Geosyntec consultants

1255 Roberts Boulevard, NW, Suite 200
Kennesaw, Georgia 30144
PH 678.202.9500
FAX 678.202.9501
www.geosyntec.com

10 April 2023

Andrew Smith, P.E., LHG
UST/Technical Services Unit Supervisor
Ecology's Toxics Cleanup Program
Southwest Regional Office
Department of Ecology
PO Box 47775
Olympia, WA 98504-7775

**Subject: Ninth Compliance Groundwater Monitoring Report**
**Agreed Order No. DE 9514**
**Frederickson Industrial Park Site, Pierce County, WA**
**Geosyntec Project: GR4631M**

Dear Mr. Smith:

Geosyntec Consultants has prepared this letter on behalf of Olin Corporation and Mallinckrodt US Holdings LLC (the Companies) to present the results from compliance monitoring completed in 2022 at, what is now the former footprint of the Frederickson Industrial Park Site (Site) in Pierce County, Washington (Figure 1). This compliance monitoring is being performed in accordance with the Washington Department of Ecology's (Ecology's) Agreed Order (AO) No. DE 9514 (Order).

## Background

The Site is referred to as the Frederickson Industrial Park and is located south of 176th Street East and east of Canyon Road East in the Fredrickson area of Pierce County, Washington. The Site is situated approximately 10 miles south of Tacoma and 8 miles southwest of Puyallup, and is located in unincorporated County area surrounded by a mixture of industrial, residential and commercial properties. Boeing is the current owner of the Frederickson Industrial Center; Olin and Mallinckrodt are the successors of former owners. Panattoni Development Company (Panattoni) purchased two parcels (Parcels B and C) from Boeing with the property sale closing on September 16, 2021. Figure 1 shows the current property outlines. One active compliance monitoring well (MW-4) is located on the Panattoni property.

The Compliance Monitoring Work Plan (CMWP) outlines the requirements for monitored natural attenuation (MNA) compliance monitoring. As described in the CMWP, compliance monitoring for the Site consists of performance monitoring to track MNA, followed by confirmational monitoring to confirm compliance with applicable cleanup standards. In accordance with procedures outlined in the CMWP, and as defined in WAC 173-340-720(9)(iv), the performance monitoring well network was reduced from the original eleven wells identified in the CMWP to the current eight wells (Table 1) and includes hydrogeologic monitoring and groundwater sampling for carbon tetrachloride (CTC) analysis. Ecology approved the use of passive diffusion bags (PDBs) based on the sampling comparison evaluation results in an email dated 6 April 2018.

## Performance Monitoring Groundwater Results

*Hydrogeologic Monitoring*

Water level data collected during the 2022 groundwater monitoring event are presented in Table 1. Water level contours for Aquifer A are shown in Figure 2 for the 2022 monitoring event. The groundwater gradient in Aquifer A is to the north-northwest towards Clover Creek, and is consistent with past monitoring events.

*Carbon Tetrachloride*

Eight monitoring wells were sampled using passive diffusion bags during the November 2022 monitoring event. The samples were analyzed for CTC by ALS laboratory. The CTC data are summarized in Table 2, and the analytical reports are provided in Attachment A. Figure 3 presents the performance monitoring well locations and updated CTC contour based on the 2022 CTC results. Concentration trends for CTC are plotted for the performance monitoring wells in Figures 4a-4c.

Consistent with previous monitoring results, monitoring wells BMW-18, HLA-1, and 11-CL continue to have the highest CTC concentrations ranging between 2.4 µg/L and 3 µg/L (Figure 4a). The intermediate concentration wells (e.g., MW-1 and MW-13) ranged between 0.99 µg/L and 1.3 µg/L (Figure 4b). The peripheral monitoring wells, MW-4 on the east, P2-S on the north, and 11-BL on the west, had CTC concentrations of 0.46 µg/L, 0.17 (J) µg/L, and 0.31 (J) µg/L, respectively (Figure 4c). CTC concentrations at monitoring well 11-BL have been below the regulatory limit for three consecutive sampling events. The trends plotted in Figures 4a-4c illustrate declining, low CTC concentrations; the data plotted in Figures 4a-4c are provided in Table 3.

Concentration of CTC declined in all wells, and an evaluation of the monitoring data indicates that MNA continues to be active based on the following observations:

- Declining trends in HLA-1, BMW-18, 11-CL, MW-1, MW-13, MW-4, and 11-BL since inception of PDB sampling;
- Concentrations at the eight performance monitoring wells had an average decrease of 24% in November 2022 compared to April 2021;
- P2-S, MW-4, and 11-BL remain below the regulatory limit; and
- Concentrations at MW-1 and MW-13, which bound the upgradient and downgradient extents of the plume, continue to trend downward.

CTC concentrations at P2-S continue to be below the CTC cleanup level of 0.63 µg/L for the tenth (10) consecutive sampling event. The approved CMWP specifies the statistical method and the representative sampling period to determine when individual monitoring wells can be removed from the Performance Monitoring program. Consistent with WAC 173-340-720 (9)(d)(i)(A), the CMWP states that "an individual compliance monitoring well will be removed from the Performance Monitoring program if the upper one-sided ninety-five percent confidence limit on the true mean groundwater concentration is below the MTCA cleanup level (which is currently 0.63 µg/L)." Per the CMWP, the representative sampling period is specified as being the preceding four (4) sampling events. Therefore, well P2-S meets the Ecology-approved criteria, as described in the CMWP, to be removed from the Performance Monitoring program. However, Ecology has previously not approved removal of this well from the performance monitoring network because it serves as a downgradient performance monitoring well for the CTC plume. Therefore, P2-S will continue to be monitored.

## Future Monitoring Schedule

In 2022 Ecology approved a change in monitoring schedule from annual to every 18 months. This November 2022 event was the first to occur on the 18 month schedule. The next monitoring event is scheduled to occur during the 2nd quarter of 2024.

## Conclusions and Recommendations

The ninth MNA compliance monitoring event confirmed that CTC concentrations continue to be low and are declining. The results of the 2022 sampling event demonstrate that MNA is effectively reducing CTC concentrations at the Site.

Please contact Julie Peoples (423-336-4084) if you have questions regarding the information presented herein.

Sincerely,

James J. Deitsch, PhD., P.E. (GA)
Senior Principal

David L. Parkinson, PhD., P.G. (WA, TX)
Principal

Cc: Julie Peoples, Olin Corporation
Karen Kampwerth, Mallinckrodt
Deborah Taege, The Boeing Company
Anne Smith, Tacoma Water

Attachments:
Tables
Figures
Attachment A: Analytical Laboratory Report

# Tables

Table 1.
Performance Monitoring for 2022 Groundwater Sampling Event Water Level Data
Brazier Site, Frederickson, Washington

| Well | Ground Elevation (ft MSL) | Top of Casing Elevation (MSL) | Top of Screen (MSL) | Bottom of Screen (MSL) | Aquifer | Sample Date | Depth to Water (ft) | Water Level (MSL) |
|---|---|---|---|---|---|---|---|---|
| 11-BL | 395.5 | 396.08 | 331.5 | 321.5 | Lower - Aquifer A | 11/22/22 | 42.99 | 353.09 |
| 11-CL | 403.69 | 404.55 | 329.7 | 319.7 | Lower - Aquifer A | 11/22/22 | 48.65 | 355.90 |
| BMW-18 | 409.74 | 412.09 | 375.7 | 345.7 | Upper - Aquifer A | 11/22/22 | 48.05 | 364.04 |
| HLA-1 | 403.86 | 405.81 | 320.9 | 310.9 | Lower - Aquifer A | 11/22/22 | 49.95 | 355.86 |
| MW-1 | 413.27 | 415.79 | 324.8 | 314.8 | Lower - Aquifer A | 11/22/22 | 48.35 | 367.44 |
| MW-4 | 465.5 | 467.72 | 317.9 | 307.9 | Aquifer A | 11/22/22 | 120.85 | 346.87 |
| P2-S | 340.55 | 343.6 | 320.6 | 310.6 | Upper - Aquifer A | 11/22/22 | 16.45 | 327.15 |
| MW-13 | 394.5 | 394.1 | 284.5 | 274.5 | Aquifer A | 11/22/22 | 55.85 | 338.25 |

Note: The Performance Monitoring Network was revised following the 2017 Annual Sampling Event in accordance with the criteria established in the Compliance Monitoring Work Plan and per Ecology approval dated 27 March 2018; BMW-3, MW-7, and P2-I were removed from the network and are no longer sampled as part of compliance monitoring.

Table 2.
Carbon Tetrachloride Results for 2022
Brazier Site, Frederickson, Washington

| Well | PDB Deployment Date | Sample Date | Result (µg/L) | Lab MRL | Lab MDL | Qualifiers | Depth to Water (ft) | Water Level (MSL) |
|---|---|---|---|---|---|---|---|---|
| 11-BL | 11/8/2022 | 11/22/22 | 0.31 | 0.5 | 0.096 | J | 42.99 | 353.09 |
| 11-CL | 11/8/2022 | 11/22/22 | **3.0** | 0.5 | 0.096 | | 48.65 | 355.90 |
| BMW-18 | 11/8/2022 | 11/22/22 | **2.4** | 0.5 | 0.096 | | 48.05 | 364.04 |
| HLA-1 | 11/8/2022 | 11/22/22 | **3.0** | 0.5 | 0.096 | | 49.95 | 355.86 |
| MW-1 | 11/8/2022 | 11/22/22 | **0.99** | 0.5 | 0.096 | | 48.35 | 367.44 |
| MW-4 | 11/8/2022 | 11/22/22 | 0.46 | 0.5 | 0.096 | J | 120.85 | 346.87 |
| P2-S | 11/8/2022 | 11/22/22 | 0.17 | 0.5 | 0.096 | J | 16.45 | 327.15 |
| MW-13 | 11/8/2022 | 11/22/22 | **1.3** | 0.5 | 0.096 | | 55.85 | 338.25 |

Notes:

**BOLD** = CTC value above groundwater cleanup level of 0.63 µg/L

µg/L = micrograms per liter;

MRL = Method Reporting Limit

MDL = Method Detection Limit

Laboratory Qualifier:

J = Carbon Tetrachloride detected between the MDL and method reporting limit (MRL: 0.5 µg/L). The reported value is estimated.

Table 3.
2014-2022 Carbon Tetrachloride Groundwater Performance Monitoring Data
Brazier Site, Frederickson, Washington

| Wells | 11-BL | 11-CL | HLA-1 | BMW-3 | BMW-18 | MW-1 | MW-4 | MW-7 | P2-S | P2-I | MW-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| May-14 | **0.97** | **5.4** | **5.0** | *0.28* | **5.5** | **1.8** | **0.82** | **2.3** | **0.76** | **0.72** | **2.3** |
| Oct-14 | **0.95** | **4.4** | **4.6** | *0.39* | **4.8** | **1.4** | **0.66** | ND | ND | ND | **1.9** |
| Mar-15 | **0.64** | **4.3** | **4.4** | *0.19* | **4.2** | **1.5** | 0.62 | *0.22* | *0.29* | ND | **1.9** |
| Oct-15 | **0.72** | **3.8** | **3.9** | 0.51 | **3.8** | **1.2** | 0.53 | *0.24* | *0.45* | ND | **1.7** |
| May-16 | 0.50 | **2.9** | **3.6** | *0.27* | **3.7** | **1.5** | 0.51 | ND | *0.28* | ND | **1.3** |
| Jun-17 | **0.74** | **3.7** | **4.4** | *0.43* | **4.7** | **1.8** | **0.67** | ND | *0.27* | ND | **1.6** |
| May-18[1] | 0.51 | **4.1** | **4.5** | -- | **3.4** | **2.1** | **0.67** | -- | *0.36* | -- | **1.8** |
| May-19[1] | **0.89** | **4.4** | **4.6** | -- | **3.5** | **1.7** | **0.67** | -- | *0.37* | -- | **2.0** |
| May-20[1] | *0.38* | **3.2** | **3.8** | -- | **2.5** | **1.3** | 0.58 | -- | *0.36* | -- | **1.7** |
| April-21[1] | *0.33* | **4.1** | **4.0** | -- | **2.9** | **1.3** | 0.65 | -- | *0.35* | -- | **1.5** |
| Nov-22[1] | *0.31* | **3.0** | **3.0** | -- | **2.4** | **0.99** | *0.46* | -- | *0.17* | -- | **1.3** |
| 95% UCL[2] | **0.89** | **4.4** | **4.6** | -- | **3.5** | **1.7** | **0.67** | -- | *0.37* | -- | **2.0** |

Notes:

1 - Groundwater sampling prior to 2018 was performed by low-flow method; use of passive diffusion bags for sampling began in 2018.

2 - 95% Upper Confidence Limit on true mean, using Ecology's Statistical Guidance for sample sets less than 20 (Example #15, page 97-98)
https://fortress.wa.gov/ecy/publications/documents/9254.pdf

**WAC 173-340-720 (9)(e)(iv) **If more than fifty percent of the measurements are below the practical quantitation limit, the largest value in the data set shall be used in place of an upper confidence limit on the true mean groundwater calculation.**

| | |
|---|---|
| **1.5** | Bold values are above the CTC cleanup level of 0.63 µg/L |
| *0.5* | Estimated Value (i.e., concentration greater than method detection limit but less than method reporting limit) |
| ND | Non-Detected (Method Detection = 0.096) |
| -- | Monitoring well no longer requires Performance Monitoring |

The Performance Monitoring Network was revised following the 2017 Annual Sampling Event in accordance with the criteria established in the Compliance Monitoring Work Plan and per Ecology approval dated 27 March 2018; BMW-3, MW-7, and P2-I were removed from the network and are no longer sampled as part of performance monitoring.

# Figures


Legend

Boeing Property

Panattoni Property

Source:
Bing Aerial Photography, May 2022

1,000 500 0 1,000 Feet

**Property Location**

Frederickson Industrial Park
Frederickson, WA

Geosyntec consultants

Seattle, WA | March 2023

Figure 1

P:\Projects\Olin Frederickson\800 GIS and CAD\920 GIS\GIS\GIS\November 2022\MXDs\Figure 01 Property Location.mxd; MInman; 2/27/2023

N

MW-7

Clover Creek

P-2I

P-2S (327.15)

330

335

340

MW-13 (338.25)

345

350

MW-4 (346.87)

355

360

63rd Ave

365

11-BL (353.09)

180th Street

11-CL (355.90)

HLA-1 (355.86*)

BMW-18 (364.04)

MW-1 (367.44)

BMW-3

750 375 0 750 Feet

Note:

* - Not used in water level contouring; well is screened in lower level of Aquifer A compared to wells used to develop contours.

Legend

- November 2022 Water Level Contours (ft masl)
- Aquifer A Compliance Monitoring Network Well (November 2022 Water Level (ft masl))
- Monitoring Wells
- Boeing Property
- Panattoni Property

**Aquifer A Groundwater Levels**
**November 2022**

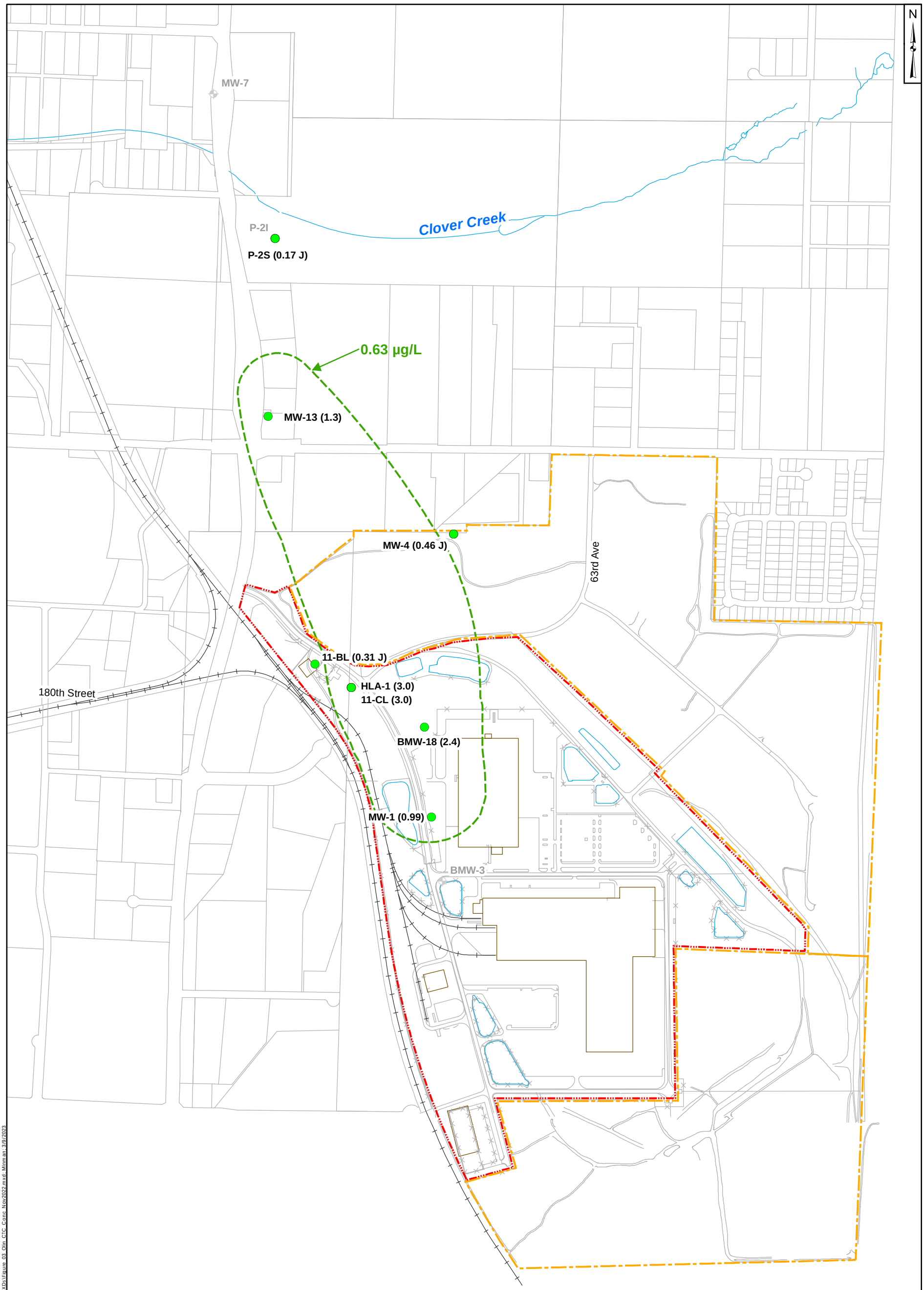
Frederickson Industrial Park
Frederickson, WA

Geosyntec consultants

Seattle, WA | March 2023

Figure **2**

P:\Projects\Olin Frederickson\800 GIS and CAD\920 GIS\GIS\November 2022\MXDs\Figure_02_Olin_GW_Elev_Nov2022.mxd: Mmman: 3/9/2023




Legend

- Aquifer A Monitoring Well (CTC Concentration (µg/L))
- Monitoring Wells
- CTC Contour for November 2022 data set
- Boeing Property
- Panattoni Property

Notes:
1. (0.33 J) The results were above the Method Detection Limit (MDL), but below the Method Reporting Limit (MRL) and thus the values are estimated (i.e., J - flagged).

750 375 0 750 Feet

**Aquifer A Carbon Tetrachloride Groundwater Results November 2022**

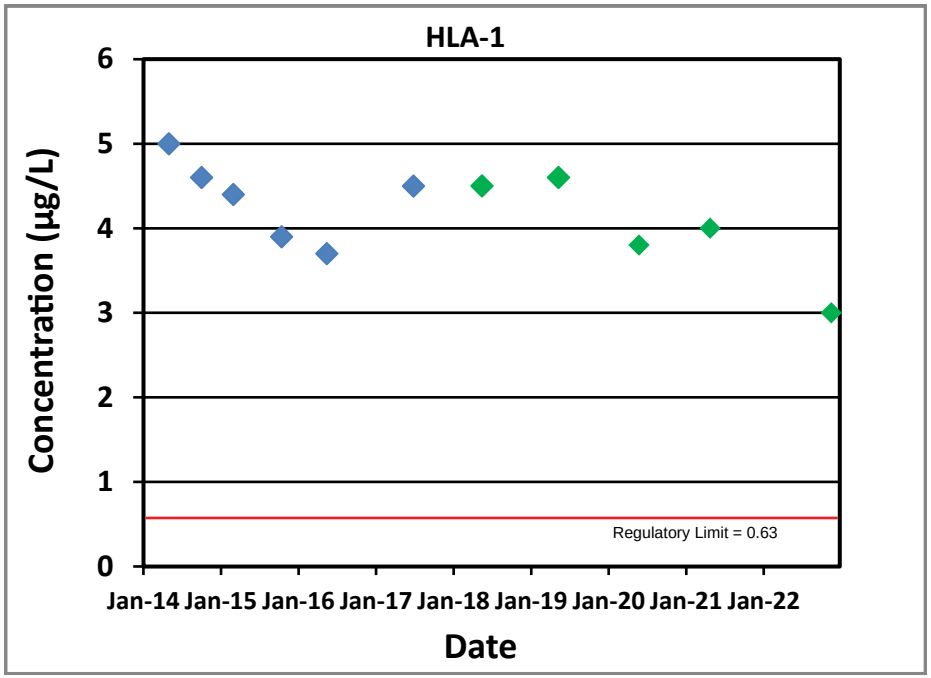
Frederickson Industrial Park
Frederickson, WA

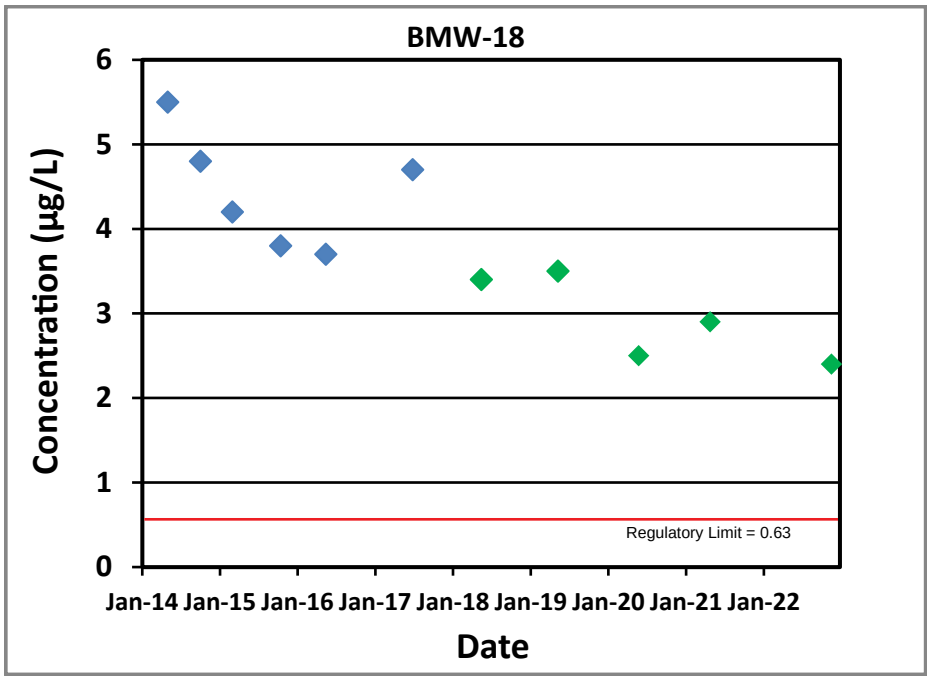
Geosyntec consultants

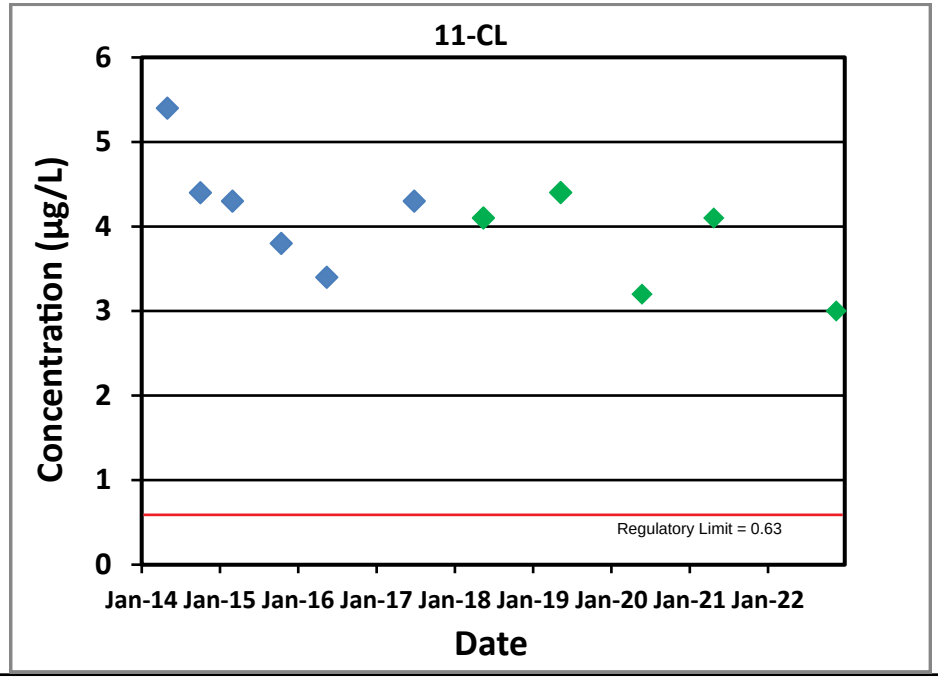
Seattle, WA | March 2023

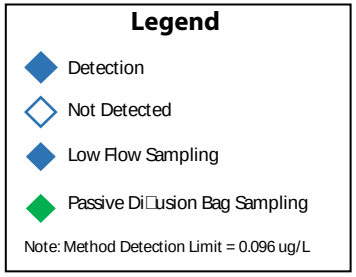
Figure 3

P:\Projects\Olin Frederickson\800 GIS and CAD\920 GIS\GIS\Nov mtg 2022\MXDs\Figure_03_Olin_CTC_Conc_Nov2022.mxd; Minman; 3/9/2023



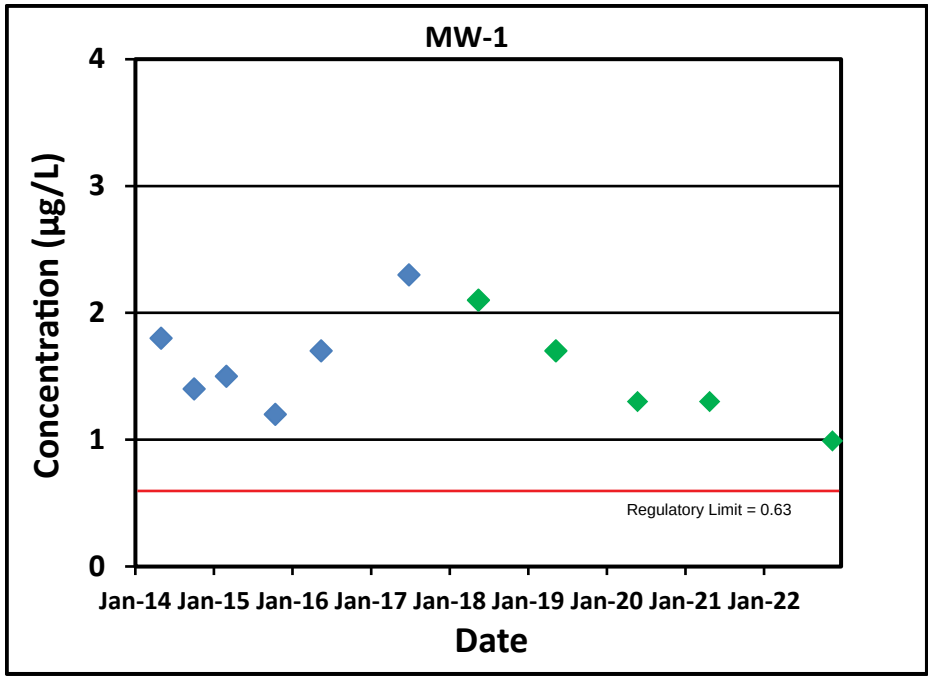



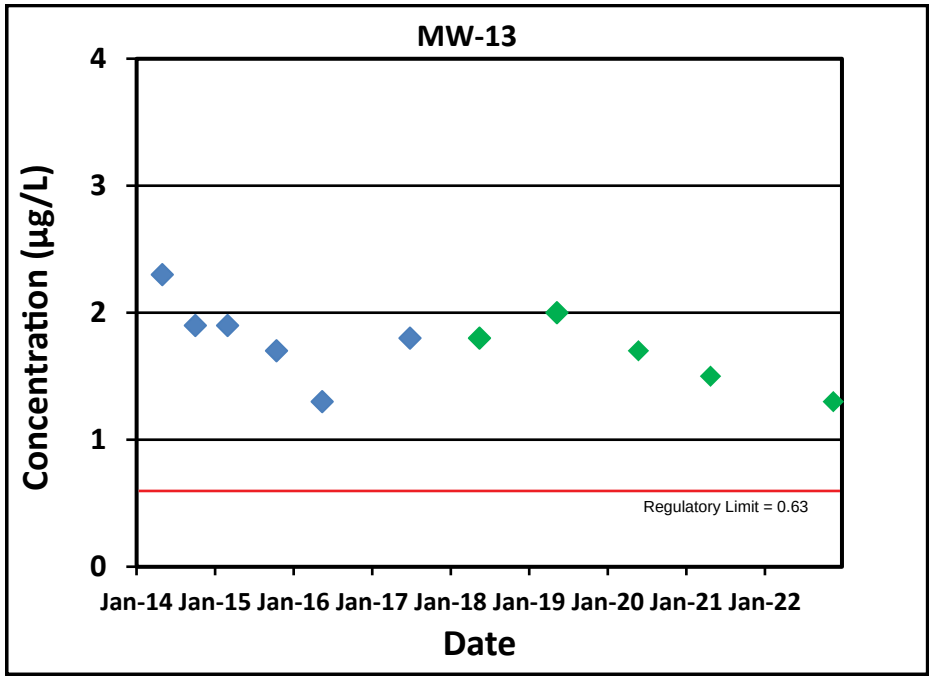

**Carbon Tetrachloride**
**Groundwater Monitoring Well Data**
Frederickson Industrial Park, Frederickson, WA

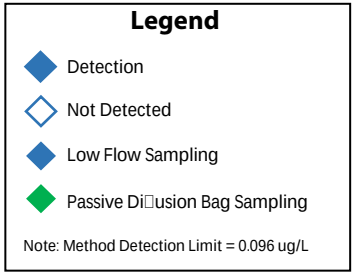
Geosyntec consultants

Seattle, WA | March 2023

Figure **4a**



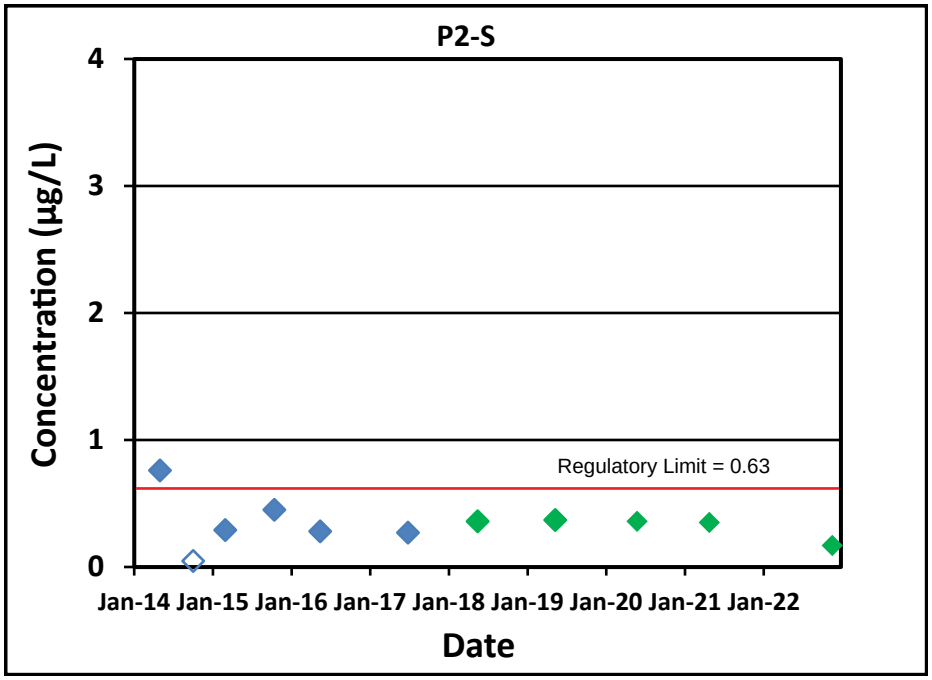



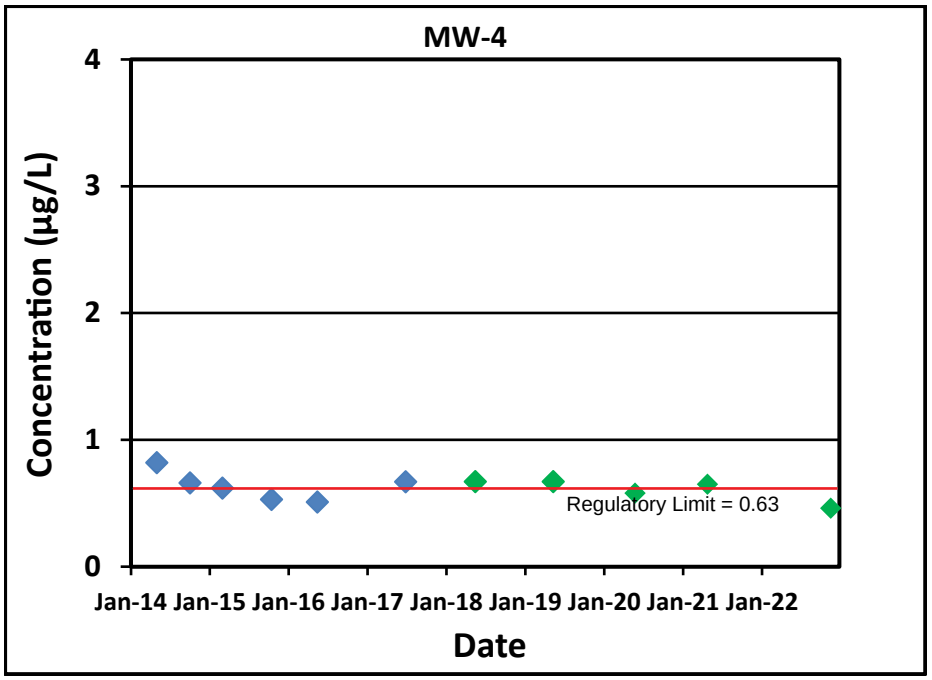

**Carbon Tetrachloride**
**Groundwater Monitoring Well Data**
Frederickson Industrial Park, Frederickson, WA

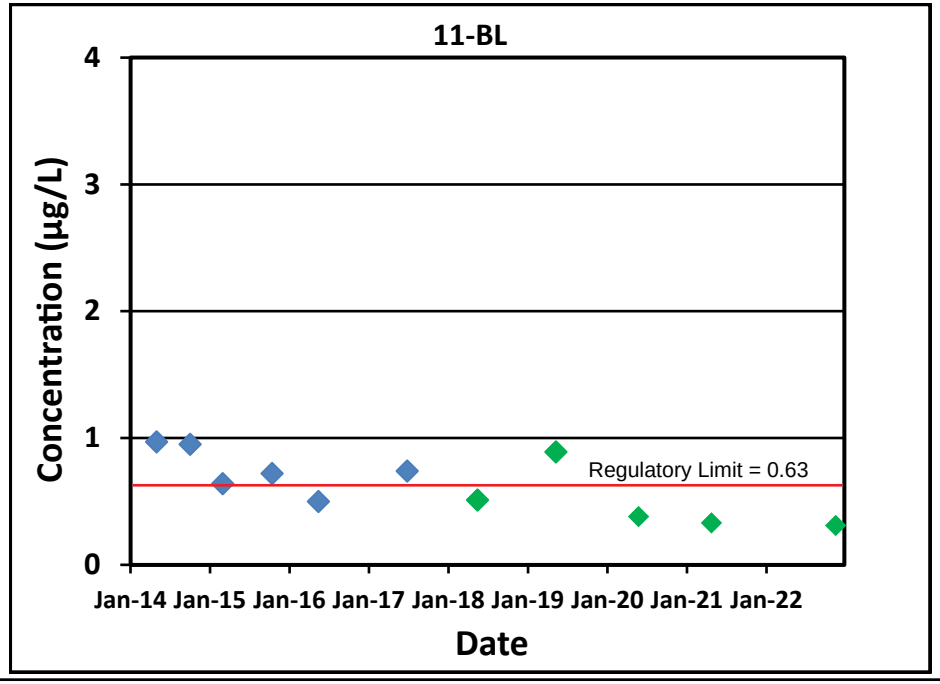
Geosyntec consultants

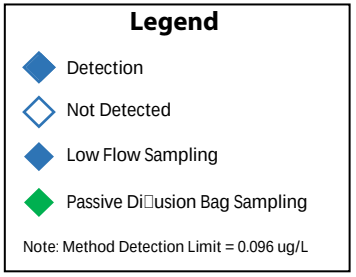
Seattle, WA | March 2023

Figure **4b**




**Carbon Tetrachloride**
**Groundwater Monitoring Well Data**
Frederickson Industrial Park, Frederickson, WA

Geosyntec consultants

Seattle, WA | March 2023

Figure **4c**

# Attachment A

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
**T :** +1 360 577 7222
**F :** +1 360 636 1068
**www.alsglobal.com**

December 01, 2022 **Analytical Report for Service Request No:** K2213860

Dave Parkinson
Geosyntec Consultants
520 Pike Street, Suite 2600
Seattle, WA 98101

**RE: Olin Fredrickson**

Dear Dave,

Enclosed are the results of the sample(s) submitted to our laboratory November 23, 2022
For your reference, these analyses have been assigned our service request number **K2213860.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3350. You may also contact me via email at Kelley.Lovejoy@alsglobal.com.

Respectfully submitted,

**ALS Group USA, Corp. dba ALS Environmental**

Kelley Lovejoy

Kelley Lovejoy
Project Manager

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
**T :** +1 360 577 7222
**F :** +1 360 636 1068
**www.alsglobal.com**

# Table of Contents

## Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| A2LA | American Association for Laboratory Accreditation |
| CARB | California Air Resources Board |
| CAS Number | Chemical Abstract Service registry Number |
| CFC | Chlorofluorocarbon |
| CFU | Colony-Forming Unit |
| DEC | Department of Environmental Conservation |
| DEQ | Department of Environmental Quality |
| DHS | Department of Health Services |
| DOE | Department of Ecology |
| DOH | Department of Health |
| EPA | U. S. Environmental Protection Agency |
| ELAP | Environmental Laboratory Accreditation Program |
| GC | Gas Chromatography |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| LOD | Limit of Detection |
| LOQ | Limit of Quantitation |
| LUFT | Leaking Underground Fuel Tank |
| M | Modified |
| MCL | Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA. |
| MDL | Method Detection Limit |
| MPN | Most Probable Number |
| MRL | Method Reporting Limit |
| NA | Not Applicable |
| NC | Not Calculated |
| NCASI | National Council of the Paper Industry for Air and Stream Improvement |
| ND | Not Detected |
| NIOSH | National Institute for Occupational Safety and Health |
| PQL | Practical Quantitation Limit |
| RCRA | Resource Conservation and Recovery Act |
| SIM | Selected Ion Monitoring |
| TPH | Total Petroleum Hydrocarbons |
| tr | Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL. |

## Inorganic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards. |
| E | The result is an estimate amount because the value exceeded the instrument calibration range. |
| J | The result is an estimated value. |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a matrix interference. |
| X | See case narrative. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |
| H | The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory. |

## Metals Data Qualifiers

| | |
|---|---|
| # | The control limit criteria is not applicable. |
| J | The result is an estimated value. |
| E | The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample. |
| M | The duplicate injection precision was not met. |
| N | The Matrix Spike sample recovery is not within control limits. See case narrative. |
| S | The reported value was determined by the Method of Standard Additions (MSA). |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| W | The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a matrix interference. |
| X | See case narrative. |
| + | The correlation coefficient for the MSA is less than 0.995. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |

## Organic Data Qualifiers

| | |
|---|---|
| * | The result is an outlier. See case narrative. |
| # | The control limit criteria is not applicable. See case narrative. |
| A | A tentatively identified compound, a suspected aldol-condensation product. |
| B | The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards. |
| C | The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data. |
| D | The reported result is from a dilution. |
| E | The result is an estimated value. |
| J | The result is an estimated value. |
| N | The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed. |
| P | The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results. |
| U | The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution. |
| i | The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference. |
| X | See case narrative. |
| Q | See case narrative. One or more quality control criteria was outside the limits. |

## Additional Petroleum Hydrocarbon Specific Qualifiers

| | |
|---|---|
| F | The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard. |
| L | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard. |
| H | The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard. |
| O | The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard. |
| Y | The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard. |
| Z | The chromatographic fingerprint does not resemble a petroleum product. |

**ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso**
**State Certifications, Accreditations, and Licenses**

| Agency | Web Site | Number |
|---|---|---|
| Alaska DEH | http://dec.alaska.gov/eh/lab/cs/csapproval.htm | UST-040 |
| Arizona DHS | http://www.azdhs.gov/lab/license/env.htm | AZ0339 |
| Arkansas - DEQ | http://www.adeq.state.ar.us/techsvs/labcert.htm | 88-0637 |
| California DHS (ELAP) | http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx | 2795 |
| DOD ELAP | http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm | L16-58-R4 |
| Florida DOH | http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm | E87412 |
| Hawaii DOH | http://health.hawaii.gov/ | - |
| ISO 17025 | http://www.pjlabs.com/ | L16-57 |
| Louisiana DEQ | http://www.deq.louisiana.gov/page/la-lab-accreditation | 03016 |
| Maine DHS | http://www.maine.gov/dhhs/ | WA01276 |
| Minnesota DOH | http://www.health.state.mn.us/accreditation | 053-999-457 |
| Nevada DEP | http://ndep.nv.gov/bsdw/labservice.htm | WA01276 |
| New Jersey DEP | http://www.nj.gov/dep/enforcement/oqa.html | WA005 |
| New York - DOH | https://www.wadsworth.org/regulatory/elap | 12060 |
| North Carolina DEQ | https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification | 605 |
| Oklahoma DEQ | http://www.deq.state.ok.us/CSDnew/labcert.htm | 9801 |
| Oregon – DEQ (NELAP) | http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx | WA100010 |
| South Carolina DHEC | http://www.scdhec.gov/environment/EnvironmentalLabCertification/ | 61002 |
| Texas CEQ | http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html | T104704427 |
| Washington DOE | http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html | C544 |
| Wyoming (EPA Region 8) | https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water- | - |
| Kelso Laboratory Website | www.alsglobal.com | NA |

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

# Case Narrative

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

**Client:** Geosyntec Consultants
**Project:** Olin Fredrickson
**Sample Matrix:** Water

**Service Request:** K2213860
**Date Received:** 11/23/2022

## CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier III level requested by the client.

**Sample Receipt:**

Ten water samples were received for analysis at ALS Environmental on 11/23/2022. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The samples were stored at minimum in accordance with the analytical method requirements.

**Volatiles by GC/MS:**

No significant anomalies were noted with this analysis.

Approved by Kelley Lovejoy Date 12/01/2022

# Chain of Custody

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

ALS Environmental

# 127453

## CHAIN OF CUSTODY
# 127453

004

SR# K223860

COC Set 1 of 1

COC#

1317 South 13th Ave, Kelso, WA 98626 Phone (360) 577-7222 / 800-695-7222 / FAX (360) 636-1068
www.alsglobal.com



| | |
|---|---|
| Project Name | OLSEN FREDERICKSON |
| Project Number: | |
| Project Manager | DAVE PARKINSON |
| Company | GEOSYNTEC |
| Address | |
| Phone # | (206) 618-0350 |
| email | |
| Sampler Signature | |
| Sampler Printed Name | LEE BORES |

| CLIENT SAMPLE ID | LABID | SAMPLING Date | SAMPLING Time | Matrix | NUMBER OF CONTAINERS | 7D Screen VOA GCMS / | 14D 8260C / VOC FP | 1 CTC | 2 | 3 | 4 | 5 | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 GW-112222-MW-1 | | 11/22/22 | 0723 | W | 3 | | | X | | | | | |
| 2. GW-112222-MW-4 | | 11/22/22 | 0910 | W | 3 | | | X | | | | | |
| 3. GW-112222-MW-13 | | 11/22/22 | 0930 | W | 3 | | | X | | | | | |
| 4. GW-112222-BMW-18 | | 11/22/22 | 0825 | W | 9 | | | X | | | | | MS/MSD |
| 5. GW-112222-PZ-5 | | 11/22/22 | 0955 | W | 3 | | | X | | | | | |
| 6. GW-112222-11-BL | | 11/22/22 | 0745 | W | 3 | | | X | | | | | |
| 7. GW-112222-11-CL | | 11/22/22 | 0800 | W | 3 | | | X | | | | | |
| 8. GW-112222-HLA-1 | | 11/22/22 | 0810 | W | 3 | | | X | | | | | |
| 9. GW-112222-DUP | | 11/22/22 | - | W | 3 | | | X | | | | | |
| 10. GW-112222-BLANK | | 11/22/22 | 1005 | W | 3 | | | X | | | | | |

**Report Requirements**

___ I. Routine Report: Method Blank, Surrogate, as required

___ II. Report Dup., MS, MSD as required

___ III. CLP Like Summary (no raw data)

___ IV. Data Validation Report

___ V. EDD

**Invoice Information**

P.O.#

Bill To:

**Turnaround Requirements**

___ 24 hr. ___ 48 hr.

___ 5 Day

___ Standard

Requested Report Date

Circle which metals are to be analyzed

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Special Instructions/Comments:

*Indicate State Hydrocarbon Procedure: AK CA WI Northwest Other____(Circle One)

| Relinquished By: | Received By: | Relinquished By: | Received By: | Relinquished By: | Received By: |
|---|---|---|---|---|---|
| Signature | Signature | Signature | Signature | Signature | Signature |
| Printed Name: LEE BORES | Printed Name: Marilyn Mitola | Printed Name | Printed Name | Printed Name | Printed Name |
| Firm: BTS | Firm: ALS | Firm | Firm | Firm | Firm |
| Date/Time: 11/23/22 0809 | Date/Time: 11/23/22 0809 | Date/Time | Date/Time | Date/Time | Date/Time |

PM Kelly

# Cooler Receipt and Preservation Form

Client GeoSyntec Service Request K22 13860

Received: 11/23/22 Opened: 11/23/22 By: MM Unloaded: 11/23/22 By: MM

1. Samples were received via? *USPS* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other*_____ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? _____
   If present, were custody seals intact? Y N If present, were they signed and dated? Y N

| Temp Blank | Sample Temp | IR Gun | Cooler #/COC ID / NA | Out of temp indicate with "X" | PM Notified if out of temp | Tracking Number NA | Filed |
|---|---|---|---|---|---|---|---|
| | 1.5 | IR02 | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

4. Was a Temperature Blank present in cooler? NA Y (N) If yes, notate the temperature in the appropriate column above:
   If no, take the temperature of a representative sample bottle contained within the cooler; notate in the column "Sample Temp":
5. Were samples received within the method specified temperature ranges? NA (Y) N
   If no, were they received on ice and same day as collected? If not, notate the cooler # below and notify the PM. NA Y N

If applicable, tissue samples were received: *Frozen* *Partially Thawed* *Thawed*

6. Packing material: *Inserts* (*Baggies*) *Bubble Wrap* *Gel Packs* (*Wet Ice*) *Dry Ice* *Sleeves* _____
7. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
8. Were samples received in good condition (unbroken) NA (Y) N
9. Were all sample labels complete (ie, analysis, preservation, etc.)? NA (Y) N
10. Did all sample labels and tags agree with custody papers? NA (Y) N
11. Were appropriate bottles/containers and volumes received for the tests indicated? NA (Y) N
12. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* (NA) Y N
13. Were VOA vials received without headspace? *Indicate in the table below.* NA (Y) N
14. Was C12/Res negative? (NA) Y N
15. Were 100ml sterile microbiology bottles filled exactly to the 100ml mark? (NA) Y N Under filled Overfilled

| Sample ID on Bottle | Sample ID on COC | Identified by: |
|---|---|---|
| | | |
| | | |
| | | |

| Sample ID | Bottle Count Bottle Type | Head-space | Broke | pH | Reagent | Volume added | Reagent Lot Number | Initials | Time |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Notes, Discrepancies, Resolutions: _____

# Volatile Organic Compounds by GC/MS

**ALS Environmental—Kelso Laboratory**
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Collected:** | 11/22/22 07:23 |
| **Sample Matrix:** | Water | **Date Received:** | 11/23/22 08:09 |
| **Sample Name:** | GW-112222-MW-1 | **Units:** | ug/L |
| **Lab Code:** | K2213860-001 | **Basis:** | NA |

## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**Prep Method:** None

| Analyte Name | Result | MRL | MDL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| Carbon Tetrachloride | **0.99** | 0.50 | 0.096 | 1 | 11/28/22 15:20 | |

| Surrogate Name | % Rec | Control Limits | Date Analyzed | Q |
|---|---|---|---|---|
| 4-Bromofluorobenzene | 95 | 68 - 117 | 11/28/22 15:20 | |
| Dibromofluoromethane | 88 | 73 - 122 | 11/28/22 15:20 | |
| Toluene-d8 | 87 | 65 - 144 | 11/28/22 15:20 | |

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Collected:** | 11/22/22 09:10 |
| **Sample Matrix:** | Water | **Date Received:** | 11/23/22 08:09 |
| **Sample Name:** | GW-112222-MW-4 | **Units:** | ug/L |
| **Lab Code:** | K2213860-002 | **Basis:** | NA |

## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**Prep Method:** None

| Analyte Name | Result | MRL | MDL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| Carbon Tetrachloride | **0.46 J** | 0.50 | 0.096 | 1 | 11/28/22 15:45 | |

| Surrogate Name | % Rec | Control Limits | Date Analyzed | Q |
|---|---|---|---|---|
| 4-Bromofluorobenzene | 96 | 68 - 117 | 11/28/22 15:45 | |
| Dibromofluoromethane | 91 | 73 - 122 | 11/28/22 15:45 | |
| Toluene-d8 | 88 | 65 - 144 | 11/28/22 15:45 | |

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Collected:** | 11/22/22 09:30 |
| **Sample Matrix:** | Water | **Date Received:** | 11/23/22 08:09 |
| **Sample Name:** | GW-112222-MW-13 | **Units:** | ug/L |
| **Lab Code:** | K2213860-003 | **Basis:** | NA |

## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**Prep Method:** None

| Analyte Name | Result | MRL | MDL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| Carbon Tetrachloride | **1.3** | 0.50 | 0.096 | 1 | 11/28/22 16:09 | |

| Surrogate Name | % Rec | Control Limits | Date Analyzed | Q |
|---|---|---|---|---|
| 4-Bromofluorobenzene | 97 | 68 - 117 | 11/28/22 16:09 | |
| Dibromofluoromethane | 89 | 73 - 122 | 11/28/22 16:09 | |
| Toluene-d8 | 87 | 65 - 144 | 11/28/22 16:09 | |

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Collected:** | 11/22/22 08:25 |
| **Sample Matrix:** | Water | **Date Received:** | 11/23/22 08:09 |
| **Sample Name:** | GW-112222-BMW-18 | **Units:** | ug/L |
| **Lab Code:** | K2213860-004 | **Basis:** | NA |

## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**Prep Method:** None

| Analyte Name | Result | MRL | MDL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| Carbon Tetrachloride | **2.4** | 0.50 | 0.096 | 1 | 11/28/22 16:33 | |

| Surrogate Name | % Rec | Control Limits | Date Analyzed | Q |
|---|---|---|---|---|
| 4-Bromofluorobenzene | 97 | 68 - 117 | 11/28/22 16:33 | |
| Dibromofluoromethane | 90 | 73 - 122 | 11/28/22 16:33 | |
| Toluene-d8 | 86 | 65 - 144 | 11/28/22 16:33 | |

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Collected:** | 11/22/22 09:55 |
| **Sample Matrix:** | Water | **Date Received:** | 11/23/22 08:09 |
| **Sample Name:** | GW-112222-P2-S | **Units:** | ug/L |
| **Lab Code:** | K2213860-005 | **Basis:** | NA |

## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**Prep Method:** None

| Analyte Name | Result | MRL | MDL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| Carbon Tetrachloride | **0.17 J** | 0.50 | 0.096 | 1 | 11/28/22 16:58 | |

| Surrogate Name | % Rec | Control Limits | Date Analyzed | Q |
|---|---|---|---|---|
| 4-Bromofluorobenzene | 97 | 68 - 117 | 11/28/22 16:58 | |
| Dibromofluoromethane | 92 | 73 - 122 | 11/28/22 16:58 | |
| Toluene-d8 | 88 | 65 - 144 | 11/28/22 16:58 | |

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Collected:** | 11/22/22 07:45 |
| **Sample Matrix:** | Water | **Date Received:** | 11/23/22 08:09 |
| **Sample Name:** | GW-112222-11-BL | **Units:** | ug/L |
| **Lab Code:** | K2213860-006 | **Basis:** | NA |

## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**Prep Method:** None

| Analyte Name | Result | MRL | MDL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| Carbon Tetrachloride | **0.31 J** | 0.50 | 0.096 | 1 | 11/28/22 17:22 | |

| Surrogate Name | % Rec | Control Limits | Date Analyzed | Q |
|---|---|---|---|---|
| 4-Bromofluorobenzene | 95 | 68 - 117 | 11/28/22 17:22 | |
| Dibromofluoromethane | 90 | 73 - 122 | 11/28/22 17:22 | |
| Toluene-d8 | 87 | 65 - 144 | 11/28/22 17:22 | |

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Collected:** | 11/22/22 08:00 |
| **Sample Matrix:** | Water | **Date Received:** | 11/23/22 08:09 |
| **Sample Name:** | GW-112222-11-CL | **Units:** | ug/L |
| **Lab Code:** | K2213860-007 | **Basis:** | NA |

## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**Prep Method:** None

| Analyte Name | Result | MRL | MDL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| Carbon Tetrachloride | **3.0** | 0.50 | 0.096 | 1 | 11/28/22 17:47 | |

| Surrogate Name | % Rec | Control Limits | Date Analyzed | Q |
|---|---|---|---|---|
| 4-Bromofluorobenzene | 96 | 68 - 117 | 11/28/22 17:47 | |
| Dibromofluoromethane | 92 | 73 - 122 | 11/28/22 17:47 | |
| Toluene-d8 | 88 | 65 - 144 | 11/28/22 17:47 | |

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Collected:** | 11/22/22 08:10 |
| **Sample Matrix:** | Water | **Date Received:** | 11/23/22 08:09 |
| **Sample Name:** | GW-112222-HLA-1 | **Units:** | ug/L |
| **Lab Code:** | K2213860-008 | **Basis:** | NA |

## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**Prep Method:** None

| Analyte Name | Result | MRL | MDL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| Carbon Tetrachloride | **3.0** | 0.50 | 0.096 | 1 | 11/28/22 18:11 | |

| Surrogate Name | % Rec | Control Limits | Date Analyzed | Q |
|---|---|---|---|---|
| 4-Bromofluorobenzene | 95 | 68 - 117 | 11/28/22 18:11 | |
| Dibromofluoromethane | 91 | 73 - 122 | 11/28/22 18:11 | |
| Toluene-d8 | 88 | 65 - 144 | 11/28/22 18:11 | |

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Collected:** | 11/22/22 |
| **Sample Matrix:** | Water | **Date Received:** | 11/23/22 08:09 |
| **Sample Name:** | GW-112222-DUP | **Units:** | ug/L |
| **Lab Code:** | K2213860-009 | **Basis:** | NA |

## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**Prep Method:** None

| Analyte Name | Result | MRL | MDL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| Carbon Tetrachloride | **1.3** | 0.50 | 0.096 | 1 | 11/28/22 18:36 | |

| Surrogate Name | % Rec | Control Limits | Date Analyzed | Q |
|---|---|---|---|---|
| 4-Bromofluorobenzene | 94 | 68 - 117 | 11/28/22 18:36 | |
| Dibromofluoromethane | 92 | 73 - 122 | 11/28/22 18:36 | |
| Toluene-d8 | 88 | 65 - 144 | 11/28/22 18:36 | |

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Collected:** | 11/22/22 10:05 |
| **Sample Matrix:** | Water | **Date Received:** | 11/23/22 08:09 |
| **Sample Name:** | GW-112222-BLANK | **Units:** | ug/L |
| **Lab Code:** | K2213860-010 | **Basis:** | NA |

## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**Prep Method:** None

| Analyte Name | Result | MRL | MDL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| Carbon Tetrachloride | ND U | 0.50 | 0.096 | 1 | 11/28/22 19:00 | |

| Surrogate Name | % Rec | Control Limits | Date Analyzed | Q |
|---|---|---|---|---|
| 4-Bromofluorobenzene | 94 | 68 - 117 | 11/28/22 19:00 | |
| Dibromofluoromethane | 93 | 73 - 122 | 11/28/22 19:00 | |
| Toluene-d8 | 88 | 65 - 144 | 11/28/22 19:00 | |

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Collected:** | NA |
| **Sample Matrix:** | Water | **Date Received:** | NA |
| **Sample Name:** | Method Blank | **Units:** | ug/L |
| **Lab Code:** | KQ2221180-05 | **Basis:** | NA |

## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**Prep Method:** None

| Analyte Name | Result | MRL | MDL | Dil. | Date Analyzed | Q |
|---|---|---|---|---|---|---|
| Carbon Tetrachloride | ND U | 0.50 | 0.096 | 1 | 11/28/22 14:55 | |

| Surrogate Name | % Rec | Control Limits | Date Analyzed | Q |
|---|---|---|---|---|
| 4-Bromofluorobenzene | 98 | 68 - 117 | 11/28/22 14:55 | |
| Dibromofluoromethane | 89 | 73 - 122 | 11/28/22 14:55 | |
| Toluene-d8 | 88 | 65 - 144 | 11/28/22 14:55 | |

**Client:** Geosyntec Consultants **Service Request:** K2213860
**Project:** Olin Fredrickson
**Sample Matrix:** Water

## SURROGATE RECOVERY SUMMARY
## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**Extraction Method:** None

| Sample Name | Lab Code | 4-Bromofluorobenzene 68-117 | Dibromofluoromethane 73-122 | Toluene-d8 65-144 |
|---|---|---|---|---|
| GW-112222-MW-1 | K2213860-001 | 95 | 88 | 87 |
| GW-112222-MW-4 | K2213860-002 | 96 | 91 | 88 |
| GW-112222-MW-13 | K2213860-003 | 97 | 89 | 87 |
| GW-112222-BMW-18 | K2213860-004 | 97 | 90 | 86 |
| GW-112222-P2-S | K2213860-005 | 97 | 92 | 88 |
| GW-112222-11-BL | K2213860-006 | 95 | 90 | 87 |
| GW-112222-11-CL | K2213860-007 | 96 | 92 | 88 |
| GW-112222-HLA-1 | K2213860-008 | 95 | 91 | 88 |
| GW-112222-DUP | K2213860-009 | 94 | 92 | 88 |
| GW-112222-BLANK | K2213860-010 | 94 | 93 | 88 |
| Method Blank | KQ2221180-05 | 98 | 89 | 88 |
| Lab Control Sample | KQ2221180-03 | 108 | 91 | 90 |
| Duplicate Lab Control Sample | KQ2221180-04 | 109 | 92 | 91 |
| GW-112222-BMW-18 | KQ2221180-06 | 110 | 90 | 90 |
| GW-112222-BMW-18 | KQ2221180-07 | 107 | 91 | 90 |

QA/QC Report

**Client:** Geosyntec Consultants **Service Request:**K2213860
**Project:** Olin Fredrickson **Date Analyzed:**11/28/22 12:04

**Internal Standard Area and RT SUMMARY**
**Volatile Organic Compounds by GC/MS**

**File ID:** J:\MS23\DATA\112822\1128F007.D\ **Lab Code:**KQ2221180-02
**Instrument ID:** K-MS-23 **Analysis Lot:**786531
**Analysis Method:** 8260C **Signal ID:**1

| | | Chlorobenzene-d5 | | 1,4-Dichlorobenzene-d4 | | Fluorobenzene | |
|---|---|---|---|---|---|---|---|
| | | **Area** | **RT** | **Area** | **RT** | **Area** | **RT** |
| | **Result ==>** | 783,611 | 9.17 | 619,622 | 11.58 | 2,118,974 | 5.73 |
| | **Upper Limit ==>** | 1,567,222 | 9.67 | 1,239,244 | 12.08 | 4,237,948 | 6.23 |
| | **Lower Limit ==>** | 391,806 | 8.67 | 309,811 | 11.08 | 1,059,487 | 5.23 |
| ***Associated Analyses*** | | | | | | | |
| Lab Control Sample | KQ2221180-03 | 744623 | 9.17 | 597717 | 11.58 | 2031093 | 5.73 |
| Duplicate Lab Control Sample | KQ2221180-04 | 794202 | 9.17 | 639809 | 11.58 | 2117229 | 5.72 |
| GW-112222-BMW-18MS | KQ2221180-06 | 777377 | 9.17 | 612786 | 11.58 | 2103550 | 5.72 |
| GW-112222-BMW-18DMS | KQ2221180-07 | 784026 | 9.17 | 615137 | 11.58 | 2122145 | 5.73 |
| Method Blank | KQ2221180-05 | 670873 | 9.17 | 507423 | 11.58 | 1773628 | 5.72 |
| GW-112222-MW-1 | K2213860-001 | 698725 | 9.17 | 503826 | 11.58 | 1866148 | 5.73 |
| GW-112222-MW-4 | K2213860-002 | 685457 | 9.17 | 508551 | 11.58 | 1825961 | 5.73 |
| GW-112222-MW-13 | K2213860-003 | 681557 | 9.17 | 510390 | 11.58 | 1829511 | 5.73 |
| GW-112222-BMW-18 | K2213860-004 | 697433 | 9.17 | 514192 | 11.58 | 1859585 | 5.73 |
| GW-112222-P2-S | K2213860-005 | 667287 | 9.17 | 496277 | 11.58 | 1770551 | 5.73 |
| GW-112222-11-BL | K2213860-006 | 649221 | 9.17 | 486443 | 11.58 | 1735935 | 5.73 |
| GW-112222-11-CL | K2213860-007 | 666037 | 9.17 | 489730 | 11.58 | 1731970 | 5.73 |
| GW-112222-HLA-1 | K2213860-008 | 647524 | 9.17 | 484602 | 11.58 | 1689262 | 5.73 |
| GW-112222-DUP | K2213860-009 | 652856 | 9.17 | 476348 | 11.58 | 1709706 | 5.73 |
| GW-112222-BLANK | K2213860-010 | 676264 | 9.17 | 493695 | 11.58 | 1736855 | 5.73 |

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Collected:** | 11/22/22 |
| **Sample Matrix:** | Water | **Date Received:** | 11/23/22 |
| | | **Date Analyzed:** | 11/28/22 |
| | | **Date Extracted:** | NA |

## Duplicate Matrix Spike Summary
## Volatile Organic Compounds by GC/MS

| | | | |
|---|---|---|---|
| **Sample Name:** | GW-112222-BMW-18 | **Units:** | ug/L |
| **Lab Code:** | K2213860-004 | **Basis:** | NA |
| **Analysis Method:** | 8260C | | |
| **Prep Method:** | None | | |

| | | Matrix Spike KQ2221180-06 | | | Duplicate Matrix Spike KQ2221180-07 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Analyte Name** | **Sample Result** | **Result** | **Spike Amount** | **% Rec** | **Result** | **Spike Amount** | **% Rec** | **% Rec Limits** | **RPD** | **RPD Limit** |
| Carbon Tetrachloride | 2.4 | 12.6 | 10.0 | 102 | 11.5 | 10.0 | 91 | 53-161 | 9 | 30 |

**Results flagged with an asterisk (*) indicate values outside control criteria.**

**Results flagged with a pound (#) indicate the control criteria is not applicable.**

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

**Matrix Spike and Matrix Spike Duplicate Data is presented for information purposes only. The matrix may or may not be relevant to samples reported in this report. The laboratory evaluates system performance based on the LCS and LCSD control limits.**

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Analyzed:** | 11/28/22 |
| **Sample Matrix:** | Water | **Date Extracted:** | NA |

## Duplicate Lab Control Sample Summary
## Volatile Organic Compounds by GC/MS

| | | | |
|---|---|---|---|
| **Analysis Method:** | 8260C | **Units:** | ug/L |
| **Prep Method:** | None | **Basis:** | NA |
| | | **Analysis Lot:** | 786531 |

| | Lab Control Sample KQ2221180-03 | | | Duplicate Lab Control Sample KQ2221180-04 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Analyte Name** | **Result** | **Spike Amount** | **% Rec** | **Result** | **Spike Amount** | **% Rec** | **% Rec Limits** | **RPD** | **RPD Limit** |
| Carbon Tetrachloride | 9.33 | 10.0 | 93 | 8.93 | 10.0 | 89 | 55-140 | 4 | 30 |

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Analyzed:** | 11/28/22 14:55 |
| **Sample Matrix:** | Water | **Date Extracted:** | |

## Method Blank Summary
## Volatile Organic Compounds by GC/MS

| | | | |
|---|---|---|---|
| **Sample Name:** | Method Blank | **Instrument ID:** | K-MS-23 |
| **Lab Code:** | KQ2221180-05 | **File ID:** | J:\MS23\DATA\112822\1128F014.D\ |
| **Analysis Method:** | 8260C | **Analysis Lot:** | 786531 |
| **Prep Method:** | None | | |

This Method Blank applies to the following analyses.

| Sample Name | Lab Code | File ID | Date Analyzed |
|---|---|---|---|
| Lab Control Sample | KQ2221180-03 | J:\MS23\DATA\112822\1128F008.D\ | 11/28/22 12:28 |
| Duplicate Lab Control Sample | KQ2221180-04 | J:\MS23\DATA\112822\1128F009.D\ | 11/28/22 12:53 |
| GW-112222-BMW-18MS | KQ2221180-06 | J:\MS23\DATA\112822\1128F010.D\ | 11/28/22 13:17 |
| GW-112222-BMW-18DMS | KQ2221180-07 | J:\MS23\DATA\112822\1128F011.D\ | 11/28/22 13:42 |
| GW-112222-MW-1 | K2213860-001 | J:\MS23\DATA\112822\1128F015.D\ | 11/28/22 15:20 |
| GW-112222-MW-4 | K2213860-002 | J:\MS23\DATA\112822\1128F016.D\ | 11/28/22 15:45 |
| GW-112222-MW-13 | K2213860-003 | J:\MS23\DATA\112822\1128F017.D\ | 11/28/22 16:09 |
| GW-112222-BMW-18 | K2213860-004 | J:\MS23\DATA\112822\1128F018.D\ | 11/28/22 16:33 |
| GW-112222-P2-S | K2213860-005 | J:\MS23\DATA\112822\1128F019.D\ | 11/28/22 16:58 |
| GW-112222-11-BL | K2213860-006 | J:\MS23\DATA\112822\1128F020.D\ | 11/28/22 17:22 |
| GW-112222-11-CL | K2213860-007 | J:\MS23\DATA\112822\1128F021.D\ | 11/28/22 17:47 |
| GW-112222-HLA-1 | K2213860-008 | J:\MS23\DATA\112822\1128F022.D\ | 11/28/22 18:11 |
| GW-112222-DUP | K2213860-009 | J:\MS23\DATA\112822\1128F023.D\ | 11/28/22 18:36 |
| GW-112222-BLANK | K2213860-010 | J:\MS23\DATA\112822\1128F024.D\ | 11/28/22 19:00 |

| | | | |
|---|---|---|---|
| **Client:** | Geosyntec Consultants | **Service Request:** | K2213860 |
| **Project:** | Olin Fredrickson | **Date Analyzed:** | 11/28/22 12:28 |
| **Sample Matrix:** | Water | **Date Extracted:** | |

## Lab Control Sample Summary
## Volatile Organic Compounds by GC/MS

| | | | |
|---|---|---|---|
| **Sample Name:** | Lab Control Sample | **Instrument ID:** | K-MS-23 |
| **Lab Code:** | KQ2221180-03 | **File ID:** | J:\MS23\DATA\112822\1128F008.D\ |
| **Analysis Method:** | 8260C | **Analysis Lot:** | 786531 |
| **Prep Method:** | None | | |

This Lab Control Sample applies to the following analyses.

| Sample Name | Lab Code | File ID | Date Analyzed |
|---|---|---|---|
| Duplicate Lab Control Sample | KQ2221180-04 | J:\MS23\DATA\112822\1128F009.D\ | 11/28/22 12:53 |
| GW-112222-BMW-18MS | KQ2221180-06 | J:\MS23\DATA\112822\1128F010.D\ | 11/28/22 13:17 |
| GW-112222-BMW-18DMS | KQ2221180-07 | J:\MS23\DATA\112822\1128F011.D\ | 11/28/22 13:42 |
| Method Blank | KQ2221180-05 | J:\MS23\DATA\112822\1128F014.D\ | 11/28/22 14:55 |
| GW-112222-MW-1 | K2213860-001 | J:\MS23\DATA\112822\1128F015.D\ | 11/28/22 15:20 |
| GW-112222-MW-4 | K2213860-002 | J:\MS23\DATA\112822\1128F016.D\ | 11/28/22 15:45 |
| GW-112222-MW-13 | K2213860-003 | J:\MS23\DATA\112822\1128F017.D\ | 11/28/22 16:09 |
| GW-112222-BMW-18 | K2213860-004 | J:\MS23\DATA\112822\1128F018.D\ | 11/28/22 16:33 |
| GW-112222-P2-S | K2213860-005 | J:\MS23\DATA\112822\1128F019.D\ | 11/28/22 16:58 |
| GW-112222-11-BL | K2213860-006 | J:\MS23\DATA\112822\1128F020.D\ | 11/28/22 17:22 |
| GW-112222-11-CL | K2213860-007 | J:\MS23\DATA\112822\1128F021.D\ | 11/28/22 17:47 |
| GW-112222-HLA-1 | K2213860-008 | J:\MS23\DATA\112822\1128F022.D\ | 11/28/22 18:11 |
| GW-112222-DUP | K2213860-009 | J:\MS23\DATA\112822\1128F023.D\ | 11/28/22 18:36 |
| GW-112222-BLANK | K2213860-010 | J:\MS23\DATA\112822\1128F024.D\ | 11/28/22 19:00 |

**Client:** Geosyntec Consultants **Service Request:** K2213860
**Project:** Olin Fredrickson **Calibration Date:** 4/15/2022

# Initial Calibration Summary
# Volatile Organic Compounds by GC/MS

**Calibration ID:** KC2200243 **Signal ID:** 1
**Instrument ID:** K-MS-23

| # | Lab Code | Sample Name | File Location | Acquisition Date |
|---|---|---|---|---|
| 01 | KC2200243-01 | ICAL 2.0 | J:\MS23\DATA\041522CAL\0415F012.D | 04/15/2022 20:25 |
| 02 | KC2200243-02 | ICAL 5.0 | J:\MS23\DATA\041522CAL\0415F013.D | 04/15/2022 20:50 |
| 03 | KC2200243-03 | ICAL 10 | J:\MS23\DATA\041522CAL\0415F014.D | 04/15/2022 21:14 |
| 04 | KC2200243-04 | ICAL 20 | J:\MS23\DATA\041522CAL\0415F015.D | 04/15/2022 21:39 |
| 05 | KC2200243-05 | ICAL 40 | J:\MS23\DATA\041522CAL\0415F016.D | 04/15/2022 22:03 |
| 06 | KC2200243-06 | ICAL 80 | J:\MS23\DATA\041522CAL\0415F017.D | 04/15/2022 22:28 |
| 07 | KC2200243-07 | ICAL 120 | J:\MS23\DATA\041522CAL\0415F018.D | 04/15/2022 22:53 |
| 08 | KC2200243-08 | ICAL 0.1 | J:\MS23\DATA\041522CAL\0416F004.D | 04/16/2022 13:39 |
| 09 | KC2200243-09 | ICAL 0.2 | J:\MS23\DATA\041522CAL\0416F005.D | 04/16/2022 14:03 |
| 10 | KC2200243-10 | ICAL 0.5 | J:\MS23\DATA\041522CAL\0416F006.D | 04/16/2022 14:28 |
| 11 | KC2200243-11 | ICAL 1.0 | J:\MS23\DATA\041522CAL\0416F020.D | 04/18/2022 11:44 |

## Analyte

**4-Bromofluorobenzene**

| # | Amount | RF | # | Amount | RF | # | Amount | RF | # | Amount | RF |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 10.000 | 0.7202 | 02 | 10.000 | 0.7253 | 03 | 10.000 | 0.7416 | 04 | 10.000 | 0.7452 |
| 05 | 10.000 | 0.7494 | 06 | 10.000 | 0.7494 | 07 | 10.000 | 0.7462 | 08 | 10.000 | 0.6624 |
| 09 | 10.000 | 0.6715 | 10 | 10.000 | 0.6906 | 11 | 10.000 | 0.702 | | | |

**Carbon Tetrachloride**

| # | Amount | RF | # | Amount | RF | # | Amount | RF | # | Amount | RF |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 0.500 | 0.2633 | 11 | 1.000 | 0.2644 | 01 | 2.000 | 0.3323 | 02 | 5.000 | 0.3415 |
| 03 | 10.000 | 0.3425 | 04 | 20.000 | 0.3962 | 05 | 40.000 | 0.3732 | 06 | 80.000 | 0.3806 |

**Dibromofluoromethane**

| # | Amount | RF | # | Amount | RF | # | Amount | RF | # | Amount | RF |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 10.000 | 0.2329 | 02 | 10.000 | 0.2338 | 03 | 10.000 | 0.2358 | 04 | 10.000 | 0.2373 |
| 05 | 10.000 | 0.24 | 06 | 10.000 | 0.2391 | 07 | 10.000 | 0.2406 | 08 | 10.000 | 0.2246 |
| 09 | 10.000 | 0.2266 | 10 | 10.000 | 0.2292 | 11 | 10.000 | 0.2305 | | | |

**Toluene-d8**

| # | Amount | RF | # | Amount | RF | # | Amount | RF | # | Amount | RF |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 10.000 | 1.05 | 02 | 10.000 | 1.065 | 03 | 10.000 | 1.075 | 04 | 10.000 | 1.075 |
| 05 | 10.000 | 1.086 | 06 | 10.000 | 1.094 | 07 | 10.000 | 1.088 | 08 | 10.000 | 1.026 |
| 09 | 10.000 | 1.017 | 10 | 10.000 | 1.031 | 11 | 10.000 | 1.037 | | | |

**Client:** Geosyntec Consultants
**Project:** Olin Fredrickson

**Service Request:** K2213860
**Calibration Date:** 4/15/2022

# Initial Calibration Summary
# Volatile Organic Compounds by GC/MS

**Calibration ID:** KC2200243
**Instrument ID:** K-MS-23

**Signal ID:** 1

| | | Calibration Evaluation | | | | Calibration Evaluation | |
|---|---|---|---|---|---|---|---|
| Analyte Name | Compound Type | Fit Type | Eval | Eval Result | Control Criteria | Average RRF | Minimum RRF |
| 4-Bromofluorobenzene | SURR | Average RF | % RSD | 4.5 | ≤20 | 0.7185 | 0.01 |
| Carbon Tetrachloride | TRG | Average RF | % RSD | 14.8 | ≤20 | 0.3367 | 0.100 |
| Dibromofluoromethane | SURR | Average RF | % RSD | 2.3 | ≤20 | 0.2337 | 0.01 |
| Toluene-d8 | SURR | Average RF | % RSD | 2.6 | ≤20 | 1.059 | 0.01 |

**Client:** Geosyntec Consultants **Service Request:** K2213860
**Project:** Olin Fredrickson **Calibration Date:** 4/15/2022

# Initial Calibration Verification Summary
# Volatile Organic Compounds by GC/MS

**Calibration ID:** KC2200243 **Signal ID:** 1
**Instrument ID:** K-MS-23

| # | Lab Code | Sample Name | File Location | Acquisition Date |
|---|---|---|---|---|
| 12 | KC2200243-12 | ICV | J:\MS23\DATA\041522CAL\0416F022.D | 04/18/2022 12:34 |

| Analyte Name | Expected | Result | Average RF | SSV RF | % D | Criteria | Curve Fit |
|---|---|---|---|---|---|---|---|
| Carbon Tetrachloride | 10.0 | 11.2 | 3.367E-1 | 3.76E-1 | 11.66 | ±30 | Average RF |

| Analyte Name | Expected | Result | Average RF | SSV RF | % D | Criteria | Curve Fit |
|---|---|---|---|---|---|---|---|
| 4-Bromofluorobenzene | 10.0 | 10.1 | 7.185E-1 | 7.278E-1 | 1.29 | ±30 | Average RF |
| Dibromofluoromethane | 10.0 | 10.1 | 2.337E-1 | 2.367E-1 | 1.32 | ±30 | Average RF |
| Toluene-d8 | 10.0 | 10.1 | 1.059E0 | 1.066E0 | 0.707 | ±30 | Average RF |

**Client:** Geosyntec Consultants
**Project:** Olin Fredrickson

**Service Request:** K2213860
**Date Analyzed:** 11/28/22 12:04

## Continuing Calibration Verification (CCV) Summary
## Volatile Organic Compounds by GC/MS

**Analysis Method:** 8260C
**File ID:** J:\MS23\DATA\112822\1128F007.D\
**Signal ID:** 1

**Calibration Date:** 4/15/2022
**Calibration ID:** KC2200243
**Analysis Lot:** 786531
**Units:** ppb

| Analyte Name | Expected | Result | Average RF | CCV RF | % D | % Drift | Criteria | Curve Fit |
|---|---|---|---|---|---|---|---|---|
| **Carbon Tetrachloride** | 10.0 | 8.93 | 0.3367 | 0.3008 | -10.7 | NA | ±20 | Average RF |

| Analyte Name | Expected | Result | Average RF | CCV RF | % D | % Drift | Criteria | Curve Fit |
|---|---|---|---|---|---|---|---|---|
| **4-Bromofluorobenzene** | 10.0 | 10.9 | 0.7185 | 0.785 | 9.3 | NA | ±20 | Average RF |
| **Dibromofluoromethane** | 10.0 | 9.03 | 0.2337 | 0.2109 | -9.7 | NA | ±20 | Average RF |
| **Toluene-d8** | 10.0 | 8.99 | 1.0586 | 0.9513 | -10.1 | NA | ±20 | Average RF |

**Client:** Geosyntec Consultants **Service Request:**K2213860
**Project:** Olin Fredrickson

## Analysis Run Log
## Volatile Organic Compounds by GC/MS

**Analysis Method:** **Analysis Lot:**786531
**Instrument ID:**K-MS-23

| Raw Data File | Sample Name | Lab Code | Date Analyzed | Time Analyzed | Q |
|---|---|---|---|---|---|
| J:\MS23\DATA\112822\1128F005.D\ | ZZZZZZZ | ZZZZZZZ | 11/28/2022 | 11:13:00 | |
| J:\MS23\DATA\112822\1128F007.D\ | Continuing Calibration Verification | KQ2221180-02 | 11/28/2022 | 12:04:00 | |
| J:\MS23\DATA\112822\1128F008.D\ | Lab Control Sample | KQ2221180-03 | 11/28/2022 | 12:28:00 | |
| J:\MS23\DATA\112822\1128F009.D\ | Duplicate Lab Control Sample | KQ2221180-04 | 11/28/2022 | 12:53:00 | |
| J:\MS23\DATA\112822\1128F010.D\ | GW-112222-BMW-18 MS | KQ2221180-06 | 11/28/2022 | 13:17:00 | |
| J:\MS23\DATA\112822\1128F011.D\ | GW-112222-BMW-18 DMS | KQ2221180-07 | 11/28/2022 | 13:42:00 | |
| J:\MS23\DATA\112822\1128F014.D\ | Method Blank | KQ2221180-05 | 11/28/2022 | 14:55:00 | |
| J:\MS23\DATA\112822\1128F015.D\ | GW-112222-MW-1 | K2213860-001 | 11/28/2022 | 15:20:00 | |
| J:\MS23\DATA\112822\1128F016.D\ | GW-112222-MW-4 | K2213860-002 | 11/28/2022 | 15:45:00 | |
| J:\MS23\DATA\112822\1128F017.D\ | GW-112222-MW-13 | K2213860-003 | 11/28/2022 | 16:09:00 | |
| J:\MS23\DATA\112822\1128F018.D\ | GW-112222-BMW-18 | K2213860-004 | 11/28/2022 | 16:33:00 | |
| J:\MS23\DATA\112822\1128F019.D\ | GW-112222-P2-S | K2213860-005 | 11/28/2022 | 16:58:00 | |
| J:\MS23\DATA\112822\1128F020.D\ | GW-112222-11-BL | K2213860-006 | 11/28/2022 | 17:22:00 | |
| J:\MS23\DATA\112822\1128F021.D\ | GW-112222-11-CL | K2213860-007 | 11/28/2022 | 17:47:00 | |
| J:\MS23\DATA\112822\1128F022.D\ | GW-112222-HLA-1 | K2213860-008 | 11/28/2022 | 18:11:00 | |
| J:\MS23\DATA\112822\1128F023.D\ | GW-112222-DUP | K2213860-009 | 11/28/2022 | 18:36:00 | |
| J:\MS23\DATA\112822\1128F024.D\ | GW-112222-BLANK | K2213860-010 | 11/28/2022 | 19:00:00 | |