial workplace scenarios

Note: The 2009 Draft VI Guidance had differentiated between the amount of attenuation that should be assumed for soil gas VOC concentrations that are located immediately below the building (like sub-slab), versus those concentrations that are at significantly greater distances below ground surface (called "deep"). CLARC's VI data tables also make this distinction. "Deep" soil gas screening levels in CLARC assume 100-times attenuation between soil gas VOC concentrations and indoor air levels. This distinction was based on the approach set out in EPA's 2002 Vapor Intrusion guidance.

However, EPA's Technical guide for assessing and mitigating the vapor intrusion pathway from subsurface vapor sources to indoor air [115] (USEPA June 2015) does not recommend that soil gas levels be assumed to attenuate more than 33 times, regardless of depth. As a result, Ecology has now eliminated the use of deep soil gas VI screening levels.

A-4 VI Investigation

This section provides site investigation recommendations when short-term inhalation exposures to TCE from VI are a potential concern.

A-4.1 Identify any buildings where VI may result in indoor TCE concentrations above the short-term action level.

Note:

- **Section A-4.1's** discussion assumes that indoor air sampling for TCE has not been conducted.
- If indoor air has already been sampled, and indoor TCE concentrations due to VI exceed the applicable short-term action level, see the appropriate responses described in **Section A-5**.
- If indoor air was sampled and TCE concentration measurements were below the short-term action level, the VI assessment team should determine whether those measurements represent the highest 3-week average indoor TCE concentration. See **Section A-4.4** for additional discussion.

Determining which buildings are a potential concern is commonly accomplished by mapping site areas where TCE is, or may be, present in soils or shallow groundwater. Buildings above or close to these areas can then be identified. In parts of the site where soils are contaminated

[115] https://www.epa.gov/vaporintrusion/technical-guide-assessing-and-mitigating-vapor-intrusion-pathway-subsurface-vapor

with TCE, soil gas samples are typically collected and analyzed.[116] CLARC's VI soil gas screening levels the short-term soil gas screening levels in Tables A-2 and A3 can then be used to determine if VI could potentially result in indoor air cleanup level or action level exceedances (respectively) at nearby buildings.

Regardless of whether the potential subsurface VI source is contaminated soil or shallow groundwater, investigators can collect soil gas samples below or near a building and use the measured TCE levels to determine the potential for an indoor exceedance of indoor air cleanup levels and/or action levels. However, if TCE concentrations in shallow groundwater are above CLARC's VI screening levels, or if significant soil contamination or residual non-aqueous phase liquid (NAPL) is close to a building and likely to contain elevated TCE concentrations, investigators should not delay indoor air sampling (see Section A-4.3). When these conditions are present, the first indoor sampling event(s) should be a priority and performed immediately, without waiting for a preliminary soil gas investigation.[117]

In areas where soils are not contaminated and shallow groundwater is the only potential VI source, investigators can use groundwater VI screening levels in CLARC and short-term groundwater screening levels in Tables A-2 and A-3 to distinguish between buildings where VI could potentially result in exceedances of indoor air cleanup (chronic) or action (short-term) levels, and those where exceedances are highly unlikely.

In addition to the exceedance of subsurface VI screening levels, there may be other building- or site-specific reasons for suspecting that indoor air TCE concentrations could exceed the short-term action level. For instance, at some building locations, contaminated shallow groundwater may be the only potential VI source and TCE concentrations in this groundwater may be below the short-term screening level. However, the short-term groundwater screening levels assume a certain amount of attenuation and dilution of vapor-phase TCE between the groundwater surface and the indoor environment. While these are conservative assumptions for most buildings, they may not be if:

- There are preferential subsurface pathways that may result in higher soil gas VOC levels below the building than the short-term groundwater screening levels assume, or if

[116] *De minimis* levels of TCE in vadose zone soils (i.e., above the seasonal low water table) are unlikely to pose a VI threat. WAC 173-340-740(3)(b)(iii)(C)(III) defines such levels as concentrations no higher than concentrations "derived for protection of groundwater for drinking water beneficial use under WAC 173-340-747(4)." Concluding that TCE levels in soils are this low requires adequate characterization of vadose zone contamination.

[117] Ecology does not recommend that soil gas sampling be *initiated* at this point to determine if TCE concentrations exceed short-term soil gas screening levels. This is because it takes time to prepare (and approve) soil gas Sampling and Analysis Plans (SAPs); obtain access; schedule and mobilize the related work; and review the sampling results. Indoor air sampling should not be delayed while these activities are being performed. It is prudent to obtain soil gas data during or immediately following the first indoor air sampling event.

- There may be a higher soil gas flowrate into the building than the short-term groundwater and soil gas screening levels assume.[118]

A-4.2 Notify and involve Ecology

This Appendix presumes that Ecology will be involved throughout the VI evaluation process, including owner/tenant notifications, the initial building visit, indoor air sampling, data analysis, and post-sampling decision making described in the rest of this section and Sections A-5 and A-6. The recommended actions and decisions identified below are therefore intended for both the party conducting the remedial actions (the responsible party) and Ecology.[119] However, when responsible parties are acting independently and choose not to involve Ecology during some or all of these actions and decisions, they should complete the applicable and recommended steps themselves.

Regardless of whether Ecology oversees the site throughout the cleanup process, or whether another party independently conducts the remedial actions, the following should occur:

1. Ecology should be contacted as soon as the responsible party determines that women of childbearing age are current building occupants and indoor air sampling is needed to assess the potential for a short-term TCE action level exceedance (see Section A-4.3 below).

2. If an Ecology staff person has already been assigned to the site, this individual should be notified. Otherwise, the responsible party should contact their local Ecology regional office. They should not wait for Ecology's response before moving to the next steps of the investigation / response process. Find Ecology's contact information at https://ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue

[118] The short-term groundwater screening levels assume that vapor-phase TCE concentrations will attenuate by a factor of 1000 between soil gas levels immediately above and in equilibrium with contaminated groundwater and indoor air. This is generally a conservative assumption, but may over-predict the degree of subsurface attenuation in certain cases, such as sites with a shallow water table, or sites with subsurface conduits capable of transporting elevated soil gas levels to areas directly below the building with minimal attenuation.

The short-term soil gas screening levels assume that vapor-phase TCE concentrations will attenuate by a factor of at least 33 times between soil gas levels immediately below the building and indoor air. This is usually a conservative assumption, but less attenuation is possible if the building or its foundation allows soil gas to enter interior spaces relatively unimpeded. This can occur when slab or basement wall penetrations or large cracks provide preferential conduits for entry.

[119] As noted in Section 1.1, "PLP" in this Guidance broadly refers to the individual or party responsible for cleaning up the site. It is not intended to limit responsibility to only those who are designated as PLPs per RCW 70A.305.040. Instead, it is a general reference to the *responsible party.*

A-4.3 Prepare for indoor air sampling

As soon as one or more site buildings have been identified as a location where VI may potentially result in indoor air TCE concentrations above the short-term action level, investigators should quickly plan for the next steps of the evaluation, unless they confirm that women of childbearing age do not regularly occupy the buildings. At this point in the investigation, it is only *potentially possible* that indoor TCE concentrations actually exceed the action level, but several actions should occur without delay including:

1. **Contact building owner and/or tenant.** The owner/tenant of the building should be contacted to determine if women of childbearing age are current occupants, and to schedule a building and property visit. This initial contact should occur soon after the building has been identified as potentially at risk. The owner and tenant(s) of these buildings should be notified that there is the *possibility* that VI-caused indoor air TCE concentrations exceed the acceptable chronic and/or short-term screening/action levels.

2. **Schedule a building visit.** If women of childbearing age are current building occupants, a building visit should be scheduled as soon as possible. During this visit Ecology and the responsible party need to be prepared to discuss the potential TCE risk, explain next steps, and answer exposure-related and other questions.[120] If the responsible party does not own the building, they should also be prepared at this time to request building access for the purpose of collecting indoor air samples. Interactions with building owners and tenants preceding indoor air sampling are further discussed in Section A-6.0.

3. **Prepare and finalize a SAP.** Following the visit to the building and property, an indoor air Sampling and Analysis Plan (SAP) should be expeditiously prepared, reviewed, and finalized.[121] The SAP should identify the timeframes for gathering and reviewing the data. The SAP should also include a site/building-specific VI conceptual site model (CSM) that serves as the basis for selecting data quality objectives and sampling design. The VI CSM is a combination of information, assumptions, and hypotheses that investigators use to help evaluate the adequacy of available site-specific information, and guide the identification of critical data gaps. The VI CSM is discussed in Section 2.4 of this guidance and Section 5.4 of EPA's 2015 *Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air* (USEPA June 2015).

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[120] Please see VI-related risk communications in Section A-6.1.

[121] This assumes that: a) an exceedance of the short-term TCE indoor air action level has not yet been measured, and b) the responsible party has decided not to pursue a "preemptive" response action. If an exceedance of the action level has already been measured, no additional pre-mitigation sampling may be needed. See Section A-5.0 for a description of appropriate response actions.

Preemptive mitigation is a term often used to describe VI mitigation efforts implemented without (or prior to) confirmation that VI-caused indoor air contamination exceeds acceptable levels. When preemptive mitigation has been chosen as the next step in Section A-4.3, indoor air sampling is not typically conducted until after mitigation has been implemented. Section 7.8 of EPA's OSWER VI guidance document (USEPA June 2015) provides additional information about preemptive mitigation.

- **Schedule indoor air sampling.** Immediately schedule the first indoor air sampling event as soon as the SAP is final. . It should not be delayed to coincide with more desirable seasonal or meteorological conditions.[122]

A-4.4 Determine if 3-week average indoor air TCE concentrations exceed the short-term action level.

For those buildings occupied by women of childbearing age, the VI investigation should provide sufficient information to determine whether 3-week average indoor air TCE concentrations ever exceed the short-term action level. A single indoor air sampling event may not provide sufficient evidence unless it coincides with a period when maximum VI impacts are occurring. This is because VI impacts can vary significantly over time, and because this variability cannot be easily predicted. As a result, it can be difficult to schedule an indoor sampling event that represents the highest 3-week average unless the sampling program is designed to intentionally create near-maximum VI conditions.[123] Unless the first sampling event finds TCE concentrations exceeding the short-term indoor air action level, the investigation will need multiple sampling events.

When the receptor of concern is a current occupant of the building, and air samples are being analyzed at an off-site laboratory, request expedited turnaround times. For at least the first sampling event, the goal should be to receive the laboratory's sampling data within three business days.

Immediately after the data have been received, share with members of the decision-making team including the Ecology site manager.[124] For at least the first indoor air sampling event, the goal should be to distribute the results to the decision-making team within seven days of sample collection. The objective of the decision-making team's review is to quickly determine if: 1) the relevant TCE short-term indoor air action levels listed in Table A-1 are being exceeded, and 2) VI is the likely cause.

The immediate review, and the decisions arising from that review, will not have the benefit of a sampling-data quality assessment or validation. These activities will typically occur later, when the results of the sampling event are being integrated into a VI evaluation report. It is possible that a later assessment of data quality will lead to a conclusion that VI is *not* causing short-term indoor air action level exceedances, and that the earlier determination was incorrect. However, if the receptors of concern are current occupants of the building, the importance of providing

[122] Additional sampling events may be necessary even if the measured indoor air concentrations were less than cleanup levels.

[123] Sections 4.5.1 and 4.10 of this Guidance provide additional direction for mechanically creating negative pressures within a building.

[124] If an Ecology site manager has not been assigned to the project, send the results to the designated Regional contact.

timely information to those receptors should outweigh the potential that the information provided might later need to be revised.

This section (A-4) is specifically devoted to recommendations related to the potential for *short-term* inhalation exposures to TCE. As discussed in Section A-3, CLARC's VI indoor air cleanup levels for TCE are lower concentrations than action levels established to be protective of short-term indoor exposures. This is because the indoor air cleanup levels in CLARC are based on chronic VI-caused exposures. Therefore, remedial actions such as VI mitigation may be needed to protect long-term indoor exposures, regardless of whether the short-term indoor air TCE action level is exceeded.

A-5 Responding to exceedances of the short-term TCE indoor air action level

If VI is causing an exceedance of the TCE short-term indoor air action level, *prompt* **action is needed.** Such actions should be taken in consultation with the building's owner (and tenant, if applicable). Protecting people inside affected buildings is a high priority and action should not be delayed. If follow-up indoor air or other sampling is scheduled before the selected action is fully implemented, this sampling needs to be conducted in a manner that does not interfere with efforts to quickly and effectively reduce indoor exposures to TCE.

A-5.1 Systems for mitigating vapor intrusion

VI *mitigation* generally refers to actions that reduce VI-caused indoor air contamination, and the focus is often on reducing the amount of contaminated soil gas entering the building.[125] Mitigation systems creating **depressurization** of the sub-slab zone or crawl space will often be the most effective approach for reducing VI impacts (until subsurface cleanup permanently remediates the source of elevated soil gas concentrations). However, these types of systems can take weeks to design, construct, and fully implement. Additional time is then needed to demonstrate that target VOC concentrations in indoor air have actually been achieved.

Active VI mitigation systems such as sub-slab and sub-membrane depressurization are often able to reduce VI-caused TCE indoor air contamination to concentrations below the short-term action levels. But before the mitigation system has been successfully implemented, TCE action levels can be exceeded. If a woman of childbearing age lives or works in an area of the building where elevated TCE concentrations are present and does not relocate, she will continue to be exposed. Mitigation should therefore be designed, constructed, and implemented as quickly as

[125] Subsurface *remediation*, on the other hand, includes cleanup actions designed to reduce soil gas VOC levels. Although these actions will also reduce VI-caused indoor air contamination, they are not typically referred to as VI "mitigation" unless they can be successfully implemented within a relatively short timeframe.

possible,[126] and other actions considered that would effectively reduce exposures during the interim.

A-5.2 EPA-recommended actions and MTCA cleanups

Prompt actions to reduce TCE exposures include the recommended responses described in EPA Region 9's 2014 TCE Memorandum[127] under two headings: "Implementation of early or interim measures to mitigate TCE inhalation exposure," and "Tiered response actions" (USEPA 2014a). Many of EPA's recommendations in these sections are appropriate guides for selecting proper response actions in Washington state. However, Ecology has clarified three of the Region 9 recommendations in terms of their applicability at MTCA cleanup sites:

1. EPA's recommendation to increase building pressurization/ventilation.

> **Ecology**: Positively pressurizing the building (with respect to the subsurface) can create a pressure barrier to advective flow of soil gas into the structure and mitigate VI impacts. However, it will not always be possible or sufficiently effective. Likewise, increasing ventilation can dilute VI impacts if the outdoor-to-indoor air exchange rate is increased. But it may not be practicable to increase the ventilation rate enough to reduce indoor air TCE below cleanup/action levels. Moreover, if the methods to increase the outdoor-to-indoor air exchange rate result in greater building depressurization, VI impacts may actually be exacerbated. Regardless, follow-up monitoring of indoor air quality should be performed to ensure TCE concentrations have been reduced to an acceptable level.

2. EPA's recommendation to seal potential conduits.

> **Ecology**: It is possible that a single foundation or building feature is primarily responsible for the degree of vapor intrusion, leading to short-term indoor air TCE action level exceedances. For instance, there could be an uncovered earthen floor in part of the building, an unsealed basement sump, a disconnected floor drain, or an unsealed utility line penetration at ground level or sub-grade. If the building has a crawl space, there could be unsealed first floor openings around pipes or wiring that run between the two levels. The crawl space could also be walled-in, preventing any significant sub-floor ventilation and dilution of soil gas emissions.
>
> Often, however, it won't be obvious where the most significant soil gas entry points are located. For this reason, consider using a portable field sampling device to identify these locations, and then subsequently implementing conduit-sealing measures to limit this influence.

[126] A qualified individual or firm should be identified early, which is often during the planning phase of the investigation.

[127] Available on Ecology's website at https://ecology.wa.gov/DOE/files/4f/4fb8c34a-f785-41f7-8dea-e2ee341a31a2.pdf

If a portable device isn't used, Ecology recommends promptly initiating sealing efforts that are:

a. Focused on any easily observable and obvious major routes by which soil gas is likely entering the building;
b. Only undertaken as the initial response if the sealing activity can be completed quickly; and
c. Promptly followed up with indoor air sampling to verify the sealing's effectiveness.

3. EPA's recommendation to respond differently, based on whether the "urgent" response action level has been exceeded.

Ecology: The EPA Region 9 Memorandum states that the response to exceeding an "accelerated" action level should be "completed and confirmed within a few weeks." If the higher "urgent" action level is also exceeded, the response time should be reduced to "a few days."

Ecology agrees that, all else being equal, there should be a greater sense of urgency when TCE concentrations are much higher than the short-term action level established for the site and building. It is also true that the types of responses likely to be effective will often partly depend on how high the indoor air TCE concentrations are. **But Ecology believes any exceedance of the short-term action level merits prompt action.**

This means that if VI is causing an exceedance of the TCE short-term indoor air action level, quickly consult with the building's owner (and if applicable, the tenant) and determine which action will be taken. The goal should be to reduce TCE exposures for women of childbearing age as soon as possible. This may require that a "stopgap" response be taken right away, while plans for long-term mitigation proceed on a parallel track. Stopgap responses include temporarily relocating the receptor, and/or installing effective indoor air treatment.

Carbon-based indoor air VOC treatment devices, sometimes referred to as air purification units (APUs) or "air cleaners," can be installed relatively quickly. These devices can be used for extended periods, but their typical VI application is temporary use. They are often operated only while a more permanent form of mitigation is being designed/constructed. As discussed in EPA's 2017 *Engineering Issue*[128] that describes these devices, indoor air treatment can be accomplished with portable air cleaning units or HVAC in-duct systems (USEPA 2017). The former usually employs a built-in air circulation fan and carbon sorbent bed.

[128] Engineering Issue (USEPA 2017) at https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NERL&dirEntryId=337835

Indoor air treatment devices may not always be able to quickly reduce TCE concentrations to acceptable levels. Regardless of which treatment device is selected, investigators cannot assume that the installed unit will *sustainably* reduce indoor air TCE to concentrations below the short-term action level. As noted in the 2017 *Engineering Issue*, this needs to be confirmed with air sampling.[129]

A-6 Working with people who are affected by vapor intrusion

This section discusses interactions with the owners and occupants of buildings where vapor intrusion is, or may be, contaminating indoor air with TCE.

In the simplest case, the building is a single-family residence owned by the occupants. The responsible party and Ecology are then interacting primarily with a head of household.

But the property where the building is located will not always be owned by the responsible party, and other scenarios will also be common, such as:

a. The building is a single-family residence where the owner resides elsewhere.
b. The building is occupied by a single business, which also owns the property.
c. The building is occupied by a single business, which does not own the property or building.
d. The building is occupied by multiple businesses, none or only one of which owns the property or building.

Throughout this Appendix, we've used the term "building owners/tenants" when referring to notifications, access requests, information sharing, and other interactions with the affected public. We use this term for simplicity, but recognize that owners are not always building occupants and receptors, and building occupants are not always owners or tenants. Women of childbearing age who occupy a building could be owners, tenants, employees or other workers, students, or visitors.

For communication purposes, it is helpful for the responsible party and Ecology to have no more than two designated "building contacts." Communications about scheduling building visits,

[129] In the EPA 2017 *Engineering Issue* discussion of treatment systems, Attachment A lists a large number of VOC air cleaners by brand name. In 2014, the California DTSC reported the use of Air Rhino and AirMedic Vocarb stand-alone air purifiers. The New Hampshire Department of Environmental Services and Massachusetts Department of Environmental Protection reported the use of portable Austin HealthMate units in 2015 and 2016, respectively. (See "TCE Vapor Intrusion Case Study" presented at the 2015 NEWMOA conference, http://www.newmoa.org/events/event.cfm?m=157 and the October 2016 Field Assessment and Support Team (FAST): "An Expedited Approach to the Investigation and Mitigation of the Vapor Intrusion Pathway").

Ecology does not endorse these particular products. We include these references here only to indicate that the products have been used in at least three states to reduce VI-caused indoor air contamination.

obtaining access, sharing sampling data and data evaluations, and consultations concerning any response actions, can then be limited to a small number of individuals (who may or may not be potential "receptors"). It will be incumbent upon these building contacts to not only disseminate the information they receive from the responsible party and Ecology to (other) building occupants who are potentially being exposed, but to relay those occupants' concerns and questions back to the decision makers.

A-6.1 Outreach before indoor air sampling

As discussed in Section A-4.1, any site building where VI may potentially result in indoor TCE concentrations above the short-term action level should be identified based on subsurface sampling and other site data. When women of childbearing age are occupants in these buildings, perform the planning, notification, and pre-sampling activities described in Section A-4.3. This includes visiting the building itself.

In addition to obtaining the building and receptor-behavior information usually needed to prepare a VI indoor air SAP, during building visits Ecology and the responsible party should:[130]

1. Verify whether women of childbearing age regularly occupy the building. If they do (especially for non-residential buildings), ascertain which areas these women spend most of their time, and the hours they are typically present in the building.

2. Determine if women of childbearing age may be occupants in the foreseeable future, even if they aren't currently present.

3. Discuss site contamination and how vapor intrusion can potentially contaminate indoor air; discuss next steps and the need for sampling access; and answer their questions.

During the building visit, Ecology and the responsible party will need to be prepared for questions the occupants may have regarding potential short- and long-term TCE health effects and how to reduce their exposures. Decisions should be made during the planning period (described in Section A-4.3) about how and when this information should be provided, and who should communicate it.

Pursuant to health-related VI questions, Ecology staff are expected to answer only the most basic health-related VI questions. Routinely refer the public to local health departments or their family physicians for answers to questions that require toxicological or medical expertise.

Washington's state and local health departments are generally more familiar with local communities and their concerns than Ecology site management staff. Health departments also have more expertise at conveying health-related information. If women of childbearing age are

[130] As noted in Section A-4.2, Appendix A assumes that Ecology will be involved throughout the VI evaluation process. When this is not the case, parties performing the site investigation and cleanup should independently complete the recommended steps outlined in this Appendix.

potentially exposed to site-related TCE contamination, it is recommended that site managers and the responsible party rapidly coordinate with state/local health departments. These agencies can better explain the potential health hazards to building occupants and/or help gain access to buildings for investigation and remediation if needed. If Ecology has assigned a Community Outreach and Environmental Education Specialist (COEES) to the site, the site manager should also confer with this individual during the pre-sampling period.[131]

Before any indoor air sampling can occur, the party performing that sampling need to obtain owner/tenant consent.[132] Typically during VI investigations, this consent is documented in an "access agreement," which usually specifies the conditions under which access is granted. Finalizing an access agreement can be a lengthy process. Sometimes it is difficult to make timely contact with the building owner or tenant. Sometimes the owner will elect to get the advice of legal counsel before entering into an agreement. There can be protracted negotiations regarding considerations such as access-related payment, or other site-specific issues. While securing access is normally the duty of the responsible party, Ecology may become involved with disputes or delays when the health threat relates to a short-term exposure to site contamination. The parties need to realize that Ecology will make best efforts, including – if needed – exercising its legal authorities, to ensure access agreements are finalized as soon as possible.

A-6.2 Outreach after indoor air sampling

Indoor air sampling results, together with other lines of evidence, should indicate whether VI is causing an exceedance of the TCE short-term indoor air action level. Once the indoor air sampling data have been received from the laboratory (assuming no "real time" sampling was performed), the responsible party and Ecology should: 1) discuss the results, 2) make a preliminary decision as to whether VI is likely to be resulting in a TCE short-term action level exceedance, 3) agree on next steps, then 4) contact the building owner/tenant.

As discussed in Section A-4.4, when women of childbearing age are current occupants of the building, this decision-making and outreach process should begin as soon as the data are initially received, without waiting for data quality assessment. In these cases, the goal should be to quickly determine the likelihood of a TCE short-term indoor air action level exceedance and then inform building owners/tenants of the sampling results. Unless owners, tenants, and other concerned building occupants would prefer to wait until the quality of sampling data has

[131] Ecology's COEESs are typically not assigned to independent cleanup sites or those in the Voluntary Cleanup Program (VCP). However, if a COEES has been assigned to a site where VI is causing or may potentially result in indoor TCE concentrations above the short-term action level, their assistance can improve communications with the owners, tenants, and occupants of the affected buildings, as well as other members of the concerned public.

[132] With limited exceptions, such as emergency situations.

been rigorously assessed and validated, they should be notified of sampling results soon after results arrive from the laboratory.[133]

The responsible party and/or Ecology should tell the building owner/tenant what the sampling results indicate and what the next steps should be. During this discussion, it is important to:

1. Explain how the conclusions were reached.
2. Differentiate between what is known (e.g., the results from this single sampling event), what was inferred from the information collected, and what is not known.
3. Urge the owner/tenant to share and explain these results – as well as plans for follow-up actions – with concerned building occupants. This includes all women of childbearing age who live or work in affected portions of the building.

Coordinating with the site's assigned COEES and state/local health departments is critical at this stage and can improve the effectiveness of these communications.

If sampling data indicate that VI is likely to be causing an exceedance of the TCE short-term indoor air action level, and if a woman of childbearing age is a building occupant, quickly determine the proper response in consultation with the building's owner (and tenant, if applicable). Section A-5.0 lists various response actions that may apply. The selected action will depend on a number of building-specific factors, such as how high the indoor air TCE concentrations appear to be, and the preferences of the building's owner/tenant and receptors of concern. Promptly reaching and carrying out a mutually acceptable decision may require the involvement of state/local health departments.

If measured levels of indoor air TCE are below the action level, however, the next step may simply be to schedule a re-sampling event for the future.[134]

[133] When the data are shared this quickly, the building occupants should be informed that implications of the sampling results could change after the data quality is evaluated. Also inform them that if the implications did change, the responsible party and/or Ecology would immediately notify the owner/tenant.

[134] Typically, a sampling report is prepared after the data have been quality assured and validated. A copy of the report, and a copy of any Ecology response letter(s), should be provided to the building owner/tenant.

APPENDIX E

Report Limitations and Guidelines for Use

REPORT LIMITATIONS AND USE GUIDELINES

Reliance Conditions for Third Parties

This report was prepared for the exclusive use of the Client. No other party may rely on this report or the product of our services without the express written consent of Aspect Consulting (Aspect). This limitation is to provide our firm with reasonable protection against liability claims by third parties with whom there would otherwise be no contractual conditions or limitations and guidelines governing their use of the report. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and recognized standards of professionals in the same locality and involving similar conditions.

Services for Specific Purposes, Persons and Projects

Aspect has performed the services in general accordance with the scope and limitations of our Agreement. This report has been prepared for the exclusive use of the Client and their authorized third parties, approved in writing by Aspect. This report is not intended for use by others, and the information contained herein is not applicable to other properties.

This report is not, and should not, be construed as a warranty or guarantee regarding the presence or absence of hazardous substances or petroleum products that may affect the subject property. The report is not intended to make any representation concerning title or ownership to the subject property. If real property records were reviewed, they were reviewed for the sole purpose of determining the subject property's historical uses. All findings, conclusions, and recommendations stated in this report are based on the data and information provided to Aspect, current use of the subject property, and observations and conditions that existed on the date and time of the report.

Aspect structures its services to meet the specific needs of our clients. Because each environmental study is unique, each environmental report is unique, prepared solely for the specific client and subject property. This report should not be applied for any purpose or project except the purpose described in the Agreement.

This Report Is Project-Specific

Aspect considered a number of unique, project-specific factors when establishing the Scope of Work for this project and report. You should not rely on this report if it was:

- Not prepared for you
- Not prepared for the specific purpose identified in the Agreement
- Not prepared for the specific real property assessed
- Completed before important changes occurred concerning the subject property, project or governmental regulatory actions

If changes are made to the project or subject property after the date of this report, Aspect should be retained to assess the impact of the changes with respect to the conclusions contained in the report.

Geoscience Interpretations

The geoscience practices (geotechnical engineering, geology, and environmental science) require interpretation of spatial information that can make them less exact than other engineering and natural science disciplines. It is important to recognize this limitation in evaluating the content of the report. If you are unclear how these "Report Limitations and Use Guidelines" apply to your project or site, you should contact Aspect.

Discipline-Specific Reports Are Not Interchangeable

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually address any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding the subject property.

Environmental Regulations Are Not Static

Some hazardous substances or petroleum products may be present near the subject property in quantities or under conditions that may have led, or may lead, to contamination of the subject property, but are not included in current local, state or federal regulatory definitions of hazardous substances or petroleum products or do not otherwise present potential liability. Changes may occur in the standards for appropriate inquiry or regulatory definitions of hazardous substance and petroleum products; therefore, this report has a limited useful life.

Property Conditions Change Over Time

This report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time (for example, Phase I ESA reports are applicable for 180 days), by events such as a change in property use or occupancy, or by natural events, such as floods, earthquakes, slope failure or groundwater fluctuations. If more than six months have passed since issuance of our report, or if any of the described events may have occurred following the issuance of the report, you should contact Aspect so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Phase I ESAs – Uncertainty Remains After Completion

Aspect has performed the services in general accordance with the scope and limitations of our Agreement and the current version of the “Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process”, ASTM E1527, and U.S. Environmental Protection Agency (EPA)'s Federal Standard 40 CFR Part 312 "Innocent Landowners, Standards for Conducting All Appropriate Inquiries".

No ESA can wholly eliminate uncertainty regarding the potential for recognized environmental conditions in connection with subject property. Performance of an ESA study is intended to reduce, but not eliminate, uncertainty regarding the potential for environmental conditions affecting the subject property. There is always a potential that areas with contamination that were not identified during this ESA exist at the subject property or in the study area. Further evaluation of such potential would require additional research, subsurface exploration, sampling and/or testing.

Historical Information Provided by Others

Aspect has relied upon information provided by others in our description of historical conditions and in our review of regulatory databases and files. The available data does not provide definitive information with regard to all past uses, operations or incidents affecting the subject property or adjacent properties. Aspect makes no warranties or guarantees regarding the accuracy or completeness of information provided or compiled by others.

Exclusion of Mold, Fungus, Radon, Lead, and HBM

Aspect’s services do not include the investigation, detection, prevention or assessment of the presence of molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts. Accordingly, this report does not include any interpretations, recommendations, findings, or conclusions regarding the detection, assessment, prevention or abatement of molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts. Aspect’s services also do not include the investigation or assessment of hazardous building materials (HBM) such as asbestos, polychlorinated biphenyls (PCBs) in light ballasts, lead based paint, asbestos-containing building materials, urea-formaldehyde insulation in on-site structures or debris or any other HBMs. Aspect’s services do not include an evaluation of radon or lead in drinking water, unless specifically requested.