

February 12, 2018

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: Fourth Annual Compliance Groundwater Monitoring Report  
Agreed Order No. DE 97TCS121  
Frederickson Industrial Park Site, Pierce County, WA  
Geosyntec Project: GR4631G**

Dear Mr. Smith:

This letter has been prepared by Geosyntec Consultants on behalf of Olin Corporation and Mallinckrodt US Holdings LLC (the Companies) to present the results from compliance monitoring completed in 2017 at 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 encompasses 527 acres of land 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 of the Site.

In 1997, the Companies entered into AO No. DE 97TC-S121 requiring the Companies to undertake the following remedial actions at the Site:

- devise and implement a permanent solution regarding the impact of carbon tetrachloride (CTC) in affected domestic drinking water wells; and

GR4631G

- design and implement a Remedial Investigation/Feasibility Study (RI/FS).

The RI/FS Report [Geosyntec, 2012]<sup>1</sup> was submitted to Ecology by the Companies on 28 March 2012 and recommended monitored natural attenuation (MNA) to address CTC in groundwater.

The Cleanup Action Plan (CAP), which was approved by Ecology after a public comment period, was based upon Ecology's approval of MNA as the groundwater remedy. A Compliance Monitoring Work Plan (CMWP) was provided as part of the CAP, and outlines the requirements for MNA compliance monitoring. The compliance monitoring network encompasses eleven monitoring wells at the Site (listed in Table 1) and includes hydrogeologic monitoring and groundwater sampling for CTC analysis. 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. The June 2017 sampling event is the fourth year of the CMWP-required performance monitoring. As outlined in the CMWP, monitoring during the third year was reduced from two monitoring events to a single annual event.

In addition, as approved by Ecology, a sampling comparison evaluation of approved low-flow sampling and passive diffusion bag sampling was conducted during the 2016 and 2017 monitoring events.

### **Performance Groundwater Monitoring Results**

#### *Hydrogeologic Monitoring*

Water level data collected during the 2017 groundwater monitoring event are presented in Table 1. Water level contours for Aquifer A are shown in Figure 2 for the 2017 monitoring event. The groundwater gradient in Aquifer A is to the north-northwest towards Clover Creek, which is consistent with past monitoring events. An upward vertical hydraulic gradient near Clover Creek was observed at the P2 intermediate and shallow monitoring wells located just south of Clover Creek.

Groundwater elevation data collected semi-annually during 2014-2015 confirmed that water level changes conform to expectations with higher groundwater elevations at the end of the wet season (Spring) and lower groundwater elevations in the dry season (Fall). The groundwater elevation

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<sup>1</sup> Geosyntec, 2012. Remedial Investigation/Feasibility Study (RI/FS) Report, Frederickson Industrial Park, Frederickson, Washington. March 2012.

data collected during the 2017 groundwater monitoring event are consistent with the observations seen during previous monitoring events conducted during wet season conditions.

#### *Field Parameters*

Field Parameters (Table 2) for the 2017 monitoring event are consistent with past monitoring events, and indicate stable hydrogeochemical conditions.

#### *Carbon Tetrachloride*

Eleven monitoring wells were sampled by low flow methods during the June 2017 monitoring event, with samples analyzed for CTC by ALS laboratory. Figure 3 presents the well locations and the June 2017 CTC results; the updated June 2017 CTC contour, corresponding to the CTC cleanup level of 0.63 µg/L, is provided based on the Aquifer A well concentrations. The CTC data are summarized in Table 3, and the analytical reports are provided in Attachment A. Concentration trends for CTC are plotted for the monitoring wells in Figures 4a-4c. Six compliance monitoring events have now been completed.

Consistent with previous monitoring results, monitoring wells BMW-18, HLA-1, and 11-CL continue to have the highest CTC concentrations ranging between 3.7 µg/L and 4.7 µg/L (Figure 4a). The intermediate concentration wells (e.g., 11-BL, MW-1, and MW-13) remain in the range between 0.74 µg/L and 1.8 µg/L (Figure 4b). The peripheral monitoring wells, MW-4 on the east, MW-7 and P-2I/P-2S on the north, and BMW-3 on the south, ranged from below detection limits of 0.096 µg/L to 0.67 µg/L (Figure 4c). During the reporting period, four wells had concentrations below the CTC cleanup level of 0.63 µg/L. The trends plotted in Figures 4a-4c illustrate stable low CTC concentrations.

Overall, the June 2017 monitoring event results are among the lowest concentrations measured for each of the monitoring wells. The monitoring wells that have been consistently non-detect or with concentrations below cleanup levels, remain at these low levels. Concentrations of CTC in certain monitoring wells (e.g., BMW-18, HLA-1, 11-CL, MW-1) increased slightly compared to 2016 results but remain within the range of historic concentrations and continue to demonstrate declining concentrations over the performance monitoring period. Fluctuations between sampling events are expected given the low CTC concentrations and the seasonal variability of groundwater recharge and discharge.

#### *Passive Sampling Results*

The Companies proposed a plan to implement a sampling comparison of low flow sampling techniques and passive diffusion bags (PDBs) for the monitoring events in 2016 and 2017.

Ecology approved the proposal. The Companies proceeded with the implementation of the sampling comparison by deploying PDBs in six monitoring wells listed in Table 5. BMW-18 was originally selected as one of the wells to be included in the sampling comparison but was replaced with monitoring well 11-CL. The reason for the change is that BMW-18 has a dedicated pump installed that would require removal and replacement as part of the PDB sampling process, potentially complicating the direct comparison between the low flow sampling data and the PDB data. Monitoring well 11-CL, which does not have a dedicated pump installed, was selected as a suitable replacement for BMW-18 given the historical CTC concentrations and trends are similar for both monitoring wells.

For the 2017 monitoring event, four of the six monitoring wells had CTC results above the method reporting limit (0.5 µg/l). PDB results for these four were slightly higher than the low-flow sampling results with relative percent difference (RPD) ranging from 2.2% to 15%.

For the two sampling events during which both low-flow and PDB samples were collected, the average RPD for nine sampling pairs is 10.2%. This is interpreted to indicate that PDB sampling is as representative of groundwater concentrations as low-flow sampling.

The Companies request that Ecology approve the PDB sampling technique as described in the Addendum to Appendix A Sampling and Analysis Plan for the CMWP submitted on March 29, 2016 and subsequently approved on April 18, 2016.

### **2018 Monitoring Schedule**

The monitoring schedule for 2018 will continue to be on an annual basis in accordance with Section 2.1 of the CMWP. This annual monitoring event will occur in the spring (2<sup>nd</sup> quarter), to coincide with higher groundwater elevations. Pending Ecology concurrence, the Companies will utilize PDBs for future groundwater monitoring events. Following the procedures outlined in the CMWP, and as described during discussions with Ecology on July 13, 2017, groundwater concentrations for monitoring wells BMW-3, MW-7, P2-S, and P2-I (Table 4) were calculated and determined to be below the Model Toxics Control Act (MTCA) regulatory limit of 0.63 µg/L. Thus, these wells will be removed from further performance monitoring upon Ecology approval.

### **Conclusions and Recommendations**

The fourth year of MNA compliance monitoring confirmed that CTC concentrations continue to be low. Consistent with these observations, and in accordance with the CMWP and as defined in WAC 173-340-720 (9)(e)(iv), **the Companies will remove BMW-3, MW-7, P2-S, and P2-I**

Mr. Andrew Smith  
12 February 2018  
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**from the Performance Monitoring portion of the Compliance Monitoring program upon Ecology's approval.**

In addition, based on two years of side-by-side low-flow and PDB sampling, the Companies request Ecology's approval to use PDBs for groundwater sampling during future monitoring events.

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

Sincerely,



James J. Deitsch, PhD., P.E.  
Principal



David L. Parkinson, PhD., P.G.  
Senior Scientist

Cc: Julie Irwin, Olin Corporation  
James Cashwell, Olin Corporation  
Karen Burke, Mallinckrodt  
Carl Bach, The Boeing Company  
Anne Smith, Tacoma Water

Attachments:

Tables

Figures

Attachment A: Analytical Laboratory Report

GR4631G

# Tables

Table 1.  
Compliance Monitoring for 2017 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	06/28/17	34.76	361.32
11-CL	403.69	404.55	329.7	319.7	Lower - Aquifer A	06/28/17	39.35	365.20
BMW-18	409.74	412.09	375.7	345.7	Upper - Aquifer A	06/28/17	35.99	376.10
BMW-3	414.74	416.76	381.7	351.7	Upper - Aquifer A	06/28/17	36.43	380.33
HLA-1	403.86	405.81	320.9	310.9	Lower - Aquifer A	06/28/17	40.73	365.08
MW-7	350.7	350.12	310.2	300.2	Upper - Aquifer A	06/29/17	26.32	323.80
MW-1	413.27	415.79	324.8	314.8	Lower - Aquifer A	06/28/17	36.11	379.68
MW-4	465.5	467.72	317.9	307.9	Aquifer A	06/28/17	113.10	354.62
P2-I	340.65	343.23	270.7	265.7	Lower - Aquifer A	06/29/17	13.32	329.91
P2-S	340.55	343.6	320.6	310.6	Upper - Aquifer A	06/29/17	15.15	328.45
MW-13	394.5	394.1	284.5	274.5	Aquifer A	06/29/17	51.45	342.65

Table 2.  
Compliance Monitoring for 2017 Groundwater Sampling Event Field Parameter Data  
Brazier Site, Frederickson, Washington

Well	Date	Time	pH	Field SC ( $\mu\text{S}/\text{cm}$ )	Temperature ( $^{\circ}\text{C}$ )	Turbidity (NTUs)	Field ORP (mV)	D.O. (mg/L)
11-BL	06/28/17	11:35	6.88	216	13.10	9	-46.8	1.27
11-CL	06/28/17	13:04	6.90	200	14.01	12	-68.1	0.94
BMW-18	06/28/17	13:41	6.91	196	14.40	5	-48.6	0.85
BMW-3	06/28/17	8:32	6.35	153	14.70	5	-50.2	1.67
HLA-1	06/28/17	12:20	6.89	214	14.21	60	-52.3	0.81
MW-7	06/29/17	8:04	6.43	214	13.72	7	-51.4	1.10
MW-1	06/28/17	9:23	6.58	190	14.18	14	-50.8	1.36
MW-4	06/28/17	10:57	6.65	229	12.36	62	-67.5	0.90
P2-I	06/29/17	9:05	6.70	205	11.61	15	-58.0	0.83
P2-S	06/29/17	9:44	6.39	255	11.52	8	-39.0	0.60
MW-13	06/29/17	10:58	6.62	179	15.38	15	-36.0	0.63

## Notes:

- SC = Specific conductivity
- D.O. = Dissolved oxygen
- NTUs = Nephelometric Turbidity Units
- ORP = Oxidation reduction potential



Table 3.  
Carbon Tetrachloride Results for 2017  
Brazier Site, Frederickson, Washington

Well	Sample Type	Sample Date	Result (µg/L)	Lab MRL	Lab MDL	Qualifiers	Depth to Water (ft)	Water Level (MSL)
11-BL		06/28/17	<b>0.74</b>	0.5	0.096		34.76	361.32
11-CL		06/28/17	<b>3.7</b>	0.5	0.096		39.35	365.20
	PDB	06/28/17	<b>4.3</b>	0.5	0.096			
BMW-18		06/28/17	<b>4.7</b>	0.5	0.096		35.99	376.10
BMW-3		06/28/17	0.43	0.5	0.096	J	36.43	380.33
HLA-1		06/28/17	<b>4.4</b>	0.5	0.096		40.73	365.08
	PDB	06/28/17	<b>4.5</b>	0.5	0.096			
MW-1		06/28/17	<b>1.8</b>	0.5	0.096		36.11	379.68
	PDB	06/28/17	<b>2.3</b>	0.5	0.096			
MW-4		06/28/17	<b>0.67</b>	0.5	0.096		113.10	354.62
MW-7		06/29/17	<0.096	0.5	0.096		26.32	323.80
P2-I		06/29/17	<0.096	0.5	0.096		13.32	329.91
	PDB	06/29/17	<b>0.75</b>	0.5	0.096			
P2-S		06/29/17	0.27	0.5	0.096	J	15.15	328.45
	PDB	06/29/17	0.29	0.5	0.096	J		
MW-13		06/29/17	<b>1.6</b>	0.5	0.096		51.45	342.65
	Duplicate	06/29/17	<b>1.0</b>	0.5	0.096			
	PDB	06/29/17	<b>1.8</b>	0.5	0.096			

## Notes:

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

µg/L = micrograms per liter; equivalent to parts per billion

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 4.  
2014-2017 Carbon Tetrachloride Groundwater Compliance Monitoring Data  
Brazier Site, Frederickson, Washington

Wells	11-BL	11-CL	HLA-1	BMW-3	BMW-18	MW1	MW4	MW7	P2S	P2I	MW-13
May-14	<b>0.97</b>	<b>5.4</b>	<b>5.0</b>	0.28	<b>5.5</b>	<b>1.8</b>	<b>0.82</b>	<b>2.3</b>	<b>0.76</b>	<b>0.72</b>	<b>2.3</b>
Oct-14	<b>0.95</b>	<b>4.4</b>	<b>4.6</b>	0.39	<b>4.8</b>	<b>1.4</b>	<b>0.66</b>	ND	ND	ND	<b>1.9</b>
Mar-15	<b>0.64</b>	<b>4.3</b>	<b>4.4</b>	0.19	<b>4.2</b>	<b>1.5</b>	0.62	0.22	0.29	ND	<b>1.9</b>
Oct-15	<b>0.72</b>	<b>3.8</b>	<b>3.9</b>	0.51	<b>3.8</b>	<b>1.2</b>	0.53	0.24	0.45	ND	<b>1.7</b>
May-16	0.50	<b>2.9</b>	<b>3.6</b>	0.27	<b>3.7</b>	<b>1.5</b>	0.51	ND	0.28	ND	<b>1.3</b>
Jun-17	<b>0.74</b>	<b>3.7</b>	<b>4.4</b>	0.43	<b>4.7</b>	<b>1.8</b>	<b>0.67</b>	ND	0.27	ND	<b>1.6</b>
95% UCL*	<b>0.72*</b>	<b>4.3*</b>	<b>4.4*</b>	0.51**	<b>4.7*</b>	<b>1.8*</b>	<b>0.67*</b>	0.24**	0.45**	0.096**	<b>1.9*</b>

## Notes:

\*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)

Table 5.  
Carbon Tetrachloride Results for 2017 from both low flow sampling and PDB  
Brazier Site, Frederickson, Washington

Well	Sample Date	PDB Result (µg/L)	Low Flow Result (µg/L)	Lab MRL	Lab MDL	Qualifiers	Depth to Water (ft)	Water Level (MSL)	RPD (%)
11-CL	06/28/17	<b>4.3</b>	<b>3.7</b>	0.5	0.096		39.35	365.20	15.0
HLA-1	06/28/17	<b>4.5</b>	<b>4.4</b>	0.5	0.096		40.73	365.08	2.2
MW-1	06/28/17	<b>2.3</b>	<b>1.8</b>	0.5	0.096		36.11	379.68	24.4
P2-I	06/29/17	<b>0.75</b>	<0.096	0.5	0.096		13.32	329.91	
P2-S	06/29/17	0.29	0.27	0.5	0.096	J	15.15	328.45	7.1
MW-13	06/29/17	<b>1.8</b>	<b>1.6</b>	0.5	0.096		51.45	342.65	11.8

Notes:

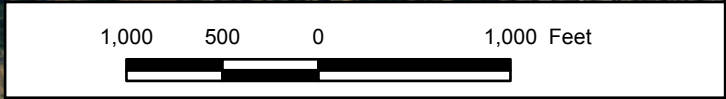
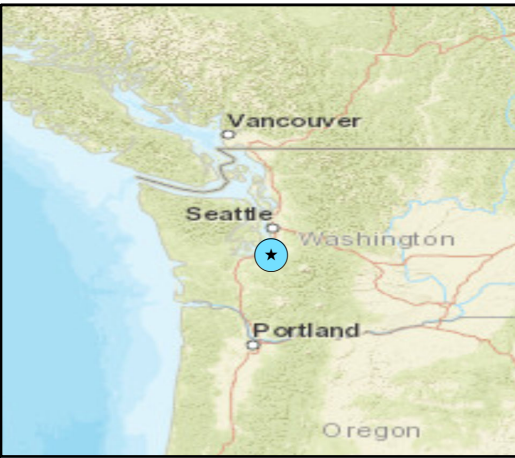
**BOLD** = CTC value above groundwater cleanup level of 0.63 µg/L

µg/L = micrograms per liter; equivalent to parts per billion

Laboratory Qualifier:

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

# Figures



**Property Location**  
 Frederickson Industrial Park  
 Frederickson, WA

**Geosyntec**  
 consultants

**Figure**  
**1**

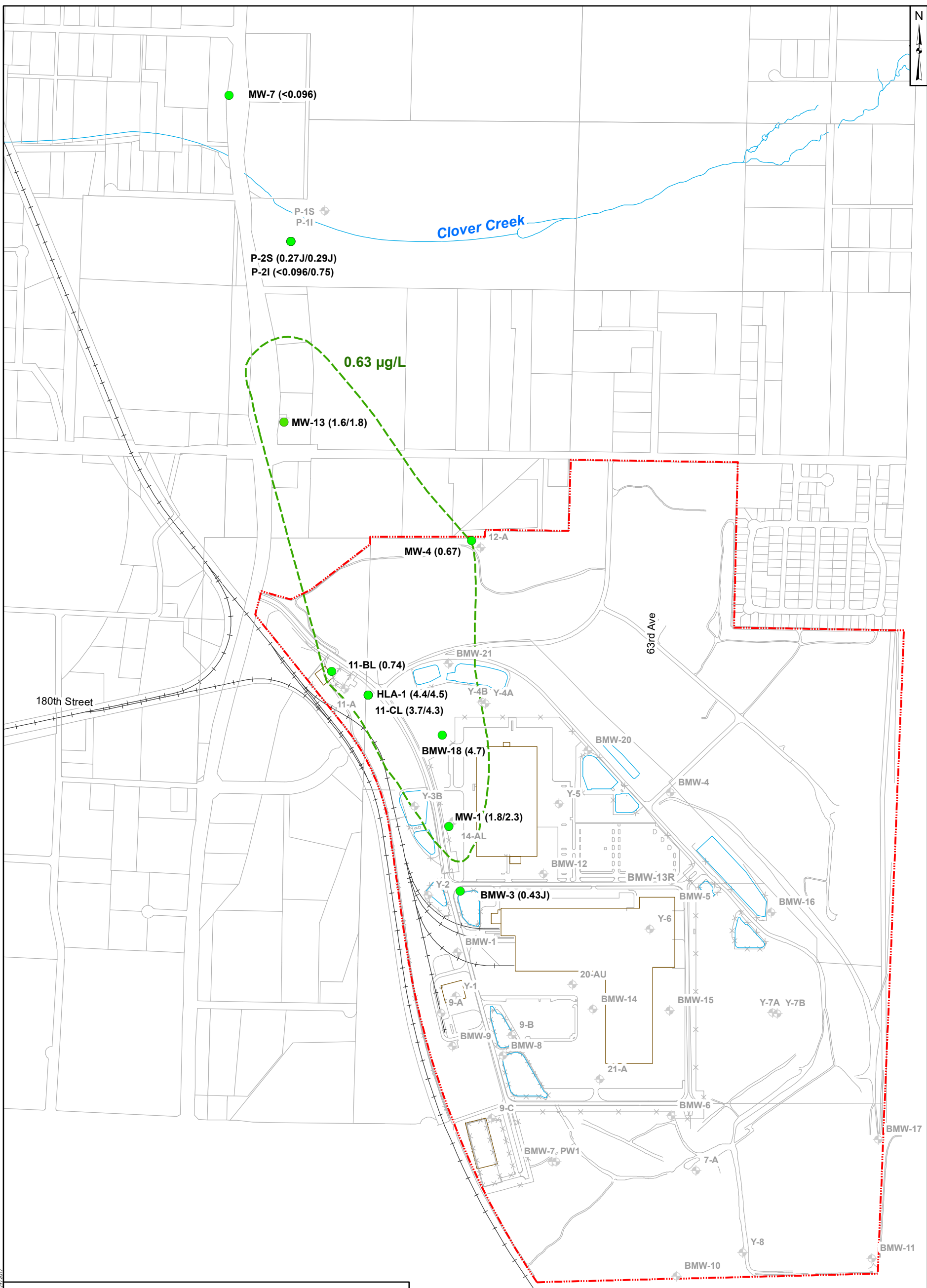
Kennesaw, GA      October 2016

**Legend**  
 - - - - - Property Boundary

Source:  
 Bing Aerial Photography, October 2006

\\Fs\Fredrickson\GIS\ESRI\...\_LI\_Property\_Location.mxd; P:\Work\10/17/2016





**Legend**

● Aquifer A Monitoring Well (CTC Concentration (µg/L))

⊕ Monitoring Wells

⌚ CTC Contour for June 2017 data set

- - - Property Boundary

**Notes:**

1. (0.27 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).
2. (1.5/1.7) Results from the June 2017 sampling event are displayed at each sampling location in parentheses. For locations with sampling by both low-flow and passive techniques both results are displayed. Low-flow results are shown on the left, and passive diffusion bag (PDB) results are shown on the right.

750 375 0 750 Feet



**Aquifer A Carbon Tetrachloride  
Groundwater Results  
June 2017**

Frederickson Industrial Park  
Frederickson, WA

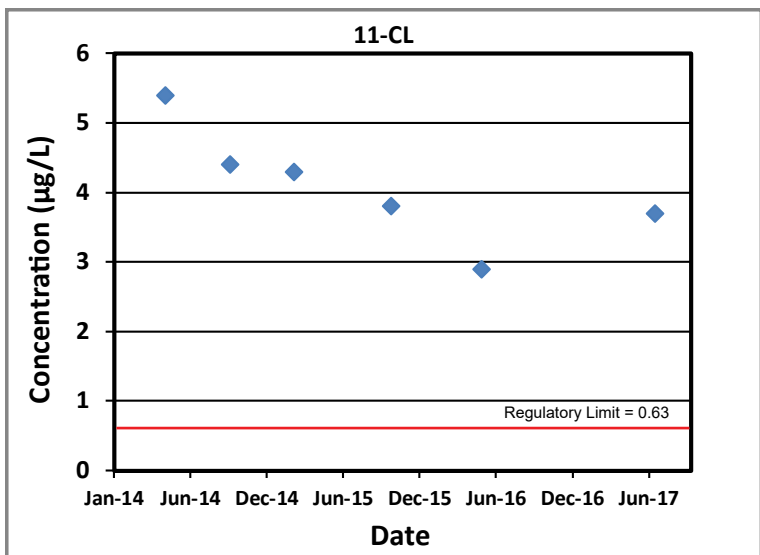
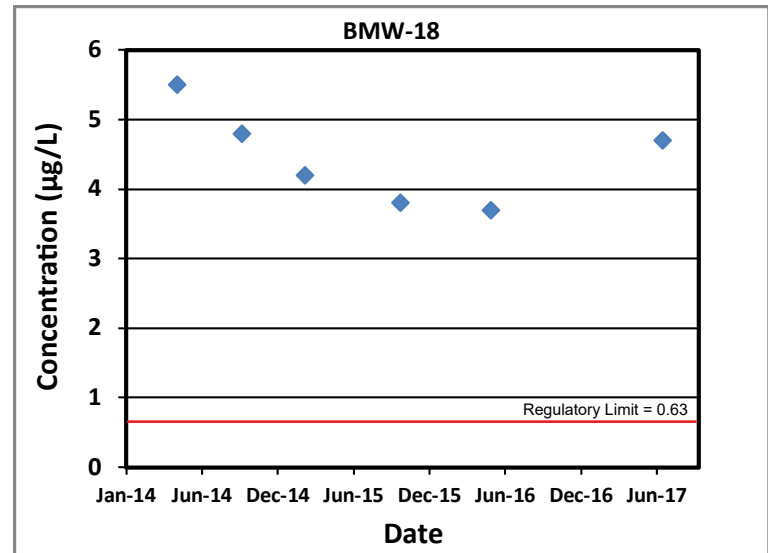
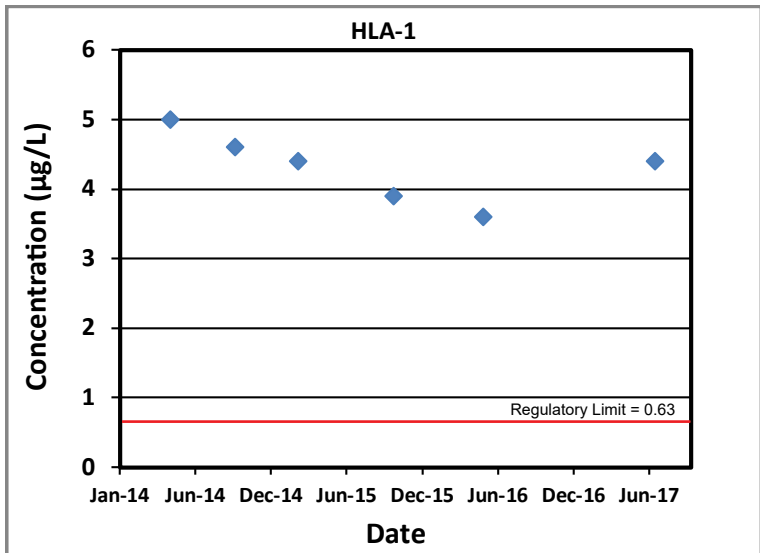
**Geosyntec**  
consultants

Kennesaw, GA

August 2017

**Figure**

**3**



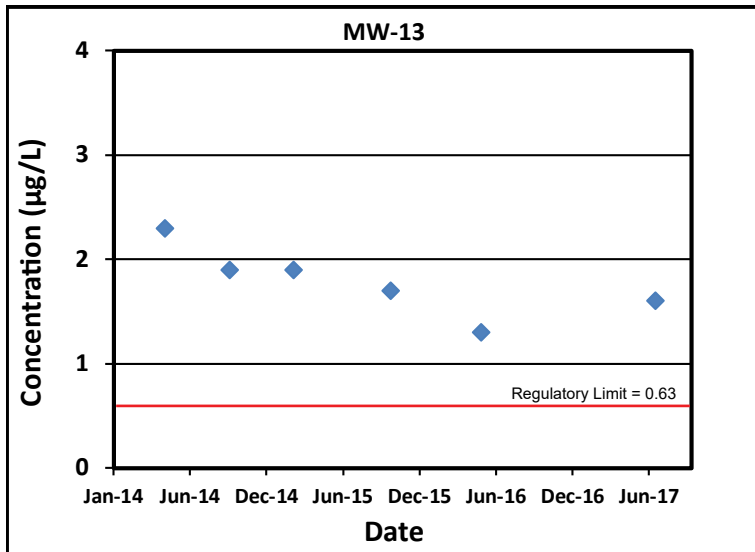
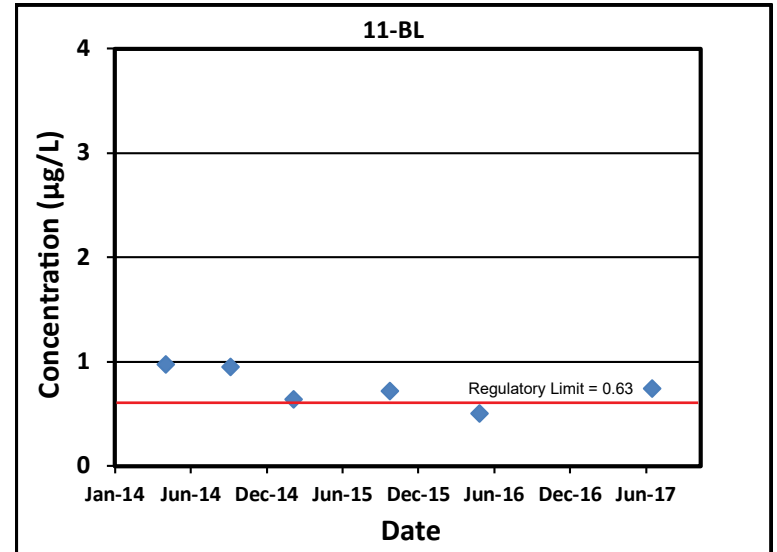
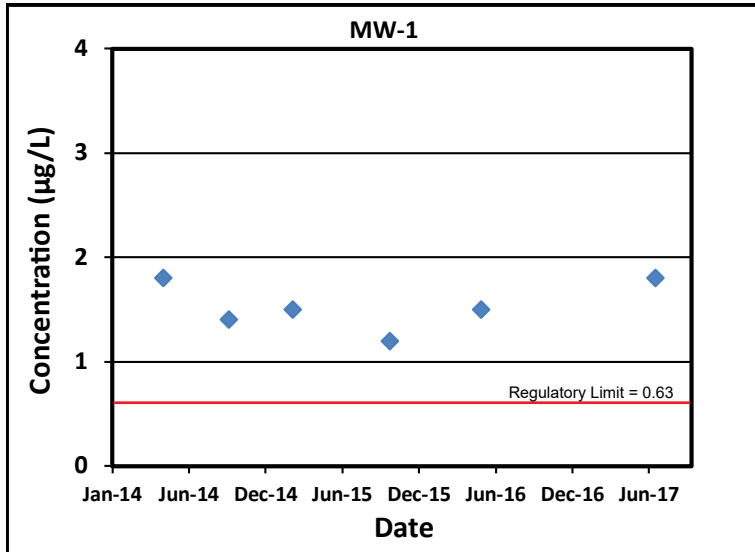
**Legend**

- ◆ Detection
- ◇ Not Detected

Note: Method Detection Limit = 0.096 ug/L

<b>Carbon Tetrachloride</b> <b>Groundwater Monitoring Well Data</b> Frederickson Industrial Park, Frederickson, WA	
Seattle, WA	August 2017
Figure <span style="font-size: 1.5em; font-weight: bold;">4a</span>	




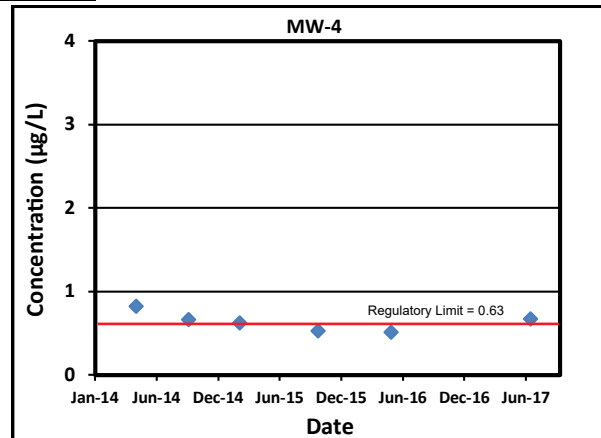
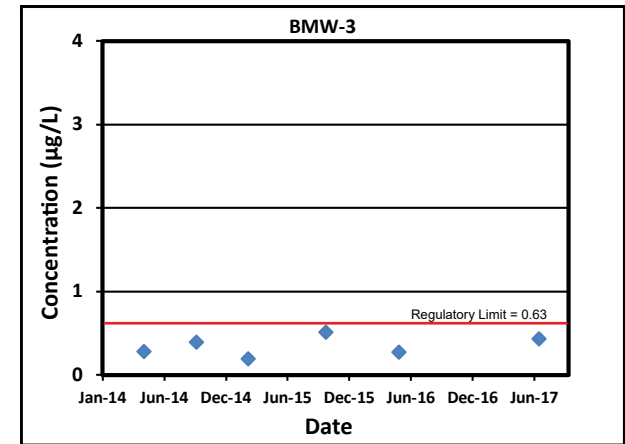
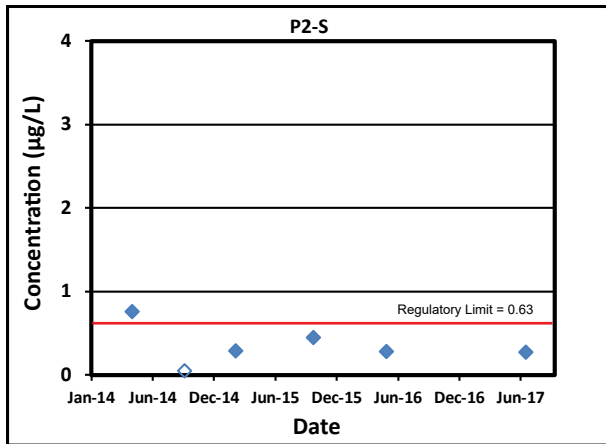
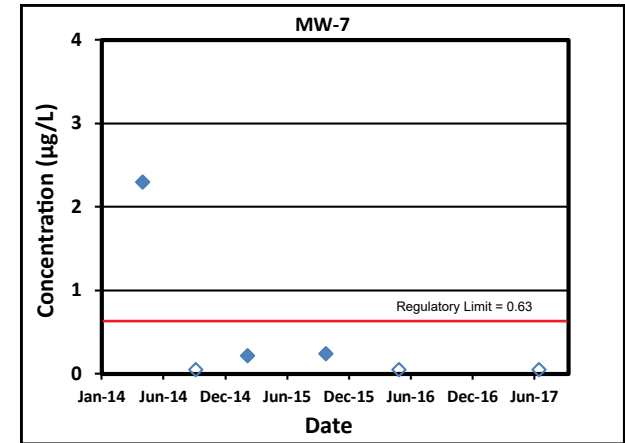
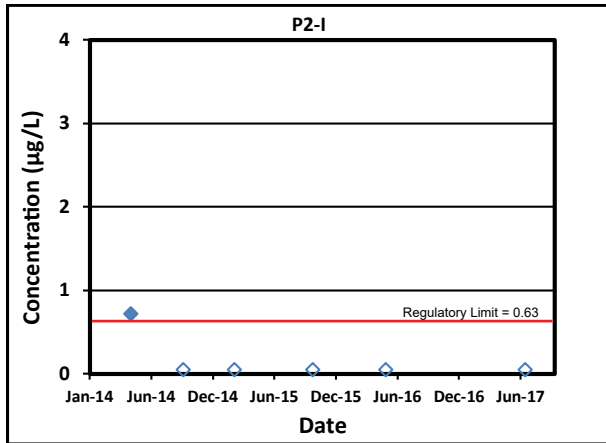


**Legend**

- ◆ Detection
- ◇ Not Detected

Note: Method Detection Limit = 0.096 ug/L

<p><b>Carbon Tetrachloride</b>  <b>Groundwater Monitoring Well Data</b>          Frederickson Industrial Park, Frederickson, WA</p>	
	
Seattle, WA	August 2017
<p>Figure <b>4b</b></p>	



**Legend**

- ◆ Detection
- ◇ Not Detected

Note: Method Detection Limit = 0.096 µg/L

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

Figure  
**4c**

Seattle, WA	August 2017
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# **Attachment A**



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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](http://www.alsglobal.com)

February 02, 2018

**Analytical Report for Service Request No: K1706918**  
**Revised Service Request No: K1706918.02**

Dave Parkinson  
GeoSyntec Consultants  
520 Pike Street, Suite #1375  
Seattle, WA 98101

**RE: OLIN-FREDRICKSON**

Dear Dave,

Enclosed is the revised report for the sample(s) submitted to our laboratory July 01, 2017  
For your reference, these analyses have been assigned our service request number **K1706918**.

This report has been updated to Tier II.

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](http://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.

We apologize for any inconvenience this may have created.

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

Respectfully submitted,

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

Kelley Lovejoy  
Project Manager



---

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## Table of Contents

Acronyms

Qualifiers

State Certifications, Accreditations, And Licenses

Chain of Custody

Volatile Organic Compounds

## 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. See case narrative.
- 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. See case narrative.
- 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**

<b>Agency</b>	<b>Web Site</b>	<b>Number</b>
Alaska DEH	<a href="http://dec.alaska.gov/eh/lab/cs/csapproval.htm">http://dec.alaska.gov/eh/lab/cs/csapproval.htm</a>	UST-040
Arizona DHS	<a href="http://www.azdhs.gov/lab/license/env.htm">http://www.azdhs.gov/lab/license/env.htm</a>	AZ0339
Arkansas - DEQ	<a href="http://www.adeq.state.ar.us/techsvs/labcert.htm">http://www.adeq.state.ar.us/techsvs/labcert.htm</a>	88-0637
California DHS (ELAP)	<a href="http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx">http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx</a>	2795
DOD ELAP	<a href="http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm">http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm</a>	L14-51
Florida DOH	<a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>	E87412
Hawaii DOH	<a href="http://health.hawaii.gov/">http://health.hawaii.gov/</a>	-
ISO 17025	<a href="http://www.pjllabs.com/">http://www.pjllabs.com/</a>	L16-57
Louisiana DEQ	<a href="http://www.deq.louisiana.gov/page/la-lab-accreditation">http://www.deq.louisiana.gov/page/la-lab-accreditation</a>	03016
Maine DHS	<a href="http://www.maine.gov/dhhs/">http://www.maine.gov/dhhs/</a>	WA01276
Minnesota DOH	<a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>	053-999-457
Nevada DEP	<a href="http://ndep.nv.gov/bsdw/labservice.htm">http://ndep.nv.gov/bsdw/labservice.htm</a>	WA01276
New Jersey DEP	<a href="http://www.nj.gov/dep/enforcement/oqa.html">http://www.nj.gov/dep/enforcement/oqa.html</a>	WA005
New York - DOH	<a href="https://www.wadsworth.org/regulatory/elap">https://www.wadsworth.org/regulatory/elap</a>	12060
North Carolina DEQ	<a href="https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification">https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification</a>	605
Oklahoma DEQ	<a href="http://www.deq.state.ok.us/CSDnew/labcert.htm">http://www.deq.state.ok.us/CSDnew/labcert.htm</a>	9801
Oregon – DEQ (NELAP)	<a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>	WA100010
South Carolina DHEC	<a href="http://www.scdhec.gov/environment/EnvironmentalLabCertification/">http://www.scdhec.gov/environment/EnvironmentalLabCertification/</a>	61002
Texas CEQ	<a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>	T104704427
Washington DOE	<a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>	C544
Wyoming (EPA Region 8)	<a href="https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water">https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water</a>	-
Kelso Laboratory Website	<a href="http://www.alsglobal.com">www.alsglobal.com</a>	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](http://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/analyte is offered by that state.





## 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](http://www.alsglobal.com)

Project Information				Analytical Information										Matrix Codes								
Project Name:	OLSEN-FREDRICKSON			(CTC) CARBON TETRACHLORIDE																		DW = Drinking Water GW = Ground Water WW = Water SW = Surface Water SO = Soil SL = Sludge OI = Oil LIQ = Other Liquid AIR = Air SOL = Other Solid WP = Wipe
Street:	18001 CANYON RD EAST																					
City:	FREDRICKSON	State:	WA																			
Project No.:																						
Project Contact:	DAVE PARKINSON																					
Email:	DPARKINSON@GEOSYNTEC.COM																					
Sampler(s) Name(s) (Printed):	L. BURES / C. PETERS																					
Client/Owner:																						

Sample Identification	Collection			Container Information				X																Remarks
	Date:	Time:	Matrix:	Total No. of Bottles:	Other:	None:	Preserved:																	
1 GW-062817-MW-1-PDB	6/28/17	0850	GW	3			3	X																
2 GW-062817-MW-1	↓	0924	GW	3			3	X																
3 GW-062817-MW-4	↓	1058	GW	3			3	X																
4 GW-062917-MW-7	6/29/17	0805	GW	3			3	X																
5 GW-062917-MW-13-PDB	↓	1030	GW	3			3	X																
6 GW-062917-MW-13	↓	1059	GW	3			3	X																
7 GW-062817-11-BL	6/28/17	1136	GW	3			3	X																
8 GW-062817-11-CL-PDB	↓	1240	GW	3			3	X																
9 GW-062817-11-CL	↓	1305	GW	3			3	X																
10 GW-062817-BMW-3	↓	0853	GW	3			3	X																
11 GW-062817-BMW-1B	↓	1342	GW	9			9	X																MS/MSD
12 GW-062917-P2-I-PDB	6/29/17	0840	GW	3			3	X																
13 GW-062917-P2-I	↓	0906	GW	3			3	X																
14 GW-062917-P2-S-PDB	↓	0918	GW	3			3	X																
15 GW-062917-P2-S	↓	0945	GW	3			3	X																

Laboratory: <b>ALS</b>		Turnaround Time: <b>STANDARD</b>		Total No. of Containers:		Method of Shipment: <b>FEDEX</b>		Laboratory Comments and Log No.:			
Relinquished by (Signature):	Date: 6/28/17	Relinquished by (Signature): <b>SHIPPED</b>	Date:	Relinquished by (Signature):	Date:	Relinquished by (Signature):	Date:				
Printed Name: <b>LEE BURES</b>	Time: 1400	Printed Name: <b>VIA FEDEX</b>	Time:	Printed Name:	Time:	Printed Name:	Time:				
Company: <b>BTS</b>		Company:		Company:		Company:					
Received by:	Date: 7/1/17	Received by:	Date:	Received by:	Date:	Received by:	Date:				
Printed Name: <b>S. Wresinski</b>	Time: 0930	Printed Name:	Time:	Printed Name:	Time:	Printed Name:	Time:				
Company: <b>ALS</b>		Company:		Company:		Company:					

Project Information				Analytical Information										Matrix Codes					
Project Name: OLIN - FREDRICKSON				(CTC) CARBON TETRACHLORIDE															DW = Drinking Water GW = Ground Water WW = Water SW = Surface Water SO = Soil SL = Sludge OI = Oil LIQ = Other Liquid AIR = Air SOL = Other Solid WP = Wipe
Street: 18001 CANYON RD EAST																			
City: FREDRICKSON State: WA																			
Project No.:																			
Project Contact: DAVE PARKINSON																			
Email: DPARKINSON@GEOSYNTEC.COM																			
Sampler(s) Name(s) (Printed): L. BURES / C. PETERS																			
Client/Owner:																			
Sample Identification	Collection			Container Information			Other:	None:	Preserved:									Remarks	
	Date:	Time:	Matrix:	Total No. of Bottles:															
16 GW-062817-H2A-1-PDB /	6/28/17	1200	GW	3					3	X									
17 GW-062817-H2A-1 /	↓	1221	GW	3					3	X									
18 GW-062917-DUP /	6/29/17	---	GW	3					3	X									
19 GW-062917-EB /	↓	1140	GW	3					3	X									

Laboratory: ALS		Turnaround Time: STANDARD		Total No. of Containers:		Method of Shipment: FEDEX		Laboratory Comments and Log No.:			
Relinquished by (Signature): <i>[Signature]</i>	Date: 6/30/17	Relinquished by (Signature): SHEPHERD	Date:	Relinquished by (Signature):	Date:	Relinquished by (Signature):	Date:				
Printed Name: LEE BURES	Time: 1400	Printed Name: VIA FEDEX	Time:	Printed Name:	Time:	Printed Name:	Time:				
Company: BIS		Company:		Company:		Company:					
Received by: <i>[Signature]</i>	Date:	Received by:	Date:	Received by:	Date:	Received by:	Date:				
Printed Name: J. W. Resinsler	Time:	Printed Name:	Time:	Printed Name:	Time:	Printed Name:	Time:				
Company: ALS		Company:		Company:		Company:					



PC JM

### Cooler Receipt and Preservation Form

Client Geosyntec Service Request K17 06918

Received: 07/01/17 Opened: ~~07/01/17~~ 07/01/17 By: JW Unloaded: 07/01/17 By: JW

- 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? 1, front
- If present, were custody seals intact? Y **N** If present, were they signed and dated? Y **N**

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID	Tracking Number	NA	Filed
-0.4	-0.6	1.2	1.0	-0.2	298		787054970701		

- 4. Packing material: **Inserts** Baggies Bubble Wrap **Gel Packs** Wet Ice **Dry Ice** **Sleeves**
- 5. Were custody papers properly filled out (ink, signed, etc.)? **NA** Y **N**
- 6. Were samples received in good condition (temperature, unbroken)? *Indicate in the table below.* **NA** Y **N**  
If applicable, tissue samples were received: **Frozen** **Partially Thawed** **Thawed**
- 7. Were all sample labels complete (i.e analysis, preservation, etc.)? **NA** Y **N**
- 8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* **NA** Y **N**
- 9. Were appropriate bottles/containers and volumes received for the tests indicated? **NA** Y **N**
- 10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA **Y** **N**
- 11. Were VOA vials received without headspace? *Indicate in the table below.* **NA** Y **N**
- 12. Was C12/Res negative? NA **Y** **N**

Sample ID on Bottle	Sample ID on COC	Identified by:

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

Notes, Discrepancies, & Resolutions: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# Volatile Organic Compounds

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

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/28/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062817-MW-1-PDB  
**Lab Code:** K1706918-001  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	2.3		0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	100	73-122	07/06/17	Acceptable
Toluene-d8	109	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	90	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/28/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062817-MW-1  
**Lab Code:** K1706918-002  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	1.8		0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	102	73-122	07/06/17	Acceptable
Toluene-d8	106	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	89	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/28/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062817-MW-4  
**Lab Code:** K1706918-003  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	0.67		0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	102	73-122	07/06/17	Acceptable
Toluene-d8	108	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	92	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_



Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/29/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062917-MW-7  
**Lab Code:** K1706918-004  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	ND	U	0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	103	73-122	07/06/17	Acceptable
Toluene-d8	108	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	91	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/29/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062917-MW-13-PDB  
**Lab Code:** K1706918-005  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	1.8		0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	101	73-122	07/06/17	Acceptable
Toluene-d8	107	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	92	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/29/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062917-MW-13  
**Lab Code:** K1706918-006  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	1.6		0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	102	73-122	07/06/17	Acceptable
Toluene-d8	107	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	90	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/28/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062817-11-BL  
**Lab Code:** K1706918-007  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	0.74		0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	103	73-122	07/06/17	Acceptable
Toluene-d8	108	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	90	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/28/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062817-11-CL-PDB  
**Lab Code:** K1706918-008  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	4.3		0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	105	73-122	07/06/17	Acceptable
Toluene-d8	107	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	90	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/28/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062817-11-CL  
**Lab Code:** K1706918-009  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	3.7		0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	104	73-122	07/06/17	Acceptable
Toluene-d8	108	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	91	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/28/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062817-BMW-3  
**Lab Code:** K1706918-010  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	0.43	J	0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	102	73-122	07/06/17	Acceptable
Toluene-d8	107	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	90	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/28/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062817-BMW-18  
**Lab Code:** K1706918-011  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	4.7		0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	103	73-122	07/06/17	Acceptable
Toluene-d8	107	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	91	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_



Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/29/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062917-P2-I-PDB  
**Lab Code:** K1706918-012  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	0.75		0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	104	73-122	07/06/17	Acceptable
Toluene-d8	108	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	90	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/29/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062917-P2-I  
**Lab Code:** K1706918-013  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	ND	U	0.50	0.096	1	07/10/17	07/10/17	KWG1705799	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	94	73-122	07/10/17	Acceptable
Toluene-d8	103	65-144	07/10/17	Acceptable
4-Bromofluorobenzene	86	68-117	07/10/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/29/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062917-P2-S-PDB  
**Lab Code:** K1706918-014  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	0.29	J	0.50	0.096	1	07/10/17	07/10/17	KWG1705799	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	92	73-122	07/10/17	Acceptable
Toluene-d8	102	65-144	07/10/17	Acceptable
4-Bromofluorobenzene	86	68-117	07/10/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/29/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062917-P2-S  
**Lab Code:** K1706918-015  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	0.27	J	0.50	0.096	1	07/10/17	07/10/17	KWG1705799	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	91	73-122	07/10/17	Acceptable
Toluene-d8	102	65-144	07/10/17	Acceptable
4-Bromofluorobenzene	85	68-117	07/10/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/28/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062817-HLA-1-PDB  
**Lab Code:** K1706918-016  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	4.5		0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	105	73-122	07/06/17	Acceptable
Toluene-d8	107	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	90	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/28/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062817-HLA-1  
**Lab Code:** K1706918-017  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	4.4		0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	104	73-122	07/06/17	Acceptable
Toluene-d8	108	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	91	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/29/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062917-DUP  
**Lab Code:** K1706918-018  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	1.0		0.50	0.096	1	07/10/17	07/10/17	KWG1705799	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	90	73-122	07/10/17	Acceptable
Toluene-d8	103	65-144	07/10/17	Acceptable
4-Bromofluorobenzene	86	68-117	07/10/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** 06/29/2017  
**Date Received:** 07/01/2017

Volatile Organic Compounds

**Sample Name:** GW-062917-EB  
**Lab Code:** K1706918-019  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	ND	U	0.50	0.096	1	07/10/17	07/10/17	KWG1705799	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	92	73-122	07/10/17	Acceptable
Toluene-d8	101	65-144	07/10/17	Acceptable
4-Bromofluorobenzene	85	68-117	07/10/17	Acceptable

**Comments:** \_\_\_\_\_



Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** NA  
**Date Received:** NA

Volatile Organic Compounds

**Sample Name:** Method Blank  
**Lab Code:** KWG1705650-5  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	ND	U	0.50	0.096	1	07/06/17	07/06/17	KWG1705650	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	104	73-122	07/06/17	Acceptable
Toluene-d8	109	65-144	07/06/17	Acceptable
4-Bromofluorobenzene	91	68-117	07/06/17	Acceptable

**Comments:** \_\_\_\_\_

Analytical Results

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Collected:** NA  
**Date Received:** NA

Volatile Organic Compounds

**Sample Name:** Method Blank  
**Lab Code:** KWG1705799-5  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Carbon Tetrachloride	ND	U	0.50	0.096	1	07/10/17	07/10/17	KWG1705799	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	90	73-122	07/10/17	Acceptable
Toluene-d8	103	65-144	07/10/17	Acceptable
4-Bromofluorobenzene	87	68-117	07/10/17	Acceptable

**Comments:** \_\_\_\_\_

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918

**Surrogate Recovery Summary  
 Volatile Organic Compounds**

**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** Percent  
**Level:** Low

<u>Sample Name</u>	<u>Lab Code</u>	<u>Sur1</u>	<u>Sur2</u>	<u>Sur3</u>
GW-062817-MW-1-PDB	K1706918-001	100	109	90
GW-062817-MW-1	K1706918-002	102	106	89
GW-062817-MW-4	K1706918-003	102	108	92
GW-062917-MW-7	K1706918-004	103	108	91
GW-062917-MW-13-PDB	K1706918-005	101	107	92
GW-062917-MW-13	K1706918-006	102	107	90
GW-062817-11-BL	K1706918-007	103	108	90
GW-062817-11-CL-PDB	K1706918-008	105	107	90
GW-062817-11-CL	K1706918-009	104	108	91
GW-062817-BMW-3	K1706918-010	102	107	90
GW-062817-BMW-18	K1706918-011	103	107	91
GW-062917-P2-I-PDB	K1706918-012	104	108	90
GW-062917-P2-I	K1706918-013	94	103	86
GW-062917-P2-S-PDB	K1706918-014	92	102	86
GW-062917-P2-S	K1706918-015	91	102	85
GW-062817-HLA-1-PDB	K1706918-016	105	107	90
GW-062817-HLA-1	K1706918-017	104	108	91
GW-062917-DUP	K1706918-018	90	103	86
GW-062917-EB	K1706918-019	92	101	85
Method Blank	KWG1705650-5	104	109	91
Method Blank	KWG1705799-5	90	103	87
GW-062817-BMW-18MS	KWG1705650-1	104	111	100
GW-062817-BMW-18DMS	KWG1705650-2	105	112	99
Lab Control Sample	KWG1705650-3	104	112	100
Duplicate Lab Control Sample	KWG1705650-4	103	112	100
Lab Control Sample	KWG1705799-3	102	109	96
Duplicate Lab Control Sample	KWG1705799-4	101	107	96

**Surrogate Recovery Control Limits (%)**

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Sur1 = Dibromofluoromethane	73-122
Sur2 = Toluene-d8	65-144
Sur3 = 4-Bromofluorobenzene	68-117

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Results flagged with an asterisk (\*) indicate values outside control criteria.  
 Results flagged with a pound (#) indicate the control criteria is not applicable.

QA/QC Report

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Extracted:** 07/06/2017  
**Date Analyzed:** 07/06/2017

**Matrix Spike Summary**  
**Volatile Organic Compounds**

**Sample Name:** GW-062817-BMW-18  
**Lab Code:** K1706918-011  
**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low  
**Extraction Lot:** KWG1705650

GW-062817-BMW-18MS  
 KWG1705650-1  
**Matrix Spike**

Analyte Name	Sample Result	Result	Spike Amount	%Rec	%Rec Limits
Carbon Tetrachloride	4.7	16.0	10.0	112	53-161

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.

QA/QC Report

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Extracted:** 07/06/2017  
**Date Analyzed:** 07/06/2017

**Lab Control Spike Summary**  
**Volatile Organic Compounds**

**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low  
**Extraction Lot:** KWG1705650

Lab Control Sample  
 KWG1705650-3  
**Lab Control Spike**

Analyte Name	Result	Spike Amount	%Rec	%Rec Limits
Carbon Tetrachloride	10.7	10.0	107	55-140

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

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

**Client:** GeoSyntec Consultants  
**Project:** OLIN-FREDRICKSON  
**Sample Matrix:** Water

**Service Request:** K1706918  
**Date Extracted:** 07/10/2017  
**Date Analyzed:** 07/10/2017

**Lab Control Spike Summary**  
**Volatile Organic Compounds**

**Extraction Method:** EPA 5030B  
**Analysis Method:** 8260C

**Units:** ug/L  
**Basis:** NA  
**Level:** Low  
**Extraction Lot:** KWG1705799

Lab Control Sample  
 KWG1705799-3  
**Lab Control Spike**

Analyte Name	Result	Spike Amount	%Rec	%Rec Limits
Carbon Tetrachloride	8.67	10.0	87	55-140

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

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