APPENDIX E
Laboratory Reports and Data Validation Memoranda

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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May 7, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on April 29, 2020 from the Precision Engineering 1803.01.01, F&BI 004344 project. There are 26 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0507R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on April 29, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.01, F&BI 004344 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
004344 -01	MW4-W-20.0
004344 -02	MW1-W-35.0
004344 -03	MW5-W-15.0
004344 -04	MWDUP-W-15.0
004344 -05	Trip Blank

Samples MW4-W-20.0, MW1-W-35.0, MW5-W-15.0, and MWDUP-W-15.0 were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

All quality control requirements were acceptable.

Date of Report: 05/07/20
Date Received: 04/29/20
Project: Precision Engineering 1803.01.01, F&BI 004344
Date Extracted: 04/30/20
Date Analyzed: 04/30/20

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
MW4-W-20.0 004344-01	<50	<250	114
MW1-W-35.0 004344-02	<50	<250	128
MW5-W-15.0 004344-03	130 x	<250	135
MWDUP-W-15.0 004344-04	97 x	<250	137
Method Blank 00-980 MB2	<50	<250	113

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW4-W-20.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004344-01
Date Analyzed:	04/30/20	Data File:	004344-01.111
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	10.6
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW1-W-35.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004344-02
Date Analyzed:	04/30/20	Data File:	004344-02.114
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	27.7
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004344-03 x5
Date Analyzed:	05/01/20	Data File:	004344-03 x5.076
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	5.37
Chromium	47,000 ve
Copper	<25
Selenium	<5

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004344-03 x100
Date Analyzed:	04/30/20	Data File:	004344-03 x100.128
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	44,600

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MWDUP-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004344-04 x5
Date Analyzed:	05/01/20	Data File:	004344-04 x5.077
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	5.17
Chromium	50,300 ve
Copper	<25
Selenium	<5

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MWDUP-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004344-04 x100
Date Analyzed:	04/30/20	Data File:	004344-04 x100.129
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	48,000

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	I0-249 mb
Date Analyzed:	04/30/20	Data File:	I0-249 mb.109
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW4-W-20.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004344-01 1/2
Date Analyzed:	04/30/20	Data File:	043027.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	82	31	160
Benzo(a)anthracene-d12	94	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW1-W-35.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004344-02 1/2
Date Analyzed:	04/30/20	Data File:	043028.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	79	31	160
Benzo(a)anthracene-d12	97	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	0.061
Pyrene	0.041
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004344-03 1/2
Date Analyzed:	05/01/20	Data File:	043029.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	82	31	160
Benzo(a)anthracene-d12	93	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MWDUP-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004344-04 1/2
Date Analyzed:	05/01/20	Data File:	043030.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	81	31	160
Benzo(a)anthracene-d12	88	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	00-982 mb
Date Analyzed:	04/30/20	Data File:	043021.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	80	31	160
Benzo(a)anthracene-d12	100	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW4-W-20.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004344-01
Date Analyzed:	05/01/20	Data File:	050137.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	100	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW1-W-35.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004344-02
Date Analyzed:	05/01/20	Data File:	050138.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	98	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004344-03
Date Analyzed:	05/01/20	Data File:	050139.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	101	63	127
4-Bromofluorobenzene	98	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<50	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<1	o-Xylene	<1
Methylene chloride	<5	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	<1
trans-1,2-Dichloroethene	<1	Bromoform	<1
1,1-Dichloroethane	<1	n-Propylbenzene	<1
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<1
2-Butanone (MEK)	<10	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<1	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<1	1,2,4-Trimethylbenzene	<1
Benzene	<0.35	sec-Butylbenzene	<1
Trichloroethene	3.3	p-Isopropyltoluene	<1
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<1	1,4-Dichlorobenzene	<1
Dibromomethane	<1	1,2-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<1	1,2,4-Trichlorobenzene	<1
Toluene	<1	Hexachlorobutadiene	<1
trans-1,3-Dichloropropene	<1	Naphthalene	<1
1,1,2-Trichloroethane	<1	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MWDUP-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004344-04
Date Analyzed:	05/01/20	Data File:	050140.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	98	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<50	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<1	o-Xylene	<1
Methylene chloride	<5	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	<1
trans-1,2-Dichloroethene	<1	Bromoform	<1
1,1-Dichloroethane	<1	n-Propylbenzene	<1
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<1
2-Butanone (MEK)	<10	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<1	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<1	1,2,4-Trimethylbenzene	<1
Benzene	<0.35	sec-Butylbenzene	<1
Trichloroethene	3.4	p-Isopropyltoluene	<1
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<1	1,4-Dichlorobenzene	<1
Dibromomethane	<1	1,2-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<1	1,2,4-Trichlorobenzene	<1
Toluene	<1	Hexachlorobutadiene	<1
trans-1,3-Dichloropropene	<1	Naphthalene	<1
1,1,2-Trichloroethane	<1	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Trip Blank	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004344-05
Date Analyzed:	05/01/20	Data File:	050134.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	99	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	00-950 mb
Date Analyzed:	05/01/20	Data File:	050116.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	101	63	127
4-Bromofluorobenzene	100	60	133

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

Date of Report: 05/07/20
Date Received: 04/29/20
Project: Precision Engineering 1803.01.01, F&BI 004344

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	108	108	63-142	0

Date of Report: 05/07/20
Date Received: 04/29/20
Project: Precision Engineering 1803.01.01, F&BI 004344

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

Laboratory Code: 004344-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	10.6	97	93	75-125	4
Chromium	ug/L (ppb)	20	<1	101	99	75-125	2
Copper	ug/L (ppb)	20	<5	93	92	75-125	1
Selenium	ug/L (ppb)	5	<1	99	98	75-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	90	80-120
Chromium	ug/L (ppb)	20	97	80-120
Copper	ug/L (ppb)	20	97	80-120
Selenium	ug/L (ppb)	5	97	80-120

Date of Report: 05/07/20
Date Received: 04/29/20
Project: Precision Engineering 1803.01.01, F&BI 004344

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270E SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	79	76	57-114	4
Acenaphthylene	ug/L (ppb)	1	77	75	65-119	3
Acenaphthene	ug/L (ppb)	1	77	76	66-118	1
Fluorene	ug/L (ppb)	1	77	77	64-125	0
Phenanthrene	ug/L (ppb)	1	85	84	67-120	1
Anthracene	ug/L (ppb)	1	86	84	65-122	2
Fluoranthene	ug/L (ppb)	1	86	87	65-127	1
Pyrene	ug/L (ppb)	1	87	84	62-130	4
Benz(a)anthracene	ug/L (ppb)	1	92	91	60-118	1
Chrysene	ug/L (ppb)	1	91	91	66-125	0
Benzo(b)fluoranthene	ug/L (ppb)	1	81	81	55-135	0
Benzo(k)fluoranthene	ug/L (ppb)	1	81	79	62-125	2
Benzo(a)pyrene	ug/L (ppb)	1	81	81	58-127	0
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	83	77	36-142	7
Dibenz(a,h)anthracene	ug/L (ppb)	1	83	79	37-133	5
Benzo(g,h,i)perylene	ug/L (ppb)	1	81	77	34-135	5

Date of Report: 05/07/20
Date Received: 04/29/20
Project: Precision Engineering 1803.01.01, F&BI 004344

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

Laboratory Code: 004342-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	106	10-172
Chloromethane	ug/L (ppb)	50	<10	99	25-166
Vinyl chloride	ug/L (ppb)	50	<0.2	101	36-166
Bromomethane	ug/L (ppb)	50	<1	121	47-169
Chloroethane	ug/L (ppb)	50	<1	105	46-160
Trichlorofluoromethane	ug/L (ppb)	50	<1	110	44-165
Acetone	ug/L (ppb)	250	<50	89	10-182
1,1-Dichloroethene	ug/L (ppb)	50	<1	111	60-136
Hexane	ug/L (ppb)	50	<1	108	52-150
Methylene chloride	ug/L (ppb)	50	<5	106	67-132
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	104	74-127
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	106	72-129
1,1-Dichloroethane	ug/L (ppb)	50	<1	105	70-128
2,2-Dichloropropane	ug/L (ppb)	50	<1	111	36-154
cis-1,2-Dichloroethene	ug/L (ppb)	50	<1	105	71-127
Chloroform	ug/L (ppb)	50	<1	106	65-132
2-Butanone (MEK)	ug/L (ppb)	250	<10	99	10-129
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	101	48-149
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	110	60-146
1,1-Dichloropropene	ug/L (ppb)	50	<1	104	69-133
Carbon tetrachloride	ug/L (ppb)	50	<1	114	56-152
Benzene	ug/L (ppb)	50	<0.35	104	76-125
Trichloroethene	ug/L (ppb)	50	<1	100	66-135
1,2-Dichloropropane	ug/L (ppb)	50	<1	111	78-125
Bromodichloromethane	ug/L (ppb)	50	<1	111	61-150
Dibromomethane	ug/L (ppb)	50	<1	111	66-141
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	111	10-185
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	112	72-132
Toluene	ug/L (ppb)	50	<1	102	76-122
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	112	76-130
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	107	68-131
2-Hexanone	ug/L (ppb)	250	<10	104	10-185
1,3-Dichloropropane	ug/L (ppb)	50	<1	107	71-128
Tetrachloroethene	ug/L (ppb)	50	<1	106	10-226
Dibromochloromethane	ug/L (ppb)	50	<1	117	70-139
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	110	69-134
Chlorobenzene	ug/L (ppb)	50	<1	106	77-122
Ethylbenzene	ug/L (ppb)	50	<1	104	69-135
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	113	73-137
m,p-Xylene	ug/L (ppb)	100	<2	107	69-135
o-Xylene	ug/L (ppb)	50	<1	105	60-140
Styrene	ug/L (ppb)	50	<1	108	71-133
Isopropylbenzene	ug/L (ppb)	50	<1	103	65-142
Bromoform	ug/L (ppb)	50	<1	117	65-142
n-Propylbenzene	ug/L (ppb)	50	<1	106	58-144
Bromobenzene	ug/L (ppb)	50	<1	104	75-124
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	107	66-137
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	111	51-154
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	106	53-150
2-Chlorotoluene	ug/L (ppb)	50	<1	105	66-127
4-Chlorotoluene	ug/L (ppb)	50	<1	106	65-130
tert-Butylbenzene	ug/L (ppb)	50	<1	104	65-137
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	106	59-146
sec-Butylbenzene	ug/L (ppb)	50	<1	106	64-140
p-Isopropyltoluene	ug/L (ppb)	50	<1	108	65-141
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	104	72-123
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	104	69-126
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	104	69-128
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	111	32-164
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	102	66-136
Hexachlorobutadiene	ug/L (ppb)	50	<1	99	60-143
Naphthalene	ug/L (ppb)	50	<1	105	44-164
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	103	69-148

Date of Report: 05/07/20
Date Received: 04/29/20
Project: Precision Engineering 1803.01.01, F&BI 004344

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	104	103	25-158	1
Chloromethane	ug/L (ppb)	50	104	103	45-156	1
Vinyl chloride	ug/L (ppb)	50	105	106	50-154	1
Bromomethane	ug/L (ppb)	50	126	127	55-143	1
Chloroethane	ug/L (ppb)	50	109	108	58-146	1
Trichlorofluoromethane	ug/L (ppb)	250	111	111	50-150	0
Acetone	ug/L (ppb)	250	88	90	22-155	2
1,1-Dichloroethene	ug/L (ppb)	50	111	110	67-136	1
Hexane	ug/L (ppb)	50	97	99	57-137	2
Methylene chloride	ug/L (ppb)	50	106	105	39-148	1
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	104	105	64-147	1
trans-1,2-Dichloroethene	ug/L (ppb)	50	106	107	68-128	1
1,1-Dichloroethane	ug/L (ppb)	50	105	105	74-135	0
2,2-Dichloropropane	ug/L (ppb)	50	116	114	55-143	2
cis-1,2-Dichloroethene	ug/L (ppb)	50	105	106	74-136	1
Chloroform	ug/L (ppb)	50	105	105	74-134	0
2-Butanone (MEK)	ug/L (ppb)	250	94	95	37-150	1
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	96	99	66-129	3
1,1,1-Trichloroethane	ug/L (ppb)	50	110	110	74-142	0
1,1-Dichloropropene	ug/L (ppb)	50	101	102	77-129	1
Carbon tetrachloride	ug/L (ppb)	50	115	116	75-158	1
Benzene	ug/L (ppb)	50	100	101	69-134	1
Trichloroethene	ug/L (ppb)	50	97	99	67-133	2
1,2-Dichloropropane	ug/L (ppb)	50	104	107	71-134	3
Bromodichloromethane	ug/L (ppb)	50	105	108	76-132	3
Dibromomethane	ug/L (ppb)	50	105	107	68-132	2
4-Methyl-2-pentanone	ug/L (ppb)	250	106	110	65-138	4
cis-1,3-Dichloropropene	ug/L (ppb)	50	103	108	74-140	5
Toluene	ug/L (ppb)	50	96	98	72-122	2
trans-1,3-Dichloropropene	ug/L (ppb)	50	104	108	80-136	4
1,1,2-Trichloroethane	ug/L (ppb)	50	100	103	75-124	3
2-Hexanone	ug/L (ppb)	250	99	101	60-136	2
1,3-Dichloropropane	ug/L (ppb)	50	99	102	76-126	3
Tetrachloroethene	ug/L (ppb)	50	102	101	76-121	1
Dibromochloromethane	ug/L (ppb)	50	112	114	84-133	2
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	103	106	82-115	3
Chlorobenzene	ug/L (ppb)	50	102	103	83-114	1
Ethylbenzene	ug/L (ppb)	50	100	101	77-124	1
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	112	112	84-127	0
m,p-Xylene	ug/L (ppb)	100	104	104	81-112	0
o-Xylene	ug/L (ppb)	50	104	105	81-121	1
Styrene	ug/L (ppb)	50	105	106	84-119	1
Isopropylbenzene	ug/L (ppb)	50	103	103	80-117	0
Bromoform	ug/L (ppb)	50	117	119	74-136	2
n-Propylbenzene	ug/L (ppb)	50	99	102	74-126	3
Bromobenzene	ug/L (ppb)	50	97	101	80-121	4
1,3,5-Trimethylbenzene	ug/L (ppb)	50	101	104	78-123	3
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	104	107	66-126	3
1,2,3-Trichloropropane	ug/L (ppb)	50	100	102	67-124	2
2-Chlorotoluene	ug/L (ppb)	50	99	101	77-127	2
4-Chlorotoluene	ug/L (ppb)	50	99	102	78-128	3
tert-Butylbenzene	ug/L (ppb)	50	100	102	80-123	2
1,2,4-Trimethylbenzene	ug/L (ppb)	50	102	105	79-122	3
sec-Butylbenzene	ug/L (ppb)	50	101	103	80-116	2
p-Isopropyltoluene	ug/L (ppb)	50	104	105	81-123	1
1,3-Dichlorobenzene	ug/L (ppb)	50	99	102	83-113	3
1,4-Dichlorobenzene	ug/L (ppb)	50	99	101	81-112	2
1,2-Dichlorobenzene	ug/L (ppb)	50	101	103	84-112	2
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	113	117	57-141	3
1,2,4-Trichlorobenzene	ug/L (ppb)	50	100	104	72-130	4
Hexachlorobutadiene	ug/L (ppb)	50	97	99	53-141	2
Naphthalene	ug/L (ppb)	50	104	108	64-133	4
1,2,3-Trichlorobenzene	ug/L (ppb)	50	102	105	65-136	3

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 004344
Work Order Number: 2004406

May 06, 2020

Attention Michael Erdahl:

Fremont Analytical, Inc. received 4 sample(s) on 4/29/2020 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *05/06/2020*

CLIENT: Friedman & Bruya
Project: 004344
Work Order: 2004406

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2004406-001	MW4-W-20.0	04/29/2020 9:40 AM	04/29/2020 2:20 PM
2004406-002	MW1-W-35.0	04/29/2020 10:15 AM	04/29/2020 2:20 PM
2004406-003	MW5-W-15.0	04/29/2020 11:50 AM	04/29/2020 2:20 PM
2004406-004	MWDUP-W-15.0	04/29/2020 11:50 AM	04/29/2020 2:20 PM

Case Narrative

WO#: **2004406**
Date: **5/6/2020**

CLIENT: Friedman & Bruya
Project: 004344

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **2004406**
Date Reported: **5/6/2020**

CLIENT: Friedman & Bruya
Project: 004344

Lab ID: 2004406-001 **Collection Date:** 4/29/2020 9:40:00 AM
Client Sample ID: **MW4-W-20.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R58995		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	4/29/2020 5:21:00 PM

Lab ID: 2004406-002 **Collection Date:** 4/29/2020 10:15:00 AM
Client Sample ID: **MW1-W-35.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R58995		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	4/29/2020 5:25:00 PM

Lab ID: 2004406-003 **Collection Date:** 4/29/2020 11:50:00 AM
Client Sample ID: **MW5-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R58995		Analyst: WF
Chromium, Hexavalent	38.5	4.50	D	mg/L	100	4/29/2020 5:30:00 PM

Lab ID: 2004406-004 **Collection Date:** 4/29/2020 11:50:00 AM
Client Sample ID: **MWDUP-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R58995		Analyst: WF
Chromium, Hexavalent	41.5	4.50	D	mg/L	100	4/29/2020 5:35:00 PM

Date: *5/6/2020*

Work Order: 2004406
CLIENT: Friedman & Bruya
Project: 004344

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-58995** SampType: **MBLK** Units: **mg/L** Prep Date: **4/29/2020** RunNo: **58995**
Client ID: **MBLKW** Batch ID: **R58995** Analysis Date: **4/29/2020** SeqNo: **1178582**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-58995** SampType: **LCS** Units: **mg/L** Prep Date: **4/29/2020** RunNo: **58995**
Client ID: **LCSW** Batch ID: **R58995** Analysis Date: **4/29/2020** SeqNo: **1178583**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.240	0.0450	0.2500	0	96.1	85	115				

Sample ID: **2004400-002ADUP** SampType: **DUP** Units: **mg/L** Prep Date: **4/29/2020** RunNo: **58995**
Client ID: **BATCH** Batch ID: **R58995** Analysis Date: **4/29/2020** SeqNo: **1178585**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		20	

Sample ID: **2004400-002AMS** SampType: **MS** Units: **mg/L** Prep Date: **4/29/2020** RunNo: **58995**
Client ID: **BATCH** Batch ID: **R58995** Analysis Date: **4/29/2020** SeqNo: **1178586**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.243	0.0450	0.2500	0	97.3	70	130				

Sample ID: **2004400-002AMSD** SampType: **MSD** Units: **mg/L** Prep Date: **4/29/2020** RunNo: **58995**
Client ID: **BATCH** Batch ID: **R58995** Analysis Date: **4/29/2020** SeqNo: **1178587**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.242	0.0450	0.2500	0	96.7	70	130	0.2432	0.577	20	

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2004406**
Logged by:	**Clare Griggs**	Date Received:	**4/29/2020 2:20:00 PM**

Chain of Custody

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

Log In

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

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler	2.5
Sample	2.8

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY 20044406

Send Report To Michael Erdahl
Company Friedman and Bruya, Inc.
Address 3012 16th Ave W
City, State, ZIP Seattle, WA 98119
Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Fremont

PROJECT NAME/NO.	PO #
004344	B-198

REMARKS: EDD: EQuIS

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

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Hexavalent Chromium							Notes
MW4-W-20.0		4/29/20	0940	water	1				X							
MW1-W-35.0		"	1015	"	1				X							
MW5-W-15.0		"	1150	"	1				X							
MWDUP-W-15.0		"	1150	"	1				X							

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

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	4/29/20	1335
Received by:	Emma Holmes	Emma Holmes	FAI	4/29/20	1420
Relinquished by:					
Received by:					

004344

SAMPLE CHAIN OF CUSTODY

ME 04/29/20 VW3/AI2/D04

Page # 1 of 1

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N State St, Suite 301

City, State, ZIP Bellingham, WA 98225

Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (*signature*) Amanda Birby

PROJECT NAME: Precision Engineering

PO #: 1803.01.01

REMARKS: *metals include As, Cr, Cu, Se & are field filtered. Project specific RLs? - Yes / No

INVOICE TO: accounting@maulfoster.com

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

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: NWTPH-Dx (Acid/Silica Gel)	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260C	PAHs EPA 8270 SIM	PCBs EPA 8082	Hex Chrom by SM 3500 CR B	Dis. Metals* by EPA 6020B			Notes
MW4-W-20.0	01 A-G	4/29/20	0940	W	7	X				X	X		X	X			see metals note above.
MW1-W-35.0	02		1015			X				X	X		X	X			
MW5-W-15.0	03		1150			X				X	X		X	X			
MW DUP-W-15.0	04		1150			X				X	X		X	X			
Trip Blank	05 A B		N/A		2					X							
																	Samples received at 4 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Amanda Birby	Amanda Birby	MFA	4/29/20	12:55
Received by: VWA	VINA	FBI	4/29/20	12:55
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

May 7, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on April 29, 2020 from the Precision Engineering 1803.01.01, F&BI 004323 project. There are 28 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0507R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on April 29, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.01, F&BI 004323 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
004323 -01	MW2-W-15.0
004323 -02	MW7-W-27.5
004323 -03	MW6-W-15.0
004323 -04	MW11-W-15.0
004323 -05	MW3-W-15.0
004323 -06	Trip Blank

Samples MW2-W-15.0, MW7-W-27.5, MW6-W-15.0, MW11-W-15.0, and MW3-W-15.0 were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

A 6020B internal standard failed the acceptance criteria for sample MW7-W-27.5. The sample was diluted and reanalyzed with acceptable results. Both data sets were reported.

The 8260D samples MW2-W-15.0 and MW6-W-15.0 were diluted due to matrix effect (foamy). The reporting limits were raised accordingly.

All other quality control requirements were acceptable.

Date of Report: 05/07/20
Date Received: 04/29/20
Project: Precision Engineering 1803.01.01, F&BI 004323
Date Extracted: 04/29/20
Date Analyzed: 04/29/20

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
MW2-W-15.0 004323-01	470 x	660 x	96
MW7-W-27.5 004323-02	170 x	<250	121
MW6-W-15.0 004323-03	590 x	550 x	62
MW11-W-15.0 004323-04	260 x	<250	128
MW3-W-15.0 004323-05	92 x	<250	126
Method Blank 00-980 MB	<50	<250	125

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW2-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004323-01
Date Analyzed:	05/01/20	Data File:	004323-01.060
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	5.90
Chromium	8.18
Copper	<5
Selenium	3.53

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW7-W-27.5	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004323-02
Date Analyzed:	04/30/20	Data File:	004323-02.145
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	8.62
Chromium	1.64 J
Copper	5.12 J
Selenium	3.58 ca

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW7-W-27.5	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004323-02 x5
Date Analyzed:	05/01/20	Data File:	004323-02 x5.061
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	<5
Copper	<25
Selenium	<5

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW6-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004323-03 x5
Date Analyzed:	05/01/20	Data File:	004323-03 x5.062
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	48.1
Chromium	25.9
Copper	<25
Selenium	6.15

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004323-04
Date Analyzed:	05/01/20	Data File:	004323-04.063
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	4.10
Chromium	3.10
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004323-05
Date Analyzed:	05/01/20	Data File:	004323-05.064
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	7.33
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	I0-249 mb
Date Analyzed:	04/30/20	Data File:	I0-249 mb.109
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW2-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004323-01 1/2
Date Analyzed:	04/30/20	Data File:	043022.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	80	31	160
Benzo(a)anthracene-d12	97	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	0.057
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW7-W-27.5	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004323-02 1/2
Date Analyzed:	04/30/20	Data File:	043023.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	85	31	160
Benzo(a)anthracene-d12	89	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW6-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004323-03 1/2
Date Analyzed:	04/30/20	Data File:	043024.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	82	31	160
Benzo(a)anthracene-d12	100	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004323-04 1/2
Date Analyzed:	04/30/20	Data File:	043025.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	82	31	160
Benzo(a)anthracene-d12	96	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	1.3
Fluorene	0.10
Phenanthrene	0.048
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004323-05 1/2
Date Analyzed:	04/30/20	Data File:	043026.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	77	31	160
Benzo(a)anthracene-d12	96	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	00-982 mb
Date Analyzed:	04/30/20	Data File:	043021.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	80	31	160
Benzo(a)anthracene-d12	100	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW2-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004323-01 1/10
Date Analyzed:	05/02/20	Data File:	050185.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	97	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW7-W-27.5	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004323-02
Date Analyzed:	05/01/20	Data File:	050142.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	101	63	127
4-Bromofluorobenzene	100	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW6-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004323-03 1/10
Date Analyzed:	05/02/20	Data File:	050186.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	103	57	121
Toluene-d8	104	63	127
4-Bromofluorobenzene	100	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004323-04
Date Analyzed:	05/01/20	Data File:	050143.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	98	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004323-05
Date Analyzed:	05/01/20	Data File:	050144.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	98	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Trip Blank	Client:	Maul Foster Alongi
Date Received:	04/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004323-06
Date Analyzed:	05/01/20	Data File:	050135.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	103	63	127
4-Bromofluorobenzene	101	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	00-941 mb
Date Analyzed:	05/01/20	Data File:	050115.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	99	60	133

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

Date of Report: 05/07/20
Date Received: 04/29/20
Project: Precision Engineering 1803.01.01, F&BI 004323

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	108	108	63-142	0

Date of Report: 05/07/20
Date Received: 04/29/20
Project: Precision Engineering 1803.01.01, F&BI 004323

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

Laboratory Code: 004344-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	10.6	97	93	75-125	4
Chromium	ug/L (ppb)	20	<1	101	99	75-125	2
Copper	ug/L (ppb)	20	<5	93	92	75-125	1
Selenium	ug/L (ppb)	5	<1	99	98	75-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	90	80-120
Chromium	ug/L (ppb)	20	97	80-120
Copper	ug/L (ppb)	20	97	80-120
Selenium	ug/L (ppb)	5	97	80-120

Date of Report: 05/07/20
Date Received: 04/29/20
Project: Precision Engineering 1803.01.01, F&BI 004323

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270E SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	79	76	57-114	4
Acenaphthylene	ug/L (ppb)	1	77	75	65-119	3
Acenaphthene	ug/L (ppb)	1	77	76	66-118	1
Fluorene	ug/L (ppb)	1	77	77	64-125	0
Phenanthrene	ug/L (ppb)	1	85	84	67-120	1
Anthracene	ug/L (ppb)	1	86	84	65-122	2
Fluoranthene	ug/L (ppb)	1	86	87	65-127	1
Pyrene	ug/L (ppb)	1	87	84	62-130	4
Benz(a)anthracene	ug/L (ppb)	1	92	91	60-118	1
Chrysene	ug/L (ppb)	1	91	91	66-125	0
Benzo(b)fluoranthene	ug/L (ppb)	1	81	81	55-135	0
Benzo(k)fluoranthene	ug/L (ppb)	1	81	79	62-125	2
Benzo(a)pyrene	ug/L (ppb)	1	81	81	58-127	0
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	83	77	36-142	7
Dibenz(a,h)anthracene	ug/L (ppb)	1	83	79	37-133	5
Benzo(g,h,i)perylene	ug/L (ppb)	1	81	77	34-135	5

Date of Report: 05/07/20
Date Received: 04/29/20
Project: Precision Engineering 1803.01.01, F&BI 004323

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

Laboratory Code: 004314-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	106	10-172
Chloromethane	ug/L (ppb)	50	<10	102	25-166
Vinyl chloride	ug/L (ppb)	50	<0.2	103	36-166
Bromomethane	ug/L (ppb)	50	<1	121	47-169
Chloroethane	ug/L (ppb)	50	<1	104	46-160
Trichlorofluoromethane	ug/L (ppb)	50	<1	109	44-165
Acetone	ug/L (ppb)	250	<50	86	10-182
1,1-Dichloroethene	ug/L (ppb)	50	<1	108	60-136
Hexane	ug/L (ppb)	50	<1	102	52-150
Methylene chloride	ug/L (ppb)	50	<5	102	67-132
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	102	74-127
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	103	72-129
1,1-Dichloroethane	ug/L (ppb)	50	<1	102	70-128
2,2-Dichloropropane	ug/L (ppb)	50	<1	110	36-154
cis-1,2-Dichloroethene	ug/L (ppb)	50	<1	102	71-127
Chloroform	ug/L (ppb)	50	<1	102	65-132
2-Butanone (MEK)	ug/L (ppb)	250	<10	97	10-129
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	97	48-149
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	107	60-146
1,1-Dichloropropene	ug/L (ppb)	50	<1	100	69-133
Carbon tetrachloride	ug/L (ppb)	50	<1	110	56-152
Benzene	ug/L (ppb)	50	<0.35	100	76-125
Trichloroethene	ug/L (ppb)	50	<1	96	66-135
1,2-Dichloropropane	ug/L (ppb)	50	<1	107	78-125
Bromodichloromethane	ug/L (ppb)	50	<1	106	61-150
Dibromomethane	ug/L (ppb)	50	<1	105	66-141
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	108	10-185
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	108	72-132
Toluene	ug/L (ppb)	50	<1	97	76-122
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	108	76-130
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	103	68-131
2-Hexanone	ug/L (ppb)	250	<10	100	10-185
1,3-Dichloropropane	ug/L (ppb)	50	<1	103	71-128
Tetrachloroethene	ug/L (ppb)	50	<1	101	10-226
Dibromochloromethane	ug/L (ppb)	50	<1	113	70-139
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	104	69-134
Chlorobenzene	ug/L (ppb)	50	<1	101	77-122
Ethylbenzene	ug/L (ppb)	50	<1	99	69-135
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	109	73-137
m,p-Xylene	ug/L (ppb)	100	<2	102	69-135
o-Xylene	ug/L (ppb)	50	<1	101	60-140
Styrene	ug/L (ppb)	50	<1	103	71-133
Isopropylbenzene	ug/L (ppb)	50	<1	100	65-142
Bromoform	ug/L (ppb)	50	<1	114	65-142
n-Propylbenzene	ug/L (ppb)	50	<1	100	58-144
Bromobenzene	ug/L (ppb)	50	<1	100	75-124
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	101	66-137
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	106	51-154
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	101	53-150
2-Chlorotoluene	ug/L (ppb)	50	<1	99	66-127
4-Chlorotoluene	ug/L (ppb)	50	<1	100	65-130
tert-Butylbenzene	ug/L (ppb)	50	<1	98	65-137
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	101	59-146
sec-Butylbenzene	ug/L (ppb)	50	<1	99	64-140
p-Isopropyltoluene	ug/L (ppb)	50	<1	103	65-141
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	99	72-123
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	98	69-126
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	99	69-128
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	110	32-164
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	96	66-136
Hexachlorobutadiene	ug/L (ppb)	50	<1	85	60-143
Naphthalene	ug/L (ppb)	50	<1	102	44-164
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	98	69-148

Date of Report: 05/07/20
Date Received: 04/29/20
Project: Precision Engineering 1803.01.01, F&BI 004323

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	102	101	25-158	1
Chloromethane	ug/L (ppb)	50	100	95	45-156	5
Vinyl chloride	ug/L (ppb)	50	101	98	50-154	3
Bromomethane	ug/L (ppb)	50	121	117	55-143	3
Chloroethane	ug/L (ppb)	50	105	106	58-146	1
Trichlorofluoromethane	ug/L (ppb)	250	108	107	50-150	1
Acetone	ug/L (ppb)	250	86	84	22-155	2
1,1-Dichloroethene	ug/L (ppb)	50	109	105	67-136	4
Hexane	ug/L (ppb)	50	95	101	57-137	6
Methylene chloride	ug/L (ppb)	50	105	104	39-148	1
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	102	96	64-147	6
trans-1,2-Dichloroethene	ug/L (ppb)	50	104	102	68-128	2
1,1-Dichloroethane	ug/L (ppb)	50	102	101	74-135	1
2,2-Dichloropropane	ug/L (ppb)	50	113	112	55-143	1
cis-1,2-Dichloroethene	ug/L (ppb)	50	102	101	74-136	1
Chloroform	ug/L (ppb)	50	102	100	74-134	2
2-Butanone (MEK)	ug/L (ppb)	250	89	91	37-150	2
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	92	92	66-129	0
1,1,1-Trichloroethane	ug/L (ppb)	50	107	107	74-142	0
1,1-Dichloropropene	ug/L (ppb)	50	97	98	77-129	1
Carbon tetrachloride	ug/L (ppb)	50	109	112	75-158	3
Benzene	ug/L (ppb)	50	97	96	69-134	1
Trichloroethene	ug/L (ppb)	50	94	93	67-133	1
1,2-Dichloropropane	ug/L (ppb)	50	100	99	71-134	1
Bromodichloromethane	ug/L (ppb)	50	100	101	76-132	1
Dibromomethane	ug/L (ppb)	50	100	100	68-132	0
4-Methyl-2-pentanone	ug/L (ppb)	250	101	99	65-138	2
cis-1,3-Dichloropropene	ug/L (ppb)	50	98	99	74-140	1
Toluene	ug/L (ppb)	50	92	95	72-122	3
trans-1,3-Dichloropropene	ug/L (ppb)	50	97	101	80-136	4
1,1,2-Trichloroethane	ug/L (ppb)	50	96	94	75-124	2
2-Hexanone	ug/L (ppb)	250	93	91	60-136	2
1,3-Dichloropropane	ug/L (ppb)	50	94	95	76-126	1
Tetrachloroethene	ug/L (ppb)	50	96	100	76-121	4
Dibromochloromethane	ug/L (ppb)	50	106	109	84-133	3
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	98	97	82-115	1
Chlorobenzene	ug/L (ppb)	50	97	98	83-114	1
Ethylbenzene	ug/L (ppb)	50	97	97	77-124	0
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	107	111	84-127	4
m,p-Xylene	ug/L (ppb)	100	100	101	81-112	1
o-Xylene	ug/L (ppb)	50	101	101	81-121	0
Styrene	ug/L (ppb)	50	100	98	84-119	2
Isopropylbenzene	ug/L (ppb)	50	100	101	80-117	1
Bromoform	ug/L (ppb)	50	110	112	74-136	2
n-Propylbenzene	ug/L (ppb)	50	96	101	74-126	5
Bromobenzene	ug/L (ppb)	50	94	95	80-121	1
1,3,5-Trimethylbenzene	ug/L (ppb)	50	97	103	78-123	6
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	100	101	66-126	1
1,2,3-Trichloropropane	ug/L (ppb)	50	95	96	67-124	1
2-Chlorotoluene	ug/L (ppb)	50	95	99	77-127	4
4-Chlorotoluene	ug/L (ppb)	50	95	98	78-128	3
tert-Butylbenzene	ug/L (ppb)	50	96	101	80-123	5
1,2,4-Trimethylbenzene	ug/L (ppb)	50	98	102	79-122	4
sec-Butylbenzene	ug/L (ppb)	50	98	103	80-116	5
p-Isopropyltoluene	ug/L (ppb)	50	100	104	81-123	4
1,3-Dichlorobenzene	ug/L (ppb)	50	96	97	83-113	1
1,4-Dichlorobenzene	ug/L (ppb)	50	95	96	81-112	1
1,2-Dichlorobenzene	ug/L (ppb)	50	98	98	84-112	0
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	110	115	57-141	4
1,2,4-Trichlorobenzene	ug/L (ppb)	50	97	99	72-130	2
Hexachlorobutadiene	ug/L (ppb)	50	94	99	53-141	5
Naphthalene	ug/L (ppb)	50	101	101	64-133	0
1,2,3-Trichlorobenzene	ug/L (ppb)	50	98	99	65-136	1

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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

Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 004323
Work Order Number: 2004400

May 06, 2020

Attention Michael Erdahl:

Fremont Analytical, Inc. received 5 sample(s) on 4/29/2020 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *05/06/2020*

CLIENT: Friedman & Bruya
Project: 004323
Work Order: 2004400

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2004400-001	MW2-W-15.0	04/28/2020 1:00 PM	04/29/2020 10:23 AM
2004400-002	MW7-W-27.5	04/28/2020 1:30 PM	04/29/2020 10:23 AM
2004400-003	MW6-W-15.0	04/28/2020 3:00 PM	04/29/2020 10:23 AM
2004400-004	MW11-W-15.0	04/28/2020 3:40 PM	04/29/2020 10:23 AM
2004400-005	MW3-W-15.0	04/28/2020 4:35 PM	04/29/2020 10:23 AM

Case Narrative

WO#: **2004400**
Date: **5/6/2020**

CLIENT: Friedman & Bruya
Project: 004323

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **2004400**
Date Reported: **5/6/2020**

CLIENT: Friedman & Bruya
Project: 004323

Lab ID: 2004400-001 **Collection Date:** 4/28/2020 1:00:00 PM
Client Sample ID: **MW2-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R58995		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	4/29/2020 12:05:00 PM

Lab ID: 2004400-002 **Collection Date:** 4/28/2020 1:30:00 PM
Client Sample ID: **MW7-W-27.5** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R58995		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	4/29/2020 11:46:00 AM

Lab ID: 2004400-003 **Collection Date:** 4/28/2020 3:00:00 PM
Client Sample ID: **MW6-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R58995		Analyst: WF
Chromium, Hexavalent	ND	0.225	D	mg/L	5	4/29/2020 12:10:00 PM

NOTES:
Diluted due to matrix.

Lab ID: 2004400-004 **Collection Date:** 4/28/2020 3:40:00 PM
Client Sample ID: **MW11-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R58995		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	4/29/2020 12:16:00 PM

Analytical Report

Work Order: **2004400**
Date Reported: **5/6/2020**

CLIENT: Friedman & Bruya
Project: 004323

Lab ID: 2004400-005 **Collection Date:** 4/28/2020 4:35:00 PM
Client Sample ID: **MW3-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R58995		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	4/29/2020 12:20:00 PM

Work Order: 2004400
CLIENT: Friedman & Bruya
Project: 004323

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-58995**	SampType: **MBLK**			Units: **mg/L**		Prep Date: **4/29/2020**			RunNo: **58995**		
Client ID: **MBLKW**	Batch ID: **R58995**					Analysis Date: **4/29/2020**			SeqNo: **1178582**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-58995**	SampType: **LCS**			Units: **mg/L**		Prep Date: **4/29/2020**			RunNo: **58995**		
Client ID: **LCSW**	Batch ID: **R58995**					Analysis Date: **4/29/2020**			SeqNo: **1178583**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.240	0.0450	0.2500	0	96.1	85	115				

Sample ID: **2004400-002ADUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **4/29/2020**			RunNo: **58995**		
Client ID: **MW7-W-27.5**	Batch ID: **R58995**					Analysis Date: **4/29/2020**			SeqNo: **1178585**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		20	

Sample ID: **2004400-002AMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **4/29/2020**			RunNo: **58995**		
Client ID: **MW7-W-27.5**	Batch ID: **R58995**					Analysis Date: **4/29/2020**			SeqNo: **1178586**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.243	0.0450	0.2500	0	97.3	70	130				

Sample ID: **2004400-002AMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **4/29/2020**			RunNo: **58995**		
Client ID: **MW7-W-27.5**	Batch ID: **R58995**					Analysis Date: **4/29/2020**			SeqNo: **1178587**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.242	0.0450	0.2500	0	96.7	70	130	0.2432	0.577	20	

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2004400**
Logged by:	**Clare Griggs**	Date Received:	**4/29/2020 10:23:00 AM**

Chain of Custody

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

Log In

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

Special Handling (if applicable)

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

Person Notified:	Michael Erdahl	Date:	4/29/2020
By Whom:	Clare Griggs	Via:	☑ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:	Confirming TAT		
Client Instructions:	Standard TAT		

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler	4.4
Sample	3.8

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY 2004400

Page # 1 of 1

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

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

SUBCONTRACTER Fremont

PROJECT NAME/NO. 004323

PO # B-198

REMARKS EDD: EQUIS

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

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	cPAH							Notes
MW2-W-15.0		4/28/20	1300	water	1				X							
MW7-W-27.5			1330						X							
MW6-W-15.0			1500						X							
MW11-W-15.0			1540						X							
MW3-W-15.0			1635						X							

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

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	4/29/20	0 1004AM.
Received by:		Emma Holmes	FAI	4/29/20	10:23
Relinquished by:					
Received by:					

004323

SAMPLE CHAIN OF CUSTODY

ME 04/29/20

VW3/DO4/AT4

Page # 1 of 1

Report To Heather Good
Company Maul Foster & Alongi
Address 1329 N State Street, Suite 301
City, State, ZIP Bellingham, WA 98225
Phone (360) Email hgood@maulfoster.com

SAMPLERS (*signature*) Amanda Bixby

PROJECT NAME: Precision Engineering
PO #: 1803.01.01

REMARKS: *Metals include As, Cr, Co, Se & are field filtered. Project specific RLs? - Yes / No
INVOICE TO: accounting@maulfoster.com

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

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	DRO+ORO by NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260C	PAHs EPA 8270	PCBs EPA 8082	Hex chrom by SM3500 Cr B	Dis. Metals* by EPA 6020B			⊗-pc AB 4/29/20 ME Notes
MW2-W-15.0	01 A-G	4/28/20	1300	W	7	X				X	⊗		X	X			See metals note above.
MW7-W-27.5	02	"	1330	"	"	X				X	⊗		X	X			
MW6-W-15.0*	03	"	1500	"	"	X				X	⊗		X	X			VOAs rinsed. 7-day hold.
MW11-W-15.0	04	"	1540	"	"	X				X	⊗		X	X			
MW3-W-15.0	05	↓	1635	"	↓	X				X	⊗		X	X			
Trip blank	06 A B	4/28/20	N/A	↓	2					X			~~X~~	~~X~~			cancel pc AB 4/29/20 ME

Samples received at 2 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Amanda Bixby	Amanda Bixby	MFA	4/29/20	9:20
Received by: VIVA	VIVA	FBI	4/29/20	9:20
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

May 6, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on April 28, 2020 from the Precision Engineering 1803.01.01, F&BI 004316 project. There are 21 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0506R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on April 28, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.01, F&BI 004316 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
004316 -01	MW10-W-15.0
004316 -02	MW9-W-32.5
004316 -03	MW8-W-15.0
004316 -04	Trip Blank

Samples MW10-W-15.0, MW9-W-32.5, and MW8-W-15.0 were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

Sample MW10-W-15.0 was diluted for the 8260D analysis due to matrix effect (foamy). The reporting limits were raised accordingly.

All quality control requirements were acceptable.

Date of Report: 05/06/20
Date Received: 04/28/20
Project: Precision Engineering 1803.01.01, F&BI 004316
Date Extracted: 04/29/20
Date Analyzed: 04/29/20

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
MW10-W-15.0 004316-01	650 x	640 x	115
MW9-W-32.5 004316-02	140 x	<250	119
MW8-W-15.0 004316-03	340 x	<250	128
Method Blank 00-967 MB2	<50	<250	110

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW10-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/28/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004316-01
Date Analyzed:	04/30/20	Data File:	004316-01.131
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	14.9
Chromium	11.5
Copper	<5
Selenium	3.68

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW9-W-32.5	Client:	Maul Foster Alongi
Date Received:	04/28/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004316-02
Date Analyzed:	04/30/20	Data File:	004316-02.133
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	8.24
Chromium	2.02
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW8-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/28/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	004316-03
Date Analyzed:	04/30/20	Data File:	004316-03.134
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	6.38
Chromium	6.30
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/30/20	Lab ID:	I0-249 mb
Date Analyzed:	04/30/20	Data File:	I0-249 mb.109
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW10-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/28/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004316-01 1/10
Date Analyzed:	05/02/20	Data File:	050187.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	101	63	127
4-Bromofluorobenzene	97	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW9-W-32.5	Client:	Maul Foster Alongi
Date Received:	04/28/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004316-02
Date Analyzed:	05/01/20	Data File:	050145.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	98	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW8-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/28/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004316-03
Date Analyzed:	05/01/20	Data File:	050146.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	103	63	127
4-Bromofluorobenzene	99	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Trip Blank	Client:	Maul Foster Alongi
Date Received:	04/28/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	004316-04
Date Analyzed:	05/01/20	Data File:	050136.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	99	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	05/01/20	Lab ID:	00-941 mb
Date Analyzed:	05/01/20	Data File:	050115.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	99	60	133

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

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW10-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/28/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/29/20	Lab ID:	004316-01 1/2
Date Analyzed:	04/29/20	Data File:	042904.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	81	31	160
Benzo(a)anthracene-d12	98	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW9-W-32.5	Client:	Maul Foster Alongi
Date Received:	04/28/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/29/20	Lab ID:	004316-02 1/2
Date Analyzed:	04/29/20	Data File:	042905.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	85	31	160
Benzo(a)anthracene-d12	101	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW8-W-15.0	Client:	Maul Foster Alongi
Date Received:	04/28/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/29/20	Lab ID:	004316-03 1/2
Date Analyzed:	04/29/20	Data File:	042906.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	78	31	160
Benzo(a)anthracene-d12	99	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	04/29/20	Lab ID:	00-972 mb2
Date Analyzed:	04/29/20	Data File:	042903.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	80	31	160
Benzo(a)anthracene-d12	98	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Date of Report: 05/06/20
Date Received: 04/28/20
Project: Precision Engineering 1803.01.01, F&BI 004316

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	100	107	63-142	7

Date of Report: 05/06/20
Date Received: 04/28/20
Project: Precision Engineering 1803.01.01, F&BI 004316

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

Laboratory Code: 004344-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	10.6	97	93	75-125	4
Chromium	ug/L (ppb)	20	<1	101	99	75-125	2
Copper	ug/L (ppb)	20	<5	93	92	75-125	1
Selenium	ug/L (ppb)	5	<1	99	98	75-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	90	80-120
Chromium	ug/L (ppb)	20	97	80-120
Copper	ug/L (ppb)	20	97	80-120
Selenium	ug/L (ppb)	5	97	80-120

Date of Report: 05/06/20
Date Received: 04/28/20
Project: Precision Engineering 1803.01.01, F&BI 004316

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

Laboratory Code: 004314-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	106	10-172
Chloromethane	ug/L (ppb)	50	<10	102	25-166
Vinyl chloride	ug/L (ppb)	50	<0.2	103	36-166
Bromomethane	ug/L (ppb)	50	<1	121	47-169
Chloroethane	ug/L (ppb)	50	<1	104	46-160
Trichlorofluoromethane	ug/L (ppb)	50	<1	109	44-165
Acetone	ug/L (ppb)	250	<50	86	10-182
1,1-Dichloroethene	ug/L (ppb)	50	<1	108	60-136
Hexane	ug/L (ppb)	50	<1	102	52-150
Methylene chloride	ug/L (ppb)	50	<5	102	67-132
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	102	74-127
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	103	72-129
1,1-Dichloroethane	ug/L (ppb)	50	<1	102	70-128
2,2-Dichloropropane	ug/L (ppb)	50	<1	110	36-154
cis-1,2-Dichloroethene	ug/L (ppb)	50	<1	102	71-127
Chloroform	ug/L (ppb)	50	<1	102	65-132
2-Butanone (MEK)	ug/L (ppb)	250	<10	97	10-129
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	97	48-149
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	107	60-146
1,1-Dichloropropene	ug/L (ppb)	50	<1	100	69-133
Carbon tetrachloride	ug/L (ppb)	50	<1	110	56-152
Benzene	ug/L (ppb)	50	<0.35	100	76-125
Trichloroethene	ug/L (ppb)	50	<1	96	66-135
1,2-Dichloropropane	ug/L (ppb)	50	<1	107	78-125
Bromodichloromethane	ug/L (ppb)	50	<1	106	61-150
Dibromomethane	ug/L (ppb)	50	<1	105	66-141
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	108	10-185
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	108	72-132
Toluene	ug/L (ppb)	50	<1	97	76-122
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	108	76-130
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	103	68-131
2-Hexanone	ug/L (ppb)	250	<10	100	10-185
1,3-Dichloropropane	ug/L (ppb)	50	<1	103	71-128
Tetrachloroethene	ug/L (ppb)	50	<1	101	10-226
Dibromochloromethane	ug/L (ppb)	50	<1	113	70-139
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	104	69-134
Chlorobenzene	ug/L (ppb)	50	<1	101	77-122
Ethylbenzene	ug/L (ppb)	50	<1	99	69-135
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	109	73-137
m,p-Xylene	ug/L (ppb)	100	<2	102	69-135
o-Xylene	ug/L (ppb)	50	<1	101	60-140
Styrene	ug/L (ppb)	50	<1	103	71-133
Isopropylbenzene	ug/L (ppb)	50	<1	100	65-142
Bromoform	ug/L (ppb)	50	<1	114	65-142
n-Propylbenzene	ug/L (ppb)	50	<1	100	58-144
Bromobenzene	ug/L (ppb)	50	<1	100	75-124
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	101	66-137
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	106	51-154
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	101	53-150
2-Chlorotoluene	ug/L (ppb)	50	<1	99	66-127
4-Chlorotoluene	ug/L (ppb)	50	<1	100	65-130
tert-Butylbenzene	ug/L (ppb)	50	<1	98	65-137
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	101	59-146
sec-Butylbenzene	ug/L (ppb)	50	<1	99	64-140
p-Isopropyltoluene	ug/L (ppb)	50	<1	103	65-141
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	99	72-123
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	98	69-126
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	99	69-128
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	110	32-164
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	96	66-136
Hexachlorobutadiene	ug/L (ppb)	50	<1	85	60-143
Naphthalene	ug/L (ppb)	50	<1	102	44-164
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	98	69-148

Date of Report: 05/06/20
Date Received: 04/28/20
Project: Precision Engineering 1803.01.01, F&BI 004316

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	102	101	25-158	1
Chloromethane	ug/L (ppb)	50	100	95	45-156	5
Vinyl chloride	ug/L (ppb)	50	101	98	50-154	3
Bromomethane	ug/L (ppb)	50	121	117	55-143	3
Chloroethane	ug/L (ppb)	50	105	106	58-146	1
Trichlorofluoromethane	ug/L (ppb)	250	108	107	50-150	1
Acetone	ug/L (ppb)	250	86	84	22-155	2
1,1-Dichloroethene	ug/L (ppb)	50	109	105	67-136	4
Hexane	ug/L (ppb)	50	95	101	57-137	6
Methylene chloride	ug/L (ppb)	50	105	104	39-148	1
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	102	96	64-147	6
trans-1,2-Dichloroethene	ug/L (ppb)	50	104	102	68-128	2
1,1-Dichloroethane	ug/L (ppb)	50	102	101	74-135	1
2,2-Dichloropropane	ug/L (ppb)	50	113	112	55-143	1
cis-1,2-Dichloroethene	ug/L (ppb)	50	102	101	74-136	1
Chloroform	ug/L (ppb)	50	102	100	74-134	2
2-Butanone (MEK)	ug/L (ppb)	250	89	91	37-150	2
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	92	92	66-129	0
1,1,1-Trichloroethane	ug/L (ppb)	50	107	107	74-142	0
1,1-Dichloropropene	ug/L (ppb)	50	97	98	77-129	1
Carbon tetrachloride	ug/L (ppb)	50	109	112	75-158	3
Benzene	ug/L (ppb)	50	97	96	69-134	1
Trichloroethene	ug/L (ppb)	50	94	93	67-133	1
1,2-Dichloropropane	ug/L (ppb)	50	100	99	71-134	1
Bromodichloromethane	ug/L (ppb)	50	100	101	76-132	1
Dibromomethane	ug/L (ppb)	50	100	100	68-132	0
4-Methyl-2-pentanone	ug/L (ppb)	250	101	99	65-138	2
cis-1,3-Dichloropropene	ug/L (ppb)	50	98	99	74-140	1
Toluene	ug/L (ppb)	50	92	95	72-122	3
trans-1,3-Dichloropropene	ug/L (ppb)	50	97	101	80-136	4
1,1,2-Trichloroethane	ug/L (ppb)	50	96	94	75-124	2
2-Hexanone	ug/L (ppb)	250	93	91	60-136	2
1,3-Dichloropropane	ug/L (ppb)	50	94	95	76-126	1
Tetrachloroethene	ug/L (ppb)	50	96	100	76-121	4
Dibromochloromethane	ug/L (ppb)	50	106	109	84-133	3
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	98	97	82-115	1
Chlorobenzene	ug/L (ppb)	50	97	98	83-114	1
Ethylbenzene	ug/L (ppb)	50	97	97	77-124	0
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	107	111	84-127	4
m,p-Xylene	ug/L (ppb)	100	100	101	81-112	1
o-Xylene	ug/L (ppb)	50	101	101	81-121	0
Styrene	ug/L (ppb)	50	100	98	84-119	2
Isopropylbenzene	ug/L (ppb)	50	100	101	80-117	1
Bromoform	ug/L (ppb)	50	110	112	74-136	2
n-Propylbenzene	ug/L (ppb)	50	96	101	74-126	5
Bromobenzene	ug/L (ppb)	50	94	95	80-121	1
1,3,5-Trimethylbenzene	ug/L (ppb)	50	97	103	78-123	6
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	100	101	66-126	1
1,2,3-Trichloropropane	ug/L (ppb)	50	95	96	67-124	1
2-Chlorotoluene	ug/L (ppb)	50	95	99	77-127	4
4-Chlorotoluene	ug/L (ppb)	50	95	98	78-128	3
tert-Butylbenzene	ug/L (ppb)	50	96	101	80-123	5
1,2,4-Trimethylbenzene	ug/L (ppb)	50	98	102	79-122	4
sec-Butylbenzene	ug/L (ppb)	50	98	103	80-116	5
p-Isopropyltoluene	ug/L (ppb)	50	100	104	81-123	4
1,3-Dichlorobenzene	ug/L (ppb)	50	96	97	83-113	1
1,4-Dichlorobenzene	ug/L (ppb)	50	95	96	81-112	1
1,2-Dichlorobenzene	ug/L (ppb)	50	98	98	84-112	0
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	110	115	57-141	4
1,2,4-Trichlorobenzene	ug/L (ppb)	50	97	99	72-130	2
Hexachlorobutadiene	ug/L (ppb)	50	94	99	53-141	5
Naphthalene	ug/L (ppb)	50	101	101	64-133	0
1,2,3-Trichlorobenzene	ug/L (ppb)	50	98	99	65-136	1

Date of Report: 05/06/20
Date Received: 04/28/20
Project: Precision Engineering 1803.01.01, F&BI 004316

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270E SIM

Laboratory Code: Laboratory Control Sample 1/0.5

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	0.5	78	80	57-114	3
Acenaphthylene	ug/L (ppb)	0.5	79	81	65-119	2
Acenaphthene	ug/L (ppb)	0.5	77	78	66-118	1
Fluorene	ug/L (ppb)	0.5	83	82	64-125	1
Phenanthrene	ug/L (ppb)	0.5	87	87	67-120	0
Anthracene	ug/L (ppb)	0.5	92	93	65-122	1
Fluoranthene	ug/L (ppb)	0.5	94	93	65-127	1
Pyrene	ug/L (ppb)	0.5	98	91	62-130	7
Benz(a)anthracene	ug/L (ppb)	0.5	101	94	60-118	7
Chrysene	ug/L (ppb)	0.5	93	91	66-125	2
Benzo(b)fluoranthene	ug/L (ppb)	0.5	87	84	55-135	4
Benzo(k)fluoranthene	ug/L (ppb)	0.5	84	85	62-125	1
Benzo(a)pyrene	ug/L (ppb)	0.5	89	87	58-127	2
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	0.5	91	93	36-142	2
Dibenz(a,h)anthracene	ug/L (ppb)	0.5	85	87	37-133	2
Benzo(g,h,i)perylene	ug/L (ppb)	0.5	85	88	34-135	3

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 004316
Work Order Number: 2004387

May 05, 2020

Attention Michael Erdahl:

Fremont Analytical, Inc. received 3 sample(s) on 4/28/2020 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *05/05/2020*

CLIENT: Friedman & Bruya
Project: 004316
Work Order: 2004387

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2004387-001	MW10-W-15.0	04/28/2020 10:05 AM	04/28/2020 2:25 PM
2004387-002	MW9-W-32.5	04/28/2020 11:00 AM	04/28/2020 2:25 PM
2004387-003	MW8-W-15.0	04/28/2020 11:50 AM	04/28/2020 2:25 PM

Case Narrative

WO#: **2004387**
Date: **5/5/2020**

CLIENT: Friedman & Bruya
Project: 004316

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **2004387**
Date Reported: **5/5/2020**

CLIENT: Friedman & Bruya
Project: 004316

Lab ID: 2004387-001 **Collection Date:** 4/28/2020 10:05:00 AM
Client Sample ID: **MW10-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R58849		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	4/29/2020 8:51:00 AM

Lab ID: 2004387-002 **Collection Date:** 4/28/2020 11:00:00 AM
Client Sample ID: **MW9-W-32.5** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R58849		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	4/29/2020 8:56:00 AM

Lab ID: 2004387-003 **Collection Date:** 4/28/2020 11:50:00 AM
Client Sample ID: **MW8-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R58849		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	4/29/2020 9:01:00 AM

Work Order: 2004387
CLIENT: Friedman & Bruya
Project: 004316

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-R58849**	SampType: **MBLK**			Units: **mg/L**		Prep Date: **4/29/2020**		RunNo: **58849**		
Client ID: **MBLKW**	Batch ID: **R58849**					Analysis Date: **4/29/2020**		SeqNo: **1175749**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-R58849**	SampType: **LCS**			Units: **mg/L**		Prep Date: **4/29/2020**		RunNo: **58849**		
Client ID: **LCSW**	Batch ID: **R58849**					Analysis Date: **4/29/2020**		SeqNo: **1175750**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.245	0.0450	0.2500	0	98.0	80.9	115				

Sample ID: **2004387-002ADUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **4/29/2020**		RunNo: **58849**		
Client ID: **MW9-W-32.5**	Batch ID: **R58849**					Analysis Date: **4/29/2020**		SeqNo: **1175754**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		30	

Sample ID: **2004387-002AMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **4/29/2020**		RunNo: **58849**		
Client ID: **MW9-W-32.5**	Batch ID: **R58849**					Analysis Date: **4/29/2020**		SeqNo: **1175755**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.213	0.0450	0.2500	0	85.2	46.2	138				

Sample ID: **2004387-002AMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **4/29/2020**		RunNo: **58849**		
Client ID: **MW9-W-32.5**	Batch ID: **R58849**					Analysis Date: **4/29/2020**		SeqNo: **1175756**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.224	0.0450	0.2500	0	89.5	46.2	138	0.2130	4.95	20	

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2004387**
Logged by:	**Clare Griggs**	Date Received:	**4/28/2020 2:25:00 PM**

Chain of Custody

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

Log In

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

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler	0.9
Sample	4.6

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY 2004397

Page # 1 of 1

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

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

SUBCONTRACTER Fremont

PROJECT NAME/NO.	PO #
004316	B-198

REMARKS

EDD: EQUIS

TURNAROUND TIME

☒ Standard TAT

☐ RUSH

Rush charges authorized by:

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Return samples

☐ Will call with instructions

Page 8 of 8

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Cr VI							Notes
MW10-W-15.0		4/28/20	1005	water	1				X							
MW9-W-32.5		"	1100	"	1				X							
MW8-W-15.0		"	1150	"	1				X							

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Michael Erdahl	Friedman & Bruya	4/28/20	1322
Received by:	Makenzie Meinhardt	FAS	4/29/20	~~1325~~ 1425
Relinquished by:				
Received by:				

4/28 mm

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

004316

SAMPLE CHAIN OF CUSTODY

ME 04/28/20

AD1 / D04 / DW13

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N State Street, Suite 301

City, State, ZIP Bellingham, WA 98225

Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (*signature*) Amanda Bixby

Page # 1 of 1

PROJECT NAME: Precision Engineering

PO #: 1803.01.01

REMARKS: *metals include As, Cr, Co, Se & are field filtered

Project specific RLs? - Yes / No

INVOICE TO: accounting@maulfoster.com

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

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: NWTPH-Dx (acid + silica gel)	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260C	PAHs EPA 8270 SIM	PCBs EPA 8082	Hex chrom by SM 3500 Cr B	Dis. Manganese by EPA 6020B			Notes
MW10-W-15.0	01A-G	4/28/20	1005	W	7	X				X	X		X	X			See metals note above. VOAs rinse
MW9-W-32.5	02	"	1100	W	7	X				X	X		X	X			
MW8-W-15.0	03	"	1150	W	7	X				X	X		X	X			
Trip Blank	04	"	N/A	W	1					X							

Samples received at 2 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Amanda Bixby	Amanda Bixby	MFA	4/28/20	1300
Received by:	Eric Young	FEB	4/28/20	1300
Relinquished by:				
Received by:				

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

Note: Per E. Young, some VOAs were rinsed due to GW reacting w/ HCl

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

February 10, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

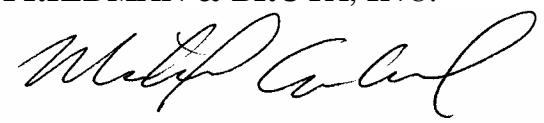
Dear Ms Good:

Included are the results from the testing of material submitted on January 30, 2020 from the Precision Engineering 1803.01.01, F&BI 001446 project. There are 28 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
MFA0210R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on January 30, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.01, F&BI 001446 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
001446 -01	MW4-W-50.0
001446 -02	MW1-W-35.0
001446 -03	MW5-W-15.0
001446 -04	MWDUP-W-15.0

The samples were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

The NWTPH-Dx surrogate in sample MW1-W-35.0 exceeded the control limits. The sample was non-detect, therefore the data were reported.

Copper in the 6020B matrix spike failed the acceptance criteria. The laboratory control sample passed the acceptance criteria, therefore the results were due to matrix effect.

Several 8260D compounds exceeded the acceptance criteria in the matrix spike sample. The compounds were not detected in the samples, therefore the data were acceptable.

The 8270E laboratory control sample and laboratory control sample duplicate failed the relative percent difference for benzo(g,h,i)perylene. The analyte was not detected therefore the data were acceptable.

All other quality control requirements were acceptable.

Date of Report: 02/10/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001446
Date Extracted: 01/30/20
Date Analyzed: 01/30/20

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 51-134)
MW4-W-50.0 001446-01	<50	<200	109
MW1-W-35.0 001446-02	<50	<250	136 vo
MW5-W-15.0 001446-03	94 x	<250	131
MWDUP-W-15.0 001446-04	75 x	<250	128
Method Blank 00-282 MB	<50	<250	110

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW4-W-50.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001446-01
Date Analyzed:	02/04/20	Data File:	001446-01.045
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	12.0
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW1-W-35.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001446-02
Date Analyzed:	02/04/20	Data File:	001446-02.046
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	30.8
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001446-03 x10
Date Analyzed:	02/04/20	Data File:	001446-03 x10.048
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<10
Chromium	42,200 ve
Copper	<50
Selenium	<10

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001446-03 x50
Date Analyzed:	02/03/20	Data File:	001446-03 x50.117
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	42,200

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MWDUP-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001446-04 x10
Date Analyzed:	02/04/20	Data File:	001446-04 x10.049
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<10
Chromium	47,300 ve
Copper	<50
Selenium	<10

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MWDUP-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001446-04 x50
Date Analyzed:	02/03/20	Data File:	001446-04 x50.118
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	45,200

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	I0-075 mb
Date Analyzed:	02/03/20	Data File:	I0-075 mb.100
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW4-W-50.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	001446-01 1/2
Date Analyzed:	01/31/20	Data File:	013104.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	83	31	160
Benzo(a)anthracene-d12	92	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	0.042
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW1-W-35.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	001446-02 1/2
Date Analyzed:	01/31/20	Data File:	013105.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	78	31	160
Benzo(a)anthracene-d12	87	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	001446-03 1/2
Date Analyzed:	01/31/20	Data File:	013106.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	85	31	160
Benzo(a)anthracene-d12	93	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MWDUP-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	001446-04 1/2
Date Analyzed:	01/31/20	Data File:	013107.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	89	31	160
Benzo(a)anthracene-d12	103	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	00-278 mb
Date Analyzed:	01/30/20	Data File:	013008.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	85	31	160
Benzo(a)anthracene-d12	95	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW4-W-50.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001446-01
Date Analyzed:	02/04/20	Data File:	020434.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	97	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW1-W-35.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001446-02
Date Analyzed:	02/04/20	Data File:	020435.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	103	63	127
4-Bromofluorobenzene	96	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/05/20	Lab ID:	001446-03
Date Analyzed:	02/06/20	Data File:	020620.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	99	63	127
4-Bromofluorobenzene	92	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<50	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<1	o-Xylene	<1
Methylene chloride	<5	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	<1
trans-1,2-Dichloroethene	<1	Bromoform	<1
1,1-Dichloroethane	<1	n-Propylbenzene	<1
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<1
2-Butanone (MEK)	<10	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<1	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<1	1,2,4-Trimethylbenzene	<1
Benzene	<0.35	sec-Butylbenzene	<1
Trichloroethene	3.3	p-Isopropyltoluene	<1
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<1	1,4-Dichlorobenzene	<1
Dibromomethane	<1	1,2-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<1	1,2,4-Trichlorobenzene	<1
Toluene	<1	Hexachlorobutadiene	<1
trans-1,3-Dichloropropene	<1	Naphthalene	<1
1,1,2-Trichloroethane	<1	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MWDUP-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001446-04
Date Analyzed:	02/04/20	Data File:	020437.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	94	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<50	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<1	o-Xylene	<1
Methylene chloride	<5	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	<1
trans-1,2-Dichloroethene	<1	Bromoform	<1
1,1-Dichloroethane	<1	n-Propylbenzene	<1
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<1
2-Butanone (MEK)	<10	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<1	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<1	1,2,4-Trimethylbenzene	<1
Benzene	<0.35	sec-Butylbenzene	<1
Trichloroethene	3.2	p-Isopropyltoluene	<1
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<1	1,4-Dichlorobenzene	<1
Dibromomethane	<1	1,2-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<1	1,2,4-Trichlorobenzene	<1
Toluene	<1	Hexachlorobutadiene	<1
trans-1,3-Dichloropropene	<1	Naphthalene	<1
1,1,2-Trichloroethane	<1	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	00-295 mb
Date Analyzed:	02/04/20	Data File:	020430.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	97	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/05/20	Lab ID:	00-296 mb
Date Analyzed:	02/06/20	Data File:	020612.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	105	57	121
Toluene-d8	105	63	127
4-Bromofluorobenzene	97	60	133

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

Date of Report: 02/10/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001446

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	104	108	58-134	4

Date of Report: 02/10/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001446

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

Laboratory Code: 001436-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	10.7	98	89	75-125	10
Chromium	ug/L (ppb)	20	1.03	75	75	75-125	0
Copper	ug/L (ppb)	20	<5	74 vo	75	75-125	1
Selenium	ug/L (ppb)	5	<1	97	90	75-125	7

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	90	80-120
Chromium	ug/L (ppb)	20	101	80-120
Copper	ug/L (ppb)	20	100	80-120
Selenium	ug/L (ppb)	5	90	80-120

Date of Report: 02/10/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001446

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270E SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	72	82	57-114	13
Acenaphthylene	ug/L (ppb)	1	76	84	65-119	10
Acenaphthene	ug/L (ppb)	1	77	85	66-118	10
Fluorene	ug/L (ppb)	1	77	82	64-125	6
Phenanthrene	ug/L (ppb)	1	78	87	67-120	11
Anthracene	ug/L (ppb)	1	80	90	65-122	12
Fluoranthene	ug/L (ppb)	1	78	84	65-127	7
Pyrene	ug/L (ppb)	1	77	87	62-130	12
Benz(a)anthracene	ug/L (ppb)	1	82	90	60-118	9
Chrysene	ug/L (ppb)	1	80	89	66-125	11
Benzo(b)fluoranthene	ug/L (ppb)	1	73	79	55-135	8
Benzo(k)fluoranthene	ug/L (ppb)	1	72	79	62-125	9
Benzo(a)pyrene	ug/L (ppb)	1	70	77	58-127	10
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	67	77	36-142	14
Dibenz(a,h)anthracene	ug/L (ppb)	1	61	73	37-133	18
Benzo(g,h,i)perylene	ug/L (ppb)	1	61	75	34-135	21 vo

Date of Report: 02/10/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001446

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

Laboratory Code: 001446-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	120	10-172
Chloromethane	ug/L (ppb)	50	<10	104	25-166
Vinyl chloride	ug/L (ppb)	50	<0.2	108	36-166
Bromomethane	ug/L (ppb)	50	<1	112	47-169
Chloroethane	ug/L (ppb)	50	<1	116	46-160
Trichlorofluoromethane	ug/L (ppb)	50	<1	114	44-165
Acetone	ug/L (ppb)	250	<50	100	10-182
1,1-Dichloroethene	ug/L (ppb)	50	<1	116	60-136
Hexane	ug/L (ppb)	50	<1	100	52-150
Methylene chloride	ug/L (ppb)	50	<5	112	67-132
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	116	74-127
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	106	72-129
1,1-Dichloroethane	ug/L (ppb)	50	<1	108	70-128
2,2-Dichloropropane	ug/L (ppb)	50	<1	116	36-154
cis-1,2-Dichloroethene	ug/L (ppb)	50	<1	110	71-127
Chloroform	ug/L (ppb)	50	<1	110	65-132
2-Butanone (MEK)	ug/L (ppb)	250	<10	100	10-129
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	94	48-149
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	116	60-146
1,1-Dichloropropene	ug/L (ppb)	50	<1	106	69-133
Carbon tetrachloride	ug/L (ppb)	50	<1	124	56-152
Benzene	ug/L (ppb)	50	<0.35	108	76-125
Trichloroethene	ug/L (ppb)	50	<1	108	66-135
1,2-Dichloropropane	ug/L (ppb)	50	<1	106	78-125
Bromodichloromethane	ug/L (ppb)	50	<1	116	61-150
Dibromomethane	ug/L (ppb)	50	<1	98	66-141
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	112	10-185
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	108	72-132
Toluene	ug/L (ppb)	50	<1	100	76-122
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	104	76-130
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	100	68-131
2-Hexanone	ug/L (ppb)	250	<10	100	10-185
1,3-Dichloropropane	ug/L (ppb)	50	<1	98	71-128
Tetrachloroethene	ug/L (ppb)	50	<1	98	10-226
Dibromochloromethane	ug/L (ppb)	50	<1	114	70-139
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	96	69-134
Chlorobenzene	ug/L (ppb)	50	<1	98	77-122
Ethylbenzene	ug/L (ppb)	50	<1	104	69-135
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	118	73-137
m,p-Xylene	ug/L (ppb)	100	<2	100	69-135
o-Xylene	ug/L (ppb)	50	<1	102	60-140
Styrene	ug/L (ppb)	50	<1	104	71-133
Isopropylbenzene	ug/L (ppb)	50	<1	110	65-142
Bromoform	ug/L (ppb)	50	<1	106	65-142
n-Propylbenzene	ug/L (ppb)	50	<1	100	58-144
Bromobenzene	ug/L (ppb)	50	<1	96	75-124
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	104	66-137
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	102	51-154
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	96	53-150
2-Chlorotoluene	ug/L (ppb)	50	<1	98	66-127
4-Chlorotoluene	ug/L (ppb)	50	<1	98	65-130
tert-Butylbenzene	ug/L (ppb)	50	<1	104	65-137
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	102	59-146
sec-Butylbenzene	ug/L (ppb)	50	<1	104	64-140
p-Isopropyltoluene	ug/L (ppb)	50	<1	102	65-141
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	94	72-123
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	92	69-126
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	98	69-128
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	104	32-164
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	104	66-136
Hexachlorobutadiene	ug/L (ppb)	50	<1	102	60-143
Naphthalene	ug/L (ppb)	50	<1	108	44-164
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	102	69-148

Date of Report: 02/10/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001446

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	133	132	25-158	1
Chloromethane	ug/L (ppb)	50	114	107	45-156	6
Vinyl chloride	ug/L (ppb)	50	115	111	50-154	4
Bromomethane	ug/L (ppb)	50	123	117	55-143	5
Chloroethane	ug/L (ppb)	50	126	120	58-146	5
Trichlorofluoromethane	ug/L (ppb)	250	125	118	50-150	6
Acetone	ug/L (ppb)	250	104	101	53-131	3
1,1-Dichloroethene	ug/L (ppb)	50	123	115	67-136	7
Hexane	ug/L (ppb)	50	102	94	57-137	8
Methylene chloride	ug/L (ppb)	50	115	109	39-148	5
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	124	122	64-147	2
trans-1,2-Dichloroethene	ug/L (ppb)	50	115	110	68-128	4
1,1-Dichloroethane	ug/L (ppb)	50	116	107	79-121	8
2,2-Dichloropropane	ug/L (ppb)	50	125	118	55-143	6
cis-1,2-Dichloroethene	ug/L (ppb)	50	117	110	80-123	6
Chloroform	ug/L (ppb)	50	115	108	80-121	6
2-Butanone (MEK)	ug/L (ppb)	250	103	99	57-149	4
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	100	95	73-132	5
1,1,1-Trichloroethane	ug/L (ppb)	50	121	115	81-125	5
1,1-Dichloropropene	ug/L (ppb)	50	113	106	77-129	6
Carbon tetrachloride	ug/L (ppb)	50	125	120	75-158	4
Benzene	ug/L (ppb)	50	112	107	69-134	5
Trichloroethene	ug/L (ppb)	50	115 vo	108	79-113	6
1,2-Dichloropropane	ug/L (ppb)	50	111	105	77-123	6
Bromodichloromethane	ug/L (ppb)	50	117	113	81-133	3
Dibromomethane	ug/L (ppb)	50	103	99	82-125	4
4-Methyl-2-pentanone	ug/L (ppb)	250	118	114	65-138	3
cis-1,3-Dichloropropene	ug/L (ppb)	50	108	106	82-132	2
Toluene	ug/L (ppb)	50	106	99	72-122	7
trans-1,3-Dichloropropene	ug/L (ppb)	50	103	101	80-136	2
1,1,2-Trichloroethane	ug/L (ppb)	50	105	101	75-124	4
2-Hexanone	ug/L (ppb)	250	101	100	60-136	1
1,3-Dichloropropane	ug/L (ppb)	50	101	97	76-126	4
Tetrachloroethene	ug/L (ppb)	50	105	98	76-121	7
Dibromochloromethane	ug/L (ppb)	50	113	110	84-133	3
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	101	97	82-115	4
Chlorobenzene	ug/L (ppb)	50	103	98	83-114	5
Ethylbenzene	ug/L (ppb)	50	108	101	77-124	7
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	123	117	84-127	5
m,p-Xylene	ug/L (ppb)	100	108	102	81-112	6
o-Xylene	ug/L (ppb)	50	110	104	81-121	6
Styrene	ug/L (ppb)	50	109	104	84-119	5
Isopropylbenzene	ug/L (ppb)	50	115	109	80-117	5
Bromoform	ug/L (ppb)	50	108	105	74-136	3
n-Propylbenzene	ug/L (ppb)	50	100	97	74-126	3
Bromobenzene	ug/L (ppb)	50	97	95	80-121	2
1,3,5-Trimethylbenzene	ug/L (ppb)	50	106	102	78-123	4
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	105	102	66-126	3
1,2,3-Trichloropropane	ug/L (ppb)	50	98	96	67-124	2
2-Chlorotoluene	ug/L (ppb)	50	100	97	77-127	3
4-Chlorotoluene	ug/L (ppb)	50	98	95	78-128	3
tert-Butylbenzene	ug/L (ppb)	50	106	102	80-123	4
1,2,4-Trimethylbenzene	ug/L (ppb)	50	104	101	79-122	3
sec-Butylbenzene	ug/L (ppb)	50	104	101	80-116	3
p-Isopropyltoluene	ug/L (ppb)	50	103	101	81-123	2
1,3-Dichlorobenzene	ug/L (ppb)	50	97	94	83-113	3
1,4-Dichlorobenzene	ug/L (ppb)	50	95	93	83-107	2
1,2-Dichlorobenzene	ug/L (ppb)	50	101	99	84-112	2
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	105	105	57-141	0
1,2,4-Trichlorobenzene	ug/L (ppb)	50	102	100	72-130	2
Hexachlorobutadiene	ug/L (ppb)	50	101	98	53-141	3
Naphthalene	ug/L (ppb)	50	106	104	64-133	2
1,2,3-Trichlorobenzene	ug/L (ppb)	50	102	98	65-136	4

Date of Report: 02/10/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001446

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

Laboratory Code: 002023-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	143	10-172
Chloromethane	ug/L (ppb)	50	<10	114	25-166
Vinyl chloride	ug/L (ppb)	50	<0.2	113	36-166
Bromomethane	ug/L (ppb)	50	<1	118	47-169
Chloroethane	ug/L (ppb)	50	<1	124	46-160
Trichlorofluoromethane	ug/L (ppb)	50	<1	127	44-165
Acetone	ug/L (ppb)	250	<50	101	10-182
1,1-Dichloroethene	ug/L (ppb)	50	<1	127	60-136
Hexane	ug/L (ppb)	50	<1	114	52-150
Methylene chloride	ug/L (ppb)	50	<5	120	67-132
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	122	74-127
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	121	72-129
1,1-Dichloroethane	ug/L (ppb)	50	<1	119	70-128
2,2-Dichloropropane	ug/L (ppb)	50	<1	129	36-154
cis-1,2-Dichloroethene	ug/L (ppb)	50	<1	121	71-127
Chloroform	ug/L (ppb)	50	<1	119	65-132
2-Butanone (MEK)	ug/L (ppb)	250	<10	105	10-129
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	104	48-149
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	123	60-146
1,1-Dichloropropene	ug/L (ppb)	50	<1	118	69-133
Carbon tetrachloride	ug/L (ppb)	50	<1	128	56-152
Benzene	ug/L (ppb)	50	<0.35	117	76-125
Trichloroethene	ug/L (ppb)	50	<1	119	66-135
1,2-Dichloropropane	ug/L (ppb)	50	<1	116	78-125
Bromodichloromethane	ug/L (ppb)	50	<1	124	61-150
Dibromomethane	ug/L (ppb)	50	<1	108	66-141
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	122	10-185
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	120	72-132
Toluene	ug/L (ppb)	50	<1	105	76-122
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	107	76-130
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	105	68-131
2-Hexanone	ug/L (ppb)	250	<10	105	10-185
1,3-Dichloropropane	ug/L (ppb)	50	<1	102	71-128
Tetrachloroethene	ug/L (ppb)	50	<1	104	10-226
Dibromochloromethane	ug/L (ppb)	50	<1	117	70-139
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	102	69-134
Chlorobenzene	ug/L (ppb)	50	<1	102	77-122
Ethylbenzene	ug/L (ppb)	50	<1	104	69-135
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	117	73-137
m,p-Xylene	ug/L (ppb)	100	<2	105	69-135
o-Xylene	ug/L (ppb)	50	<1	105	60-140
Styrene	ug/L (ppb)	50	<1	107	71-133
Isopropylbenzene	ug/L (ppb)	50	<1	108	65-142
Bromoform	ug/L (ppb)	50	<1	108	65-142
n-Propylbenzene	ug/L (ppb)	50	<1	101	58-144
Bromobenzene	ug/L (ppb)	50	<1	101	75-124
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	103	66-137
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	106	51-154
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	99	53-150
2-Chlorotoluene	ug/L (ppb)	50	<1	100	66-127
4-Chlorotoluene	ug/L (ppb)	50	<1	99	65-130
tert-Butylbenzene	ug/L (ppb)	50	<1	103	65-137
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	102	59-146
sec-Butylbenzene	ug/L (ppb)	50	<1	102	64-140
p-Isopropyltoluene	ug/L (ppb)	50	<1	101	65-141
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	98	72-123
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	96	69-126
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	100	69-128
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	102	32-164
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	98	66-136
Hexachlorobutadiene	ug/L (ppb)	50	<1	96	60-143
Naphthalene	ug/L (ppb)	50	<1	101	44-164
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	97	69-148

Date of Report: 02/10/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001446

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	148	125	25-158	17
Chloromethane	ug/L (ppb)	50	114	101	45-156	12
Vinyl chloride	ug/L (ppb)	50	116	103	50-154	12
Bromomethane	ug/L (ppb)	50	122	108	55-143	12
Chloroethane	ug/L (ppb)	50	123	109	58-146	12
Trichlorofluoromethane	ug/L (ppb)	250	126	115	50-150	9
Acetone	ug/L (ppb)	250	95	94	53-131	1
1,1-Dichloroethene	ug/L (ppb)	50	122	113	67-136	8
Hexane	ug/L (ppb)	50	112	106	57-137	6
Methylene chloride	ug/L (ppb)	50	111	109	39-148	2
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	118	111	64-147	6
trans-1,2-Dichloroethene	ug/L (ppb)	50	112	106	68-128	6
1,1-Dichloroethane	ug/L (ppb)	50	112	108	79-121	4
2,2-Dichloropropane	ug/L (ppb)	50	124	114	55-143	8
cis-1,2-Dichloroethene	ug/L (ppb)	50	114	109	80-123	4
Chloroform	ug/L (ppb)	50	112	110	80-121	2
2-Butanone (MEK)	ug/L (ppb)	250	95	102	57-149	7
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	96	100	73-132	4
1,1,1-Trichloroethane	ug/L (ppb)	50	117	111	81-125	5
1,1-Dichloropropene	ug/L (ppb)	50	110	109	77-129	1
Carbon tetrachloride	ug/L (ppb)	50	121	118	75-158	3
Benzene	ug/L (ppb)	50	108	109	69-134	1
Trichloroethene	ug/L (ppb)	50	111	112	79-113	1
1,2-Dichloropropane	ug/L (ppb)	50	107	110	77-123	3
Bromodichloromethane	ug/L (ppb)	50	113	120	81-133	6
Dibromomethane	ug/L (ppb)	50	102	105	82-125	3
4-Methyl-2-pentanone	ug/L (ppb)	250	113	115	65-138	2
cis-1,3-Dichloropropene	ug/L (ppb)	50	106	118	82-132	11
Toluene	ug/L (ppb)	50	98	98	72-122	0
trans-1,3-Dichloropropene	ug/L (ppb)	50	95	107	80-136	12
1,1,2-Trichloroethane	ug/L (ppb)	50	97	102	75-124	5
2-Hexanone	ug/L (ppb)	250	96	101	60-136	5
1,3-Dichloropropane	ug/L (ppb)	50	96	101	76-126	5
Tetrachloroethene	ug/L (ppb)	50	99	98	76-121	1
Dibromochloromethane	ug/L (ppb)	50	104	114	84-133	9
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	95	102	82-115	7
Chlorobenzene	ug/L (ppb)	50	95	97	83-114	2
Ethylbenzene	ug/L (ppb)	50	98	99	77-124	1
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	111	110	84-127	1
m,p-Xylene	ug/L (ppb)	100	99	100	81-112	1
o-Xylene	ug/L (ppb)	50	100	98	81-121	2
Styrene	ug/L (ppb)	50	100	102	84-119	2
Isopropylbenzene	ug/L (ppb)	50	104	100	80-117	4
Bromoform	ug/L (ppb)	50	95	105	74-136	10
n-Propylbenzene	ug/L (ppb)	50	93	97	74-126	4
Bromobenzene	ug/L (ppb)	50	92	97	80-121	5
1,3,5-Trimethylbenzene	ug/L (ppb)	50	98	98	78-123	0
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	97	102	66-126	5
1,2,3-Trichloropropane	ug/L (ppb)	50	91	96	67-124	5
2-Chlorotoluene	ug/L (ppb)	50	93	96	77-127	3
4-Chlorotoluene	ug/L (ppb)	50	91	95	78-128	4
tert-Butylbenzene	ug/L (ppb)	50	99	99	80-123	0
1,2,4-Trimethylbenzene	ug/L (ppb)	50	96	97	79-122	1
sec-Butylbenzene	ug/L (ppb)	50	97	97	80-116	0
p-Isopropyltoluene	ug/L (ppb)	50	97	96	81-123	1
1,3-Dichlorobenzene	ug/L (ppb)	50	91	93	83-113	2
1,4-Dichlorobenzene	ug/L (ppb)	50	89	92	83-107	3
1,2-Dichlorobenzene	ug/L (ppb)	50	94	95	84-112	1
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	94	98	57-141	4
1,2,4-Trichlorobenzene	ug/L (ppb)	50	96	93	72-130	3
Hexachlorobutadiene	ug/L (ppb)	50	95	93	53-141	2
Naphthalene	ug/L (ppb)	50	98	96	64-133	2
1,2,3-Trichlorobenzene	ug/L (ppb)	50	94	93	65-136	1

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 001446
Work Order Number: 2001509

February 06, 2020

Attention Michael Erdahl:

Fremont Analytical, Inc. received 4 sample(s) on 1/30/2020 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *02/06/2020*

CLIENT: Friedman & Bruya
Project: 001446
Work Order: 2001509

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2001509-001	MW4-W-20.0	01/30/2020 9:40 AM	01/30/2020 2:18 PM
2001509-002	MW1-W-35.0	01/30/2020 10:01 AM	01/30/2020 2:18 PM
2001509-003	MW5-W-15.0	01/30/2020 11:30 AM	01/30/2020 2:18 PM
2001509-004	MWDUP-W-15.0	01/30/2020 11:30 AM	01/30/2020 2:18 PM

Case Narrative

WO#: **2001509**
Date: **2/6/2020**

CLIENT: Friedman & Bruya
Project: 001446

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **2001509**
Date Reported: **2/6/2020**

CLIENT: Friedman & Bruya
Project: 001446

Lab ID: 2001509-001 **Collection Date:** 1/30/2020 9:40:00 AM
Client Sample ID: **MW4-W-20.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R57080		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	1/30/2020 3:04:00 PM

Lab ID: 2001509-002 **Collection Date:** 1/30/2020 10:01:00 AM
Client Sample ID: **MW1-W-35.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R57080		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	1/30/2020 2:59:00 PM

Lab ID: 2001509-003 **Collection Date:** 1/30/2020 11:30:00 AM
Client Sample ID: **MW5-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R57080		Analyst: WF
Chromium, Hexavalent	36.2	4.50	D	mg/L	100	1/30/2020 3:08:00 PM

Lab ID: 2001509-004 **Collection Date:** 1/30/2020 11:30:00 AM
Client Sample ID: **MWDUP-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R57080		Analyst: WF
Chromium, Hexavalent	37.6	4.50	D	mg/L	100	1/30/2020 3:13:00 PM

Date: *2/6/2020*

Work Order: 2001509
CLIENT: Friedman & Bruya
Project: 001446

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-57080**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **1/30/2020**	RunNo: **57080**
Client ID: **MBLKW**	Batch ID: **R57080**		Analysis Date: **1/30/2020**	SeqNo: **1138115**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-57080**	SampType: **LCS**	Units: **mg/L**	Prep Date: **1/30/2020**	RunNo: **57080**
Client ID: **LCSW**	Batch ID: **R57080**		Analysis Date: **1/30/2020**	SeqNo: **1138116**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.244	0.0450	0.2500	0	97.4	80.9	115				

Sample ID: **2001501-001ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **1/30/2020**	RunNo: **57080**
Client ID: **BATCH**	Batch ID: **R57080**		Analysis Date: **1/30/2020**	SeqNo: **1138118**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		30	

Sample ID: **2001501-001AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **1/30/2020**	RunNo: **57080**
Client ID: **BATCH**	Batch ID: **R57080**		Analysis Date: **1/30/2020**	SeqNo: **1138119**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450	0.2500	0	0	46.2	138				S

NOTES:
S - Outlying spike recovery(ies) observed. A duplicate analysis was performed with similar results indicating a possible matrix effect.

Sample ID: **2001501-001AMSD**	SampType: **MSD**	Units: **mg/L**	Prep Date: **1/30/2020**	RunNo: **57080**
Client ID: **BATCH**	Batch ID: **R57080**		Analysis Date: **1/30/2020**	SeqNo: **1138120**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450	0.2500	0	2.68	46.2	138	0		20	S

NOTES:
S - Outlying spike recovery(ies) observed. A duplicate analysis was performed with similar results indicating a possible matrix effect.

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2001509**
Logged by:	**Clare Griggs**	Date Received:	**1/30/2020 2:18:00 PM**

Chain of Custody

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

Log In

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

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler	9.6
Sample	11.8

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY 2001509

Page # 1 of 1

Send Report To Michael Erdahl
Company Friedman and Bruya, Inc.
Address 3012 16th Ave W
City, State, ZIP Seattle, WA 98119
Phone # (206) 285-8282 Fax # (206) 283-5044

SUBCONTRACTER Fremont
PROJECT NAME/NO. 001446
PO # A-550
REMARKS
Please Email Results EQUIS

TURNAROUND TIME
☒ Standard ~~(2 Weeks)~~ 1 week
☐ RUSH
Rush charges authorized by:

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Cr VI						Notes
MW4-W-20.0		1/30/20	940	H_2O	1				x						
MW1-W-35.0		"	1001	"	1				x						
MW5-W-15.0		"	1130	"	1				x						
MWDUP-W-15.0		"	1130	"	1				x						

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

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	1/30/20	13:21
Received by:		Emma Holmes	FAI	1/30/20	14:20
Relinquished by:					
Received by:					

001446

SAMPLE CHAIN OF CUSTODY ME 01-30-20 VW2/AI2/BQ5

Page # 1 of 1

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N State Street #301

City, State, ZIP Bellingham, WA 98225

Phone 360-594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering

PO # 1803 01.01

REMARKS: Dissolved samples were field filtered.
Project specific RLs? - Yes / No

INVOICE TO: accounting@maulfoster.com

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

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars (NP)	ANALYSES REQUESTED: Diesel + Motor Oil NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260C	PAHs EPA 8270 SIM	PCBs EPA 8082	4x chosen by 3500 CRB	Dis. As, Cr, Cu, Ni by EPA 6020B			Notes
MW4-W-20.0	01 A-G	1/30/20	0940	W	7	X				X	X		X	X			
MW1-W-35.0	02	↓	1001	↓	↓	X				X	X		X	X			
MW5-W-15.0	03	↓	1130	↓	↓	X				X	X		X	X			
Trip Blank		↓	NA	↓	4					X							(NP) 01-30-20 Did not receive
MWDUP-W-15.0	04 A-G	↓	1130	W	5 (4)	X				X	X		X	X			
													Samples received at 4°C				

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Sean Maloney	MFA	1/30/20	1245
Received by:	VINA	FBI	1/30/20	1245
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

February 7, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

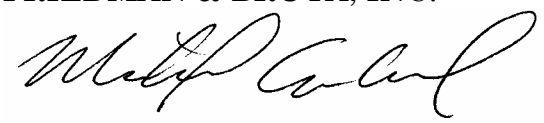
Dear Ms Good:

Included are the results from the testing of material submitted on January 30, 2020 from the Precision Engineering 1803.01.01, F&BI 001436 project. There are 18 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
MFA0207R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on January 30, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.01 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
001436 -01	MW3-W-15.0
001436 -02	MW11-W-15.0
001436 -03	Trip Blank

The samples were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

Copper in the 6020B matrix spike failed the acceptance criteria. The laboratory control sample passed the acceptance criteria, therefore the results were due to matrix effect.

Several 8260D compounds exceeded the acceptance criteria in the laboratory control sample. The compounds were not detected in the samples, therefore the data were acceptable.

The 8270E laboratory control sample and laboratory control sample duplicate failed the relative percent difference for benzo(g,h,i)perylene. The analyte was not detected therefore the data were acceptable.

All other quality control requirements were acceptable.

Date of Report: 02/07/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001436
Date Extracted: 01/30/20
Date Analyzed: 01/30/20

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 51-134)
MW3-W-15.0 001436-01	<50	<250	101
MW11-W-15.0 001436-02	150 x	<250	110
Method Blank 00-270 MB2	<50	<250	113

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001436-01
Date Analyzed:	02/04/20	Data File:	001436-01.041
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	10.7
Chromium	1.03
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001436-02
Date Analyzed:	02/04/20	Data File:	001436-02.044
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	7.16
Chromium	3.42
Copper	<5
Selenium	1.76

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	I0-075 mb
Date Analyzed:	02/03/20	Data File:	I0-075 mb.100
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001436-01
Date Analyzed:	02/03/20	Data File:	020324.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	98	57	121
Toluene-d8	95	63	127
4-Bromofluorobenzene	89	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001436-02
Date Analyzed:	02/03/20	Data File:	020325.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	57	121
Toluene-d8	100	63	127
4-Bromofluorobenzene	98	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Trip Blank	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001436-03
Date Analyzed:	02/03/20	Data File:	020326.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	57	121
Toluene-d8	99	63	127
4-Bromofluorobenzene	93	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	00-232 mb
Date Analyzed:	02/03/20	Data File:	020310.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	57	121
Toluene-d8	99	63	127
4-Bromofluorobenzene	98	60	133

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

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	001436-01 1/2
Date Analyzed:	01/31/20	Data File:	013109.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	81	31	160
Benzo(a)anthracene-d12	93	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/30/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	001436-02 1/2
Date Analyzed:	01/31/20	Data File:	013110.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	80	31	160
Benzo(a)anthracene-d12	93	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	2.0
Fluorene	0.23
Phenanthrene	0.079
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	00-278 mb
Date Analyzed:	01/30/20	Data File:	013008.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	85	31	160
Benzo(a)anthracene-d12	95	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Date of Report: 02/07/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001436

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	100	108	63-142	8

Date of Report: 02/07/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001436

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

Laboratory Code: 001436-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	10.7	98	89	75-125	10
Chromium	ug/L (ppb)	20	1.03	75	75	75-125	0
Copper	ug/L (ppb)	20	<5	74 vo	75	75-125	1
Selenium	ug/L (ppb)	5	<1	97	90	75-125	7

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	90	80-120
Chromium	ug/L (ppb)	20	101	80-120
Copper	ug/L (ppb)	20	100	80-120
Selenium	ug/L (ppb)	5	90	80-120

Date of Report: 02/07/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001436

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

Laboratory Code: 001436-02 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	130	10-172
Chloromethane	ug/L (ppb)	50	<10	107	25-166
Vinyl chloride	ug/L (ppb)	50	<0.2	112	36-166
Bromomethane	ug/L (ppb)	50	<1	120	47-169
Chloroethane	ug/L (ppb)	50	<1	134	46-160
Trichlorofluoromethane	ug/L (ppb)	50	<1	128	44-165
Acetone	ug/L (ppb)	250	<50	81	10-182
1,1-Dichloroethene	ug/L (ppb)	50	<1	133	60-136
Hexane	ug/L (ppb)	50	<1	107	52-150
Methylene chloride	ug/L (ppb)	50	<5	122	67-132
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	125	74-127
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	121	72-129
1,1-Dichloroethane	ug/L (ppb)	50	<1	117	70-128
2,2-Dichloropropane	ug/L (ppb)	50	<1	140	36-154
cis-1,2-Dichloroethene	ug/L (ppb)	50	<1	119	71-127
Chloroform	ug/L (ppb)	50	<1	115	65-132
2-Butanone (MEK)	ug/L (ppb)	250	<10	70	10-129
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	88	48-149
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	127	60-146
1,1-Dichloropropene	ug/L (ppb)	50	<1	106	69-133
Carbon tetrachloride	ug/L (ppb)	50	<1	130	56-152
Benzene	ug/L (ppb)	50	<0.35	106	76-125
Trichloroethene	ug/L (ppb)	50	<1	106	66-135
1,2-Dichloropropane	ug/L (ppb)	50	<1	101	78-125
Bromodichloromethane	ug/L (ppb)	50	<1	104	61-150
Dibromomethane	ug/L (ppb)	50	<1	89	66-141
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	94	10-185
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	89	72-132
Toluene	ug/L (ppb)	50	<1	100	76-122
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	83	76-130
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	90	68-131
2-Hexanone	ug/L (ppb)	250	<10	77	10-185
1,3-Dichloropropane	ug/L (ppb)	50	<1	85	71-128
Tetrachloroethene	ug/L (ppb)	50	<1	100	10-226
Dibromochloromethane	ug/L (ppb)	50	<1	98	70-139
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	84	69-134
Chlorobenzene	ug/L (ppb)	50	<1	96	77-122
Ethylbenzene	ug/L (ppb)	50	<1	104	69-135
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	121	73-137
m,p-Xylene	ug/L (ppb)	100	<2	104	69-135
o-Xylene	ug/L (ppb)	50	<1	109	60-140
Styrene	ug/L (ppb)	50	<1	103	71-133
Isopropylbenzene	ug/L (ppb)	50	<1	114	65-142
Bromoform	ug/L (ppb)	50	<1	92	65-142
n-Propylbenzene	ug/L (ppb)	50	<1	96	58-144
Bromobenzene	ug/L (ppb)	50	<1	91	75-124
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	103	66-137
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	93	51-154
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	85	53-150
2-Chlorotoluene	ug/L (ppb)	50	<1	97	66-127
4-Chlorotoluene	ug/L (ppb)	50	<1	93	65-130
tert-Butylbenzene	ug/L (ppb)	50	<1	102	65-137
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	101	59-146
sec-Butylbenzene	ug/L (ppb)	50	<1	102	64-140
p-Isopropyltoluene	ug/L (ppb)	50	<1	102	65-141
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	93	72-123
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	91	69-126
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	98	69-128
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	92	32-164
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	103	66-136
Hexachlorobutadiene	ug/L (ppb)	50	<1	102	60-143
Naphthalene	ug/L (ppb)	50	<1	105	44-164
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	102	69-148

Date of Report: 02/07/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001436

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	156	136	25-158	14
Chloromethane	ug/L (ppb)	50	122	106	45-156	14
Vinyl chloride	ug/L (ppb)	50	124	108	50-154	14
Bromomethane	ug/L (ppb)	50	124	110	55-143	12
Chloroethane	ug/L (ppb)	50	132	114	58-146	15
Trichlorofluoromethane	ug/L (ppb)	250	125	111	50-150	12
Acetone	ug/L (ppb)	250	101	89	53-131	13
1,1-Dichloroethene	ug/L (ppb)	50	127	110	67-136	14
Hexane	ug/L (ppb)	50	111	105	57-137	6
Methylene chloride	ug/L (ppb)	50	121	105	39-148	14
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	128	112	64-147	13
trans-1,2-Dichloroethene	ug/L (ppb)	50	117	105	68-128	11
1,1-Dichloroethane	ug/L (ppb)	50	116	106	79-121	9
2,2-Dichloropropane	ug/L (ppb)	50	137	119	55-143	14
cis-1,2-Dichloroethene	ug/L (ppb)	50	118	106	80-123	11
Chloroform	ug/L (ppb)	50	116	105	80-121	10
2-Butanone (MEK)	ug/L (ppb)	250	89	93	57-149	4
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	95	91	73-132	4
1,1,1-Trichloroethane	ug/L (ppb)	50	126 vo	112	81-125	12
1,1-Dichloropropene	ug/L (ppb)	50	109	102	77-129	7
Carbon tetrachloride	ug/L (ppb)	50	133	120	75-158	10
Benzene	ug/L (ppb)	50	108	102	69-134	6
Trichloroethene	ug/L (ppb)	50	109	103	79-113	6
1,2-Dichloropropane	ug/L (ppb)	50	106	101	77-123	5
Bromodichloromethane	ug/L (ppb)	50	116	110	81-133	5
Dibromomethane	ug/L (ppb)	50	98	94	82-125	4
4-Methyl-2-pentanone	ug/L (ppb)	250	108	105	65-138	3
cis-1,3-Dichloropropene	ug/L (ppb)	50	103	103	82-132	0
Toluene	ug/L (ppb)	50	107	99	72-122	8
trans-1,3-Dichloropropene	ug/L (ppb)	50	101	105	80-136	4
1,1,2-Trichloroethane	ug/L (ppb)	50	101	101	75-124	0
2-Hexanone	ug/L (ppb)	250	93	100	60-136	7
1,3-Dichloropropane	ug/L (ppb)	50	96	97	76-126	1
Tetrachloroethene	ug/L (ppb)	50	107	99	76-121	8
Dibromochloromethane	ug/L (ppb)	50	118	115	84-133	3
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	96	98	82-115	2
Chlorobenzene	ug/L (ppb)	50	103	97	83-114	6
Ethylbenzene	ug/L (ppb)	50	110	102	77-124	8
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	137 vo	119	84-127	14
m,p-Xylene	ug/L (ppb)	100	109	103	81-112	6
o-Xylene	ug/L (ppb)	50	114	103	81-121	10
Styrene	ug/L (ppb)	50	108	104	84-119	4
Isopropylbenzene	ug/L (ppb)	50	121 vo	109	80-117	10
Bromoform	ug/L (ppb)	50	114	112	74-136	2
n-Propylbenzene	ug/L (ppb)	50	106	100	74-126	6
Bromobenzene	ug/L (ppb)	50	99	97	80-121	2
1,3,5-Trimethylbenzene	ug/L (ppb)	50	115	104	78-123	10
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	107	105	66-126	2
1,2,3-Trichloropropane	ug/L (ppb)	50	98	97	67-124	1
2-Chlorotoluene	ug/L (ppb)	50	108	100	77-127	8
4-Chlorotoluene	ug/L (ppb)	50	101	98	78-128	3
tert-Butylbenzene	ug/L (ppb)	50	114	105	80-123	8
1,2,4-Trimethylbenzene	ug/L (ppb)	50	113	102	79-122	10
sec-Butylbenzene	ug/L (ppb)	50	115	105	80-116	9
p-Isopropyltoluene	ug/L (ppb)	50	114	104	81-123	9
1,3-Dichlorobenzene	ug/L (ppb)	50	100	97	83-113	3
1,4-Dichlorobenzene	ug/L (ppb)	50	99	95	83-107	4
1,2-Dichlorobenzene	ug/L (ppb)	50	108	100	84-112	8
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	121	110	57-141	10
1,2,4-Trichlorobenzene	ug/L (ppb)	50	121	105	72-130	14
Hexachlorobutadiene	ug/L (ppb)	50	122	103	53-141	17
Naphthalene	ug/L (ppb)	50	125	109	64-133	14
1,2,3-Trichlorobenzene	ug/L (ppb)	50	120	104	65-136	14

Date of Report: 02/07/20
Date Received: 01/30/20
Project: Precision Engineering 1803.01.01, F&BI 001436

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270E SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	72	82	57-114	13
Acenaphthylene	ug/L (ppb)	1	76	84	65-119	10
Acenaphthene	ug/L (ppb)	1	77	85	66-118	10
Fluorene	ug/L (ppb)	1	77	82	64-125	6
Phenanthrene	ug/L (ppb)	1	78	87	67-120	11
Anthracene	ug/L (ppb)	1	80	90	65-122	12
Fluoranthene	ug/L (ppb)	1	78	84	65-127	7
Pyrene	ug/L (ppb)	1	77	87	62-130	12
Benz(a)anthracene	ug/L (ppb)	1	82	90	60-118	9
Chrysene	ug/L (ppb)	1	80	89	66-125	11
Benzo(b)fluoranthene	ug/L (ppb)	1	73	79	55-135	8
Benzo(k)fluoranthene	ug/L (ppb)	1	72	79	62-125	9
Benzo(a)pyrene	ug/L (ppb)	1	70	77	58-127	10
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	67	77	36-142	14
Dibenz(a,h)anthracene	ug/L (ppb)	1	61	73	37-133	18
Benzo(g,h,i)perylene	ug/L (ppb)	1	61	75	34-135	21 vo

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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info@fremontanalytical.com

Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 001436
Work Order Number: 2001501

February 06, 2020

Attention Michael Erdahl:

Fremont Analytical, Inc. received 2 sample(s) on 1/30/2020 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *02/06/2020*

CLIENT: Friedman & Bruya
Project: 001436
Work Order: 2001501

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2001501-001	MW3-W-15.0	01/29/2020 3:25 PM	01/30/2020 11:40 AM
2001501-002	MW11-W-15.0	01/29/2020 3:55 PM	01/30/2020 11:40 AM

Case Narrative

WO#: **2001501**
Date: **2/6/2020**

CLIENT: Friedman & Bruya
Project: 001436

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **2001501**
Date Reported: **2/6/2020**

CLIENT: Friedman & Bruya
Project: 001436

Lab ID: 2001501-001 **Collection Date:** 1/29/2020 3:25:00 PM
Client Sample ID: **MW3-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R57080		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	1/30/2020 12:44:00 PM

Lab ID: 2001501-002 **Collection Date:** 1/29/2020 3:55:00 PM
Client Sample ID: **MW11-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R57080		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	1/30/2020 1:04:00 PM

Date: *2/6/2020*

Work Order: 2001501
CLIENT: Friedman & Bruya
Project: 001436

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-57080** SampType: **MBLK** Units: **mg/L** Prep Date: **1/30/2020** RunNo: **57080**
Client ID: **MBLKW** Batch ID: **R57080** Analysis Date: **1/30/2020** SeqNo: **1138115**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-57080** SampType: **LCS** Units: **mg/L** Prep Date: **1/30/2020** RunNo: **57080**
Client ID: **LCSW** Batch ID: **R57080** Analysis Date: **1/30/2020** SeqNo: **1138116**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.244	0.0450	0.2500	0	97.4	80.9	115				

Sample ID: **2001501-001ADUP** SampType: **DUP** Units: **mg/L** Prep Date: **1/30/2020** RunNo: **57080**
Client ID: **MW3-W-15.0** Batch ID: **R57080** Analysis Date: **1/30/2020** SeqNo: **1138118**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		30	

Sample ID: **2001501-001AMS** SampType: **MS** Units: **mg/L** Prep Date: **1/30/2020** RunNo: **57080**
Client ID: **MW3-W-15.0** Batch ID: **R57080** Analysis Date: **1/30/2020** SeqNo: **1138119**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450	0.2500	0	0	46.2	138				S

NOTES:
S - Outlying spike recovery(ies) observed. A duplicate analysis was performed with similar results indicating a possible matrix effect.

Sample ID: **2001501-001AMSD** SampType: **MSD** Units: **mg/L** Prep Date: **1/30/2020** RunNo: **57080**
Client ID: **MW3-W-15.0** Batch ID: **R57080** Analysis Date: **1/30/2020** SeqNo: **1138120**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450	0.2500	0	2.68	46.2	138	0		20	S

NOTES:
S - Outlying spike recovery(ies) observed. A duplicate analysis was performed with similar results indicating a possible matrix effect.

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2001501**
Logged by:	**Carissa True**	Date Received:	**1/30/2020 11:40:00 AM**

Chain of Custody

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

Log In

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

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler 1	5.4
Sample 1	2.6

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

2001801

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Page # 1 of 1

Send Report To Michael Erdahl
Company Friedman and Bruya, Inc.
Address 3012 16th Ave W
City, State, ZIP Seattle, WA 98119
Phone # (206) 285-8282 Fax # (206) 283-5044

SUBCONTRACTER Fremont

PROJECT NAME/NO.	PO #
001436	A-536

REMARKS
Please Email Results

TURNAROUND TIME
☒ Standard ~~(2 Weeks)~~ 1 Week
☐ RUSH
Rush charges authorized by:

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Dioxins/Furans	EPH	VPH	cVOC						Notes
MW3-W-15.0		1/29/20	1525	Water					X						
MW11-W-15.0		1	1555	1					X						

ANALYSES REQUESTED

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	1/29/20	10:37 AM
Received by:		EAI	Sara Becker-Meyer	1/30/20	1140
Relinquished by:					
Received by:					

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

001436

SAMPLE CHAIN OF CUSTODY

ME 01/30/20 VW2/AI2/B05

Page # ____ of ____

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N State Street, #301

City, State, ZIP Bellingham, WA 98225

Phone 360-594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering

PO #: 1903.01.01

REMARKS: Dissolved Samples were field filtered.

Project specific RLs? - Yes / No

INVOICE TO: accounting@maulfoster.com

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

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars (NP)	ANALYSES REQUESTED: Diesel & Motor Oil NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260C	PAHs EPA 8270D SIM / 8270E SIM	PCBs EPA 8082	Hex Chrom by 3500 CrB	Dis. As, Cr, Cu, Sb by EPA 6020B			Notes
MW3-W-15.0	01 A-G	1/29/20	1525	W	7 (7)	X				X	X		X	X			(X)-logged in
MW11-W-15.0	02 A-G	1/29/20	1555	W	7 (7)	X				X	X		X	X			on SDG 001446
Trip Blank	03 A B	—	—	W	2					(X)							Added at lab (NP) 01/30/20
													Samples received at 3 °C				

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Sean Maloney	MFA	1/30/20	9:20
Received by:	VINH	FBI	1/31/20	9:20
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

February 7, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

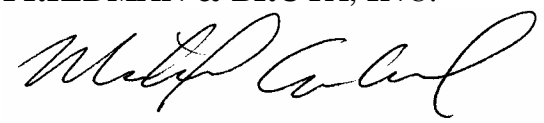
Dear Ms Good:

Included are the results from the testing of material submitted on January 29, 2020 from the Precision Engineering 1803.01.01, F&BI 001419 project. There are 31 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
MFA0207R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on January 29, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.01, F&BI 001419 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
001419 -01	MW8-W-15.0
001419 -02	MW10-W-15.0
001419 -03	MW9-W-33.5
001419 -04	MW2-W-15.0
001419 -05	MW6-W-15.0
001419 -06	MW7-W-28.5

The samples were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

The 8260D water samples MW10-W-15.0, MW2-W-15.0, and MW6-W-15.0 were diluted due to matrix effect (foamy). The reporting limits were raised accordingly.

Copper in the 6020B matrix spike failed the acceptance criteria. The laboratory control sample passed the acceptance criteria, therefore the results were due to matrix effect.

Several 8260D compounds exceeded the acceptance criteria in the matrix spike sample. The compounds were not detected in the samples, therefore the data were acceptable.

The 8270E laboratory control sample and laboratory control sample duplicate failed the relative percent difference for benzo(g,h,i)perylene. The analyte was not detected therefore the data were acceptable.

All other quality control requirements were acceptable.

Date of Report: 02/07/20
Date Received: 01/29/20
Project: Precision Engineering 1803.01.01, F&BI 001419
Date Extracted: 01/30/20
Date Analyzed: 01/30/20

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 51-134)
MW8-W-15.0 001419-01	300 x	<250	128
MW10-W-15.0 001419-02	410 x	690 x	114
MW9-W-33.5 001419-03	100 x	<250	132
MW2-W-15.0 001419-04	240 x	460 x	88
MW6-W-15.0 001419-05	370 x	810 x	70
MW7-W-28.5 001419-06	88 x	<250	121
Method Blank 00-270 MB2	<50	<250	113

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW8-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001419-01
Date Analyzed:	02/04/20	Data File:	001419-01.054
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	18.6
Copper	<5
Selenium	<5

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW8-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001419-01 x10
Date Analyzed:	02/03/20	Data File:	001419-01 x10.103
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	<10

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW10-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001419-02
Date Analyzed:	02/04/20	Data File:	001419-02.055
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	25.5
Chromium	10.5
Copper	<5
Selenium	<5

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW9-W-33.5	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001419-03
Date Analyzed:	02/04/20	Data File:	001419-03.056
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	10.9
Chromium	2.20
Copper	<5
Selenium	<5

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW2-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001419-04
Date Analyzed:	02/04/20	Data File:	001419-04.057
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	6.46
Chromium	7.82
Copper	<5
Selenium	<5

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW6-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001419-05
Date Analyzed:	02/04/20	Data File:	001419-05.058
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	20.3
Copper	<5

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW6-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001419-05 x10
Date Analyzed:	02/03/20	Data File:	001419-05 x10.107
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	48.7
Selenium	14.3

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW7-W-28.5	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	001419-06
Date Analyzed:	02/04/20	Data File:	001419-06.059
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	8.51
Chromium	1.73
Copper	5.87
Selenium	<5

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	02/03/20	Lab ID:	I0-075 mb
Date Analyzed:	02/03/20	Data File:	I0-075 mb.100
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<5

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW8-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/31/20	Lab ID:	001419-01
Date Analyzed:	02/03/20	Data File:	020327.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	57	121
Toluene-d8	101	63	127
4-Bromofluorobenzene	98	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW10-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/31/20	Lab ID:	001419-02 1/10
Date Analyzed:	02/03/20	Data File:	020331.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	57	121
Toluene-d8	100	63	127
4-Bromofluorobenzene	95	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW9-W-33.5	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/31/20	Lab ID:	001419-03
Date Analyzed:	02/03/20	Data File:	020328.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	100	63	127
4-Bromofluorobenzene	93	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW2-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/31/20	Lab ID:	001419-04 1/10
Date Analyzed:	02/03/20	Data File:	020332.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	101	63	127
4-Bromofluorobenzene	99	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW6-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/31/20	Lab ID:	001419-05 1/10
Date Analyzed:	02/03/20	Data File:	020336.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	97	57	121
Toluene-d8	95	63	127
4-Bromofluorobenzene	94	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	MW7-W-28.5	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/31/20	Lab ID:	001419-06
Date Analyzed:	02/03/20	Data File:	020329.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	99	63	127
4-Bromofluorobenzene	97	60	133

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/31/20	Lab ID:	00-230 mb
Date Analyzed:	01/31/20	Data File:	013107.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	97	50	150
Toluene-d8	96	50	150
4-Bromofluorobenzene	104	50	150

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

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW8-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	001419-01 1/2
Date Analyzed:	01/30/20	Data File:	013009.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	77	31	160
Benzo(a)anthracene-d12	84	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW10-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	001419-02 1/2
Date Analyzed:	01/30/20	Data File:	013010.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	85	31	160
Benzo(a)anthracene-d12	94	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW9-W-33.5	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	001419-03 1/2
Date Analyzed:	01/30/20	Data File:	013011.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	85	31	160
Benzo(a)anthracene-d12	96	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW2-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	001419-04 1/2
Date Analyzed:	01/30/20	Data File:	013012.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	83	31	160
Benzo(a)anthracene-d12	97	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW6-W-15.0	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	001419-05 1/2
Date Analyzed:	01/30/20	Data File:	013013.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	75	31	160
Benzo(a)anthracene-d12	87	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	MW7-W-28.5	Client:	Maul Foster Alongi
Date Received:	01/29/20	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	001419-06 1/2
Date Analyzed:	01/30/20	Data File:	013014.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	83	31	160
Benzo(a)anthracene-d12	91	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	01/30/20	Lab ID:	00-278 mb
Date Analyzed:	01/30/20	Data File:	013008.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	85	31	160
Benzo(a)anthracene-d12	95	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Date of Report: 02/07/20
Date Received: 01/29/20
Project: Precision Engineering 1803.01.01, F&BI 001419

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	100	108	63-142	8

Date of Report: 02/07/20
Date Received: 01/29/20
Project: Precision Engineering 1803.01.01, F&BI 001419

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

Laboratory Code: 001436-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	10.7	98	89	75-125	10
Chromium	ug/L (ppb)	20	1.03	75	75	75-125	0
Copper	ug/L (ppb)	20	<5	74 vo	75	75-125	1
Selenium	ug/L (ppb)	5	<1	97	90	75-125	7

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	90	80-120
Chromium	ug/L (ppb)	20	101	80-120
Copper	ug/L (ppb)	20	100	80-120
Selenium	ug/L (ppb)	5	90	80-120

Date of Report: 02/07/20
Date Received: 01/29/20
Project: Precision Engineering 1803.01.01, F&BI 001419

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

Laboratory Code: 001469-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	103	55-137
Chloromethane	ug/L (ppb)	50	<10	106	57-129
Vinyl chloride	ug/L (ppb)	50	<0.2	139	61-139
Bromomethane	ug/L (ppb)	50	<1	94	20-265
Chloroethane	ug/L (ppb)	50	<1	107	55-149
Trichlorofluoromethane	ug/L (ppb)	50	<1	106	65-137
Acetone	ug/L (ppb)	250	<50	74	48-149
1,1-Dichloroethene	ug/L (ppb)	50	<1	127 vo	71-123
Hexane	ug/L (ppb)	50	<1	106	44-139
Methylene chloride	ug/L (ppb)	50	<5	121	61-126
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	122	68-125
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	120	72-122
1,1-Dichloroethane	ug/L (ppb)	50	<1	118 vo	79-113
2,2-Dichloropropane	ug/L (ppb)	50	<1	123	48-157
cis-1,2-Dichloroethene	ug/L (ppb)	50	<1	118	63-126
Chloroform	ug/L (ppb)	50	<1	120 vo	77-117
2-Butanone (MEK)	ug/L (ppb)	250	<10	84	70-135
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	96	70-119
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	117	75-121
1,1-Dichloropropene	ug/L (ppb)	50	<1	105	67-121
Carbon tetrachloride	ug/L (ppb)	50	<1	111	70-132
Benzene	ug/L (ppb)	50	<0.35	95	75-114
Trichloroethene	ug/L (ppb)	50	<1	106	73-122
1,2-Dichloropropane	ug/L (ppb)	50	<1	116 vo	80-111
Bromodichloromethane	ug/L (ppb)	50	<1	114	78-117
Dibromomethane	ug/L (ppb)	50	<1	107	73-125
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	106	79-140
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	102	76-120
Toluene	ug/L (ppb)	50	<1	91	73-117
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	96	75-122
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	90	81-116
2-Hexanone	ug/L (ppb)	250	<10	79	74-127
1,3-Dichloropropane	ug/L (ppb)	50	<1	96	80-113
Tetrachloroethene	ug/L (ppb)	50	<1	91	40-155
Dibromochloromethane	ug/L (ppb)	50	<1	97	69-129
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	95	79-120
Chlorobenzene	ug/L (ppb)	50	<1	99	75-115
Ethylbenzene	ug/L (ppb)	50	<1	103	66-124
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	115	76-130
m,p-Xylene	ug/L (ppb)	100	<2	91	63-128
o-Xylene	ug/L (ppb)	50	<1	101	64-129
Styrene	ug/L (ppb)	50	<1	107	56-142
Isopropylbenzene	ug/L (ppb)	50	<1	110	74-122
Bromoform	ug/L (ppb)	50	<1	112	49-138
n-Propylbenzene	ug/L (ppb)	50	<1	86	65-129
Bromobenzene	ug/L (ppb)	50	<1	82	70-121
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	88	60-138
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	88	77-120
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	90	62-125
2-Chlorotoluene	ug/L (ppb)	50	<1	90	40-159
4-Chlorotoluene	ug/L (ppb)	50	<1	87	76-122
tert-Butylbenzene	ug/L (ppb)	50	<1	83	74-125
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	77	59-136
sec-Butylbenzene	ug/L (ppb)	50	<1	79	69-127
p-Isopropyltoluene	ug/L (ppb)	50	<1	88	64-132
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	86	77-113
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	84	75-110
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	88	70-120
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	103	69-129
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	73	66-123
Hexachlorobutadiene	ug/L (ppb)	50	<1	69	53-136
Naphthalene	ug/L (ppb)	50	<1	76	60-145
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	69	59-130

Date of Report: 02/07/20
Date Received: 01/29/20
Project: Precision Engineering 1803.01.01, F&BI 001419

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	105	117	25-158	11
Chloromethane	ug/L (ppb)	50	94	99	45-156	5
Vinyl chloride	ug/L (ppb)	50	96	102	50-154	6
Bromomethane	ug/L (ppb)	50	98	104	55-143	6
Chloroethane	ug/L (ppb)	50	101	109	58-146	8
Trichlorofluoromethane	ug/L (ppb)	250	100	107	50-150	7
Acetone	ug/L (ppb)	250	87	92	53-131	6
1,1-Dichloroethene	ug/L (ppb)	50	99	108	67-136	9
Hexane	ug/L (ppb)	50	87	96	57-137	10
Methylene chloride	ug/L (ppb)	50	92	102	39-148	10
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	103	110	64-147	7
trans-1,2-Dichloroethene	ug/L (ppb)	50	93	102	68-128	9
1,1-Dichloroethane	ug/L (ppb)	50	96	105	79-121	9
2,2-Dichloropropane	ug/L (ppb)	50	96	102	55-143	6
cis-1,2-Dichloroethene	ug/L (ppb)	50	96	105	80-123	9
Chloroform	ug/L (ppb)	50	96	105	80-121	9
2-Butanone (MEK)	ug/L (ppb)	250	87	96	57-149	10
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	86	94	73-132	9
1,1,1-Trichloroethane	ug/L (ppb)	50	100	109	81-125	9
1,1-Dichloropropene	ug/L (ppb)	50	94	103	77-129	9
Carbon tetrachloride	ug/L (ppb)	50	104	115	75-158	10
Benzene	ug/L (ppb)	50	93	103	69-134	10
Trichloroethene	ug/L (ppb)	50	96	105	79-113	9
1,2-Dichloropropane	ug/L (ppb)	50	95	104	77-123	9
Bromodichloromethane	ug/L (ppb)	50	101	112	81-133	10
Dibromomethane	ug/L (ppb)	50	89	98	82-125	10
4-Methyl-2-pentanone	ug/L (ppb)	250	100	106	65-138	6
cis-1,3-Dichloropropene	ug/L (ppb)	50	97	105	82-132	8
Toluene	ug/L (ppb)	50	90	102	72-122	12
trans-1,3-Dichloropropene	ug/L (ppb)	50	93	106	80-136	13
1,1,2-Trichloroethane	ug/L (ppb)	50	91	105	75-124	14
2-Hexanone	ug/L (ppb)	250	90	103	60-136	13
1,3-Dichloropropane	ug/L (ppb)	50	90	102	76-126	12
Tetrachloroethene	ug/L (ppb)	50	87	100	76-121	14
Dibromochloromethane	ug/L (ppb)	50	100	112	84-133	11
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	89	101	82-115	13
Chlorobenzene	ug/L (ppb)	50	91	100	83-114	9
Ethylbenzene	ug/L (ppb)	50	93	103	77-124	10
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	105	117	84-127	11
m,p-Xylene	ug/L (ppb)	100	94	103	81-112	9
o-Xylene	ug/L (ppb)	50	94	103	81-121	9
Styrene	ug/L (ppb)	50	95	106	84-119	11
Isopropylbenzene	ug/L (ppb)	50	96	107	80-117	11
Bromoform	ug/L (ppb)	50	94	108	74-136	14
n-Propylbenzene	ug/L (ppb)	50	92	101	74-126	9
Bromobenzene	ug/L (ppb)	50	90	100	80-121	11
1,3,5-Trimethylbenzene	ug/L (ppb)	50	96	104	78-123	8
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	98	107	66-126	9
1,2,3-Trichloropropane	ug/L (ppb)	50	92	102	67-124	10
2-Chlorotoluene	ug/L (ppb)	50	92	101	77-127	9
4-Chlorotoluene	ug/L (ppb)	50	90	99	78-128	10
tert-Butylbenzene	ug/L (ppb)	50	97	105	80-123	8
1,2,4-Trimethylbenzene	ug/L (ppb)	50	96	104	79-122	8
sec-Butylbenzene	ug/L (ppb)	50	95	103	80-116	8
p-Isopropyltoluene	ug/L (ppb)	50	95	103	81-123	8
1,3-Dichlorobenzene	ug/L (ppb)	50	90	97	83-113	7
1,4-Dichlorobenzene	ug/L (ppb)	50	88	95	83-107	8
1,2-Dichlorobenzene	ug/L (ppb)	50	93	101	84-112	8
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	99	107	57-141	8
1,2,4-Trichlorobenzene	ug/L (ppb)	50	95	103	72-130	8
Hexachlorobutadiene	ug/L (ppb)	50	95	100	53-141	5
Naphthalene	ug/L (ppb)	50	103	108	64-133	5
1,2,3-Trichlorobenzene	ug/L (ppb)	50	96	104	65-136	8

Date of Report: 02/07/20
Date Received: 01/29/20
Project: Precision Engineering 1803.01.01, F&BI 001419

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270E SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	72	82	57-114	13
Acenaphthylene	ug/L (ppb)	1	76	84	65-119	10
Acenaphthene	ug/L (ppb)	1	77	85	66-118	10
Fluorene	ug/L (ppb)	1	77	82	64-125	6
Phenanthrene	ug/L (ppb)	1	78	87	67-120	11
Anthracene	ug/L (ppb)	1	80	90	65-122	12
Fluoranthene	ug/L (ppb)	1	78	84	65-127	7
Pyrene	ug/L (ppb)	1	77	87	62-130	12
Benz(a)anthracene	ug/L (ppb)	1	82	90	60-118	9
Chrysene	ug/L (ppb)	1	80	89	66-125	11
Benzo(b)fluoranthene	ug/L (ppb)	1	73	79	55-135	8
Benzo(k)fluoranthene	ug/L (ppb)	1	72	79	62-125	9
Benzo(a)pyrene	ug/L (ppb)	1	70	77	58-127	10
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	67	77	36-142	14
Dibenz(a,h)anthracene	ug/L (ppb)	1	61	73	37-133	18
Benzo(g,h,i)perylene	ug/L (ppb)	1	61	75	34-135	21 vo

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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

Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 001419
Work Order Number: 2001487

February 05, 2020

Attention Michael Erdahl:

Fremont Analytical, Inc. received 6 sample(s) on 1/29/2020 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *02/05/2020*

CLIENT: Friedman & Bruya
Project: 001419
Work Order: 2001487

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2001487-001	MW8-W-15.0	01/29/2020 9:35 AM	01/29/2020 3:43 PM
2001487-002	MW10-W-15.0	01/29/2020 11:15 AM	01/29/2020 3:43 PM
2001487-003	MW9-W-33.5	01/29/2020 11:20 AM	01/29/2020 3:43 PM
2001487-004	MW2-W-15.0	01/29/2020 12:40 PM	01/29/2020 3:43 PM
2001487-005	MW6-W-15.0	01/29/2020 1:55 PM	01/29/2020 3:43 PM
2001487-006	MW7-W-28.5	01/29/2020 1:40 PM	01/29/2020 3:43 PM

Case Narrative

WO#: **2001487**
Date: **2/5/2020**

CLIENT: Friedman & Bruya
Project: 001419

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **2001487**
Date Reported: **2/5/2020**

Client: Friedman & Bruya
Collection Date: 1/29/2020 9:35:00 AM
Project: 001419
Lab ID: 2001487-001
Matrix: Water
Client Sample ID: MW8-W-15.0

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R57062		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	1/29/2020 6:19:00 PM

Analytical Report

Work Order: **2001487**
Date Reported: **2/5/2020**

Client: Friedman & Bruya
Project: 001419
Lab ID: 2001487-002
Client Sample ID: **MW10-W-15.0**

Collection Date: 1/29/2020 11:15:00 AM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R57062		Analyst: WF
Chromium, Hexavalent	ND	0.0900	D	mg/L	2	1/29/2020 5:37:00 PM

Analytical Report

Work Order: **2001487**
Date Reported: **2/5/2020**

Client: Friedman & Bruya
Project: 001419
Lab ID: 2001487-003
Client Sample ID: **MW9-W-33.5**

Collection Date: 1/29/2020 11:20:00 AM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R57062		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	1/29/2020 5:42:00 PM

Analytical Report

Work Order: **2001487**
Date Reported: **2/5/2020**

Client: Friedman & Bruya
Project: 001419
Lab ID: 2001487-004
Client Sample ID: **MW2-W-15.0**

Collection Date: 1/29/2020 12:40:00 PM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R57062		Analyst: WF
Chromium, Hexavalent	ND	0.0900	D	mg/L	2	1/29/2020 5:47:00 PM

Analytical Report

Work Order: **2001487**
Date Reported: **2/5/2020**

Client: Friedman & Bruya
Project: 001419
Lab ID: 2001487-005
Client Sample ID: **MW6-W-15.0**

Collection Date: 1/29/2020 1:55:00 PM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R57062		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	1/29/2020 5:52:00 PM

Analytical Report

Work Order: **2001487**
Date Reported: **2/5/2020**

Client: Friedman & Bruya
Project: 001419
Lab ID: 2001487-006
Client Sample ID: **MW7-W-28.5**

Collection Date: 1/29/2020 1:40:00 PM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R57062		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	1/29/2020 5:18:00 PM

Work Order: 2001487
CLIENT: Friedman & Bruya
Project: 001419

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-57062**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **1/29/2020**	RunNo: **57062**
Client ID: **MBLKW**	Batch ID: **R57062**		Analysis Date: **1/29/2020**	SeqNo: **1137760**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-57062**	SampType: **LCS**	Units: **mg/L**	Prep Date: **1/29/2020**	RunNo: **57062**
Client ID: **LCSW**	Batch ID: **R57062**		Analysis Date: **1/29/2020**	SeqNo: **1137761**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.238	0.0450	0.2500	0	95.1	80.9	115				

Sample ID: **2001487-006ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **1/29/2020**	RunNo: **57062**
Client ID: **MW7-W-28.5**	Batch ID: **R57062**		Analysis Date: **1/29/2020**	SeqNo: **1137763**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		30	

Sample ID: **2001487-006AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **1/29/2020**	RunNo: **57062**
Client ID: **MW7-W-28.5**	Batch ID: **R57062**		Analysis Date: **1/29/2020**	SeqNo: **1137764**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.230	0.0450	0.2500	0	92.2	46.2	138				

Sample ID: **2001487-006AMSD**	SampType: **MSD**	Units: **mg/L**	Prep Date: **1/29/2020**	RunNo: **57062**
Client ID: **MW7-W-28.5**	Batch ID: **R57062**		Analysis Date: **1/29/2020**	SeqNo: **1137765**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.238	0.0450	0.2500	0	95.2	46.2	138	0.2304	3.25	20	

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**2001487**
Logged by:	**Carissa True**	Date Received:	**1/29/2020 3:43:00 PM**

Chain of Custody

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

Log In

3.	Coolers are present?	Yes	☑	No ☐	NA	☐
4.	Shipping container/cooler in good condition?	Yes	☑	No ☐		
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes	☐	No ☐	Not Required	☑
6.	Was an attempt made to cool the samples?	Yes	☑	No ☐	NA	☐
7.	Were all items received at a temperature of >0°C to 10.0°C *	Yes	☑	No ☐	NA	☐
8.	Sample(s) in proper container(s)?	Yes	☑	No ☐		
9.	Sufficient sample volume for indicated test(s)?	Yes	☑	No ☐		
10.	Are samples properly preserved?	Yes	☑	No ☐		
11.	Was preservative added to bottles?	Yes	☐	No ☑	NA	☐
12.	Is there headspace in the VOA vials?	Yes	☐	No ☐	NA	☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes	☑	No ☐		
14.	Does paperwork match bottle labels?	Yes	☑	No ☐		
15.	Are matrices correctly identified on Chain of Custody?	Yes	☑	No ☐		
16.	Is it clear what analyses were requested?	Yes	☑	No ☐		
17.	Were all holding times able to be met?	Yes	☑	No ☐		

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler 1	6.9
Sample 1	6.2

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

2001487

Page # 1 of 1

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 Fax # (206) 283-5044

SUBCONTRACTER Fremont

PROJECT NAME/NO.	PO #
001419	A-536

REMARKS

Please Email Results

TURNAROUND TIME

☒ Standard (2 Weeks)

☐ RUSH

Rush charges authorized by:

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Return samples

☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	$Cr6^+$						Notes
MW 8-W-15.0		1/29/20	0935	W	1				X						
MW 10-W-15.0			1115	W	1				X						
MW 9-W-33.5			1120	W	1				X						
MW 2-W-15.0			1240	W	1				X						
MW 6-W-15.0			1355	W	1				X						
MW-7-W-28.5		1/29/20	1340	W	1				X						

Friedman & Bruya, Inc. 3012 16th Avenue West Seattle, WA 98119-2029 Ph. (206) 285-8282 Fax (206) 283-5044	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
	Relinquished by:	Michael Erdahl	Friedman & Bruya	1/29/20	1443
	Received by:	Emma Holmes	FAI	1/29/20	1543
	Relinquished by:				
	Received by:				

SAMPLE CHAIN OF CUSTODY ME 1/29/20 AI3/B05/VW3

001419

Report To Heather Good
Company Maul Foster & Alongi
Address 1329 N State St, #301
City, State, ZIP Bellingham, WA 98225
Phone 360-594-6218 Email hgood@maulfoster.com

SAMPLERS (*signature*) Amanda Bixby
PROJECT NAME: Precision Engineering
PO #: 1803.0101
REMARKS: Dissolved samples were field filtered. Project specific RLs? - Yes / No
INVOICE TO: accounting@maulfoster.com

Page # 1 of 1

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

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: Diesel+Motor Oil NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260C	PAHs 8270D SIM (EPA 8270)	PCBs EPA 8082	Hexchrom by 3500 CRB	Dis. As, Cr, Cu, Se by EPA 6020B			Notes
MW8-W-15.0	01 A-G	1/29/20	0935	W	5+2	X				X	X		X	X			X pcAB
MW10-W-15.0	02		1115		2	X				X	X		X	X			1/30/20 ME
MW9-W-33.5	03		1120		2	X				X	X		X	X			
MW2-W-15.0	04		1240		2	X				X	X		X	X			
MW6-W-15.0	05		1355		3	X				X	X		X	X			
MW7-W-28.5	06		1340		2	X				X	X		X	X			

Samples received at 4 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Amanda Bixby	Amanda Bixby	MFA	1/29/20	1430
Received by: VWH	VINH	FBI	1/29/20	1430
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

January 2, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on December 18, 2019 from the Precision Engineering 1803.01.01, F&BI 912322 project. There are 30 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0102R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on December 18, 2019 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.01, F&BI 912322 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
912322 -01	MW10-W-15.0
912322 -02	MW8-W-15.0
912322 -03	Trip Blank
912322 -04	MW1-W-32.0
912322 -05	MW5-W-15.0
912322 -06	MWDUP-W-15.0

The samples were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

A 6020B internal standard failed the acceptance criteria for sample MW8-W-15.0. In addition, chromium concentration for samples MW5-W-15.0 and MWDUP-W-15.0 exceeded the calibration range. The samples were diluted and reanalyzed with acceptable results. Both data sets were reported.

Several compounds in the 8260C laboratory control sample and laboratory control sample duplicate exceeded the acceptance criteria. The analytes were not detected in the samples, therefore the data were acceptable.

The 8260C samples MW10-W-15.0, MW8-W-15.0, MW5-W-15.0, and MWDUP-W-15.0 were were diluted due to matrix effect (foamy). The reporting limits were raised accordingly.

All other quality control requirements were acceptable.

Date of Report: 01/02/20
Date Received: 12/18/19
Project: Precision Engineering 1803.01.01, F&BI 912322
Date Extracted: 12/19/19
Date Analyzed: 12/19/19

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
MW10-W-15.0 912322-01	440 x	360 x	97
MW8-W-15.0 912322-02	430 x	260 x	86
MW1-W-32.0 912322-04	<50	<250	93
MW5-W-15.0 912322-05	58 x	<250	103
MWDUP-W-15.0 912322-06	67 x	<250	104
Method Blank 09-3072 MB	<50	<250	84

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW10-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-01
Date Analyzed:	12/24/19	Data File:	912322-01.126
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	13.2
Chromium	7.67
Copper	<5
Selenium	10.4

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW8-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-02
Date Analyzed:	12/24/19	Data File:	912322-02.127
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	22.2
Chromium	4.97 J
Copper	<5 J
Selenium	3.44

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW8-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-02 x10
Date Analyzed:	12/26/19	Data File:	912322-02 x10.072
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	<10
Copper	<50

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW1-W-32.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-04
Date Analyzed:	12/24/19	Data File:	912322-04.119
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	29.7
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-05
Date Analyzed:	12/24/19	Data File:	912322-05.120
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	6.19
Chromium	35,000 ve
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-05 x500
Date Analyzed:	12/23/19	Data File:	912322-05 x500.169
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	38,900

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MWDUP-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-06
Date Analyzed:	12/24/19	Data File:	912322-06.121
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	6.47
Chromium	36,800 ve
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MWDUP-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-06 x500
Date Analyzed:	12/23/19	Data File:	912322-06 x500.170
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	35,500

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	I9-816 mb
Date Analyzed:	12/19/19	Data File:	I9-816 mb.065
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW10-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-01 1/2
Date Analyzed:	12/19/19	Data File:	121909.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	102	31	160
Benzo(a)anthracene-d12	110	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW8-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-02 1/2
Date Analyzed:	12/19/19	Data File:	121910.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	99	31	160
Benzo(a)anthracene-d12	104	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW1-W-32.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-04 1/2
Date Analyzed:	12/19/19	Data File:	121911.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	107	31	160
Benzo(a)anthracene-d12	114	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	0.040
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-05 1/2
Date Analyzed:	12/19/19	Data File:	121912.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	94	31	160
Benzo(a)anthracene-d12	96	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MWDUP-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912322-06 1/2
Date Analyzed:	12/19/19	Data File:	121913.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	106	31	160
Benzo(a)anthracene-d12	111	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	09-3060 mb2
Date Analyzed:	12/19/19	Data File:	121907.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	108	31	160
Benzo(a)anthracene-d12	112	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW10-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/24/19	Lab ID:	912322-01 1/10
Date Analyzed:	12/25/19	Data File:	122459.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	50	150
Toluene-d8	108	50	150
4-Bromofluorobenzene	106	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW8-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/24/19	Lab ID:	912322-02 1/10
Date Analyzed:	12/25/19	Data File:	122460.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	50	150
Toluene-d8	105	50	150
4-Bromofluorobenzene	104	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	Trip Blank	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/24/19	Lab ID:	912322-03
Date Analyzed:	12/24/19	Data File:	122436.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	100	63	127
4-Bromofluorobenzene	98	60	133

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW1-W-32.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/24/19	Lab ID:	912322-04
Date Analyzed:	12/24/19	Data File:	122437.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	101	63	127
4-Bromofluorobenzene	98	60	133

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/24/19	Lab ID:	912322-05 1/5
Date Analyzed:	12/27/19	Data File:	122661.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	95	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<5	1,3-Dichloropropane	<5
Chloromethane	<50	Tetrachloroethene	<5
Vinyl chloride	<1	Dibromochloromethane	<5
Bromomethane	<5	1,2-Dibromoethane (EDB)	<5
Chloroethane	<5	Chlorobenzene	<5
Trichlorofluoromethane	<5	Ethylbenzene	<5
Acetone	<250	1,1,1,2-Tetrachloroethane	<5
1,1-Dichloroethene	<5	m,p-Xylene	<10
Hexane	<5	o-Xylene	<5
Methylene chloride	<25	Styrene	<5
Methyl t-butyl ether (MTBE)	<5	Isopropylbenzene	<5
trans-1,2-Dichloroethene	<5	Bromoform	<5
1,1-Dichloroethane	<5	n-Propylbenzene	<5
2,2-Dichloropropane	<5	Bromobenzene	<5
cis-1,2-Dichloroethene	<5	1,3,5-Trimethylbenzene	<5
Chloroform	<5	1,1,2,2-Tetrachloroethane	<5
2-Butanone (MEK)	<50	1,2,3-Trichloropropane	<5
1,2-Dichloroethane (EDC)	<5	2-Chlorotoluene	<5
1,1,1-Trichloroethane	<5	4-Chlorotoluene	<5
1,1-Dichloropropene	<5	tert-Butylbenzene	<5
Carbon tetrachloride	<5	1,2,4-Trimethylbenzene	<5
Benzene	<1.7	sec-Butylbenzene	<5
Trichloroethene	<5	p-Isopropyltoluene	<5
1,2-Dichloropropane	<5	1,3-Dichlorobenzene	<5
Bromodichloromethane	<5	1,4-Dichlorobenzene	<5
Dibromomethane	<5	1,2-Dichlorobenzene	<5
4-Methyl-2-pentanone	<50	1,2-Dibromo-3-chloropropane	<50
cis-1,3-Dichloropropene	<5	1,2,4-Trichlorobenzene	<5
Toluene	<5	Hexachlorobutadiene	<5
trans-1,3-Dichloropropene	<5	Naphthalene	<5
1,1,2-Trichloroethane	<5	1,2,3-Trichlorobenzene	<5
2-Hexanone	<50		

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MWDUP-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/24/19	Lab ID:	912322-06 1/5
Date Analyzed:	12/27/19	Data File:	122662.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	98	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<5	1,3-Dichloropropane	<5
Chloromethane	<50	Tetrachloroethene	<5
Vinyl chloride	<1	Dibromochloromethane	<5
Bromomethane	<5	1,2-Dibromoethane (EDB)	<5
Chloroethane	<5	Chlorobenzene	<5
Trichlorofluoromethane	<5	Ethylbenzene	<5
Acetone	<250	1,1,1,2-Tetrachloroethane	<5
1,1-Dichloroethene	<5	m,p-Xylene	<10
Hexane	<5	o-Xylene	<5
Methylene chloride	<25	Styrene	<5
Methyl t-butyl ether (MTBE)	<5	Isopropylbenzene	<5
trans-1,2-Dichloroethene	<5	Bromoform	<5
1,1-Dichloroethane	<5	n-Propylbenzene	<5
2,2-Dichloropropane	<5	Bromobenzene	<5
cis-1,2-Dichloroethene	<5	1,3,5-Trimethylbenzene	<5
Chloroform	<5	1,1,2,2-Tetrachloroethane	<5
2-Butanone (MEK)	<50	1,2,3-Trichloropropane	<5
1,2-Dichloroethane (EDC)	<5	2-Chlorotoluene	<5
1,1,1-Trichloroethane	<5	4-Chlorotoluene	<5
1,1-Dichloropropene	<5	tert-Butylbenzene	<5
Carbon tetrachloride	<5	1,2,4-Trimethylbenzene	<5
Benzene	<1.7	sec-Butylbenzene	<5
Trichloroethene	<5	p-Isopropyltoluene	<5
1,2-Dichloropropane	<5	1,3-Dichlorobenzene	<5
Bromodichloromethane	<5	1,4-Dichlorobenzene	<5
Dibromomethane	<5	1,2-Dichlorobenzene	<5
4-Methyl-2-pentanone	<50	1,2-Dibromo-3-chloropropane	<50
cis-1,3-Dichloropropene	<5	1,2,4-Trichlorobenzene	<5
Toluene	<5	Hexachlorobutadiene	<5
trans-1,3-Dichloropropene	<5	Naphthalene	<5
1,1,2-Trichloroethane	<5	1,2,3-Trichlorobenzene	<5
2-Hexanone	<50		

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/24/19	Lab ID:	09-3080 mb2
Date Analyzed:	12/24/19	Data File:	122411.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	50	150
Toluene-d8	110	50	150
4-Bromofluorobenzene	105	50	150

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

Date of Report: 01/02/20
Date Received: 12/18/19
Project: Precision Engineering 1803.01.01, F&BI 912322

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	116	112	63-142	4

Date of Report: 01/02/20
Date Received: 12/18/19
Project: Precision Engineering 1803.01.01, F&BI 912322

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

Laboratory Code: 912238-05 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	3.25	91	89	75-125	2
Chromium	ug/L (ppb)	20	<1	94	92	75-125	2
Copper	ug/L (ppb)	20	<5	90	88	75-125	2
Selenium	ug/L (ppb)	5	<1	86	85	75-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	98	80-120
Chromium	ug/L (ppb)	20	100	80-120
Copper	ug/L (ppb)	20	100	80-120
Selenium	ug/L (ppb)	5	95	80-120

Date of Report: 01/02/20
Date Received: 12/18/19
Project: Precision Engineering 1803.01.01, F&BI 912322

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270D SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	78	80	57-114	3
Acenaphthylene	ug/L (ppb)	1	85	86	65-119	1
Acenaphthene	ug/L (ppb)	1	84	86	66-118	2
Fluorene	ug/L (ppb)	1	87	86	64-125	1
Phenanthrene	ug/L (ppb)	1	85	87	67-120	2
Anthracene	ug/L (ppb)	1	89	89	65-122	0
Fluoranthene	ug/L (ppb)	1	95	89	65-127	7
Pyrene	ug/L (ppb)	1	89	88	62-130	1
Benz(a)anthracene	ug/L (ppb)	1	92	94	60-118	2
Chrysene	ug/L (ppb)	1	88	90	66-125	2
Benzo(b)fluoranthene	ug/L (ppb)	1	84	88	55-135	5
Benzo(k)fluoranthene	ug/L (ppb)	1	77	80	62-125	4
Benzo(a)pyrene	ug/L (ppb)	1	81	82	58-127	1
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	74	71	36-142	4
Dibenz(a,h)anthracene	ug/L (ppb)	1	65	65	37-133	0
Benzo(g,h,i)perylene	ug/L (ppb)	1	67	67	34-135	0

Date of Report: 01/02/20
Date Received: 12/18/19
Project: Precision Engineering 1803.01.01, F&BI 912322

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

Laboratory Code: 912315-02 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	89	10-172
Chloromethane	ug/L (ppb)	50	<10	98	25-166
Vinyl chloride	ug/L (ppb)	50	<0.2	98	36-166
Bromomethane	ug/L (ppb)	50	<1	113	47-169
Chloroethane	ug/L (ppb)	50	<1	102	46-160
Trichlorofluoromethane	ug/L (ppb)	50	<1	101	44-165
Acetone	ug/L (ppb)	250	<50	72	10-182
1,1-Dichloroethene	ug/L (ppb)	50	<1	99	60-136
Hexane	ug/L (ppb)	50	<1	90	52-150
Methylene chloride	ug/L (ppb)	50	<5	103	67-132
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	107	74-127
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	97	72-129
1,1-Dichloroethane	ug/L (ppb)	50	<1	99	70-128
2,2-Dichloropropane	ug/L (ppb)	50	<1	95	36-154
cis-1,2-Dichloroethene	ug/L (ppb)	50	<1	95	71-127
Chloroform	ug/L (ppb)	50	<1	99	65-132
2-Butanone (MEK)	ug/L (ppb)	250	<10	88	10-129
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	99	48-149
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	100	60-146
1,1-Dichloropropene	ug/L (ppb)	50	<1	99	69-133
Carbon tetrachloride	ug/L (ppb)	50	<1	101	56-152
Benzene	ug/L (ppb)	50	<0.35	98	76-125
Trichloroethene	ug/L (ppb)	50	<1	100	66-135
1,2-Dichloropropane	ug/L (ppb)	50	<1	99	78-125
Bromodichloromethane	ug/L (ppb)	50	<1	101	61-150
Dibromomethane	ug/L (ppb)	50	<1	93	66-141
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	101	10-185
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	98	72-132
Toluene	ug/L (ppb)	50	<1	96	76-122
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	97	76-130
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	96	68-131
2-Hexanone	ug/L (ppb)	250	<10	93	10-185
1,3-Dichloropropane	ug/L (ppb)	50	<1	95	71-128
Tetrachloroethene	ug/L (ppb)	50	<1	100	10-226
Dibromochloromethane	ug/L (ppb)	50	<1	106	70-139
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	96	69-134
Chlorobenzene	ug/L (ppb)	50	<1	94	77-122
Ethylbenzene	ug/L (ppb)	50	<1	98	69-135
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	108	73-137
m,p-Xylene	ug/L (ppb)	100	<2	97	69-135
o-Xylene	ug/L (ppb)	50	<1	99	60-140
Styrene	ug/L (ppb)	50	<1	98	71-133
Isopropylbenzene	ug/L (ppb)	50	<1	101	65-142
Bromoform	ug/L (ppb)	50	<1	107	65-142
n-Propylbenzene	ug/L (ppb)	50	<1	96	58-144
Bromobenzene	ug/L (ppb)	50	<1	93	75-124
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	100	66-137
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	101	51-154
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	95	53-150
2-Chlorotoluene	ug/L (ppb)	50	<1	96	66-127
4-Chlorotoluene	ug/L (ppb)	50	<1	95	65-130
tert-Butylbenzene	ug/L (ppb)	50	<1	102	65-137
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	97	59-146
sec-Butylbenzene	ug/L (ppb)	50	<1	99	64-140
p-Isopropyltoluene	ug/L (ppb)	50	<1	98	65-141
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	96	72-123
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	94	69-126
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	98	69-128
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	105	32-164
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	96	66-136
Hexachlorobutadiene	ug/L (ppb)	50	<1	88	60-143
Naphthalene	ug/L (ppb)	50	<1	104	44-164
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	100	69-148

Date of Report: 01/02/20
Date Received: 12/18/19
Project: Precision Engineering 1803.01.01, F&BI 912322

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	126	127	50-157	1
Chloromethane	ug/L (ppb)	50	127	126	62-130	1
Vinyl chloride	ug/L (ppb)	50	115	115	70-128	0
Bromomethane	ug/L (ppb)	50	105	106	60-143	1
Chloroethane	ug/L (ppb)	50	104	100	66-149	4
Trichlorofluoromethane	ug/L (ppb)	250	93	91	65-138	2
Acetone	ug/L (ppb)	250	134	126	44-145	6
1,1-Dichloroethene	ug/L (ppb)	50	95	88	72-121	8
Hexane	ug/L (ppb)	50	116	113	51-153	3
Methylene chloride	ug/L (ppb)	50	128	123	63-132	4
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	121	119	70-122	2
trans-1,2-Dichloroethene	ug/L (ppb)	50	118	115	76-118	3
1,1-Dichloroethane	ug/L (ppb)	50	125 vo	125 vo	77-119	0
2,2-Dichloropropane	ug/L (ppb)	50	117	114	62-141	3
cis-1,2-Dichloroethene	ug/L (ppb)	50	117	113	76-119	3
Chloroform	ug/L (ppb)	50	119 vo	119 vo	78-117	0
2-Butanone (MEK)	ug/L (ppb)	250	151 vo	148	48-150	2
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	124 vo	123 vo	75-116	1
1,1,1-Trichloroethane	ug/L (ppb)	50	118 vo	117 vo	80-116	1
1,1-Dichloropropene	ug/L (ppb)	50	117	115	78-119	2
Carbon tetrachloride	ug/L (ppb)	50	116	114	72-128	2
Benzene	ug/L (ppb)	50	114	112	75-116	2
Trichloroethene	ug/L (ppb)	50	108	107	72-119	1
1,2-Dichloropropane	ug/L (ppb)	50	122 vo	121	79-121	1
Bromodichloromethane	ug/L (ppb)	50	120	121 vo	76-120	1
Dibromomethane	ug/L (ppb)	50	108	108	79-121	0
4-Methyl-2-pentanone	ug/L (ppb)	250	137	138	54-153	1
cis-1,3-Dichloropropene	ug/L (ppb)	50	112	115	76-128	3
Toluene	ug/L (ppb)	50	104	103	79-115	1
trans-1,3-Dichloropropene	ug/L (ppb)	50	104	107	76-128	3
1,1,2-Trichloroethane	ug/L (ppb)	50	110	111	78-120	1
2-Hexanone	ug/L (ppb)	250	136	136	49-147	0
1,3-Dichloropropane	ug/L (ppb)	50	106	107	81-111	1
Tetrachloroethene	ug/L (ppb)	50	97	95	78-109	2
Dibromochloromethane	ug/L (ppb)	50	99	100	63-140	1
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	106	108	82-118	2
Chlorobenzene	ug/L (ppb)	50	101	102	80-113	1
Ethylbenzene	ug/L (ppb)	50	110	109	83-111	1
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	111	108	76-125	3
m,p-Xylene	ug/L (ppb)	100	107	106	81-112	1
o-Xylene	ug/L (ppb)	50	111	109	81-117	2
Styrene	ug/L (ppb)	50	111	110	83-121	1
Isopropylbenzene	ug/L (ppb)	50	113	110	78-118	3
Bromoform	ug/L (ppb)	50	107	108	40-161	1
n-Propylbenzene	ug/L (ppb)	50	105	107	81-115	2
Bromobenzene	ug/L (ppb)	50	94	97	80-113	3
1,3,5-Trimethylbenzene	ug/L (ppb)	50	105	106	83-117	1
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	120 vo	123 vo	79-118	2
1,2,3-Trichloropropane	ug/L (ppb)	50	116	120 vo	74-116	3
2-Chlorotoluene	ug/L (ppb)	50	104	106	79-112	2
4-Chlorotoluene	ug/L (ppb)	50	102	105	80-116	3
tert-Butylbenzene	ug/L (ppb)	50	103	104	81-119	1
1,2,4-Trimethylbenzene	ug/L (ppb)	50	104	104	81-121	0
sec-Butylbenzene	ug/L (ppb)	50	106	107	83-123	1
p-Isopropyltoluene	ug/L (ppb)	50	102	101	81-117	1
1,3-Dichlorobenzene	ug/L (ppb)	50	99	101	80-115	2
1,4-Dichlorobenzene	ug/L (ppb)	50	99	99	77-112	0
1,2-Dichlorobenzene	ug/L (ppb)	50	103	100	79-115	3
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	128	116	62-133	10
1,2,4-Trichlorobenzene	ug/L (ppb)	50	104	104	75-119	0
Hexachlorobutadiene	ug/L (ppb)	50	100	100	70-116	0
Naphthalene	ug/L (ppb)	50	108	112	72-131	4
1,2,3-Trichlorobenzene	ug/L (ppb)	50	101	104	74-122	3

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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

Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 912322
Work Order Number: 1912318

December 26, 2019

Attention Michael Erdahl:

Fremont Analytical, Inc. received 5 sample(s) on 12/18/2019 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

CC:
Eric Young

Date: *12/26/2019*

CLIENT: Friedman & Bruya
Project: 912322
Work Order: 1912318

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1912318-001	MW10-W-15.0	12/18/2019 10:15 AM	12/18/2019 4:40 PM
1912318-002	MW8-W-15.0	12/18/2019 10:20 AM	12/18/2019 4:40 PM
1912318-003	MW1-W-32.0	12/18/2019 1:35 PM	12/18/2019 4:40 PM
1912318-004	MW5-W-15.0	12/18/2019 12:25 PM	12/18/2019 4:40 PM
1912318-005	MWDup-W-15.0	12/18/2019 12:25 PM	12/18/2019 4:40 PM

Case Narrative

WO#: **1912318**

Date: **12/26/2019**

CLIENT: Friedman & Bruya

Project: 912322

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **1912318**
Date Reported: **12/26/2019**

CLIENT: Friedman & Bruya
Project: 912322

Lab ID: 1912318-001 **Collection Date:** 12/18/2019 10:15:00 AM
Client Sample ID: **MW10-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R56144		Analyst: WF
Chromium, Hexavalent	ND	0.135	D	mg/L	3	12/18/2019 6:47:00 PM

NOTES:
Diluted due to matrix.

Lab ID: 1912318-002 **Collection Date:** 12/18/2019 10:20:00 AM
Client Sample ID: **MW8-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R56144		Analyst: WF
Chromium, Hexavalent	ND	0.135	D	mg/L	3	12/18/2019 6:51:00 PM

NOTES:
Diluted due to matrix.

Lab ID: 1912318-003 **Collection Date:** 12/18/2019 1:35:00 PM
Client Sample ID: **MW1-W-32.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R56144		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	12/18/2019 6:27:00 PM

Analytical Report

Work Order: **1912318**
Date Reported: **12/26/2019**

CLIENT: Friedman & Bruya
Project: 912322

Lab ID: 1912318-004 **Collection Date:** 12/18/2019 12:25:00 PM
Client Sample ID: **MW5-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R56144		Analyst: WF
Chromium, Hexavalent	31.6	4.50	D	mg/L	100	12/18/2019 7:06:00 PM

Lab ID: 1912318-005 **Collection Date:** 12/18/2019 12:25:00 PM
Client Sample ID: **MWDup-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R56144		Analyst: WF
Chromium, Hexavalent	32.2	4.50	D	mg/L	100	12/18/2019 7:11:00 PM

Work Order: 1912318
CLIENT: Friedman & Bruya
Project: 912322

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-56144**	SampType: **MBLK**			Units: **mg/L**		Prep Date: **12/18/2019**		RunNo: **56144**		
Client ID: **MBLKW**	Batch ID: **R56144**					Analysis Date: **12/18/2019**		SeqNo: **1118489**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-56144**	SampType: **LCS**			Units: **mg/L**		Prep Date: **12/18/2019**		RunNo: **56144**		
Client ID: **LCSW**	Batch ID: **R56144**					Analysis Date: **12/18/2019**		SeqNo: **1118490**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.236	0.0450	0.2500	0	94.4	80.9	115				

Sample ID: **1912318-003ADUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **12/18/2019**		RunNo: **56144**		
Client ID: **MW1-W-32.0**	Batch ID: **R56144**					Analysis Date: **12/18/2019**		SeqNo: **1118492**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		30	

Sample ID: **1912318-003AMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **12/18/2019**		RunNo: **56144**		
Client ID: **MW1-W-32.0**	Batch ID: **R56144**					Analysis Date: **12/18/2019**		SeqNo: **1118493**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.243	0.0450	0.2500	0	97.3	46.2	138				

Sample ID: **1912318-003AMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **12/18/2019**		RunNo: **56144**		
Client ID: **MW1-W-32.0**	Batch ID: **R56144**					Analysis Date: **12/18/2019**		SeqNo: **1118494**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.246	0.0450	0.2500	0	98.3	46.2	138	0.2432	1.02	20	

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**1912318**
Logged by:	**Carissa True**	Date Received:	**12/18/2019 4:40:00 PM**

Chain of Custody

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

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Required ☑
6.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
7.	Were all items received at a temperature of >0°C to 10.0°C *	Yes ☑	No ☐	NA ☐
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
10.	Are samples properly preserved?	Yes ☑	No ☐	
11.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
12.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
14.	Does paperwork match bottle labels?	Yes ☑	No ☐	
15.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
16.	Is it clear what analyses were requested?	Yes ☑	No ☐	
17.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler 1	6.8
Sample 1	6.1

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

1912318

Page # _____ of _____

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 Fax # (206) 283-5044

SUBCONTRACTER

PROJECT NAME/NO.: 912322

PO #: A-512

REMARKS: Please Email Results

TURNAROUND TIME
- ☐ Standard (2 Weeks)
- ☐ RUSH
- Rush charges authorized by:

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Cr6+						Notes
MW10-W-15.0		12/18/19	1015	Water	1				X						
MW8-W-15.0			1020		1				X						
MW1-W-32.0			1335		1				X						
MW5-W15.0			1225		1				X						
MWDUP-W-15.0			1225		1				X						

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

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	D. M-B	~~Michael Erdahl~~ Liz Webber-Bruya	Friedman & Bruya	12/18/19	
Received by:		Sara Reinhart-Mauger	FA1	12/19/19	1640
Relinquished by:					
Received by:					

912322

SAMPLE CHAIN OF CUSTODY ME12-18-19

Page # 1 of 1 VWZ

Report To Heather Good
Company Maul Foster & Alongi
Address 1329 N. State St, Ste 301
City, State, ZIP Bellingham, WA 98225
Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (signature)

PROJECT NAME: Precision Engineering
PO #: 180301-01

REMARKS: *Metals include As, Cr, Cu, & Se only
Project specific RLs? - Yes / No

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
☒ Standard turnaround AI4 004
☐ RUSH
Rush charges authorized by:

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	Diesel/Motor Oil NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260C	8270D SIM PAHs EPA [redacted]	PCBs EPA 8082	Hexchrom by SM 3500CRB	Diss. metals by EPA 6020B*			Notes
MW10-W-15.0	01A-G	12/18/19	[redacted]1015	W	7	X				X	X		X	X			
MW8-W-15.0	02		1020	W	7	X				X	X		X	X			
Trip Blank	03A,B		N	W	2					X							
MW1-W-32.0	04A-G		1335	W	7	X				X	X		X	X			labelled MW1-W-32.0
MW5-W-15.0	05		1225	W	7	X				X	X		X	X			½L 40 label DB
MW DUP-W-15.0	06	↓	1225	W	7	X				X	X		X	X			
per #G 12/19/19 AB																	
																	Samples received at 4 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Amanda Bixby	MFA	12/18/19	1500
Received by:	VINH	FBI	12/18/19	1500
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

December 30, 2019

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

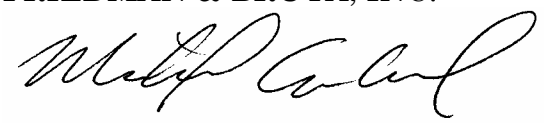
Dear Ms Good:

Included are the results from the testing of material submitted on December 18, 2019 from the Precision Engineering 1803.01.01, F&BI 912298 project. There are 17 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
MFA1230R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on December 18, 2019 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.01, F&BI 912298 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
912298 -01	MW3-W-15.0
912298 -02	MW4-W-20.0

The samples were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

The 8260C method blank showed the presence of methylene chloride due to laboratory contamination. The data were qualified accordingly.

Several 8260C compounds exceeded the acceptance criteria in the matrix spike sample. The laboratory control samples met the acceptance criteria, therefore the data were likely due to sample matrix effect.

All other quality control requirements were acceptable.

Date of Report: 12/30/19
Date Received: 12/18/19
Project: Precision Engineering 1803.01.01, F&BI 912298
Date Extracted: 12/18/19
Date Analyzed: 12/18/19

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 47-140)
MW3-W-15.0 912298-01	65 x	<250	138
MW4-W-20.0 912298-02	<50	<250	127
Method Blank 09-3058 MB	<50	<250	123

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/23/19	Lab ID:	912298-01
Date Analyzed:	12/23/19	Data File:	912298-01.159
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	8.81
Chromium	<1
Copper	<5
Selenium	<2

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW4-W-20.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/23/19	Lab ID:	912298-02
Date Analyzed:	12/23/19	Data File:	912298-02.160
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	13.5
Chromium	<1
Copper	<5
Selenium	<2

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/23/19	Lab ID:	I9-826 mb
Date Analyzed:	12/23/19	Data File:	I9-826 mb.044
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<2

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/18/19	Lab ID:	912298-01 1/2
Date Analyzed:	12/18/19	Data File:	121814.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	98	31	160
Benzo(a)anthracene-d12	107	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW4-W-20.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/18/19	Lab ID:	912298-02 1/2
Date Analyzed:	12/18/19	Data File:	121815.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	97	31	160
Benzo(a)anthracene-d12	105	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/18/19	Lab ID:	09-3060 mb
Date Analyzed:	12/18/19	Data File:	121808.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	102	31	160
Benzo(a)anthracene-d12	112	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912298-01
Date Analyzed:	12/19/19	Data File:	121915.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	50	150
Toluene-d8	107	50	150
4-Bromofluorobenzene	111	50	150

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW4-W-20.0	Client:	Maul Foster Alongi
Date Received:	12/18/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912298-02
Date Analyzed:	12/19/19	Data File:	121916.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	50	150
Toluene-d8	106	50	150
4-Bromofluorobenzene	110	50	150

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	09-3067 mb
Date Analyzed:	12/19/19	Data File:	121937.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	50	150
Toluene-d8	105	50	150
4-Bromofluorobenzene	110	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<50	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<1	o-Xylene	<1
Methylene chloride	6.0 lc	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	<1
trans-1,2-Dichloroethene	<1	Bromoform	<1
1,1-Dichloroethane	<1	n-Propylbenzene	<1
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<1
2-Butanone (MEK)	<10	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<1	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<1	1,2,4-Trimethylbenzene	<1
Benzene	<0.35	sec-Butylbenzene	<1
Trichloroethene	<1	p-Isopropyltoluene	<1
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<1	1,4-Dichlorobenzene	<1
Dibromomethane	<1	1,2-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<1	1,2,4-Trichlorobenzene	<1
Toluene	<1	Hexachlorobutadiene	<1
trans-1,3-Dichloropropene	<1	Naphthalene	<1
1,1,2-Trichloroethane	<1	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

Date of Report: 12/30/19
Date Received: 12/18/19
Project: Precision Engineering 1803.01.01, F&BI 912298

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	112	108	61-133	4

Date of Report: 12/30/19
Date Received: 12/18/19
Project: Precision Engineering 1803.01.01, F&BI 912298

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

Laboratory Code: 912395-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	3.72	84	79	75-125	6
Chromium	ug/L (ppb)	20	2.85	91	87	75-125	4
Copper	ug/L (ppb)	20	20.7	87	81	75-125	7
Selenium	ug/L (ppb)	5	<2	79	74	75-125	7

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	99	80-120
Chromium	ug/L (ppb)	20	98	80-120
Copper	ug/L (ppb)	20	100	80-120
Selenium	ug/L (ppb)	5	96	80-120

Date of Report: 12/30/19
Date Received: 12/18/19
Project: Precision Engineering 1803.01.01, F&BI 912298

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270D SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	78	80	57-114	3
Acenaphthylene	ug/L (ppb)	1	85	86	65-119	1
Acenaphthene	ug/L (ppb)	1	84	86	66-118	2
Fluorene	ug/L (ppb)	1	87	86	64-125	1
Phenanthrene	ug/L (ppb)	1	85	87	67-120	2
Anthracene	ug/L (ppb)	1	89	89	65-122	0
Fluoranthene	ug/L (ppb)	1	95	89	65-127	7
Pyrene	ug/L (ppb)	1	89	88	62-130	1
Benz(a)anthracene	ug/L (ppb)	1	92	94	60-118	2
Chrysene	ug/L (ppb)	1	88	90	66-125	2
Benzo(b)fluoranthene	ug/L (ppb)	1	84	88	55-135	5
Benzo(k)fluoranthene	ug/L (ppb)	1	77	80	62-125	4
Benzo(a)pyrene	ug/L (ppb)	1	81	82	58-127	1
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	74	71	36-142	4
Dibenz(a,h)anthracene	ug/L (ppb)	1	65	65	37-133	0
Benzo(g,h,i)perylene	ug/L (ppb)	1	67	67	34-135	0

Date of Report: 12/30/19
Date Received: 12/18/19
Project: Precision Engineering 1803.01.01, F&BI 912298

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

Laboratory Code: 912298-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	110	55-137
Chloromethane	ug/L (ppb)	50	<10	112	57-129
Vinyl chloride	ug/L (ppb)	50	<0.2	107	61-139
Bromomethane	ug/L (ppb)	50	<1	104	20-265
Chloroethane	ug/L (ppb)	50	<1	97	55-149
Trichlorofluoromethane	ug/L (ppb)	50	<1	86	65-137
Acetone	ug/L (ppb)	250	<50	98	48-149
1,1-Dichloroethene	ug/L (ppb)	50	<1	86	71-123
Hexane	ug/L (ppb)	50	<1	88	44-139
Methylene chloride	ug/L (ppb)	50	<5	107	61-126
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	105	68-125
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	101	72-122
1,1-Dichloroethane	ug/L (ppb)	50	<1	114 vo	79-113
2,2-Dichloropropane	ug/L (ppb)	50	<1	69	48-157
cis-1,2-Dichloroethene	ug/L (ppb)	50	<1	103	63-126
Chloroform	ug/L (ppb)	50	<1	110	77-117
2-Butanone (MEK)	ug/L (ppb)	250	<10	135	70-135
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	126 vo	70-119
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	104	75-121
1,1-Dichloropropene	ug/L (ppb)	50	<1	117	67-121
Carbon tetrachloride	ug/L (ppb)	50	<1	102	70-132
Benzene	ug/L (ppb)	50	<0.35	112	75-114
Trichloroethene	ug/L (ppb)	50	<1	112	73-122
1,2-Dichloropropane	ug/L (ppb)	50	<1	123 vo	80-111
Bromodichloromethane	ug/L (ppb)	50	<1	125 vo	78-117
Dibromomethane	ug/L (ppb)	50	<1	113	73-125
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	139	79-140
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	122 vo	76-120
Toluene	ug/L (ppb)	50	<1	107	73-117
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	116	75-122
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	120 vo	81-116
2-Hexanone	ug/L (ppb)	250	<10	146 vo	74-127
1,3-Dichloropropane	ug/L (ppb)	50	<1	118 vo	80-113
Tetrachloroethene	ug/L (ppb)	50	<1	94	40-155
Dibromochloromethane	ug/L (ppb)	50	<1	104	69-129
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	120	79-120
Chlorobenzene	ug/L (ppb)	50	<1	105	75-115
Ethylbenzene	ug/L (ppb)	50	<1	107	66-124
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	106	76-130
m,p-Xylene	ug/L (ppb)	100	<2	104	63-128
o-Xylene	ug/L (ppb)	50	<1	104	64-129
Styrene	ug/L (ppb)	50	<1	109	56-142
Isopropylbenzene	ug/L (ppb)	50	<1	104	74-122
Bromoform	ug/L (ppb)	50	<1	109	49-138
n-Propylbenzene	ug/L (ppb)	50	<1	107	65-129
Bromobenzene	ug/L (ppb)	50	<1	103	70-121
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	106	60-138
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	132 vo	77-120
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	130 vo	62-125
2-Chlorotoluene	ug/L (ppb)	50	<1	107	40-159
4-Chlorotoluene	ug/L (ppb)	50	<1	107	76-122
tert-Butylbenzene	ug/L (ppb)	50	<1	107	74-125
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	105	59-136
sec-Butylbenzene	ug/L (ppb)	50	<1	108	69-127
p-Isopropyltoluene	ug/L (ppb)	50	<1	103	64-132
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	102	77-113
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	100	75-110
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	104	70-120
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	136 vo	69-129
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	98	66-123
Hexachlorobutadiene	ug/L (ppb)	50	<1	92	53-136
Naphthalene	ug/L (ppb)	50	<1	115	60-145
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	106	59-130

Date of Report: 12/30/19
Date Received: 12/18/19
Project: Precision Engineering 1803.01.01, F&BI 912298

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	109	130	50-157	18
Chloromethane	ug/L (ppb)	50	109	118	62-130	8
Vinyl chloride	ug/L (ppb)	50	107	112	70-128	5
Bromomethane	ug/L (ppb)	50	119	126	60-143	6
Chloroethane	ug/L (ppb)	50	115	122	66-149	6
Trichlorofluoromethane	ug/L (ppb)	50	109	114	65-138	4
Acetone	ug/L (ppb)	250	95	97	44-145	2
1,1-Dichloroethene	ug/L (ppb)	50	107	115	72-121	7
Hexane	ug/L (ppb)	50	109	115	51-153	5
Methylene chloride	ug/L (ppb)	50	105	116	63-132	10
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	107	115	70-122	7
trans-1,2-Dichloroethene	ug/L (ppb)	50	104	112	76-118	7
1,1-Dichloroethane	ug/L (ppb)	50	103	111	77-119	7
2,2-Dichloropropane	ug/L (ppb)	50	106	111	62-141	5
cis-1,2-Dichloroethene	ug/L (ppb)	50	105	113	76-119	7
Chloroform	ug/L (ppb)	50	100	108	78-117	8
2-Butanone (MEK)	ug/L (ppb)	250	94	100	48-150	6
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	103	109	75-116	6
1,1,1-Trichloroethane	ug/L (ppb)	50	108	115	80-116	6
1,1-Dichloropropene	ug/L (ppb)	50	102	108	78-119	6
Carbon tetrachloride	ug/L (ppb)	50	111	117	72-128	5
Benzene	ug/L (ppb)	50	103	109	75-116	6
Trichloroethene	ug/L (ppb)	50	99	105	72-119	6
1,2-Dichloropropane	ug/L (ppb)	50	104	109	79-121	5
Bromodichloromethane	ug/L (ppb)	50	104	110	76-120	6
Dibromomethane	ug/L (ppb)	50	101	106	79-121	5
4-Methyl-2-pentanone	ug/L (ppb)	250	104	109	54-153	5
cis-1,3-Dichloropropene	ug/L (ppb)	50	110	116	76-128	5
Toluene	ug/L (ppb)	50	96	102	79-115	6
trans-1,3-Dichloropropene	ug/L (ppb)	50	102	110	76-128	8
1,1,2-Trichloroethane	ug/L (ppb)	50	94	101	78-120	7
2-Hexanone	ug/L (ppb)	250	95	101	49-147	6
1,3-Dichloropropane	ug/L (ppb)	50	95	101	81-111	6
Tetrachloroethene	ug/L (ppb)	50	98	104	78-109	6
Dibromochloromethane	ug/L (ppb)	50	103	110	63-140	7
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	95	101	82-118	6
Chlorobenzene	ug/L (ppb)	50	97	103	80-113	6
Ethylbenzene	ug/L (ppb)	50	99	105	83-111	6
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	104	111	76-125	7
m,p-Xylene	ug/L (ppb)	100	98	104	81-112	6
o-Xylene	ug/L (ppb)	50	99	104	81-117	5
Styrene	ug/L (ppb)	50	98	104	83-121	6
Isopropylbenzene	ug/L (ppb)	50	100	105	78-118	5
Bromoform	ug/L (ppb)	50	108	115	40-161	6
n-Propylbenzene	ug/L (ppb)	50	97	103	81-115	6
Bromobenzene	ug/L (ppb)	50	95	103	80-113	8
1,3,5-Trimethylbenzene	ug/L (ppb)	50	100	106	83-117	6
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	96	104	79-118	8
1,2,3-Trichloropropane	ug/L (ppb)	50	95	103	74-116	8
2-Chlorotoluene	ug/L (ppb)	50	97	104	79-112	7
4-Chlorotoluene	ug/L (ppb)	50	97	103	80-116	6
tert-Butylbenzene	ug/L (ppb)	50	100	106	81-119	6
1,2,4-Trimethylbenzene	ug/L (ppb)	50	98	104	81-121	6
sec-Butylbenzene	ug/L (ppb)	50	98	103	83-123	5
p-Isopropyltoluene	ug/L (ppb)	50	98	102	81-117	4
1,3-Dichlorobenzene	ug/L (ppb)	50	98	104	80-115	6
1,4-Dichlorobenzene	ug/L (ppb)	50	95	101	77-112	6
1,2-Dichlorobenzene	ug/L (ppb)	50	99	104	79-115	5
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	101	108	62-133	7
1,2,4-Trichlorobenzene	ug/L (ppb)	50	101	106	75-119	5
Hexachlorobutadiene	ug/L (ppb)	50	95	97	70-116	2
Naphthalene	ug/L (ppb)	50	100	107	72-131	7
1,2,3-Trichlorobenzene	ug/L (ppb)	50	98	105	74-122	7

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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

Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 912298
Work Order Number: 1912306

December 26, 2019

Attention Michael Erdahl:

Fremont Analytical, Inc. received 2 sample(s) on 12/18/2019 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

CC:
Eric Young

Date: *12/26/2019*

CLIENT: Friedman & Bruya
Project: 912298
Work Order: 1912306

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1912306-001	MW3-W-15.0	12/17/2019 4:16 PM	12/18/2019 11:34 AM
1912306-002	MW4-W-20.0	12/17/2019 4:20 PM	12/18/2019 11:34 AM

Case Narrative

WO#: **1912306**

Date: **12/26/2019**

CLIENT: Friedman & Bruya
Project: 912298

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **1912306**
Date Reported: **12/26/2019**

CLIENT: Friedman & Bruya
Project: 912298

Lab ID: 1912306-001 **Collection Date:** 12/17/2019 4:16:00 PM
Client Sample ID: **MW3-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R56144		Analyst: WF
Chromium, Hexavalent	ND	0.0900	DH	mg/L	2	12/18/2019 7:16:00 PM

NOTES:
Diluted due to matrix.

Lab ID: 1912306-002 **Collection Date:** 12/17/2019 4:20:00 PM
Client Sample ID: **MW4-W-20.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R56144		Analyst: WF
Chromium, Hexavalent	ND	0.0450	H	mg/L	1	12/18/2019 7:21:00 PM

Work Order: 1912306
CLIENT: Friedman & Bruya
Project: 912298

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-56144**	SampType: **MBLK**			Units: **mg/L**		Prep Date: **12/18/2019**		RunNo: **56144**		
Client ID: **MBLKW**	Batch ID: **R56144**					Analysis Date: **12/18/2019**		SeqNo: **1118489**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-56144**	SampType: **LCS**			Units: **mg/L**		Prep Date: **12/18/2019**		RunNo: **56144**		
Client ID: **LCSW**	Batch ID: **R56144**					Analysis Date: **12/18/2019**		SeqNo: **1118490**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.236	0.0450	0.2500	0	94.4	80.9	115				

Sample ID: **1912318-003ADUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **12/18/2019**		RunNo: **56144**		
Client ID: **BATCH**	Batch ID: **R56144**					Analysis Date: **12/18/2019**		SeqNo: **1118492**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		30	

Sample ID: **1912318-003AMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **12/18/2019**		RunNo: **56144**		
Client ID: **BATCH**	Batch ID: **R56144**					Analysis Date: **12/18/2019**		SeqNo: **1118493**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.243	0.0450	0.2500	0	97.3	46.2	138				

Sample ID: **1912318-003AMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **12/18/2019**		RunNo: **56144**		
Client ID: **BATCH**	Batch ID: **R56144**					Analysis Date: **12/18/2019**		SeqNo: **1118494**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.246	0.0450	0.2500	0	98.3	46.2	138	0.2432	1.02	20	

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**1912306**
Logged by:	**Carissa True**	Date Received:	**12/18/2019 11:34:00 AM**

Chain of Custody

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

Log In

3.	Coolers are present?	Yes	☐	No ☑	NA	☐
	Samples received at appropriate temperature					
4.	Shipping container/cooler in good condition?	Yes	☑	No ☐		
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes	☐	No ☑	Not Required	☐
6.	Was an attempt made to cool the samples?	Yes	☑	No ☐	NA	☐
7.	Were all items received at a temperature of >0°C to 10.0°C *	Yes	☑	No ☐	NA	☐
8.	Sample(s) in proper container(s)?	Yes	☑	No ☐		
9.	Sufficient sample volume for indicated test(s)?	Yes	☑	No ☐		
10.	Are samples properly preserved?	Yes	☑	No ☐		
11.	Was preservative added to bottles?	Yes	☐	No ☑	NA	☐
12.	Is there headspace in the VOA vials?	Yes	☐	No ☐	NA	☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes	☑	No ☐		
14.	Does paperwork match bottle labels?	Yes	☑	No ☐		
15.	Are matrices correctly identified on Chain of Custody?	Yes	☑	No ☐		
16.	Is it clear what analyses were requested?	Yes	☑	No ☐		
17.	Were all holding times able to be met?	Yes	☐	No ☑		

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Sample 1	6.8

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

1912306

Page # 1 of 1

Send Report To Michael Erdahl
Company Friedman and Bruya, Inc.
Address 3012 16th Ave W
City, State, ZIP Seattle, WA 98119
Phone # (206) 285-8282 Fax # (206) 283-5044

SUBCONTRACTER Fremont
PROJECT NAME/NO. 912298
PO # A-513
REMARKS Please Email Results

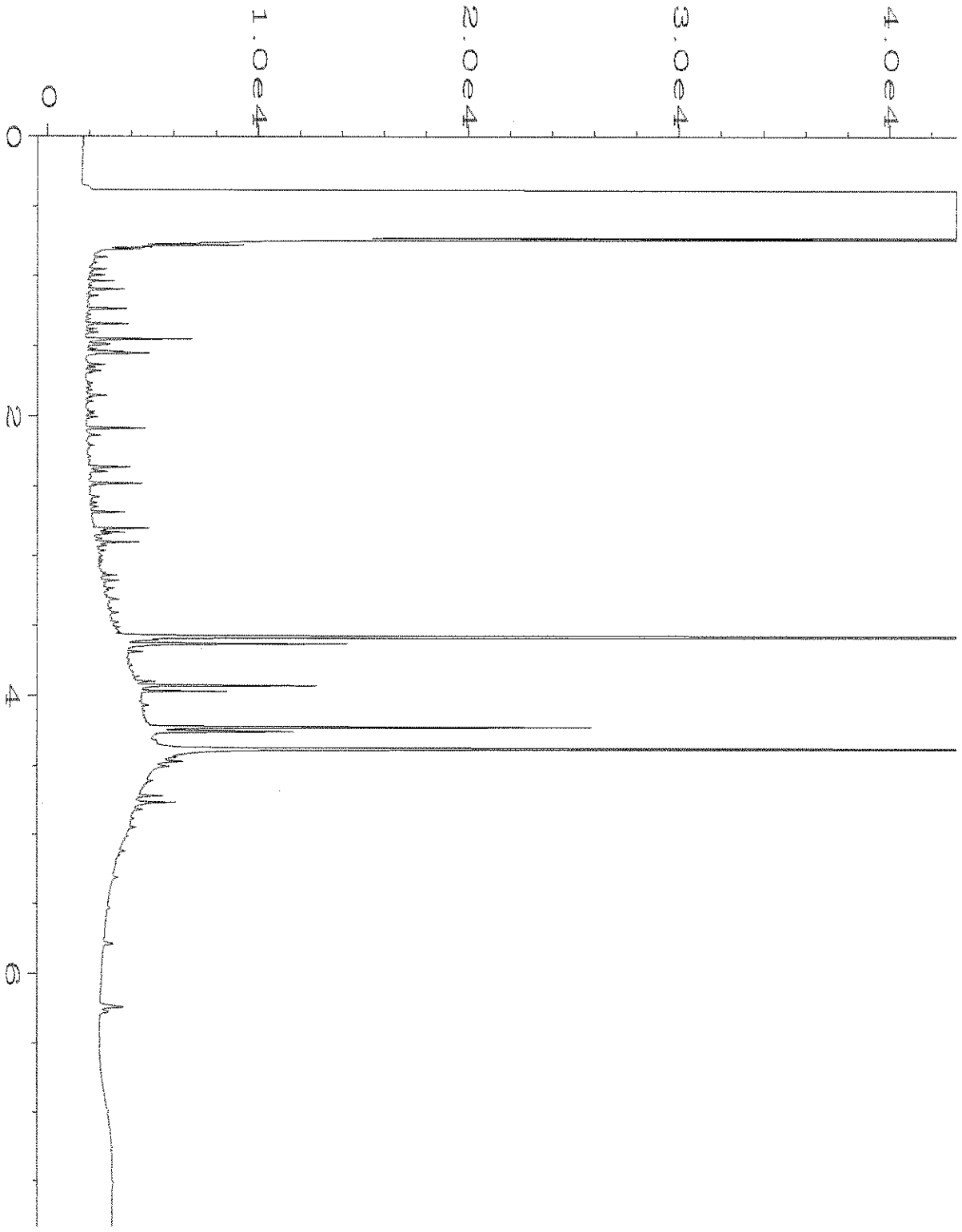
TURNAROUND TIME
☒ Standard (~~2 Weeks~~) Week
☐ RUSH
Rush charges authorized by:

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

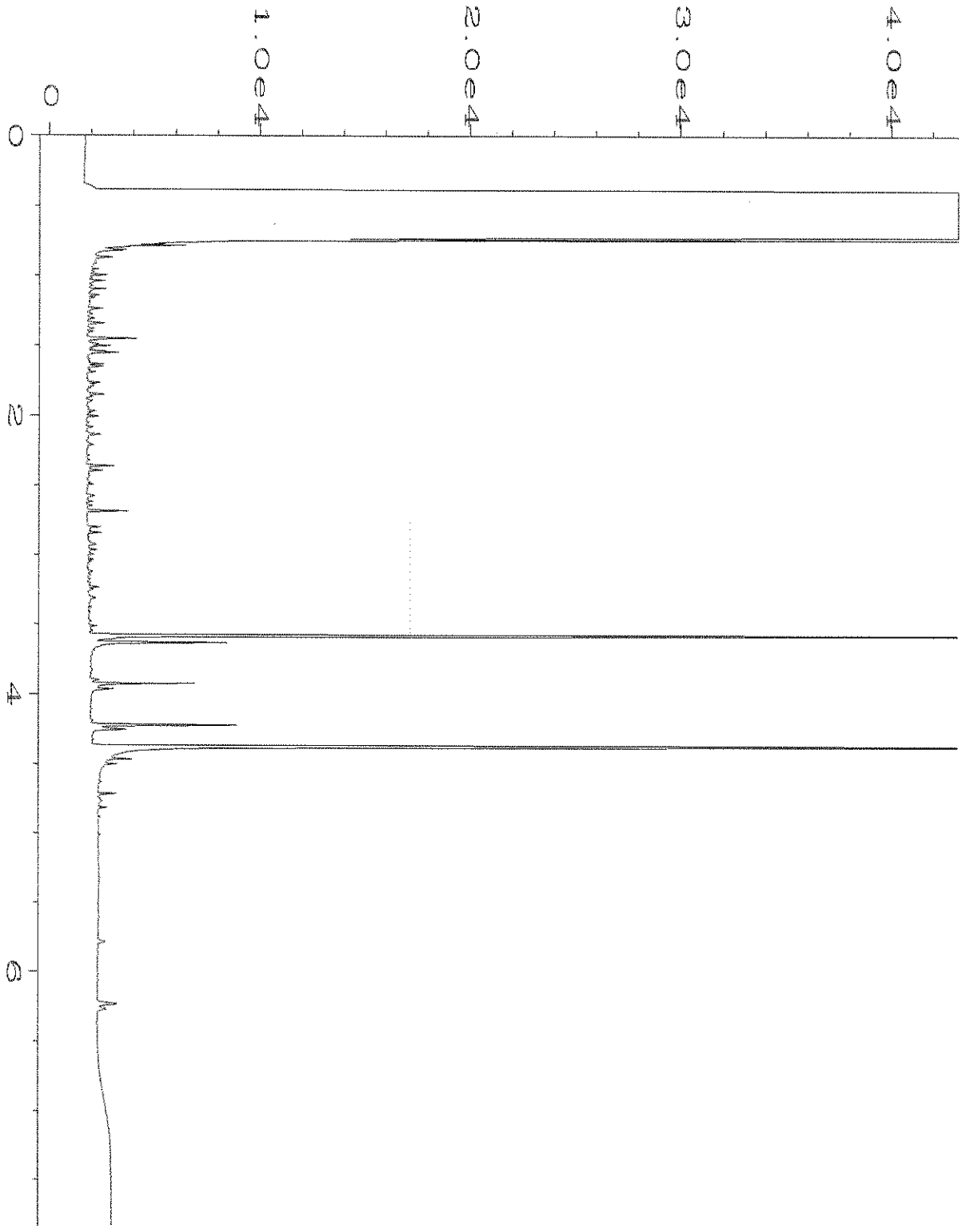
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Chrome VI						Notes
MW3-W-15.0		12/17/15	1616	water					X						
MW4-W-20.0		"	1620	"					X						

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

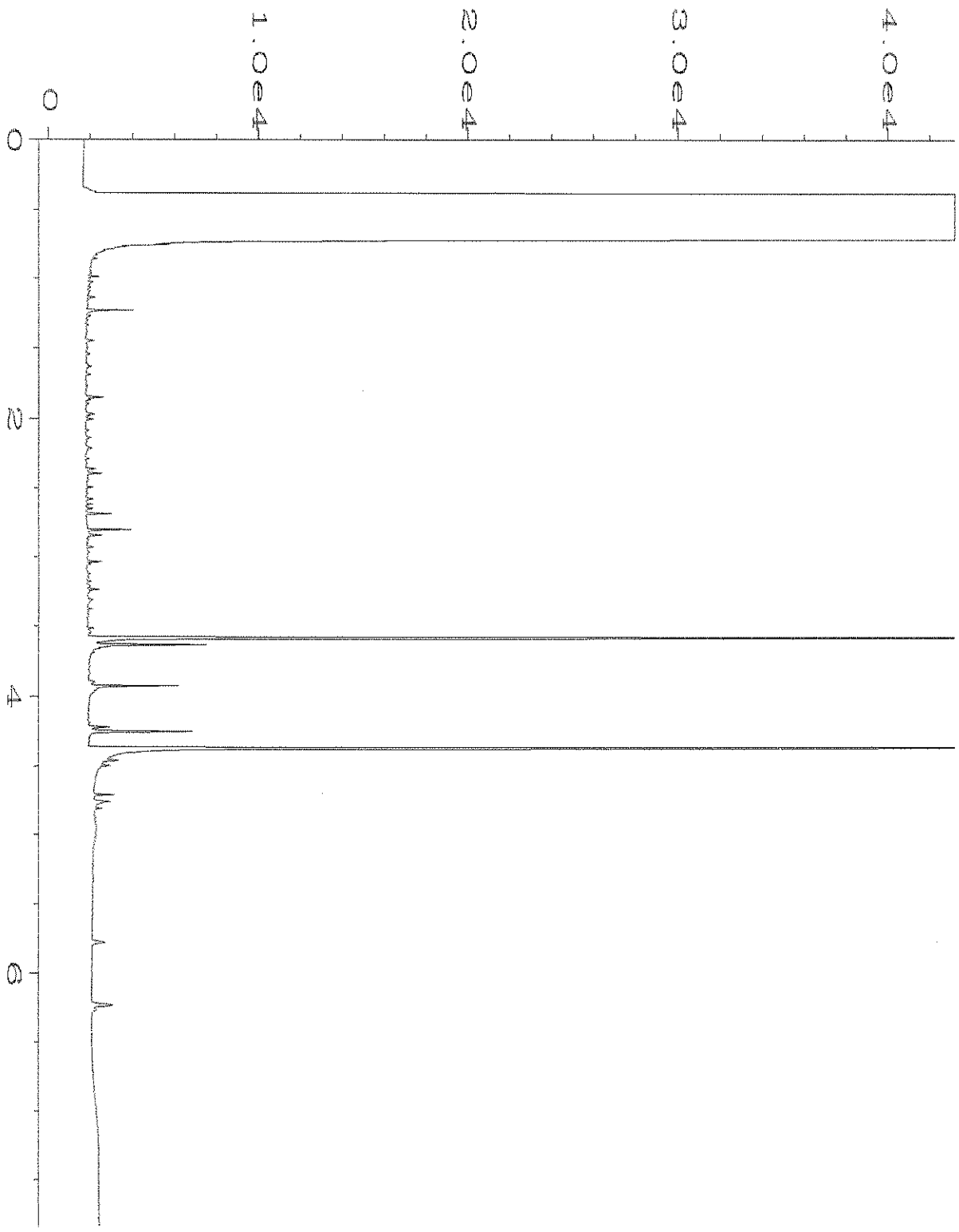
	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	12/18/15	10:08
Received by:		Sara Becker-Mayer	FAI	12/18/15	1134
Relinquished by:					
Received by:					



Data File Name	: C:\HPCHEM\4\DATA\12-18-19\030F1101.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 30
Sample Name	: 912298-01	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 11
Acquired on	: 18 Dec 19 05:08 PM	Instrument Method	: DX.MTH
Report Created on:	19 Dec 19 09:00 AM	Analysis Method	: DEFAULT.MTH

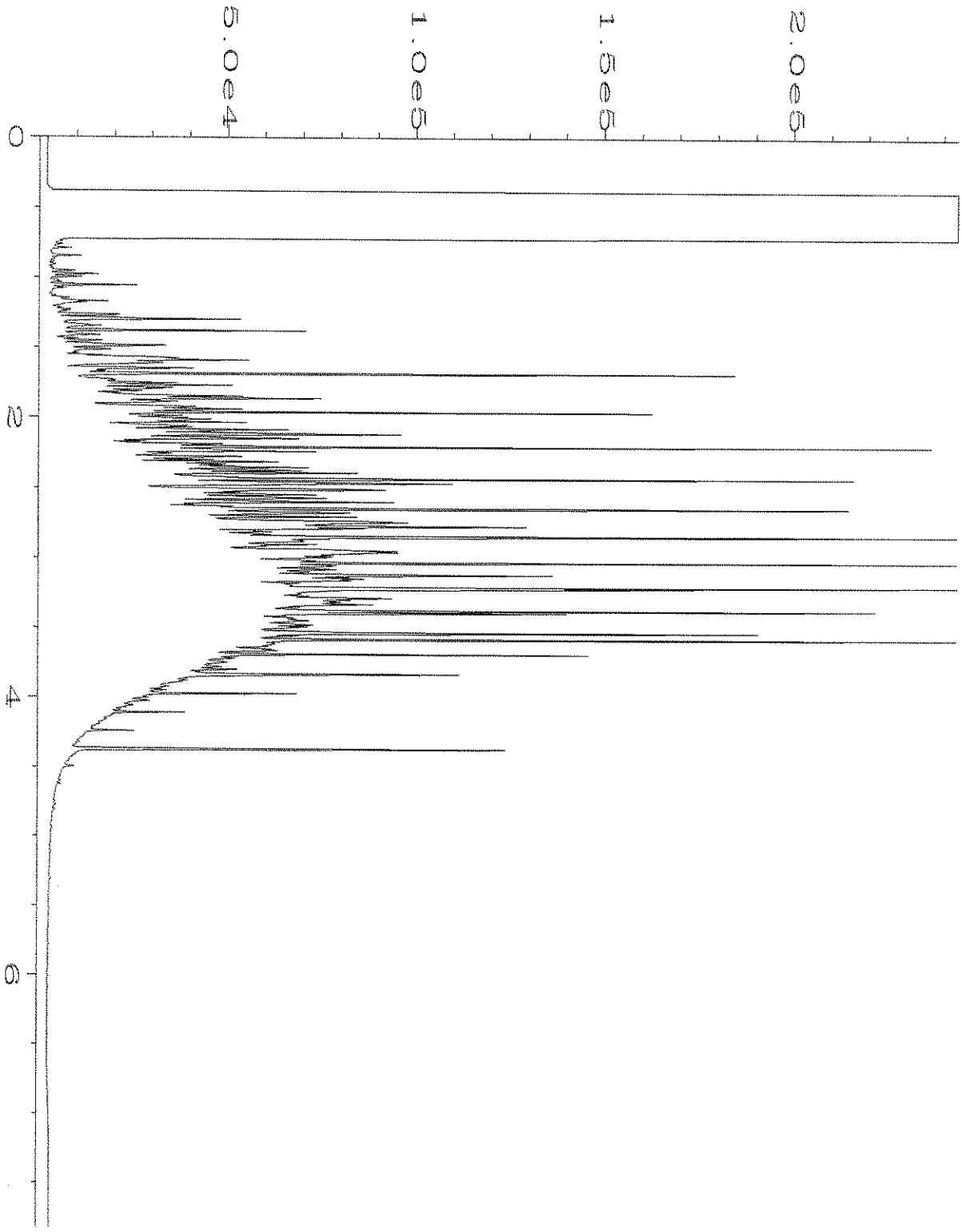


Data File Name	: C:\HPCHEM\4\DATA\12-18-19\031F1101.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 31
Sample Name	: 912298-02	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 11
Acquired on	: 18 Dec 19 05:20 PM	Instrument Method	: DX.MTH
Report Created on:	19 Dec 19 09:00 AM	Analysis Method	: DEFAULT.MTH



Data File Name : C:\HPCHEM\4\DATA\12-18-19\015F0701.D
Operator : TL
Instrument : GC#4
Sample Name : 09-3058 mb
Run Time Bar Code:
Acquired on : 18 Dec 19 12:54 PM
Report Created on: 19 Dec 19 08:58 AM

Page Number : 1
Vial Number : 15
Injection Number : 1
Sequence Line : 7
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name	: C:\HPCHEM\4\DATA\12-18-19\005F1501.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 5
Sample Name	: 1000 Dx 58-146C	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 15
Acquired on	: 18 Dec 19 09:00 PM	Instrument Method	: DX.MTH
Report Created on	: 19 Dec 19 08:58 AM	Analysis Method	: DEFAULT.MTH

912298

SAMPLE CHAIN OF CUSTODY

ME 12-18-19

Page # 1 of 1 VW2

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N State St, Ste 301

City, State, ZIP Bellingham, WA 98225

Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (*signature*) Amanda Birby

PROJECT NAME: Precision Engineering

PO #: 1803.01.01

REMARKS: *metals include As, Cr, Cu, & Se only

Project specific RLs? - Yes / No

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
- [X] Standard turnaround ATI DOH
- [ ] RUSH
- Rush charges authorized by:

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	Diesel/Motor oil NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260C 82760 SIM	PAHs EPA	PCBs EPA 8082	Hex chrom by SM 3500 CrB	Dissolved metals by EPA 6020B*			Notes
MW3-W-15.0	01 A-G	12/17/19	1616	W	7	X				X	X		X	X			
MW4-W-20.0	02	↓	1620	W	7	X				X	X		X	X			
~~Trip Blank~~			~~N/A~~	~~W~~	~~2~~												

Samples received at 4 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Amanda Birby	Amanda Birby	MFA	12/18/19	0830
Received by: VWH	VWH	FBI	12/18/19	8:30
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

December 30, 2019

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

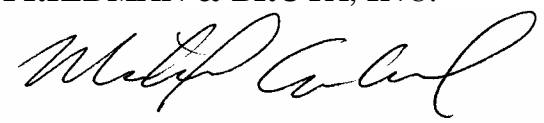
Dear Ms Good:

Included are the results from the testing of material submitted on December 17, 2019 from the Precision Engineering 1803.01.01, F&BI 912292 project. There are 27 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
MFA1230R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on December 17, 2019 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.01, F&BI 912292 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
912292 -01	MW9-W-33.5
912292 -02	MW2-W-15.0
912292 -03	MW7-W-27.5
912292 -04	MW6-W-15.0
912292 -05	Trip Blank
912292 -06	MW11-W-15.0

Samples MW9-W-33.5, MW2-W-15.0, MW7-W-27.5, MW6-W-15.0, and MW11-W-15.0 were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

The 8260C sample Trip Blank showed the presence of methylene chloride due to laboratory contamination. The data were qualified accordingly. In addition, the 8260C samples MW2-W-15.0 and MW6-W-15.0 were performed at a dilution due to the sample matrix (foamy).

The 6020B calibration standard failed the acceptance criteria for arsenic and selenium for sample MW6-W-15.0. The sample was diluted and reanalyzed with acceptable results. Both data sets were reported.

All other quality control requirements were acceptable.

Date of Report: 12/30/19
Date Received: 12/17/19
Project: Precision Engineering 1803.01.01, F&BI 912292
Date Extracted: 12/18/19
Date Analyzed: 12/18/19

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 47-140)
MW9-W-33.5 912292-01	200 x	330 x	122
MW2-W-15.0 912292-02	450 x	790 x	115
MW7-W-27.5 912292-03	99 x	<250	122
MW6-W-15.0 912292-04	410 x	700 x	ip
MW11-W-15.0 912292-06	250 x	430 x	135
Method Blank 09-3058 MB	<50	<250	123

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW9-W-33.5	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912292-01
Date Analyzed:	12/24/19	Data File:	912292-01.122
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	11.5
Chromium	21.6
Copper	<5
Selenium	4.66

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW2-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912292-02
Date Analyzed:	12/24/19	Data File:	912292-02.123
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	9.05
Chromium	8.42
Copper	<5
Selenium	10.8

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW7-W-27.5	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912292-03
Date Analyzed:	12/24/19	Data File:	912292-03.128
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	9.03
Chromium	1.75
Copper	<5
Selenium	8.21

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW6-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912292-04
Date Analyzed:	12/24/19	Data File:	912292-04.197
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	41.2 ca
Chromium	17.4
Copper	<5
Selenium	11.7 ca

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW6-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912292-04 x10
Date Analyzed:	12/26/19	Data File:	912292-04 x10.071
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	46.4
Selenium	13.5

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	912292-06
Date Analyzed:	12/24/19	Data File:	912292-06.125
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	6.16
Chromium	2.48
Copper	<5
Selenium	2.66

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/19/19	Lab ID:	I9-816 mb
Date Analyzed:	12/19/19	Data File:	I9-816 mb.065
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW9-W-33.5	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/18/19	Lab ID:	912292-01 1/2
Date Analyzed:	12/18/19	Data File:	121809.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	102	31	160
Benzo(a)anthracene-d12	108	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW2-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/18/19	Lab ID:	912292-02 1/2
Date Analyzed:	12/18/19	Data File:	121810.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	101	31	160
Benzo(a)anthracene-d12	108	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW7-W-27.5	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/18/19	Lab ID:	912292-03 1/2
Date Analyzed:	12/18/19	Data File:	121811.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	99	31	160
Benzo(a)anthracene-d12	101	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW6-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/18/19	Lab ID:	912292-04 1/2
Date Analyzed:	12/18/19	Data File:	121812.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	103	31	160
Benzo(a)anthracene-d12	113	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/18/19	Lab ID:	912292-06 1/2
Date Analyzed:	12/18/19	Data File:	121813.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	98	31	160
Benzo(a)anthracene-d12	105	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	1.7
Fluorene	0.15
Phenanthrene	0.061
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/18/19	Lab ID:	09-3060 mb
Date Analyzed:	12/18/19	Data File:	121808.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	102	31	160
Benzo(a)anthracene-d12	112	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW9-W-33.5	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/23/19	Lab ID:	912292-01
Date Analyzed:	12/23/19	Data File:	122324.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	50	150
Toluene-d8	109	50	150
4-Bromofluorobenzene	107	50	150

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW2-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/23/19	Lab ID:	912292-02 1/10
Date Analyzed:	12/24/19	Data File:	122419.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	50	150
Toluene-d8	107	50	150
4-Bromofluorobenzene	100	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW7-W-27.5	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/23/19	Lab ID:	912292-03
Date Analyzed:	12/23/19	Data File:	122321.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	50	150
Toluene-d8	109	50	150
4-Bromofluorobenzene	108	50	150

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW6-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/23/19	Lab ID:	912292-04 1/10
Date Analyzed:	12/24/19	Data File:	122420.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	50	150
Toluene-d8	108	50	150
4-Bromofluorobenzene	102	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	Trip Blank	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/23/19	Lab ID:	912292-05
Date Analyzed:	12/23/19	Data File:	122322.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	50	150
Toluene-d8	110	50	150
4-Bromofluorobenzene	106	50	150

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<1	1,3-Dichloropropane	<1
Chloromethane	<10	Tetrachloroethene	<1
Vinyl chloride	<0.2	Dibromochloromethane	<1
Bromomethane	<1	1,2-Dibromoethane (EDB)	<1
Chloroethane	<1	Chlorobenzene	<1
Trichlorofluoromethane	<1	Ethylbenzene	<1
Acetone	<50	1,1,1,2-Tetrachloroethane	<1
1,1-Dichloroethene	<1	m,p-Xylene	<2
Hexane	<1	o-Xylene	<1
Methylene chloride	6.6 lc	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	<1
trans-1,2-Dichloroethene	<1	Bromoform	<1
1,1-Dichloroethane	<1	n-Propylbenzene	<1
2,2-Dichloropropane	<1	Bromobenzene	<1
cis-1,2-Dichloroethene	<1	1,3,5-Trimethylbenzene	<1
Chloroform	<1	1,1,2,2-Tetrachloroethane	<1
2-Butanone (MEK)	<10	1,2,3-Trichloropropane	<1
1,2-Dichloroethane (EDC)	<1	2-Chlorotoluene	<1
1,1,1-Trichloroethane	<1	4-Chlorotoluene	<1
1,1-Dichloropropene	<1	tert-Butylbenzene	<1
Carbon tetrachloride	<1	1,2,4-Trimethylbenzene	<1
Benzene	<0.35	sec-Butylbenzene	<1
Trichloroethene	<1	p-Isopropyltoluene	<1
1,2-Dichloropropane	<1	1,3-Dichlorobenzene	<1
Bromodichloromethane	<1	1,4-Dichlorobenzene	<1
Dibromomethane	<1	1,2-Dichlorobenzene	<1
4-Methyl-2-pentanone	<10	1,2-Dibromo-3-chloropropane	<10
cis-1,3-Dichloropropene	<1	1,2,4-Trichlorobenzene	<1
Toluene	<1	Hexachlorobutadiene	<1
trans-1,3-Dichloropropene	<1	Naphthalene	<1
1,1,2-Trichloroethane	<1	1,2,3-Trichlorobenzene	<1
2-Hexanone	<10		

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	12/17/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/23/19	Lab ID:	912292-06
Date Analyzed:	12/23/19	Data File:	122323.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	50	150
Toluene-d8	109	50	150
4-Bromofluorobenzene	105	50	150

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	12/23/19	Lab ID:	09-3081 mb
Date Analyzed:	12/23/19	Data File:	122314.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	57	121
Toluene-d8	104	63	127
4-Bromofluorobenzene	93	60	133

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

Date of Report: 12/30/19
Date Received: 12/17/19
Project: Precision Engineering 1803.01.01, F&BI 912292

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	112	108	61-133	4

Date of Report: 12/30/19
Date Received: 12/17/19
Project: Precision Engineering 1803.01.01, F&BI 912292

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

Laboratory Code: 912238-05 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	3.25	91	89	75-125	2
Chromium	ug/L (ppb)	20	<1	94	92	75-125	2
Copper	ug/L (ppb)	20	<5	90	88	75-125	2
Selenium	ug/L (ppb)	5	<1	86	85	75-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	98	80-120
Chromium	ug/L (ppb)	20	100	80-120
Copper	ug/L (ppb)	20	100	80-120
Selenium	ug/L (ppb)	5	95	80-120

Date of Report: 12/30/19
Date Received: 12/17/19
Project: Precision Engineering 1803.01.01, F&BI 912292

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270D SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	78	80	57-114	3
Acenaphthylene	ug/L (ppb)	1	85	86	65-119	1
Acenaphthene	ug/L (ppb)	1	84	86	66-118	2
Fluorene	ug/L (ppb)	1	87	86	64-125	1
Phenanthrene	ug/L (ppb)	1	85	87	67-120	2
Anthracene	ug/L (ppb)	1	89	89	65-122	0
Fluoranthene	ug/L (ppb)	1	95	89	65-127	7
Pyrene	ug/L (ppb)	1	89	88	62-130	1
Benz(a)anthracene	ug/L (ppb)	1	92	94	60-118	2
Chrysene	ug/L (ppb)	1	88	90	66-125	2
Benzo(b)fluoranthene	ug/L (ppb)	1	84	88	55-135	5
Benzo(k)fluoranthene	ug/L (ppb)	1	77	80	62-125	4
Benzo(a)pyrene	ug/L (ppb)	1	81	82	58-127	1
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	74	71	36-142	4
Dibenz(a,h)anthracene	ug/L (ppb)	1	65	65	37-133	0
Benzo(g,h,i)perylene	ug/L (ppb)	1	67	67	34-135	0

Date of Report: 12/30/19
Date Received: 12/17/19
Project: Precision Engineering 1803.01.01, F&BI 912292

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	122	140	25-158	14
Chloromethane	ug/L (ppb)	50	122	127	45-156	4
Vinyl chloride	ug/L (ppb)	50	116	123	50-154	6
Bromomethane	ug/L (ppb)	50	127	137	55-143	8
Chloroethane	ug/L (ppb)	50	121	129	58-146	6
Trichlorofluoromethane	ug/L (ppb)	250	117	123	50-150	5
Acetone	ug/L (ppb)	250	99	98	53-131	1
1,1-Dichloroethene	ug/L (ppb)	50	118	121	67-136	3
Hexane	ug/L (ppb)	50	109	108	57-137	1
Methylene chloride	ug/L (ppb)	50	118	122	39-148	3
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	118	121	64-147	3
trans-1,2-Dichloroethene	ug/L (ppb)	50	116	117	68-128	1
1,1-Dichloroethane	ug/L (ppb)	50	114	116	79-121	2
2,2-Dichloropropane	ug/L (ppb)	50	105	112	55-143	6
cis-1,2-Dichloroethene	ug/L (ppb)	50	116	119	80-123	3
Chloroform	ug/L (ppb)	50	111	113	80-121	2
2-Butanone (MEK)	ug/L (ppb)	250	106	107	57-149	1
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	114	117	73-132	3
1,1,1-Trichloroethane	ug/L (ppb)	50	117	121	81-125	3
1,1-Dichloropropene	ug/L (ppb)	50	112	114	77-129	2
Carbon tetrachloride	ug/L (ppb)	50	120	124	75-158	3
Benzene	ug/L (ppb)	50	114	117	69-134	3
Trichloroethene	ug/L (ppb)	50	109	112	79-113	3
1,2-Dichloropropane	ug/L (ppb)	50	114	117	77-123	3
Bromodichloromethane	ug/L (ppb)	50	115	119	81-133	3
Dibromomethane	ug/L (ppb)	50	112	113	82-125	1
4-Methyl-2-pentanone	ug/L (ppb)	250	114	116	65-138	2
cis-1,3-Dichloropropene	ug/L (ppb)	50	123	125	82-132	2
Toluene	ug/L (ppb)	50	99	102	72-122	3
trans-1,3-Dichloropropene	ug/L (ppb)	50	109	111	80-136	2
1,1,2-Trichloroethane	ug/L (ppb)	50	100	101	75-124	1
2-Hexanone	ug/L (ppb)	250	98	101	60-136	3
1,3-Dichloropropane	ug/L (ppb)	50	101	104	76-126	3
Tetrachloroethene	ug/L (ppb)	50	99	103	76-121	4
Dibromochloromethane	ug/L (ppb)	50	110	113	84-133	3
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	101	103	82-115	2
Chlorobenzene	ug/L (ppb)	50	100	104	83-114	4
Ethylbenzene	ug/L (ppb)	50	102	106	77-124	4
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	107	112	84-127	5
m,p-Xylene	ug/L (ppb)	100	101	104	81-112	3
o-Xylene	ug/L (ppb)	50	101	105	81-121	4
Styrene	ug/L (ppb)	50	101	106	84-119	5
Isopropylbenzene	ug/L (ppb)	50	101	106	80-117	5
Bromoform	ug/L (ppb)	50	117	120	74-136	3
n-Propylbenzene	ug/L (ppb)	50	98	101	74-126	3
Bromobenzene	ug/L (ppb)	50	100	102	80-121	2
1,3,5-Trimethylbenzene	ug/L (ppb)	50	101	104	78-123	3
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	100	102	66-126	2
1,2,3-Trichloropropane	ug/L (ppb)	50	98	100	67-124	2
2-Chlorotoluene	ug/L (ppb)	50	99	102	77-127	3
4-Chlorotoluene	ug/L (ppb)	50	99	102	78-128	3
tert-Butylbenzene	ug/L (ppb)	50	101	105	80-123	4
1,2,4-Trimethylbenzene	ug/L (ppb)	50	99	103	79-122	4
sec-Butylbenzene	ug/L (ppb)	50	98	102	80-116	4
p-Isopropyltoluene	ug/L (ppb)	50	97	101	81-123	4
1,3-Dichlorobenzene	ug/L (ppb)	50	99	102	83-113	3
1,4-Dichlorobenzene	ug/L (ppb)	50	97	100	83-107	3
1,2-Dichlorobenzene	ug/L (ppb)	50	100	104	84-112	4
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	100	107	57-141	7
1,2,4-Trichlorobenzene	ug/L (ppb)	50	101	106	72-130	5
Hexachlorobutadiene	ug/L (ppb)	50	94	98	53-141	4
Naphthalene	ug/L (ppb)	50	102	107	64-133	5
1,2,3-Trichlorobenzene	ug/L (ppb)	50	100	106	65-136	6

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 912292
Work Order Number: 1912289

December 23, 2019

Attention Michael Erdahl:

Fremont Analytical, Inc. received 5 sample(s) on 12/17/2019 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

CC:
Eric Young

Date: *12/23/2019*

CLIENT: Friedman & Bruya
Project: 912292
Work Order: 1912289

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1912289-001	MW9-W-33.5	12/17/2019 10:55 AM	12/17/2019 4:55 PM
1912289-002	MW2-W-15.0	12/17/2019 11:45 AM	12/17/2019 4:55 PM
1912289-003	MW7-W-27.5	12/17/2019 12:56 PM	12/17/2019 4:55 PM
1912289-004	MW6-W-15.0	12/17/2019 1:50 PM	12/17/2019 4:55 PM
1912289-005	MW11-W-15.0	12/17/2019 2:40 PM	12/17/2019 4:55 PM

Case Narrative

WO#: **1912289**
Date: **12/23/2019**

CLIENT: Friedman & Bruya
Project: 912292

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **1912289**
Date Reported: **12/23/2019**

CLIENT: Friedman & Bruya
Project: 912292

Lab ID: 1912289-001 **Collection Date:** 12/17/2019 10:55:00 AM
Client Sample ID: **MW9-W-33.5** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R56084		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	12/17/2019 6:46:00 PM

Lab ID: 1912289-002 **Collection Date:** 12/17/2019 11:45:00 AM
Client Sample ID: **MW2-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R56084		Analyst: WF
Chromium, Hexavalent	ND	0.135	D	mg/L	3	12/17/2019 6:51:00 PM

NOTES:
Diluted due to matrix.

Lab ID: 1912289-003 **Collection Date:** 12/17/2019 12:56:00 PM
Client Sample ID: **MW7-W-27.5** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R56084		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	12/17/2019 6:56:00 PM

CLIENT: Friedman & Bruya
Project: 912292

Lab ID: 1912289-004 **Collection Date:** 12/17/2019 1:50:00 PM
Client Sample ID: **MW6-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R56084		Analyst: WF
Chromium, Hexavalent	ND	0.450	D	mg/L	10	12/17/2019 7:01:00 PM

NOTES:
Diluted due to matrix.

Lab ID: 1912289-005 **Collection Date:** 12/17/2019 2:40:00 PM
Client Sample ID: **MW11-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R56084		Analyst: WF
Chromium, Hexavalent	ND	0.0450		mg/L	1	12/17/2019 7:06:00 PM

Work Order: 1912289
CLIENT: Friedman & Bruya
Project: 912292

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-R56084**	SampType: **MBLK**	Units: **mg/L**	Prep Date: **12/17/2019**	RunNo: **56084**
Client ID: **MBLKW**	Batch ID: **R56084**		Analysis Date: **12/17/2019**	SeqNo: **1116789**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-R56084**	SampType: **LCS**	Units: **mg/L**	Prep Date: **12/17/2019**	RunNo: **56084**
Client ID: **LCSW**	Batch ID: **R56084**		Analysis Date: **12/17/2019**	SeqNo: **1116790**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.232	0.0450	0.2500	0	92.8	80.9	115				

Sample ID: **1912270-002ADUP**	SampType: **DUP**	Units: **mg/L**	Prep Date: **12/17/2019**	RunNo: **56084**
Client ID: **BATCH**	Batch ID: **R56084**		Analysis Date: **12/17/2019**	SeqNo: **1116792**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		30	

Sample ID: **1912270-002AMS**	SampType: **MS**	Units: **mg/L**	Prep Date: **12/17/2019**	RunNo: **56084**
Client ID: **BATCH**	Batch ID: **R56084**		Analysis Date: **12/17/2019**	SeqNo: **1116793**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.242	0.0450	0.2500	0	96.8	46.2	138				

Sample ID: **1912270-002AMSD**	SampType: **MSD**	Units: **mg/L**	Prep Date: **12/17/2019**	RunNo: **56084**
Client ID: **BATCH**	Batch ID: **R56084**		Analysis Date: **12/17/2019**	SeqNo: **1116794**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.244	0.0450	0.2500	0	97.5	46.2	138	0.2419	0.741	20	

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**1912289**
Logged by:	**Clare Griggs**	Date Received:	**12/17/2019 4:55:00 PM**

Chain of Custody

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

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Required ☑
6.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
7.	Were all items received at a temperature of >0°C to 10.0°C *	Yes ☑	No ☐	NA ☐
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
10.	Are samples properly preserved?	Yes ☑	No ☐	
11.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
12.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
14.	Does paperwork match bottle labels?	Yes ☑	No ☐	
15.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
16.	Is it clear what analyses were requested?	Yes ☑	No ☐	
17.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler	5.8
Sample	7.9

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY 1912289

Page # _____ of _____

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 Fax # (206) 283-5044

SUBCONTRACTER

PROJECT NAME/NO.	PO #
912292	A-513

REMARKS

Please Email Results

TURNAROUND TIME

☒ Standard (2 Weeks)

☐ RUSH _____

Rush charges authorized by: _____

SAMPLE DISPOSAL

☐ Dispose after 30 days

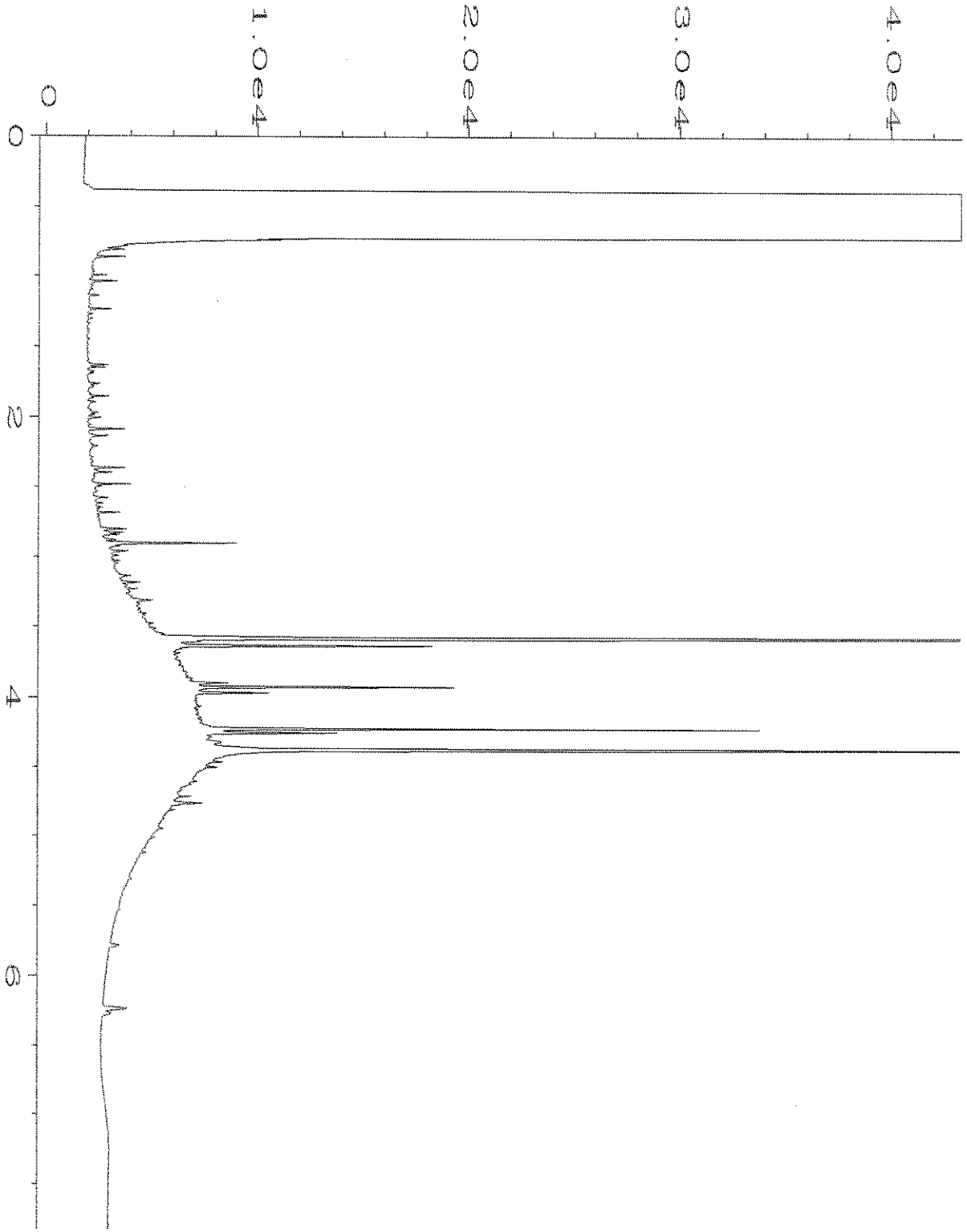
☐ Return samples

☐ Will call with instructions

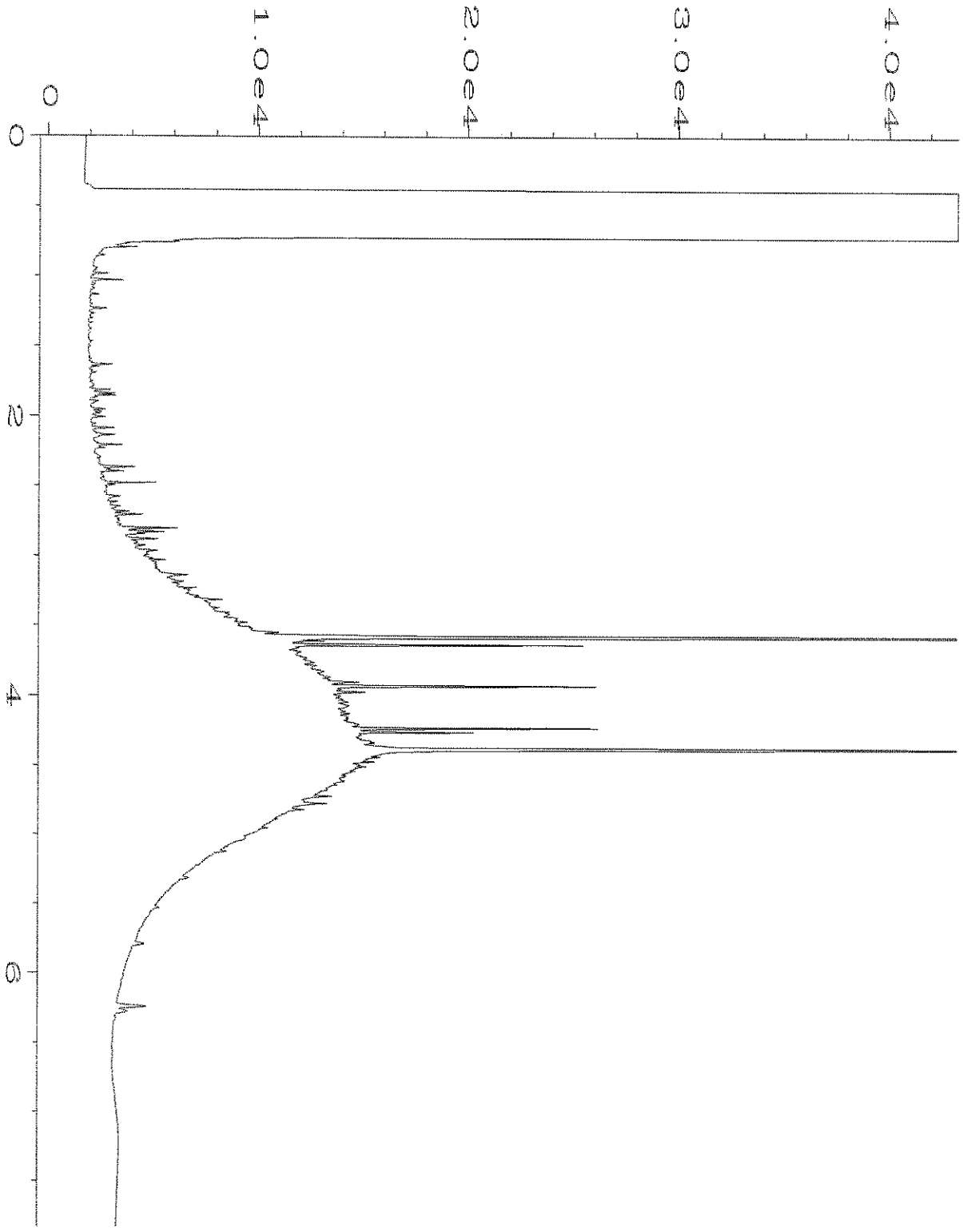
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Cr 6+						Notes
MW9-W-33.5		12/17/19	1055	Water	1				X						
MW2-W-15.0		"	1145	"	1				X						
MW7-W-27.5		"	1256	"	1				X						
MW6-W-15.0		"	1350	"	1				X						
MW11-W-15.0		"	1440	"	1				X						

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: D. M. B	~~Michael Erdahl~~ Liz Wagner, Bruya	Friedman & Bruya	12/17/19	1655
Received by:	Sara Becker-Mayer	FAI	12/17/19	1655
Relinquished by:				
Received by:				

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



Data File Name	: C:\HPCHEM\4\DATA\12-18-19\022F0901.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 22
Sample Name	: 912292-01	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 9
Acquired on	: 18 Dec 19 02:55 PM	Instrument Method	: DX.MTH
Report Created on	: 19 Dec 19 08:59 AM	Analysis Method	: DEFAULT.MTH



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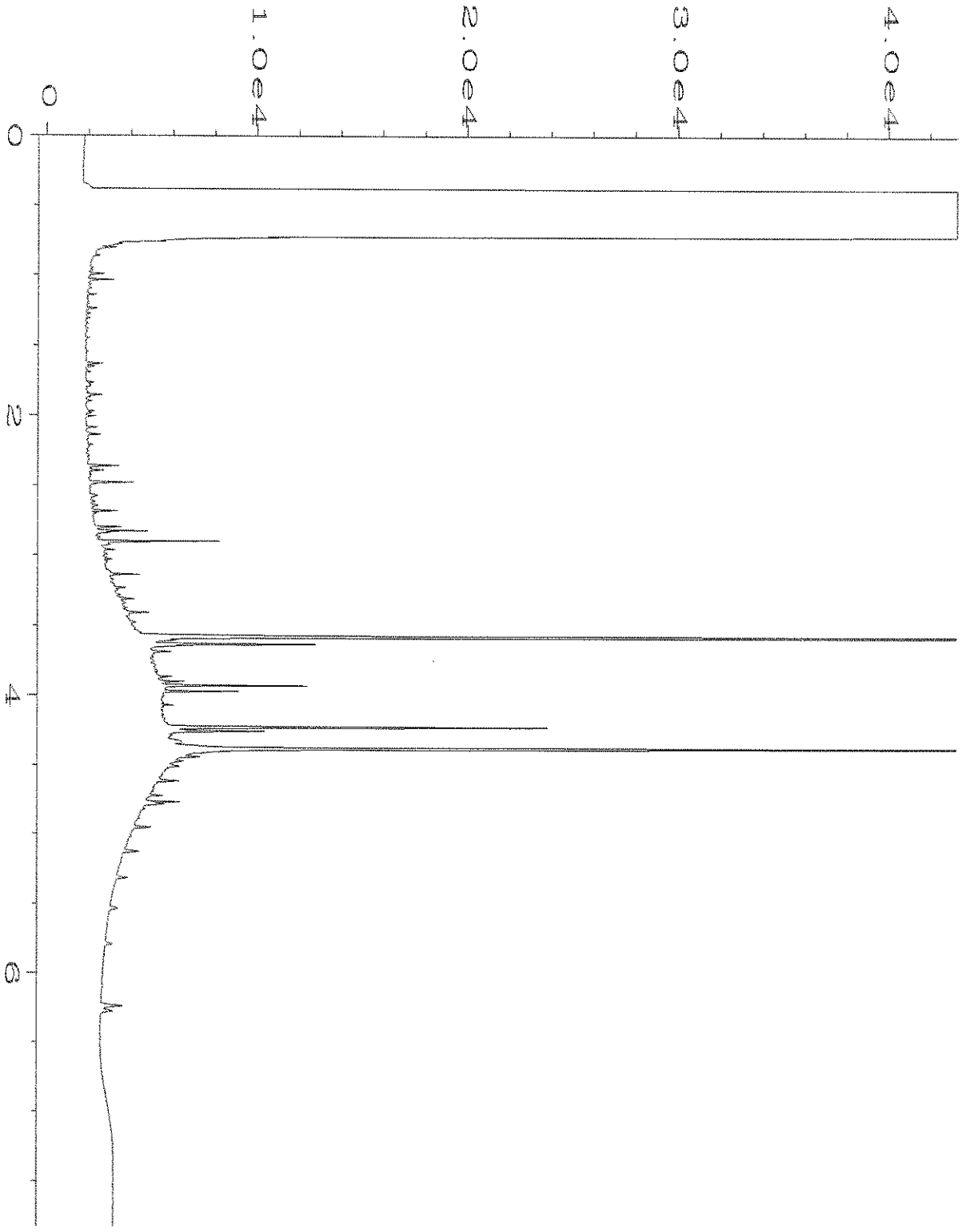
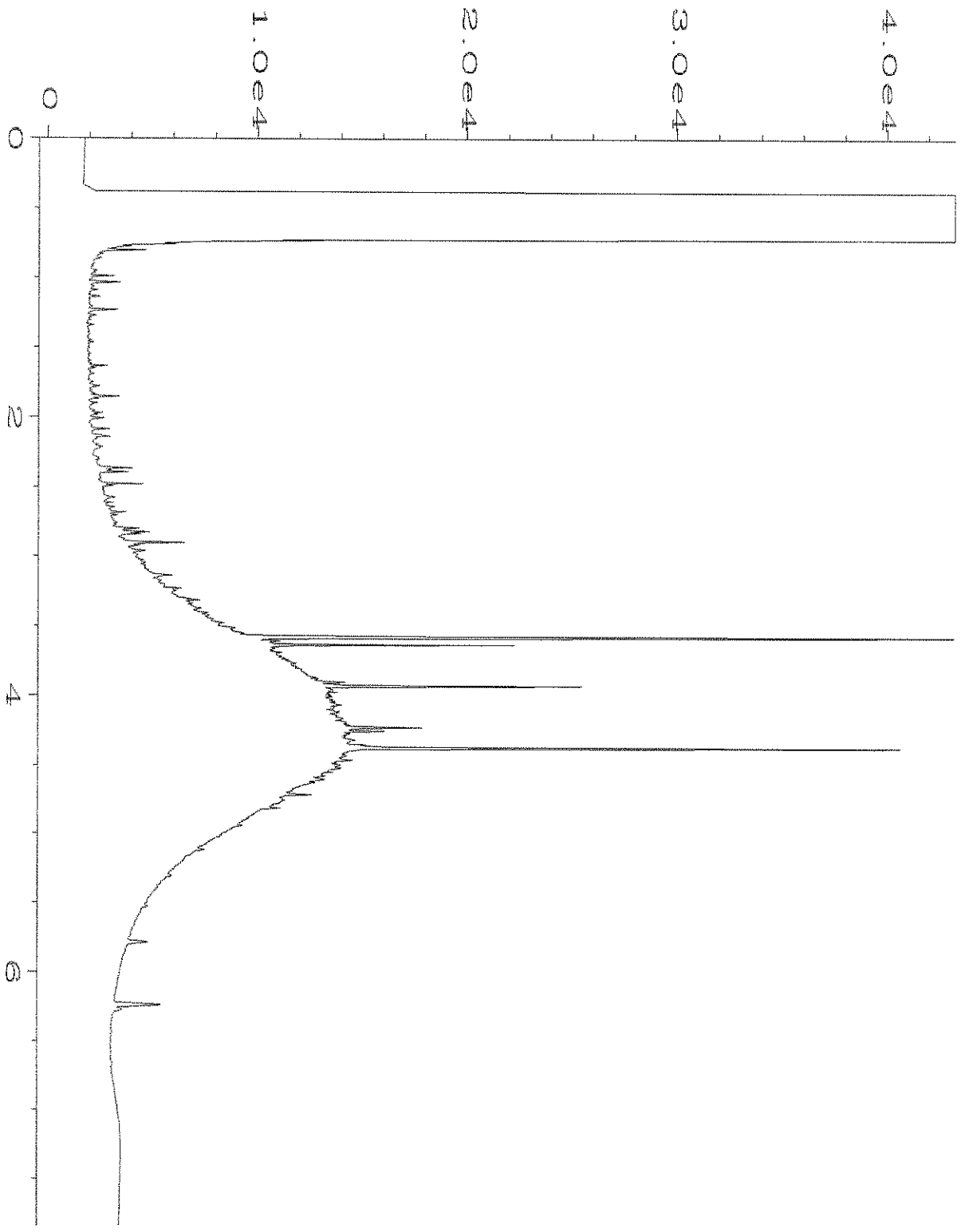
Operator : TL
Instrument : GC#4
Sample Name : 912292-02
Run Time Bar Code:
Acquired on : 18 Dec 19 03:06 PM
Report Created on: 19 Dec 19 08:59 AM

Page Number : 1
Vial Number : 23
Injection Number : 1
Sequence Line : 9
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH

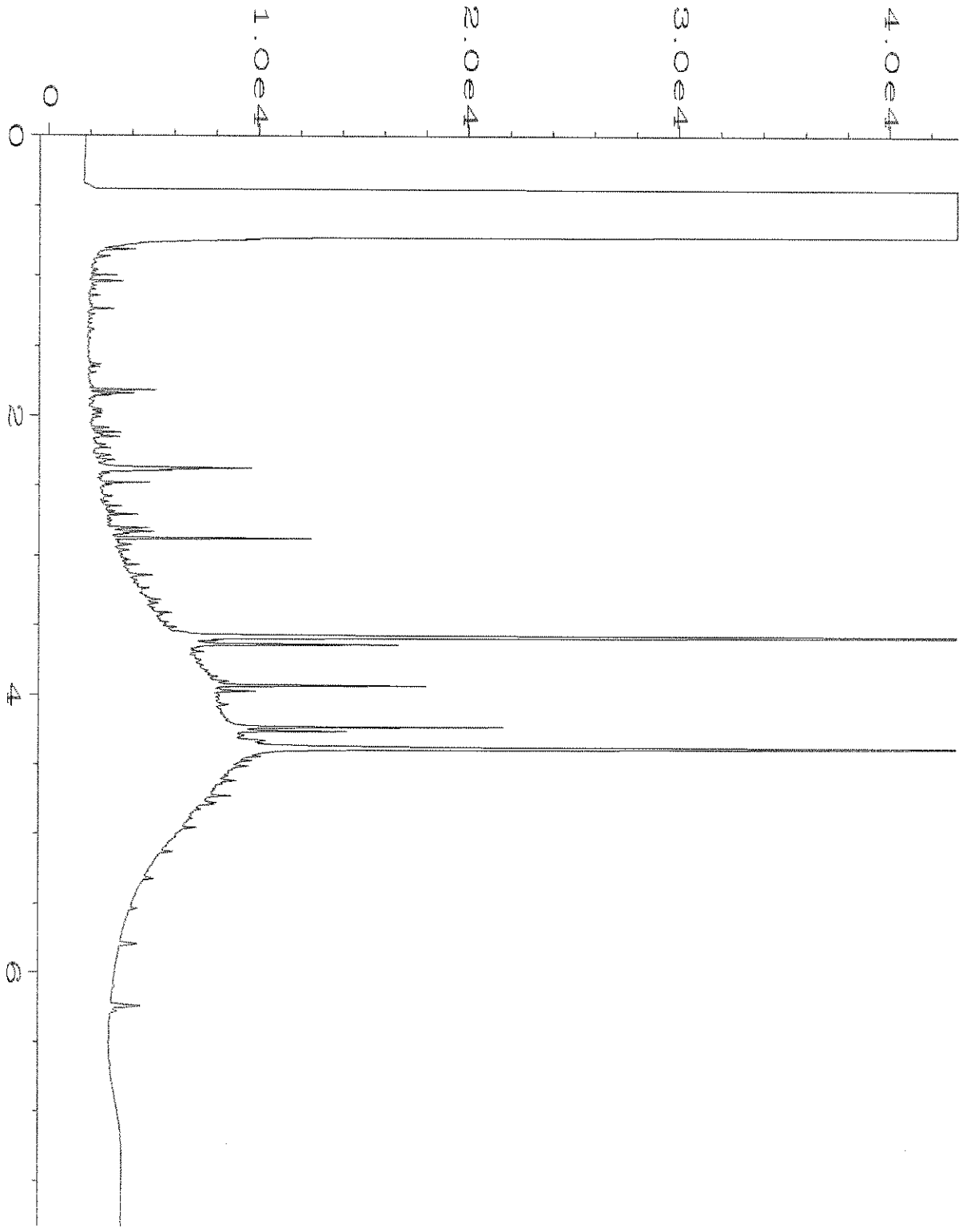


Data File Name	: C:\HPCHEM\4\DATA\12-18-19\024F0901.D		
Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 24
Sample Name	: 912292-03	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 9
Acquired on	: 18 Dec 19 03:18 PM	Instrument Method	: DX.MTH
Report Created on	: 19 Dec 19 08:59 AM	Analysis Method	: DEFAULT.MTH



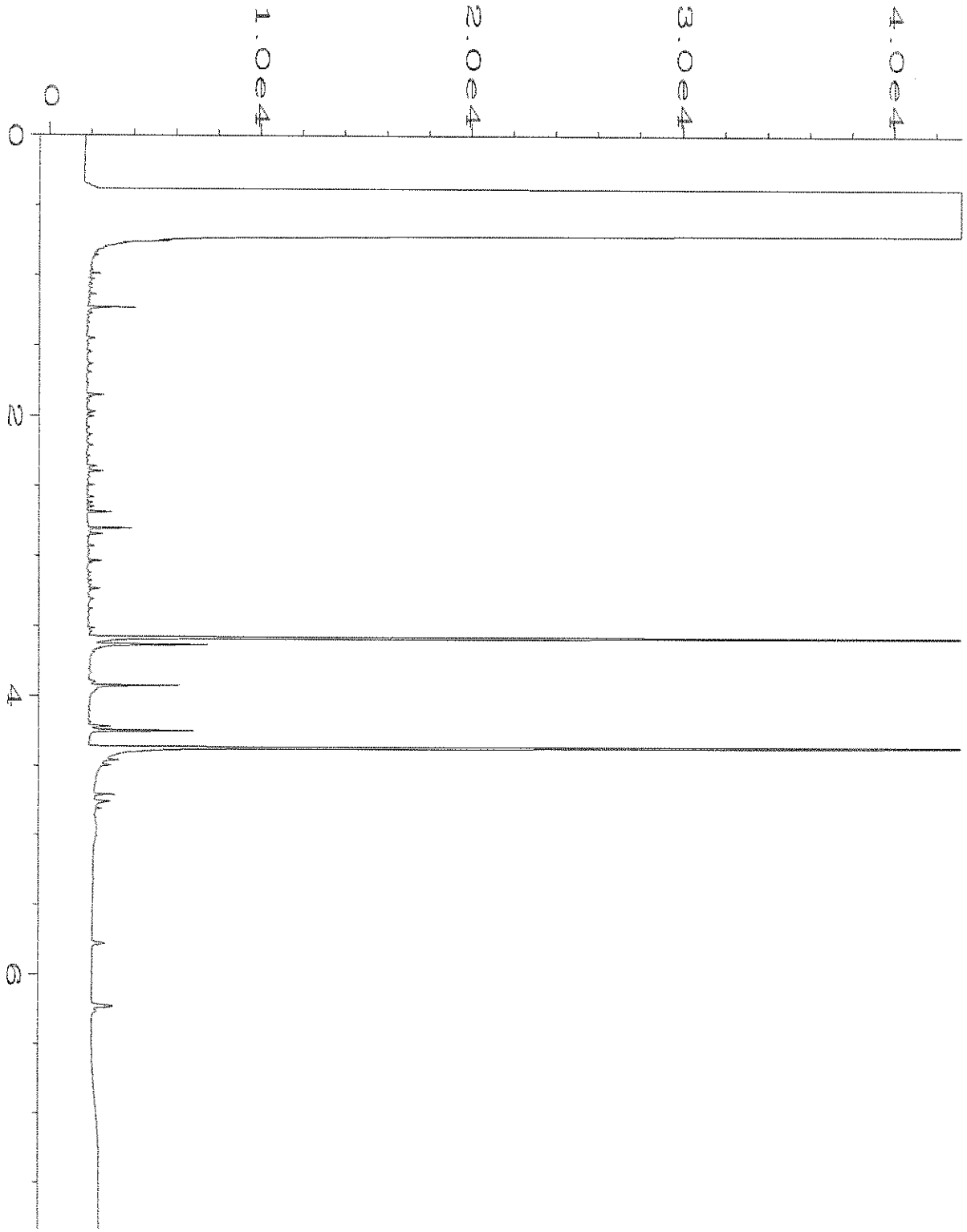
Data File Name : C:\HPCHEM\4\DATA\12-18-19\025F0901.D
Operator : TL
Instrument : GC#4
Sample Name : 912292-04
Run Time Bar Code:
Acquired on : 18 Dec 19 03:30 PM
Report Created on: 19 Dec 19 08:59 AM

Page Number : 1
Vial Number : 25
Injection Number : 1
Sequence Line : 9
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



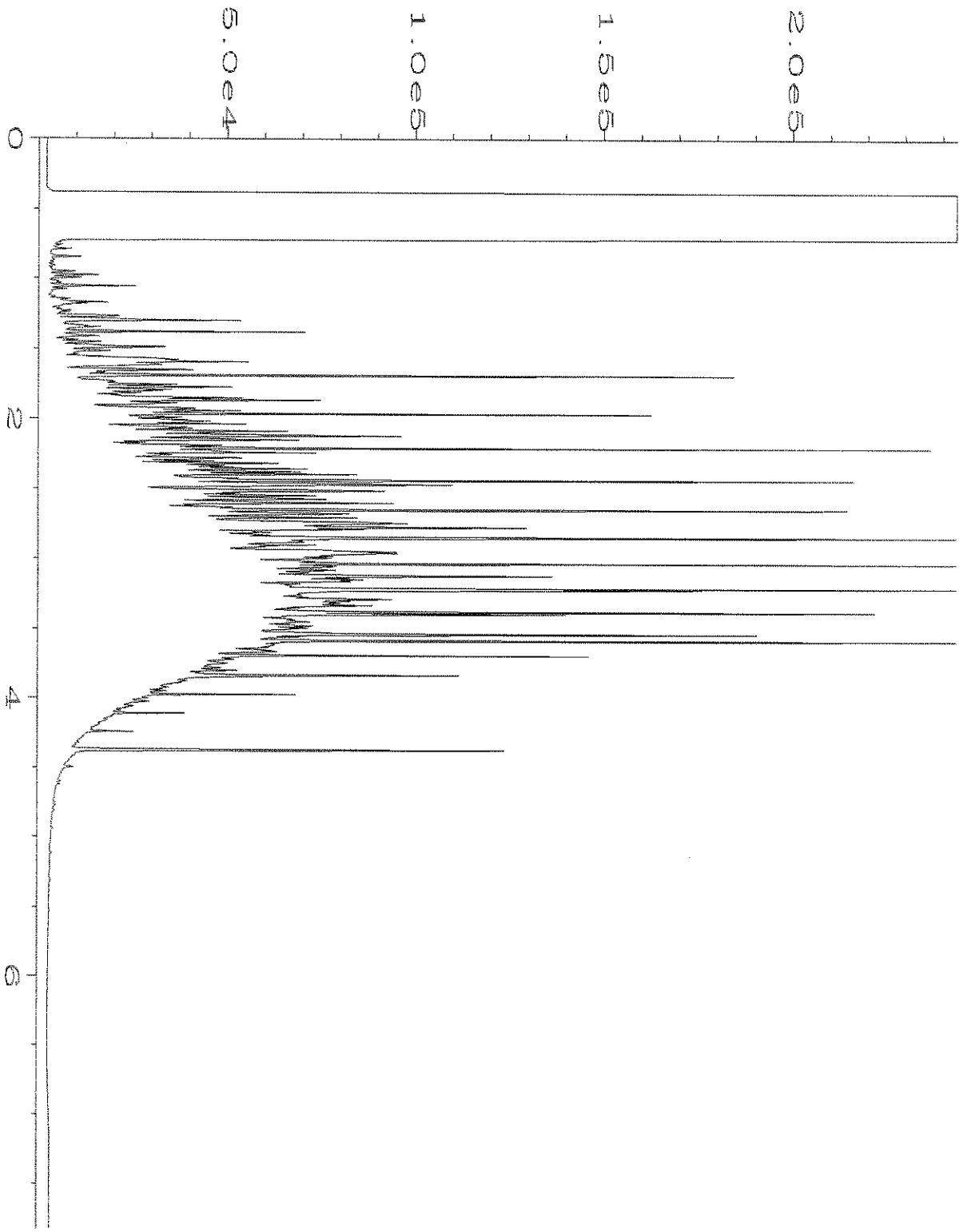
Data File Name : C:\HPCHEM\4\DATA\12-18-19\026F0901.D
Operator : TL
Instrument : GC#4
Sample Name : 912292-06
Run Time Bar Code:
Acquired on : 18 Dec 19 03:42 PM
Report Created on: 19 Dec 19 08:59 AM

Page Number : 1
Vial Number : 26
Injection Number : 1
Sequence Line : 9
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\4\DATA\12-18-19\015F0701.D
Operator : TL
Instrument : GC#4
Sample Name : 09-3058 mb
Run Time Bar Code:
Acquired on : 18 Dec 19 12:54 PM
Report Created on: 19 Dec 19 08:58 AM

Page Number : 1
Vial Number : 15
Injection Number : 1
Sequence Line : 7
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\4\DATA\12-18-19\005F1501.D
Operator : TL
Instrument : GC#4
Sample Name : 1000 Dx 58-146C
Run Time Bar Code:
Acquired on : 18 Dec 19 09:00 PM
Report Created on: 19 Dec 19 08:58 AM

Page Number : 1
Vial Number : 5
Injection Number : 1
Sequence Line : 15
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH

912292

SAMPLE CHAIN OF CUSTODY

ME 12-17-19

AIS/DOY/VW3

Page # 1 of 1

Report To Heather Good

Company Maul Foster Alongi

Address 1329 N State St

City, State, ZIP Bellingham, WA 98225

Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (*signature*): Amanda Bixby

PROJECT NAME: Precision Engineering

PO # 1803.01.01

REMARKS: *dis. metals = As, Cr, Co, Se

Project specific RLs? - Yes / No

INVOICE TO: accounting@maulfoster.com

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

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: Diesel/Motor Oil NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260C	8270D SIM PAHs EPA	PCBs EPA 8082	Hex chrom by SM 3500CR B	Dissolved metals by EPA 6020 B*			Notes
MW9-W-33.5	01 A-F	12/17/19	1055	W	7	X				X	X		X	X			
MW2-W-15.0	02		1145	W	7	X				X	X		X	X			
MW7-W-27.5	03		1255	W	7	X				X	X		X	X			
MW6-W-15.0	04		1350	W	7	X				X	X		X	X			
Trip Blank	05 A,B		NA	W	2					X							
MW11-W-15.0	06A-F		1440	W	7	X				X	X		X	X			

Samples received at 3 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Amanda Bixby	Amanda Bixby	MFA	12/17/19	1500
Received by: VWA	VINTA	FBI	12/17/19	15:00
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

August 6, 2019

Merideth D'Andrea, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms D'Andrea:

Included are the results from the testing of material submitted on July 25, 2019 from the Precision Engineering, PO 1803.01.01, F&BI 907445 project. There are 21 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Ryan Lewis
MFA0806R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on July 25, 2019 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering, PO 1803.01.01, F&BI 907445 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
907445 -01	MW5-W-15.0
907445 -02	MW7-W-20.0
907445 -03	MW2-W-19.0

The samples were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

A 6020A internal standard failed the acceptance criteria for sample MW5-W-15.0 and the calibration standard for chromium, copper, and selenium. The sample was diluted and reanalyzed with acceptable results. Both data sets were reported.

Acetone in the 8260C laboratory control sample failed the acceptance criteria. The data were flagged accordingly.

The 8260C samples MW5-W-15.0 and MW2-W-19.0 were analyzed at a dilution due to matrix effect (foamy). The reporting limits were raised accordingly.

All other quality control requirements were acceptable.

Date of Report: 08/06/19
Date Received: 07/25/19
Project: Precision Engineering, PO 1803.01.01, F&BI 907445
Date Extracted: 07/25/19
Date Analyzed: 07/25/19

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 51-134)
MW5-W-15.0 907445-01	93 x	<250	86
MW7-W-20.0 907445-02	80 x	<250	91
MW2-W-19.0 907445-03	250 x	<250	62
Method Blank 09-1784 MB2	<50	<250	86

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/25/19	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907445-01 x10
Date Analyzed:	07/30/19	Data File:	907445-01 x10.156
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<10
Chromium	82,700 J ca ve
Copper	<50 J ca
Selenium	11.3 ca

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/25/19	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907445-01 x200
Date Analyzed:	08/01/19	Data File:	907445-01 x200.093
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	132,000
Copper	<1000
Selenium	<200

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW7-W-20.0	Client:	Maul Foster Alongi
Date Received:	07/25/19	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907445-02 x2
Date Analyzed:	08/01/19	Data File:	907445-02 x2.095
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	8.59
Chromium	3.01
Copper	<10
Selenium	6.24

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW2-W-19.0	Client:	Maul Foster Alongi
Date Received:	07/25/19	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907445-03 x2
Date Analyzed:	08/01/19	Data File:	907445-03 x2.096
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	7.54
Chromium	9.19
Copper	<10
Selenium	9.02

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/29/19	Lab ID:	I9-457 mb
Date Analyzed:	07/30/19	Data File:	I9-457 mb.040
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/25/19	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/30/19	Lab ID:	907445-01 1/2
Date Analyzed:	07/30/19	Data File:	073025.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	82	31	160
Benzo(a)anthracene-d12	98	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW7-W-20.0	Client:	Maul Foster Alongi
Date Received:	07/25/19	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/30/19	Lab ID:	907445-02 1/2
Date Analyzed:	07/30/19	Data File:	073026.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	85	31	160
Benzo(a)anthracene-d12	94	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW2-W-19.0	Client:	Maul Foster Alongi
Date Received:	07/25/19	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/30/19	Lab ID:	907445-03 1/2
Date Analyzed:	07/30/19	Data File:	073027.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	87	31	160
Benzo(a)anthracene-d12	98	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	0.050
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/30/19	Lab ID:	09-1816 mb
Date Analyzed:	07/30/19	Data File:	073019.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	84	31	160
Benzo(a)anthracene-d12	101	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW5-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/25/19	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907445-01 1/10
Date Analyzed:	07/29/19	Data File:	072946.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	100	63	127
4-Bromofluorobenzene	98	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500 jl	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW7-W-20.0	Client:	Maul Foster Alongi
Date Received:	07/25/19	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907445-02
Date Analyzed:	07/29/19	Data File:	072941.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	100	63	127
4-Bromofluorobenzene	98	60	133

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW2-W-19.0	Client:	Maul Foster Alongi
Date Received:	07/25/19	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907445-03 1/10
Date Analyzed:	07/29/19	Data File:	072945.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	100	63	127
4-Bromofluorobenzene	98	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500 jl	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering, PO 1803.01.01
Date Extracted:	07/29/19	Lab ID:	09-1703 mb
Date Analyzed:	07/29/19	Data File:	072926.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	101	63	127
4-Bromofluorobenzene	98	60	133

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

Date of Report: 08/06/19
Date Received: 07/25/19
Project: Precision Engineering, PO 1803.01.01, F&BI 907445

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	72	68	58-134	6

Date of Report: 08/06/19
Date Received: 07/25/19
Project: Precision Engineering, PO 1803.01.01, F&BI 907445

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

Laboratory Code: 907486-04 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	3.72	107	106	75-125	1
Chromium	ug/L (ppb)	20	<1	102	103	75-125	1
Copper	ug/L (ppb)	20	<5	92	92	75-125	0
Selenium	ug/L (ppb)	5	<1	108	107	75-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	106	80-120
Chromium	ug/L (ppb)	20	96	80-120
Copper	ug/L (ppb)	20	95	80-120
Selenium	ug/L (ppb)	5	107	80-120

Date of Report: 08/06/19
Date Received: 07/25/19
Project: Precision Engineering, PO 1803.01.01, F&BI 907445

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270D SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	71	76	57-114	7
Acenaphthylene	ug/L (ppb)	1	81	84	65-119	4
Acenaphthene	ug/L (ppb)	1	80	84	66-118	5
Fluorene	ug/L (ppb)	1	84	88	64-125	5
Phenanthrene	ug/L (ppb)	1	84	87	67-120	4
Anthracene	ug/L (ppb)	1	84	87	65-122	4
Fluoranthene	ug/L (ppb)	1	95	97	65-127	2
Pyrene	ug/L (ppb)	1	93	96	62-130	3
Benz(a)anthracene	ug/L (ppb)	1	92	95	60-118	3
Chrysene	ug/L (ppb)	1	90	93	66-125	3
Benzo(b)fluoranthene	ug/L (ppb)	1	94	98	55-135	4
Benzo(k)fluoranthene	ug/L (ppb)	1	92	94	62-125	2
Benzo(a)pyrene	ug/L (ppb)	1	92	93	58-127	1
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	77	82	36-142	6
Dibenz(a,h)anthracene	ug/L (ppb)	1	78	85	37-133	9
Benzo(g,h,i)perylene	ug/L (ppb)	1	68	75	34-135	10

Date of Report: 08/06/19
Date Received: 07/25/19
Project: Precision Engineering, PO 1803.01.01, F&BI 907445

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

Laboratory Code: 907506-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	80	10-172
Chloromethane	ug/L (ppb)	50	<10	94	25-166
Vinyl chloride	ug/L (ppb)	50	<0.2	107	36-166
Bromomethane	ug/L (ppb)	50	<1	92	47-169
Chloroethane	ug/L (ppb)	50	<1	93	46-160
Trichlorofluoromethane	ug/L (ppb)	50	<1	106	44-165
Acetone	ug/L (ppb)	250	<50	57	10-182
1,1-Dichloroethene	ug/L (ppb)	50	<1	103	60-136
Hexane	ug/L (ppb)	50	<1	96	52-150
Methylene chloride	ug/L (ppb)	50	5.2	102	67-132
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	104	74-127
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	102	72-129
1,1-Dichloroethane	ug/L (ppb)	50	<1	102	70-128
2,2-Dichloropropane	ug/L (ppb)	50	<1	78	36-154
cis-1,2-Dichloroethene	ug/L (ppb)	50	4.7	106	71-127
Chloroform	ug/L (ppb)	50	<1	102	65-132
2-Butanone (MEK)	ug/L (ppb)	250	<10	80	10-129
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	102	48-149
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	104	60-146
1,1-Dichloropropene	ug/L (ppb)	50	<1	104	69-133
Carbon tetrachloride	ug/L (ppb)	50	<1	103	56-152
Benzene	ug/L (ppb)	50	<0.35	103	76-125
Trichloroethene	ug/L (ppb)	50	<1	101	66-135
1,2-Dichloropropane	ug/L (ppb)	50	<1	105	78-125
Bromodichloromethane	ug/L (ppb)	50	<1	105	61-150
Dibromomethane	ug/L (ppb)	50	<1	107	66-141
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	112	10-185
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	105	72-132
Toluene	ug/L (ppb)	50	<1	94	76-122
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	98	76-130
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	104	68-131
2-Hexanone	ug/L (ppb)	250	<10	98	10-185
1,3-Dichloropropane	ug/L (ppb)	50	<1	103	71-128
Tetrachloroethene	ug/L (ppb)	50	3.7	100	10-226
Dibromochloromethane	ug/L (ppb)	50	<1	104	70-139
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	103	69-134
Chlorobenzene	ug/L (ppb)	50	<1	101	77-122
Ethylbenzene	ug/L (ppb)	50	<1	98	69-135
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	106	73-137
m,p-Xylene	ug/L (ppb)	100	<2	99	69-135
o-Xylene	ug/L (ppb)	50	<1	99	60-140
Styrene	ug/L (ppb)	50	<1	102	71-133
Isopropylbenzene	ug/L (ppb)	50	<1	101	65-142
Bromoform	ug/L (ppb)	50	<1	106	65-142
n-Propylbenzene	ug/L (ppb)	50	<1	100	58-144
Bromobenzene	ug/L (ppb)	50	<1	101	75-124
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	101	66-137
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	108	51-154
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	103	53-150
2-Chlorotoluene	ug/L (ppb)	50	<1	101	66-127
4-Chlorotoluene	ug/L (ppb)	50	<1	100	65-130
tert-Butylbenzene	ug/L (ppb)	50	<1	102	65-137
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	101	59-146
sec-Butylbenzene	ug/L (ppb)	50	<1	102	64-140
p-Isopropyltoluene	ug/L (ppb)	50	<1	100	65-141
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	102	72-123
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	98	69-126
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	100	69-128
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	104	32-164
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	103	66-136
Hexachlorobutadiene	ug/L (ppb)	50	<1	96	60-143
Naphthalene	ug/L (ppb)	50	<1	104	44-164
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	102	69-148

Date of Report: 08/06/19
Date Received: 07/25/19
Project: Precision Engineering, PO 1803.01.01, F&BI 907445

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	93	76	25-158	20
Chloromethane	ug/L (ppb)	50	95	87	45-156	9
Vinyl chloride	ug/L (ppb)	50	101	92	50-154	9
Bromomethane	ug/L (ppb)	50	95	88	55-143	8
Chloroethane	ug/L (ppb)	50	98	92	58-146	6
Trichlorofluoromethane	ug/L (ppb)	250	108	101	50-150	7
Acetone	ug/L (ppb)	250	51 vo	53	53-131	4
1,1-Dichloroethene	ug/L (ppb)	50	102	100	67-136	2
Hexane	ug/L (ppb)	50	106	108	57-137	2
Methylene chloride	ug/L (ppb)	50	108	100	39-148	8
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	107	101	64-147	6
trans-1,2-Dichloroethene	ug/L (ppb)	50	108	102	68-128	6
1,1-Dichloroethane	ug/L (ppb)	50	106	101	79-121	5
2,2-Dichloropropane	ug/L (ppb)	50	120	112	55-143	7
cis-1,2-Dichloroethene	ug/L (ppb)	50	110	106	80-123	4
Chloroform	ug/L (ppb)	50	106	102	80-121	4
2-Butanone (MEK)	ug/L (ppb)	250	73	81	57-149	10
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	100	101	73-132	1
1,1,1-Trichloroethane	ug/L (ppb)	50	108	102	81-125	6
1,1-Dichloropropene	ug/L (ppb)	50	106	104	77-129	2
Carbon tetrachloride	ug/L (ppb)	50	107	102	75-158	5
Benzene	ug/L (ppb)	50	103	102	69-134	1
Trichloroethene	ug/L (ppb)	50	102	100	79-113	2
1,2-Dichloropropane	ug/L (ppb)	50	102	105	77-123	3
Bromodichloromethane	ug/L (ppb)	50	105	105	81-133	0
Dibromomethane	ug/L (ppb)	50	106	109	82-125	3
4-Methyl-2-pentanone	ug/L (ppb)	250	101	110	65-138	9
cis-1,3-Dichloropropene	ug/L (ppb)	50	107	112	82-132	5
Toluene	ug/L (ppb)	50	97	95	72-122	2
trans-1,3-Dichloropropene	ug/L (ppb)	50	103	107	80-136	4
1,1,2-Trichloroethane	ug/L (ppb)	50	102	106	75-124	4
2-Hexanone	ug/L (ppb)	250	87	101	60-136	15
1,3-Dichloropropane	ug/L (ppb)	50	99	105	76-126	6
Tetrachloroethene	ug/L (ppb)	50	105	102	76-121	3
Dibromochloromethane	ug/L (ppb)	50	105	107	84-133	2
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	99	104	82-115	5
Chlorobenzene	ug/L (ppb)	50	103	102	83-114	1
Ethylbenzene	ug/L (ppb)	50	101	100	77-124	1
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	114	107	84-127	6
m,p-Xylene	ug/L (ppb)	100	103	101	81-112	2
o-Xylene	ug/L (ppb)	50	105	100	81-121	5
Styrene	ug/L (ppb)	50	103	104	84-119	1
Isopropylbenzene	ug/L (ppb)	50	108	102	80-117	6
Bromoform	ug/L (ppb)	50	105	108	74-136	3
n-Propylbenzene	ug/L (ppb)	50	108	103	74-126	5
Bromobenzene	ug/L (ppb)	50	105	102	80-121	3
1,3,5-Trimethylbenzene	ug/L (ppb)	50	111	103	78-123	7
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	109	109	66-126	0
1,2,3-Trichloropropane	ug/L (ppb)	50	103	103	67-124	0
2-Chlorotoluene	ug/L (ppb)	50	108	102	77-127	6
4-Chlorotoluene	ug/L (ppb)	50	105	102	78-128	3
tert-Butylbenzene	ug/L (ppb)	50	111	102	80-123	8
1,2,4-Trimethylbenzene	ug/L (ppb)	50	110	103	79-122	7
sec-Butylbenzene	ug/L (ppb)	50	112	103	80-116	8
p-Isopropyltoluene	ug/L (ppb)	50	112	103	81-123	8
1,3-Dichlorobenzene	ug/L (ppb)	50	106	103	83-113	3
1,4-Dichlorobenzene	ug/L (ppb)	50	101	98	83-107	3
1,2-Dichlorobenzene	ug/L (ppb)	50	108	101	84-112	7
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	112	106	57-141	6
1,2,4-Trichlorobenzene	ug/L (ppb)	50	120	106	72-130	12
Hexachlorobutadiene	ug/L (ppb)	50	115	101	53-141	13
Naphthalene	ug/L (ppb)	50	120	104	64-133	14
1,2,3-Trichlorobenzene	ug/L (ppb)	50	123	105	65-136	16

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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

Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 907445
Work Order Number: 1907337

July 30, 2019

Attention Michael Erdahl:

Fremont Analytical, Inc. received 3 sample(s) on 7/25/2019 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *07/30/2019*

CLIENT: Friedman & Bruya
Project: 907445
Work Order: 1907337

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1907337-001	MW5-W-15.0	07/24/2019 1:45 PM	07/25/2019 10:20 AM
1907337-002	MW7-W-20.0	07/24/2019 4:00 PM	07/25/2019 10:20 AM
1907337-003	MW2-W-19.0	07/24/2019 4:40 PM	07/25/2019 10:20 AM

Case Narrative

WO#: **1907337**

Date: **7/30/2019**

CLIENT: Friedman & Bruya
Project: 907445

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **1907337**
Date Reported: **7/30/2019**

CLIENT: Friedman & Bruya
Project: 907445

Lab ID: 1907337-001 **Collection Date:** 7/24/2019 1:45:00 PM
Client Sample ID: **MW5-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R52886		Analyst: TN
Chromium, Hexavalent	117	45.0	D	mg/L	1000	7/25/2019 1:38:00 PM

Lab ID: 1907337-002 **Collection Date:** 7/24/2019 4:00:00 PM
Client Sample ID: **MW7-W-20.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R52886		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	7/25/2019 12:42:00 PM

Lab ID: 1907337-003 **Collection Date:** 7/24/2019 4:40:00 PM
Client Sample ID: **MW2-W-19.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R52886		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	7/25/2019 1:01:00 PM

Work Order: 1907337
CLIENT: Friedman & Bruya
Project: 907445

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-R52886**	SampType: **MBLK**			Units: **mg/L**		Prep Date: **7/25/2019**			RunNo: **52886**	
Client ID: **MBLKW**	Batch ID: **R52886**					Analysis Date: **7/25/2019**			SeqNo: **1045145**	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-R52886**	SampType: **LCS**			Units: **mg/L**		Prep Date: **7/25/2019**			RunNo: **52886**	
Client ID: **LCSW**	Batch ID: **R52886**					Analysis Date: **7/25/2019**			SeqNo: **1045146**	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.242	0.0450	0.2500	0	97.0	90	110				

Sample ID: **1907337-002ADUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **7/25/2019**			RunNo: **52886**	
Client ID: **MW7-W-20.0**	Batch ID: **R52886**					Analysis Date: **7/25/2019**			SeqNo: **1045149**	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		30	

Sample ID: **1907337-002AMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **7/25/2019**			RunNo: **52886**	
Client ID: **MW7-W-20.0**	Batch ID: **R52886**					Analysis Date: **7/25/2019**			SeqNo: **1045150**	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.253	0.0450	0.2500	0	101	65	135				

Sample ID: **1907337-002AMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **7/25/2019**			RunNo: **52886**	
Client ID: **MW7-W-20.0**	Batch ID: **R52886**					Analysis Date: **7/25/2019**			SeqNo: **1045151**	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.244	0.0450	0.2500	0	97.5	65	135	0.2530	3.74	30	

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**1907337**
Logged by:	**Clare Griggs**	Date Received:	**7/25/2019 10:20:00 AM**

Chain of Custody

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

Log In

3.	Coolers are present?	Yes ☐	No ☑	NA ☐	
		No cooler present.			
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐		
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☑	Not Required ☐	
6.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐	
7.	Were all items received at a temperature of >0°C to 10.0°C *	Yes ☐	No ☑	NA ☐	
		Refer to item information			
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐		
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐		
10.	Are samples properly preserved?	Yes ☑	No ☐		
11.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐	
12.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑	
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐		
14.	Does paperwork match bottle labels?	Yes ☑	No ☐		
15.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐		
16.	Is it clear what analyses were requested?	Yes ☑	No ☐		
17.	Were all holding times able to be met?	Yes ☑	No ☐		

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Sample	11.6

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY 1907337

Send Report To Michael Erdahl
Company Friedman and Bruya, Inc.
Address 3012 16th Ave W
City, State, ZIP Seattle, WA 98119
Phone # (206) 285-8282 Fax # (206) 283-5044

SUBCONTRACTER Fremont
PROJECT NAME/NO. 907445
PO # A-331
REMARKS Please Email Results EQuIS EDD

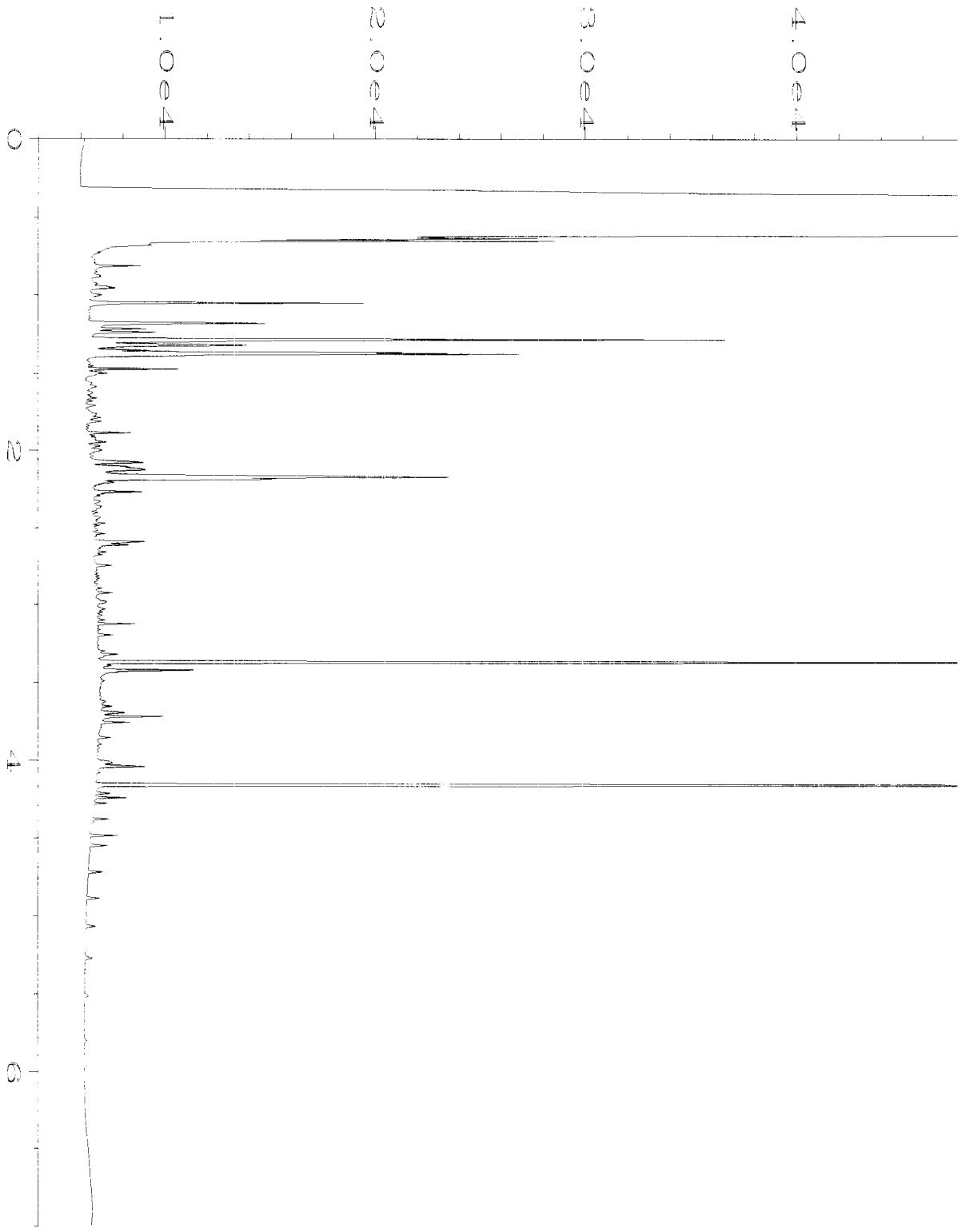
TURNAROUND TIME
☒ Standard (2 Weeks)
☐ RUSH
Rush charges authorized by:

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Dioxins/Furans	EPH	VPH	Cr VI						Notes
						ANALYSES REQUESTED									
MW5-W-15.0		7/24/19	1345	water	1				X						
MW7-W-20.0		↓	1600	↓	1				X						
MW2-W-19.0		↓	1640	↓	1				X						

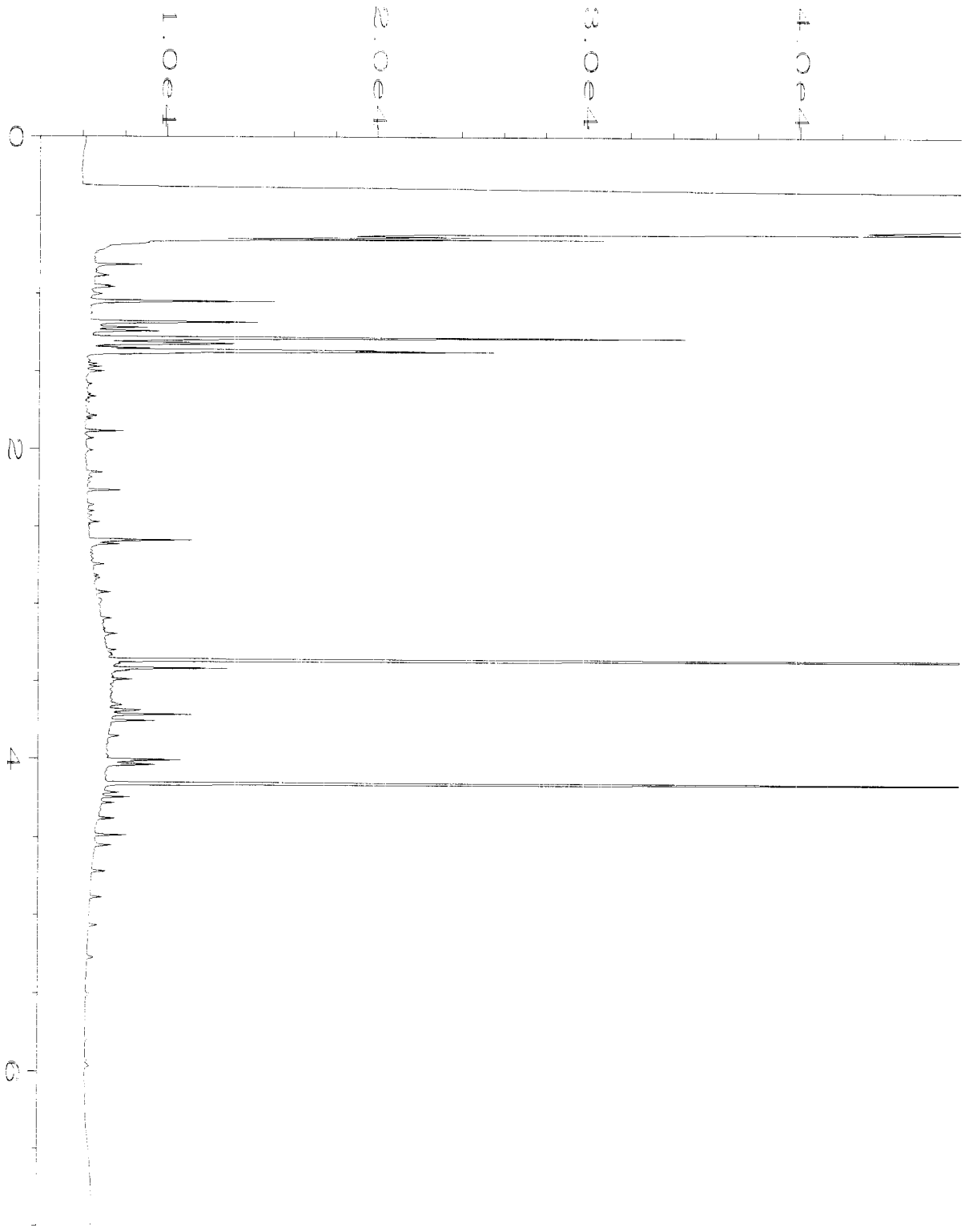
Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	7/25/19	07:51AM.
Received by:		Eduardo Alcantar	FAI	7/25/19	1040
Relinquished by:					
Received by:					

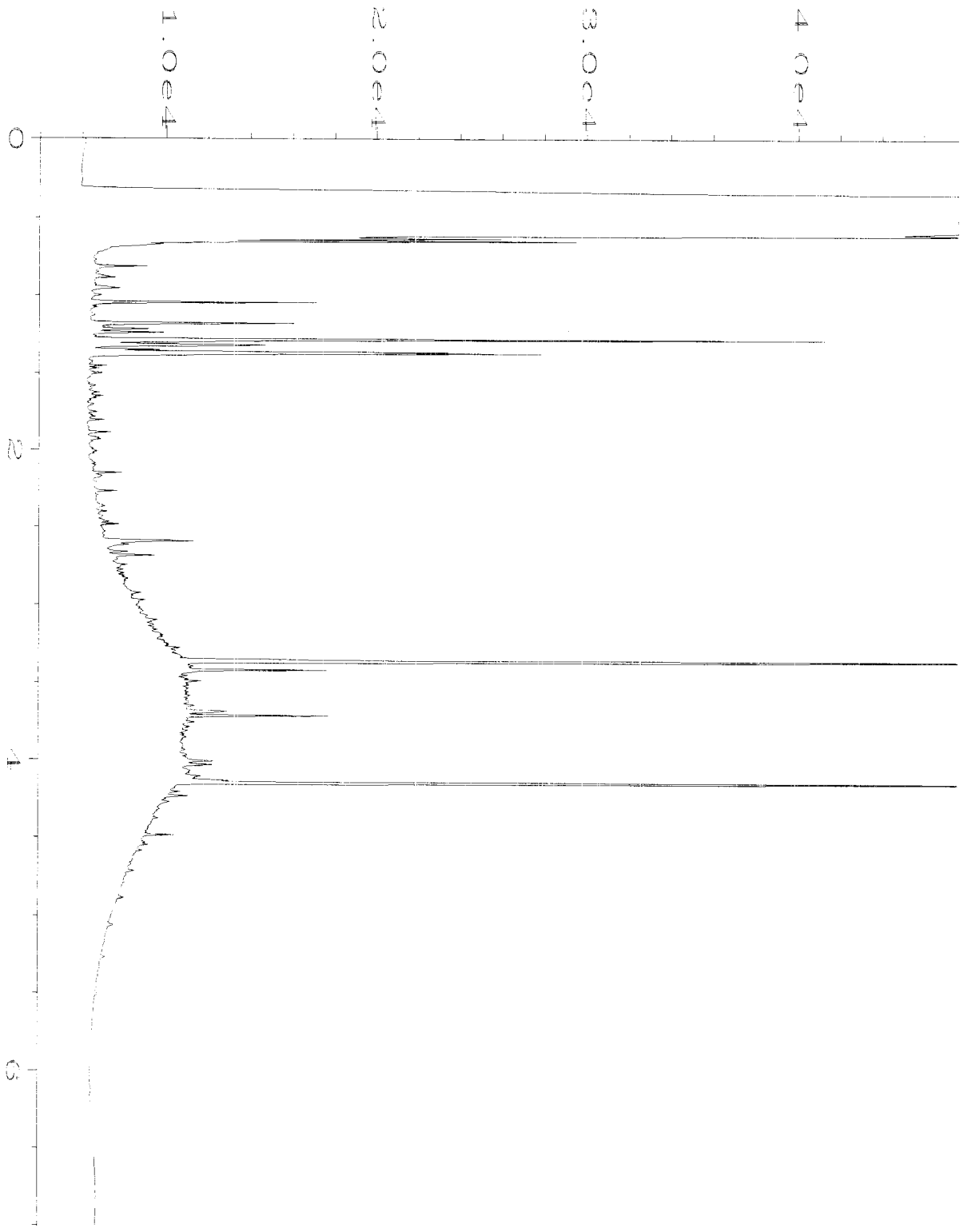


Data File Name : C:\HPCHEM\6\DATA\07-25-19\023F0501.D
Operator : TL
Instrument : GC6
Sample Name : 907445-01
Run Time Bar Code:
Acquired on : 25 Jul 19 05:44 PM
Report Created on: 26 Jul 19 11:30 AM

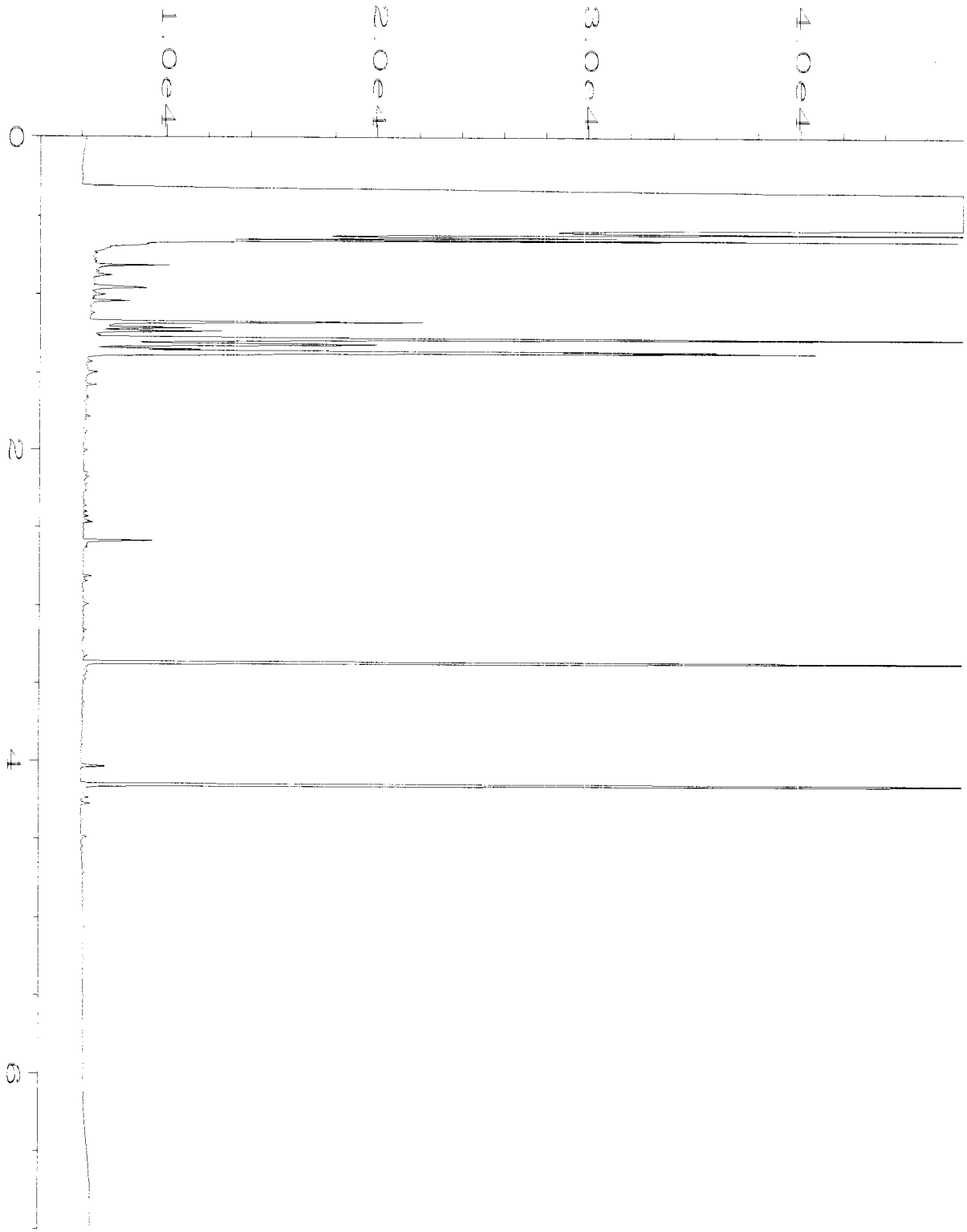
Page Number : 1
Vial Number : 23
Injection Number : 1
Sequence Line : 5
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



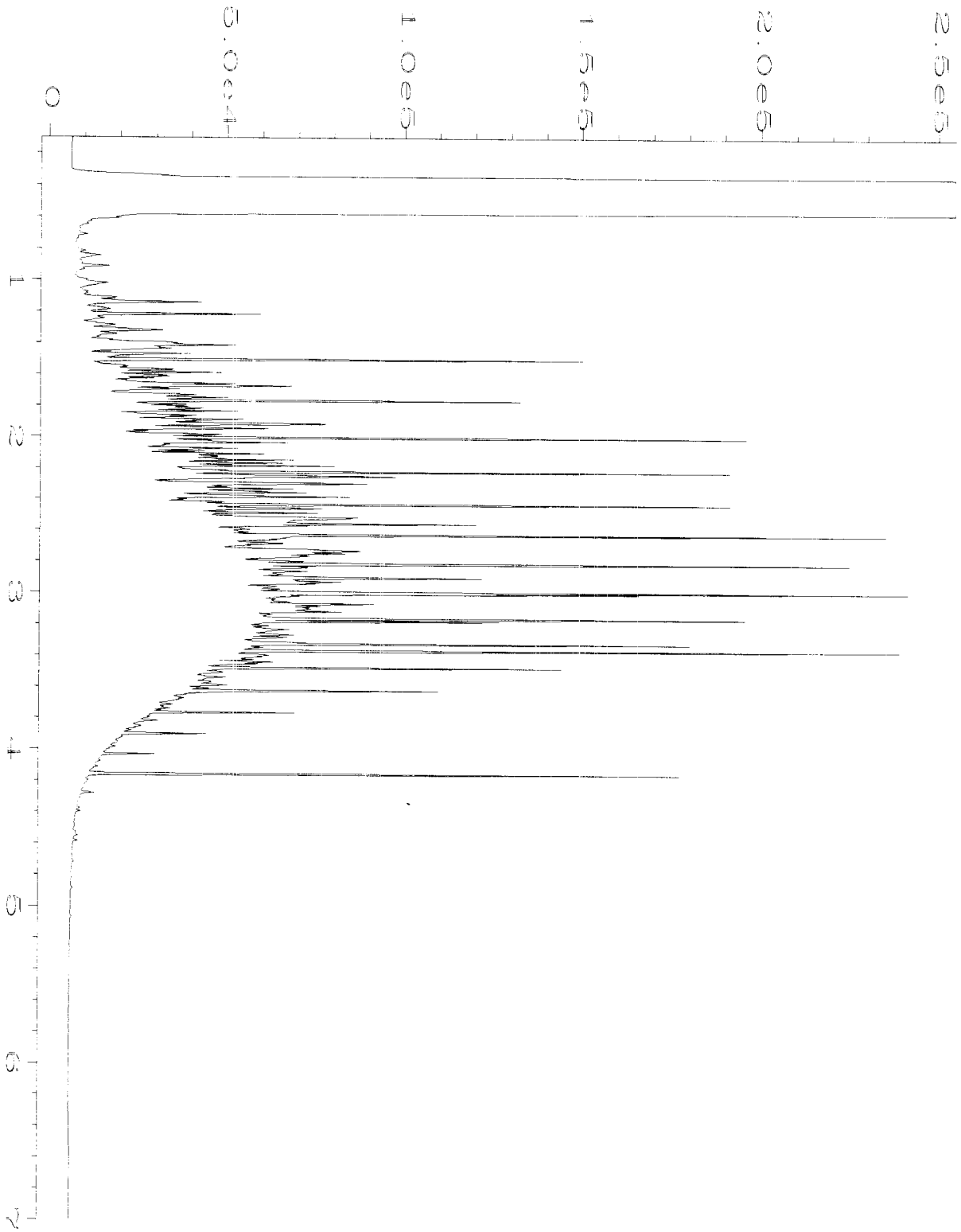
Data File Name	: C:\HPCHEM\6\DATA\07-25-19\024F0501.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 24
Sample Name	: 907445-02	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 5
Acquired on	: 25 Jul 19 05:55 PM	Instrument Method	: DX.MTH
Report Created on	: 26 Jul 19 11:30 AM	Analysis Method	: DEFAULT.MTH



Data File Name	: C:\HPCHEM\6\DATA\07-25-19\025F0501.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 25
Sample Name	: 907445-03	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 5
Acquired on	: 25 Jul 19 06:06 PM	Instrument Method	: DX.MTH
Report Created on	: 26 Jul 19 11:30 AM	Analysis Method	: DEFAULT.MTH



Data File Name	: C:\HPCHEM\6\DATA\07-25-19\017F0501.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 17
Sample Name	: 09-1784 mb2	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 5
Acquired on	: 25 Jul 19 04:36 PM	Instrument Method	: DX.MTH
Report Created on	: 26 Jul 19 11:29 AM	Analysis Method	: DEFAULT.MTH



Data File Name	: C:\HPCHEM\6\DATA\07-25-19\005F0401.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 5
Sample Name	: 1000 Dx 57-78B	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 4
Acquired on	: 25 Jul 19 04:00 PM	Instrument Method	: DX.MTH
Report Created on	: 26 Jul 19 11:29 AM	Analysis Method	: DEFAULT.MTH

907445

SAMPLE CHAIN OF CUSTODY

ME 07/25/19 (NP) VW1/BO5/AT2

Page # _____ of 25

Report To Marideth D'Andrea / Ryan Lewis

Company Maul Foster Alongi

Address 2815 2nd Avenue, Suite 540

City, State, ZIP Seattle, WA, 98121

Phone _____ Email mdandrea

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering

PO #: 1803.01.01

REMARKS

INVOICE TO: MFA

TURNAROUND TIME
- [X] Standard Turnaround
- [ ] RUSH _____
- Rush charges authorized by: _____

SAMPLE DISPOSAL
- [ ] Dispose after 30 days
- [ ] Archive Samples
- [ ] Other _____

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel (RE)	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	Heavy Chlorinated Dissolved Metals	Cu, As, Se			Notes
MW5-W-15.0	01A-G	7/24/19	1345	W	7		X			X		X	X	X			
MW7-W-20.0	02A-G	7/24/19	1600	W	7		X			X		X	X	X			
MW2-W-19.0	03A-F	7/24/19	1640	W	6		X			X		X	X	X			

Samples received at 3 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Ryan Lewis	MFA	7/25/19	730
Received by:	Nhan Phan	FEBT	7/25/19	0730
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

August 5, 2019

Merideth D'Andrea, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms D'Andrea:

Included are the results from the testing of material submitted on July 24, 2019 from the Precision Engineering 1803.01.01, F&BI 907430 project. There are 20 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Ryan Lewis
MFA0805R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on July 24, 2019 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.01, F&BI 907430 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
907430 -01	MW4-W-20.0
907430 -02	MWDUP-W-20.0
907430 -03	MW1-W-35.0

The samples were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

The 8260C calibration standard failed the acceptance criteria for 2,2-dichloropropane. The data were flagged accordingly.

All other quality control requirements were acceptable.

Date of Report: 08/05/19
Date Received: 07/24/19
Project: Precision Engineering 1803.01.01, F&BI 907430
Date Extracted: 07/25/19
Date Analyzed: 07/25/19

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 51-134)
MW4-W-20.0 907430-01	<50	<250	80
MWDUP-W-20.0 907430-02	<50	<250	77
MW1-W-35.0 907430-03	<50	<250	104
Method Blank 09-1784 MB2	<50	<250	86

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW4-W-20.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907430-01
Date Analyzed:	08/01/19	Data File:	907430-01.090
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	12.6
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MWDUP-W-20.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907430-02
Date Analyzed:	08/01/19	Data File:	907430-02.091
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	13.3
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW1-W-35.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907430-03
Date Analyzed:	08/01/19	Data File:	907430-03.092
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	33.3
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	I9-457 mb
Date Analyzed:	07/30/19	Data File:	I9-457 mb.040
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW4-W-20.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/30/19	Lab ID:	907430-01 1/2
Date Analyzed:	07/30/19	Data File:	073022.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	85	31	160
Benzo(a)anthracene-d12	94	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MWDUP-W-20.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/30/19	Lab ID:	907430-02 1/2
Date Analyzed:	07/30/19	Data File:	073023.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	84	31	160
Benzo(a)anthracene-d12	89	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW1-W-35.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/30/19	Lab ID:	907430-03 1/2
Date Analyzed:	07/30/19	Data File:	073024.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	82	31	160
Benzo(a)anthracene-d12	98	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/30/19	Lab ID:	09-1816 mb
Date Analyzed:	07/30/19	Data File:	073019.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	84	31	160
Benzo(a)anthracene-d12	101	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW4-W-20.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/25/19	Lab ID:	907430-01
Date Analyzed:	07/25/19	Data File:	072551.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	98	50	150
Toluene-d8	101	50	150
4-Bromofluorobenzene	99	50	150

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MWDUP-W-20.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/25/19	Lab ID:	907430-02
Date Analyzed:	07/25/19	Data File:	072552.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	50	150
Toluene-d8	101	50	150
4-Bromofluorobenzene	99	50	150

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW1-W-35.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/25/19	Lab ID:	907430-03
Date Analyzed:	07/25/19	Data File:	072553.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	50	150
Toluene-d8	99	50	150
4-Bromofluorobenzene	98	50	150

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

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/25/19	Lab ID:	09-1694 mb
Date Analyzed:	07/25/19	Data File:	072513.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	99	63	127
4-Bromofluorobenzene	97	60	133

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

Date of Report: 08/05/19
Date Received: 07/24/19
Project: Precision Engineering 1803.01.01, F&BI 907430

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	72	68	58-134	6

Date of Report: 08/05/19
Date Received: 07/24/19
Project: Precision Engineering 1803.01.01, F&BI 907430

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

Laboratory Code: 907486-04 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	3.72	107	106	75-125	1
Chromium	ug/L (ppb)	20	<1	102	103	75-125	1
Copper	ug/L (ppb)	20	<5	92	92	75-125	0
Selenium	ug/L (ppb)	5	<1	108	107	75-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	106	80-120
Chromium	ug/L (ppb)	20	96	80-120
Copper	ug/L (ppb)	20	95	80-120
Selenium	ug/L (ppb)	5	107	80-120

Date of Report: 08/05/19
Date Received: 07/24/19
Project: Precision Engineering 1803.01.01, F&BI 907430

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270D SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	71	76	57-114	7
Acenaphthylene	ug/L (ppb)	1	81	84	65-119	4
Acenaphthene	ug/L (ppb)	1	80	84	66-118	5
Fluorene	ug/L (ppb)	1	84	88	64-125	5
Phenanthrene	ug/L (ppb)	1	84	87	67-120	4
Anthracene	ug/L (ppb)	1	84	87	65-122	4
Fluoranthene	ug/L (ppb)	1	95	97	65-127	2
Pyrene	ug/L (ppb)	1	93	96	62-130	3
Benz(a)anthracene	ug/L (ppb)	1	92	95	60-118	3
Chrysene	ug/L (ppb)	1	90	93	66-125	3
Benzo(b)fluoranthene	ug/L (ppb)	1	94	98	55-135	4
Benzo(k)fluoranthene	ug/L (ppb)	1	92	94	62-125	2
Benzo(a)pyrene	ug/L (ppb)	1	92	93	58-127	1
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	77	82	36-142	6
Dibenz(a,h)anthracene	ug/L (ppb)	1	78	85	37-133	9
Benzo(g,h,i)perylene	ug/L (ppb)	1	68	75	34-135	10

Date of Report: 08/05/19
Date Received: 07/24/19
Project: Precision Engineering 1803.01.01, F&BI 907430

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

Laboratory Code: 907431-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	103	10-172
Chloromethane	ug/L (ppb)	50	<10	94	25-166
Vinyl chloride	ug/L (ppb)	50	<0.2	102	36-166
Bromomethane	ug/L (ppb)	50	<1	94	47-169
Chloroethane	ug/L (ppb)	50	<1	96	46-160
Trichlorofluoromethane	ug/L (ppb)	50	<1	103	44-165
Acetone	ug/L (ppb)	250	<50	55	10-182
1,1-Dichloroethene	ug/L (ppb)	50	<1	98	60-136
Hexane	ug/L (ppb)	50	<1	89	52-150
Methylene chloride	ug/L (ppb)	50	<5	96	67-132
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	100	74-127
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	99	72-129
1,1-Dichloroethane	ug/L (ppb)	50	<1	99	70-128
2,2-Dichloropropane	ug/L (ppb)	50	<1	73	36-154
cis-1,2-Dichloroethene	ug/L (ppb)	50	2.6	102	71-127
Chloroform	ug/L (ppb)	50	<1	100	65-132
2-Butanone (MEK)	ug/L (ppb)	250	<10	80	10-129
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	100	48-149
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	101	60-146
1,1-Dichloropropene	ug/L (ppb)	50	<1	101	69-133
Carbon tetrachloride	ug/L (ppb)	50	<1	101	56-152
Benzene	ug/L (ppb)	50	<0.35	100	76-125
Trichloroethene	ug/L (ppb)	50	15	99 b	66-135
1,2-Dichloropropane	ug/L (ppb)	50	<1	102	78-125
Bromodichloromethane	ug/L (ppb)	50	<1	103	61-150
Dibromomethane	ug/L (ppb)	50	<1	106	66-141
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	110	10-185
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	102	72-132
Toluene	ug/L (ppb)	50	<1	95	76-122
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	99	76-130
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	105	68-131
2-Hexanone	ug/L (ppb)	250	<10	101	10-185
1,3-Dichloropropane	ug/L (ppb)	50	<1	104	71-128
Tetrachloroethene	ug/L (ppb)	50	<1	99	10-226
Dibromochloromethane	ug/L (ppb)	50	<1	106	70-139
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	104	69-134
Chlorobenzene	ug/L (ppb)	50	<1	102	77-122
Ethylbenzene	ug/L (ppb)	50	<1	98	69-135
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	107	73-137
m,p-Xylene	ug/L (ppb)	100	<2	100	69-135
o-Xylene	ug/L (ppb)	50	<1	99	60-140
Styrene	ug/L (ppb)	50	<1	98	71-133
Isopropylbenzene	ug/L (ppb)	50	<1	101	65-142
Bromoform	ug/L (ppb)	50	<1	107	65-142
n-Propylbenzene	ug/L (ppb)	50	<1	101	58-144
Bromobenzene	ug/L (ppb)	50	<1	103	75-124
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	102	66-137
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	110	51-154
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	105	53-150
2-Chlorotoluene	ug/L (ppb)	50	<1	101	66-127
4-Chlorotoluene	ug/L (ppb)	50	<1	101	65-130
tert-Butylbenzene	ug/L (ppb)	50	<1	102	65-137
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	101	59-146
sec-Butylbenzene	ug/L (ppb)	50	<1	102	64-140
p-Isopropyltoluene	ug/L (ppb)	50	<1	101	65-141
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	102	72-123
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	98	69-126
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	102	69-128
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	105	32-164
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	103	66-136
Hexachlorobutadiene	ug/L (ppb)	50	<1	96	60-143
Naphthalene	ug/L (ppb)	50	<1	103	44-164
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	103	69-148

Date of Report: 08/05/19
Date Received: 07/24/19
Project: Precision Engineering 1803.01.01, F&BI 907430

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	101	102	25-158	1
Chloromethane	ug/L (ppb)	50	98	98	45-156	0
Vinyl chloride	ug/L (ppb)	50	105	107	50-154	2
Bromomethane	ug/L (ppb)	50	100	102	55-143	2
Chloroethane	ug/L (ppb)	50	98	100	58-146	2
Trichlorofluoromethane	ug/L (ppb)	250	107	108	50-150	1
Acetone	ug/L (ppb)	250	61	61	53-131	0
1,1-Dichloroethene	ug/L (ppb)	50	99	102	67-136	3
Hexane	ug/L (ppb)	50	98	98	57-137	0
Methylene chloride	ug/L (ppb)	50	93	105	39-148	12
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	103	105	64-147	2
trans-1,2-Dichloroethene	ug/L (ppb)	50	101	104	68-128	3
1,1-Dichloroethane	ug/L (ppb)	50	100	102	79-121	2
2,2-Dichloropropane	ug/L (ppb)	50	114	114	55-143	0
cis-1,2-Dichloroethene	ug/L (ppb)	50	105	106	80-123	1
Chloroform	ug/L (ppb)	50	102	102	80-121	0
2-Butanone (MEK)	ug/L (ppb)	250	83	83	57-149	0
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	100	100	73-132	0
1,1,1-Trichloroethane	ug/L (ppb)	50	103	106	81-125	3
1,1-Dichloropropene	ug/L (ppb)	50	103	103	77-129	0
Carbon tetrachloride	ug/L (ppb)	50	104	104	75-158	0
Benzene	ug/L (ppb)	50	100	100	69-134	0
Trichloroethene	ug/L (ppb)	50	100	99	79-113	1
1,2-Dichloropropane	ug/L (ppb)	50	101	101	77-123	0
Bromodichloromethane	ug/L (ppb)	50	103	103	81-133	0
Dibromomethane	ug/L (ppb)	50	106	106	82-125	0
4-Methyl-2-pentanone	ug/L (ppb)	250	111	109	65-138	2
cis-1,3-Dichloropropene	ug/L (ppb)	50	108	107	82-132	1
Toluene	ug/L (ppb)	50	94	94	72-122	0
trans-1,3-Dichloropropene	ug/L (ppb)	50	104	102	80-136	2
1,1,2-Trichloroethane	ug/L (ppb)	50	104	103	75-124	1
2-Hexanone	ug/L (ppb)	250	101	99	60-136	2
1,3-Dichloropropane	ug/L (ppb)	50	102	101	76-126	1
Tetrachloroethene	ug/L (ppb)	50	100	101	76-121	1
Dibromochloromethane	ug/L (ppb)	50	106	105	84-133	1
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	104	103	82-115	1
Chlorobenzene	ug/L (ppb)	50	101	101	83-114	0
Ethylbenzene	ug/L (ppb)	50	99	99	77-124	0
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	107	107	84-127	0
m,p-Xylene	ug/L (ppb)	100	100	100	81-112	0
o-Xylene	ug/L (ppb)	50	100	100	81-121	0
Styrene	ug/L (ppb)	50	103	103	84-119	0
Isopropylbenzene	ug/L (ppb)	50	102	103	80-117	1
Bromoform	ug/L (ppb)	50	109	108	74-136	1
n-Propylbenzene	ug/L (ppb)	50	103	103	74-126	0
Bromobenzene	ug/L (ppb)	50	103	102	80-121	1
1,3,5-Trimethylbenzene	ug/L (ppb)	50	103	103	78-123	0
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	110	109	66-126	1
1,2,3-Trichloropropane	ug/L (ppb)	50	105	104	67-124	1
2-Chlorotoluene	ug/L (ppb)	50	102	102	77-127	0
4-Chlorotoluene	ug/L (ppb)	50	102	101	78-128	1
tert-Butylbenzene	ug/L (ppb)	50	103	102	80-123	1
1,2,4-Trimethylbenzene	ug/L (ppb)	50	103	103	79-122	0
sec-Butylbenzene	ug/L (ppb)	50	103	103	80-116	0
p-Isopropyltoluene	ug/L (ppb)	50	104	103	81-123	1
1,3-Dichlorobenzene	ug/L (ppb)	50	104	103	83-113	1
1,4-Dichlorobenzene	ug/L (ppb)	50	98	98	83-107	0
1,2-Dichlorobenzene	ug/L (ppb)	50	103	103	84-112	0
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	110	109	57-141	1
1,2,4-Trichlorobenzene	ug/L (ppb)	50	106	107	72-130	1
Hexachlorobutadiene	ug/L (ppb)	50	101	102	53-141	1
Naphthalene	ug/L (ppb)	50	106	106	64-133	0
1,2,3-Trichlorobenzene	ug/L (ppb)	50	104	105	65-136	1

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

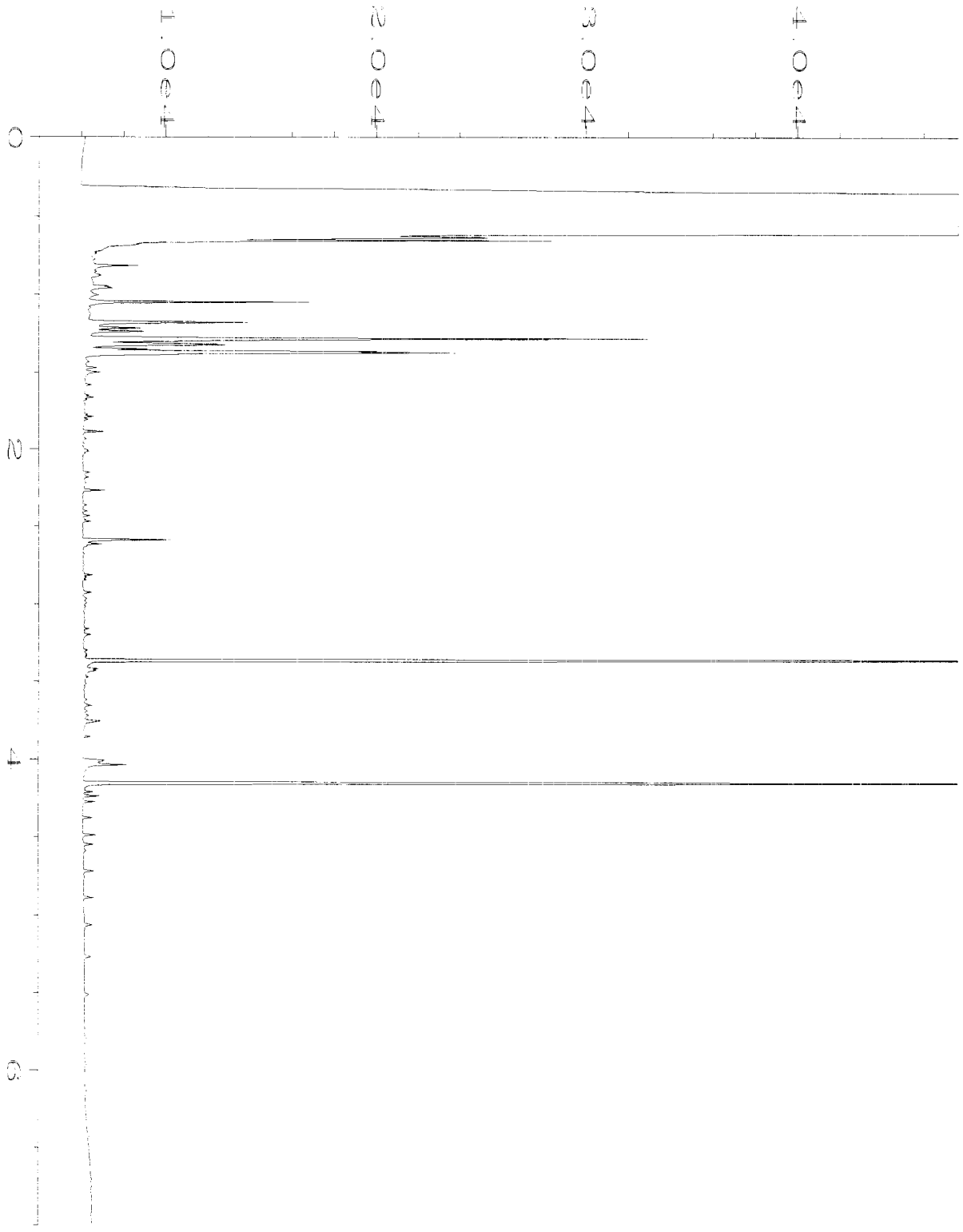
nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

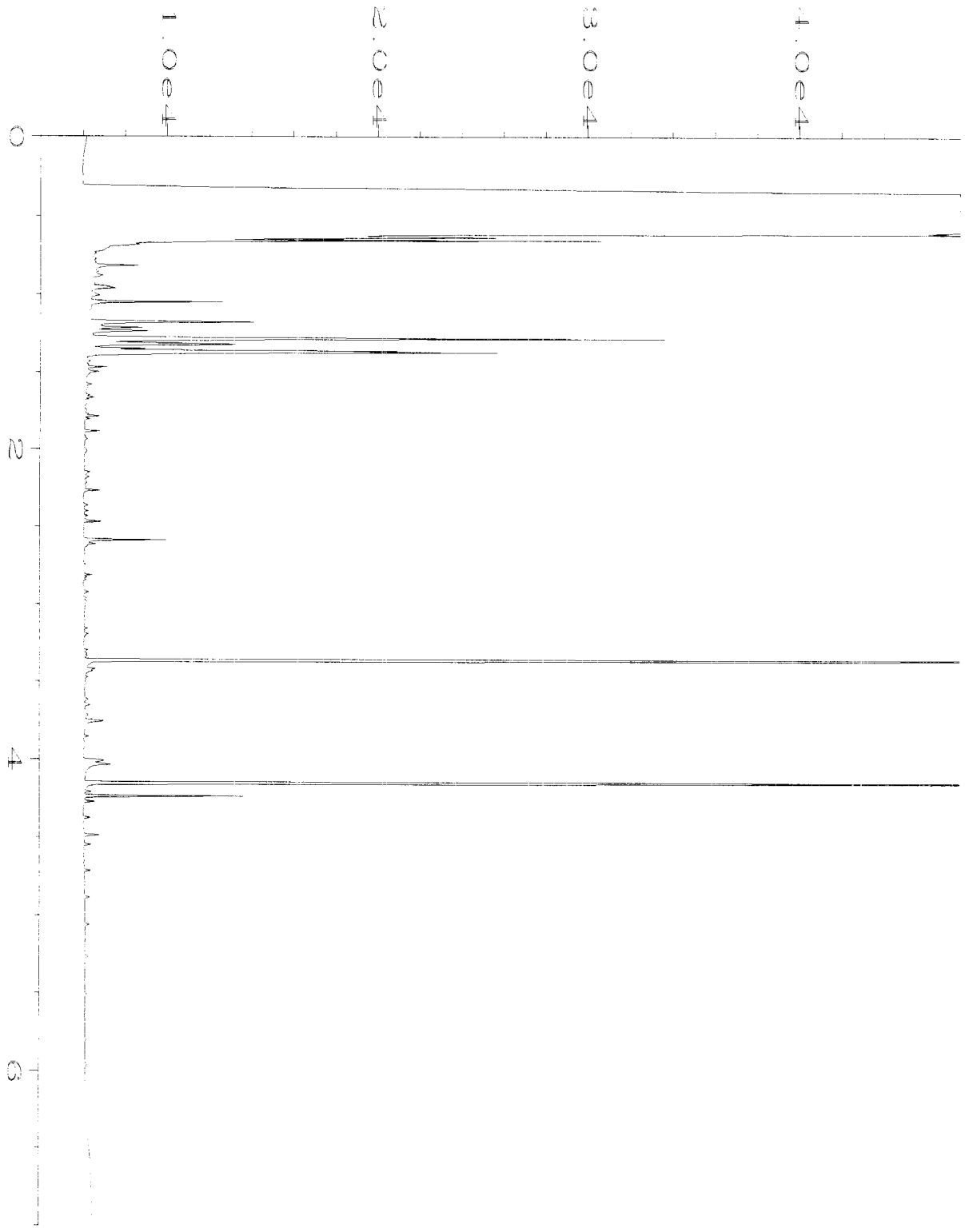
ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



Data File Name	: C:\HPCHEM\6\DATA\07-25-19\020F0501.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 20
Sample Name	: 907430-01	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 5
Acquired on	: 25 Jul 19 05:10 PM	Instrument Method	: DX.MTH
Report Created on	: 26 Jul 19 11:30 AM	Analysis Method	: DEFAULT.MTH



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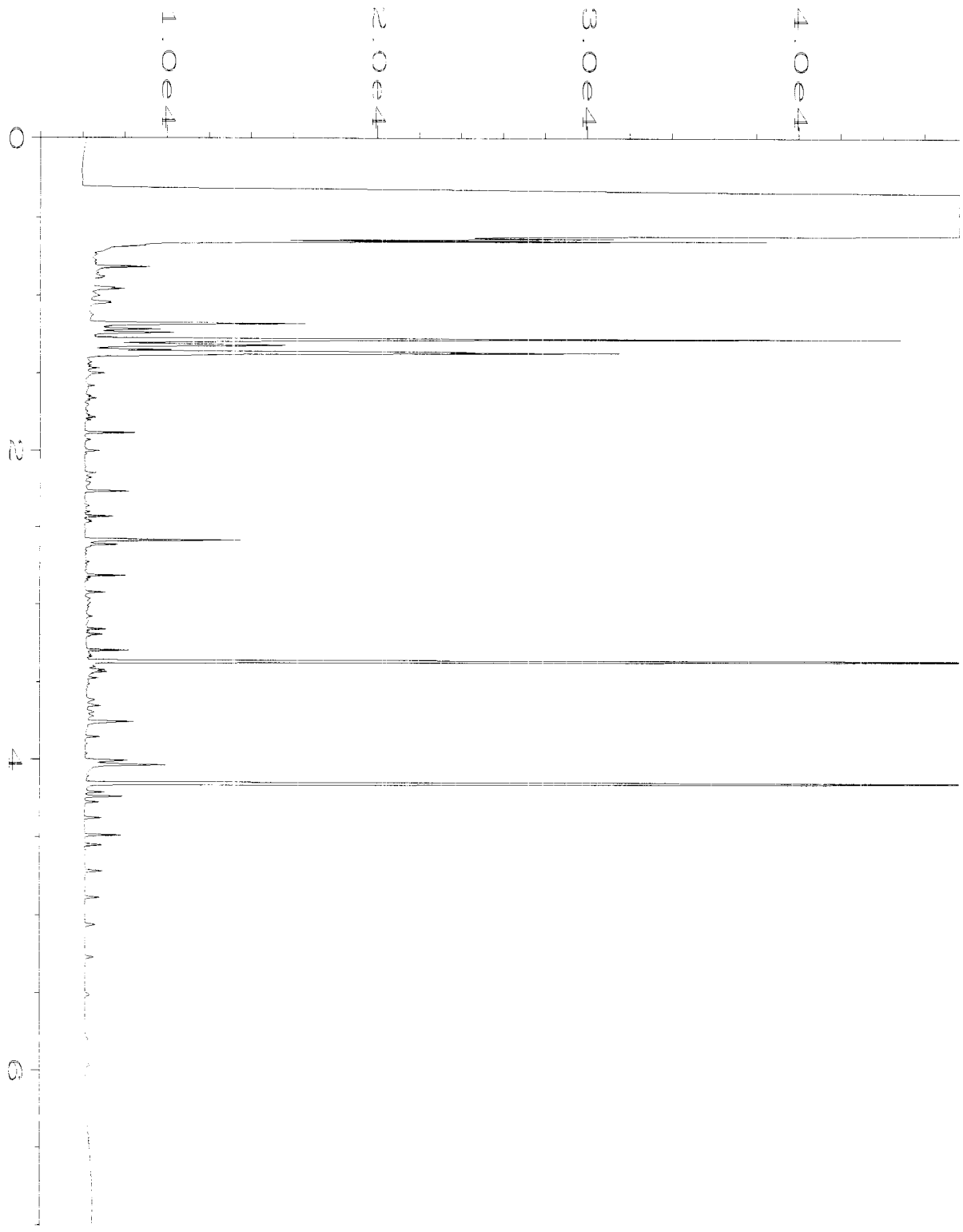
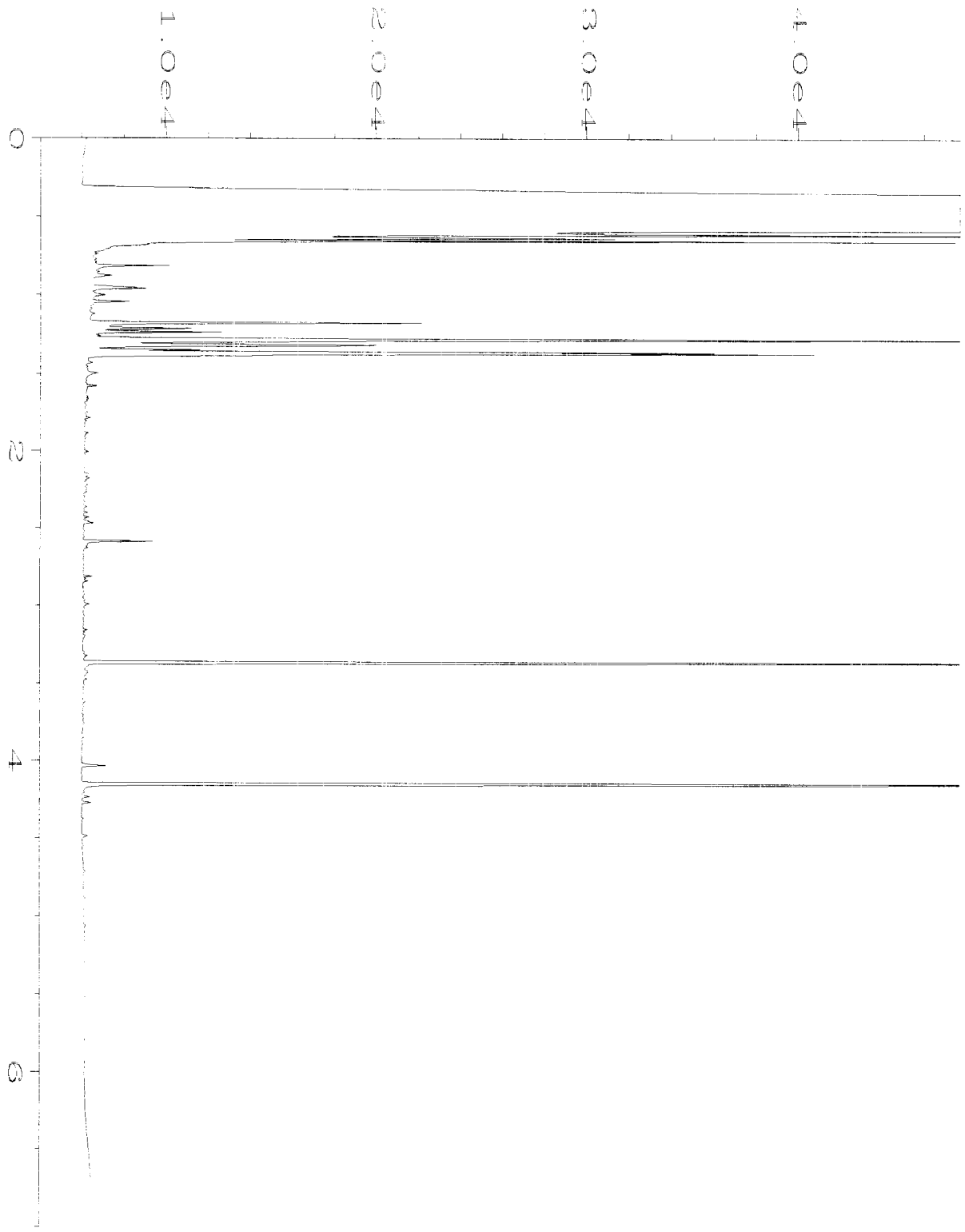
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 21
Sample Name	: 907430-02	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 5
Acquired on	: 25 Jul 19 05:21 PM	Instrument Method	: DX.MTH
Report Created on	: 26 Jul 19 11:30 AM	Analysis Method	: DEFAULT.MTH

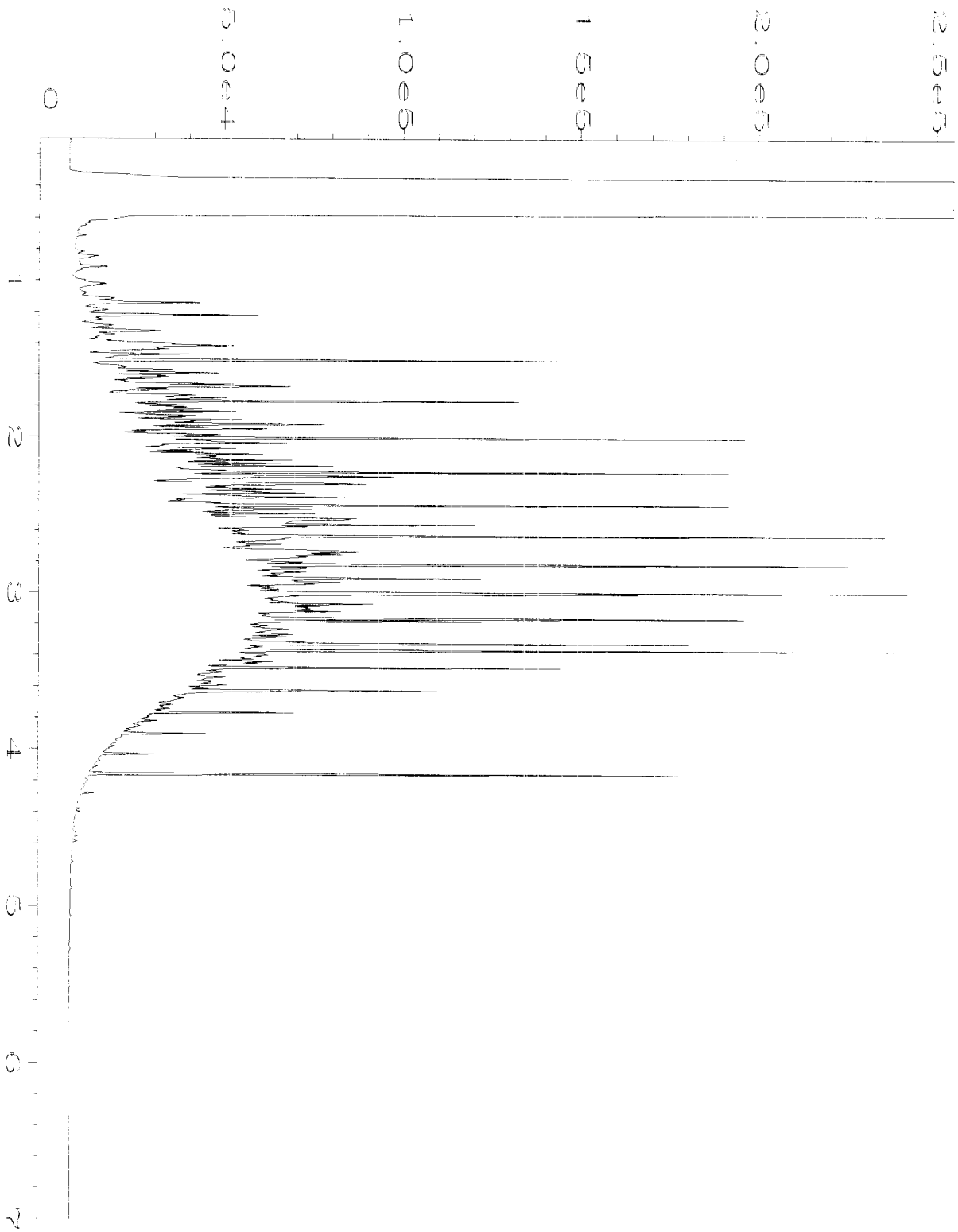


Data File Name	: C:\HPCHEM\6\DATA\07-25-19\022F0501.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 22
Sample Name	: 907430-03	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 5
Acquired on	: 25 Jul 19 05:32 PM	Instrument Method	: DX.MTH
Report Created on	: 26 Jul 19 11:30 AM	Analysis Method	: DEFAULT.MTH



Data File Name : C:\HPCHEM\6\DATA\07-25-19\017F0501.D
Operator : TL
Instrument : GC6
Sample Name : 09-1784 mb2
Run Time Bar Code:
Acquired on : 25 Jul 19 04:36 PM
Report Created on: 26 Jul 19 11:29 AM

Page Number : 1
Vial Number : 17
Injection Number : 1
Sequence Line : 5
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\6\DATA\07-25-19\005F0401.D

Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 5
Sample Name	: 1000 Dx 57-78B	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 4
Acquired on	: 25 Jul 19 04:00 PM	Instrument Method	: DX.MTH
Report Created on	: 26 Jul 19 11:29 AM	Analysis Method	: DEFAULT.MTH

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

Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 907430
Work Order Number: 1907331

July 30, 2019

Attention Michael Erdahl:

Fremont Analytical, Inc. received 3 sample(s) on 7/24/2019 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *07/31/2019*

CLIENT: Friedman & Bruya
Project: 907430
Work Order: 1907331

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1907331-001	MW4-W-20.0	07/24/2019 9:05 AM	07/24/2019 3:19 PM
1907331-002	MWDUP-W-20.0	07/24/2019 9:10 AM	07/24/2019 3:19 PM
1907331-003	MW1-W-35.0	07/24/2019 11:40 AM	07/24/2019 3:19 PM

Case Narrative

WO#: **1907331**

Date: **7/30/2019**

CLIENT: Friedman & Bruya
Project: 907430

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **1907331**
Date Reported: **7/30/2019**

CLIENT: Friedman & Bruya
Project: 907430

Lab ID: 1907331-001 **Collection Date:** 7/24/2019 9:05:00 AM
Client Sample ID: **MW4-W-20.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R52853		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	7/24/2019 4:24:00 PM

Lab ID: 1907331-002 **Collection Date:** 7/24/2019 9:10:00 AM
Client Sample ID: **MWDUP-W-20.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R52853		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	7/24/2019 4:29:00 PM

Lab ID: 1907331-003 **Collection Date:** 7/24/2019 11:40:00 AM
Client Sample ID: **MW1-W-35.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R52853		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	7/24/2019 4:34:00 PM

Work Order: 1907331
CLIENT: Friedman & Bruya
Project: 907430

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-R52853**	SampType: **MBLK**			Units: **mg/L**		Prep Date: **7/24/2019**			RunNo: **52853**	
Client ID: **MBLKW**	Batch ID: **R52853**					Analysis Date: **7/24/2019**			SeqNo: **1044492**	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-R52853**	SampType: **LCS**			Units: **mg/L**		Prep Date: **7/24/2019**			RunNo: **52853**	
Client ID: **LCSW**	Batch ID: **R52853**					Analysis Date: **7/24/2019**			SeqNo: **1044493**	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.248	0.0450	0.2500	0	99.1	90	110				

Sample ID: **1907319-002ADUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **7/24/2019**			RunNo: **52853**	
Client ID: **BATCH**	Batch ID: **R52853**					Analysis Date: **7/24/2019**			SeqNo: **1044495**	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		30	

Sample ID: **1907319-002AMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **7/24/2019**			RunNo: **52853**	
Client ID: **BATCH**	Batch ID: **R52853**					Analysis Date: **7/24/2019**			SeqNo: **1044496**	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.308	0.0450	0.2500	0	123	65	135				

Sample ID: **1907319-002AMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **7/24/2019**			RunNo: **52853**	
Client ID: **BATCH**	Batch ID: **R52853**					Analysis Date: **7/24/2019**			SeqNo: **1044497**	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.262	0.0450	0.2500	0	105	65	135	0.3085	16.2	30	

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**1907331**
Logged by:	**Clare Griggs**	Date Received:	**7/24/2019 3:19:00 PM**

Chain of Custody

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

Log In

3.	Coolers are present?	Yes	☑	No ☐	NA	☐
4.	Shipping container/cooler in good condition?	Yes	☑	No ☐		
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes	☐	No ☑	Not Required	☐
6.	Was an attempt made to cool the samples?	Yes	☑	No ☐	NA	☐
7.	Were all items received at a temperature of >0°C to 10.0°C *	Yes	☑	No ☐	NA	☐
8.	Sample(s) in proper container(s)?	Yes	☑	No ☐		
9.	Sufficient sample volume for indicated test(s)?	Yes	☑	No ☐		
10.	Are samples properly preserved?	Yes	☑	No ☐		
11.	Was preservative added to bottles?	Yes	☐	No ☑	NA	☐
12.	Is there headspace in the VOA vials?	Yes	☐	No ☐	NA	☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes	☑	No ☐		
14.	Does paperwork match bottle labels?	Yes	☑	No ☐		
15.	Are matrices correctly identified on Chain of Custody?	Yes	☑	No ☐		
16.	Is it clear what analyses were requested?	Yes	☑	No ☐		
17.	Were all holding times able to be met?	Yes	☑	No ☐		

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp °C
Cooler	9.3
Sample	8.3

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY 1907331

Page # 1 of 1

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 Fax # (206) 283-5044

SUBCONTRACTER Fremont

PROJECT NAME/NO. 907430

PO # A-331

REMARKS

Please Email Results EQuIS EDD

TURNAROUND TIME

☑ Standard (2 Weeks)

☐ RUSH

Rush charges authorized by:

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Return samples

☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	Cr VI						Notes
MW4-W-20.0		7/24/19	905	Water	1				X						
MWDUP-W-20.0		7/24/19	910	Water	1				X						
MW1-W-35.0		7/24/19	1140	Water	1				X						

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

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	7/	
Received by:		Eduardo Alcantar Sol	FAI	7/24/19	1819
Relinquished by:					
Received by:					

907430

SAMPLE CHAIN OF CUSTODY

ME 07-24-19

805 / AT2 / VW2

Page # 1 of 2

Report To Meredith D'andrea / Ryan Lewis

Company Maul Foster Alongi

Address 2815 2nd Ave, Suite 540

City, State, ZIP Seattle, WA, 98121

Phone _____ Email mdandrea@maulfoster.com

SAMPLERS (*signature*) Ryan Lewis

PROJECT NAME: Precision Engineering

PO #: 180301.01

REMARKS

INVOICE TO: MFA

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

SAMPLE DISPOSAL
- [ ] Dispose after 30 days
- [ ] Archive Samples
- [ ] Other _____

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: TPH-HCID	TPH-Diesel Req	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	Hexavalent Chromium	Dissolved metals Chromium, Cu, As, Se			Notes
MW4-W-20.0	01A-G	7/24/19	905	W	7		X			X		X	X	X			
MWDUP-W-20.0	02 T	7/24/19	910	W	7		X			X		X	X	X			
MW1-W-35.0	03	7/24/19	~~1235~~ 1140 RL	W	7		X			X		X	X	X			
																	~~Samples received at~~ 2 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Ryan Lewis	Ryan Lewis	MFA	7/24/19	1237
Received by: E. Webber-Bruya	Liz Webber-Bruya	FBI	7/24/19	1237
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

August 5, 2019

Merideth D'Andrea, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms D'Andrea:

Included are the results from the testing of material submitted on July 24, 2019 from the Precision Engineering 1803.01.01, F&BI 907410 project. There are 24 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Ryan Lewis
MFA0805R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on July 24, 2019 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.01, F&BI 907410 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
907410 -01	MW-8-W-19.0
907410 -02	MW-9-W-33.0
907410 -03	MW-10-W-15.0
907410 -04	MW-6-W-15.0

The samples were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

A 6020B internal standard failed the acceptance criteria for sample MW-8-W-19.0. The sample was diluted and reanalyzed with acceptable results. Both data sets were reported.

The 8260C sample MW-6-W-15.0 was analyzed at a dilution due to matrix effect (foamy). The reporting limits were raised accordingly.

All other quality control requirements were acceptable.

Date of Report: 08/05/19
Date Received: 07/24/19
Project: Precision Engineering 1803.01.01, F&BI 907410
Date Extracted: 07/24/19
Date Analyzed: 07/24/19

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 51-134)
MW-8-W-19.0 907410-01	370 x	<250	88
MW-9-W-33.0 907410-02	110 x	<250	85
MW-10-W-15.0 907410-03	370 x	<250	91
MW-6-W-15.0 907410-04	550 x	580 x	54
Method Blank 09-1784 MB	<50	<250	75

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-8-W-19.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907410-01 x2
Date Analyzed:	08/01/19	Data File:	907410-01 x2.034
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	20.4
Chromium	7.55 J
Copper	44.7
Selenium	2.99

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-8-W-19.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907410-01 x5
Date Analyzed:	08/01/19	Data File:	907410-01 x5.083
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	8.82

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-9-W-33.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907410-02
Date Analyzed:	08/01/19	Data File:	907410-02.035
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	9.26
Chromium	1.56
Copper	5.87
Selenium	2.70

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-10-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907410-03
Date Analyzed:	08/01/19	Data File:	907410-03.084
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	16.2
Chromium	7.96
Copper	<5
Selenium	4.34

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW-6-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907410-04 x10
Date Analyzed:	08/01/19	Data File:	907410-04 x10.085
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	42.8
Chromium	34.5
Copper	210
Selenium	11.8

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	I9-457 mb
Date Analyzed:	07/30/19	Data File:	I9-457 mb.040
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW-8-W-19.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/24/19	Lab ID:	907410-01 1/2
Date Analyzed:	07/25/19	Data File:	072505.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	74	31	160
Benzo(a)anthracene-d12	88	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW-9-W-33.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/24/19	Lab ID:	907410-02 1/2
Date Analyzed:	07/25/19	Data File:	072506.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	94	31	160
Benzo(a)anthracene-d12	112	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW-10-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/24/19	Lab ID:	907410-03 1/2
Date Analyzed:	07/25/19	Data File:	072507.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	96	31	160
Benzo(a)anthracene-d12	123	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW-6-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/24/19	Lab ID:	907410-04 1/2
Date Analyzed:	07/25/19	Data File:	072508.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	97	31	160
Benzo(a)anthracene-d12	128	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/24/19	Lab ID:	09-1772 mb2
Date Analyzed:	07/25/19	Data File:	072437.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	100	31	160
Benzo(a)anthracene-d12	116	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW-8-W-19.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/25/19	Lab ID:	907410-01
Date Analyzed:	07/25/19	Data File:	072515.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	57	121
Toluene-d8	99	63	127
4-Bromofluorobenzene	96	60	133

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW-9-W-33.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/25/19	Lab ID:	907410-02
Date Analyzed:	07/25/19	Data File:	072516.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	99	63	127
4-Bromofluorobenzene	96	60	133

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW-10-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/25/19	Lab ID:	907410-03
Date Analyzed:	07/25/19	Data File:	072517.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	100	63	127
4-Bromofluorobenzene	96	60	133

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW-6-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/24/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/25/19	Lab ID:	907410-04 1/10
Date Analyzed:	07/25/19	Data File:	072514.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	99	63	127
4-Bromofluorobenzene	97	60	133

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Dichlorodifluoromethane	<10	1,3-Dichloropropane	<10
Chloromethane	<100	Tetrachloroethene	<10
Vinyl chloride	<2	Dibromochloromethane	<10
Bromomethane	<10	1,2-Dibromoethane (EDB)	<10
Chloroethane	<10	Chlorobenzene	<10
Trichlorofluoromethane	<10	Ethylbenzene	<10
Acetone	<500	1,1,1,2-Tetrachloroethane	<10
1,1-Dichloroethene	<10	m,p-Xylene	<20
Hexane	<10	o-Xylene	<10
Methylene chloride	<50	Styrene	<10
Methyl t-butyl ether (MTBE)	<10	Isopropylbenzene	<10
trans-1,2-Dichloroethene	<10	Bromoform	<10
1,1-Dichloroethane	<10	n-Propylbenzene	<10
2,2-Dichloropropane	<10	Bromobenzene	<10
cis-1,2-Dichloroethene	<10	1,3,5-Trimethylbenzene	<10
Chloroform	<10	1,1,2,2-Tetrachloroethane	<10
2-Butanone (MEK)	<100	1,2,3-Trichloropropane	<10
1,2-Dichloroethane (EDC)	<10	2-Chlorotoluene	<10
1,1,1-Trichloroethane	<10	4-Chlorotoluene	<10
1,1-Dichloropropene	<10	tert-Butylbenzene	<10
Carbon tetrachloride	<10	1,2,4-Trimethylbenzene	<10
Benzene	<3.5	sec-Butylbenzene	<10
Trichloroethene	<10	p-Isopropyltoluene	<10
1,2-Dichloropropane	<10	1,3-Dichlorobenzene	<10
Bromodichloromethane	<10	1,4-Dichlorobenzene	<10
Dibromomethane	<10	1,2-Dichlorobenzene	<10
4-Methyl-2-pentanone	<100	1,2-Dibromo-3-chloropropane	<100
cis-1,3-Dichloropropene	<10	1,2,4-Trichlorobenzene	<10
Toluene	<10	Hexachlorobutadiene	<10
trans-1,3-Dichloropropene	<10	Naphthalene	<10
1,1,2-Trichloroethane	<10	1,2,3-Trichlorobenzene	<10
2-Hexanone	<100		

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/25/19	Lab ID:	09-1694 mb
Date Analyzed:	07/25/19	Data File:	072513.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	99	63	127
4-Bromofluorobenzene	97	60	133

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

Date of Report: 08/05/19
Date Received: 07/24/19
Project: Precision Engineering 1803.01.01, F&BI 907410

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	72	68	58-134	6

Date of Report: 08/05/19
Date Received: 07/24/19
Project: Precision Engineering 1803.01.01, F&BI 907410

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

Laboratory Code: 907486-04 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	3.72	107	106	75-125	1
Chromium	ug/L (ppb)	20	<1	102	103	75-125	1
Copper	ug/L (ppb)	20	<5	92	92	75-125	0
Selenium	ug/L (ppb)	5	<1	108	107	75-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	106	80-120
Chromium	ug/L (ppb)	20	96	80-120
Copper	ug/L (ppb)	20	95	80-120
Selenium	ug/L (ppb)	5	107	80-120

Date of Report: 08/05/19
Date Received: 07/24/19
Project: Precision Engineering 1803.01.01, F&BI 907410

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270D SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	85	83	57-114	2
Acenaphthylene	ug/L (ppb)	1	87	87	65-119	0
Acenaphthene	ug/L (ppb)	1	88	88	66-118	0
Fluorene	ug/L (ppb)	1	87	88	64-125	1
Phenanthrene	ug/L (ppb)	1	90	90	67-120	0
Anthracene	ug/L (ppb)	1	90	88	65-122	2
Fluoranthene	ug/L (ppb)	1	93	91	65-127	2
Pyrene	ug/L (ppb)	1	88	83	62-130	6
Benz(a)anthracene	ug/L (ppb)	1	96	92	60-118	4
Chrysene	ug/L (ppb)	1	95	92	66-125	3
Benzo(b)fluoranthene	ug/L (ppb)	1	87	89	55-135	2
Benzo(k)fluoranthene	ug/L (ppb)	1	89	91	62-125	2
Benzo(a)pyrene	ug/L (ppb)	1	87	88	58-127	1
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	81	79	36-142	2
Dibenz(a,h)anthracene	ug/L (ppb)	1	81	79	37-133	2
Benzo(g,h,i)perylene	ug/L (ppb)	1	79	76	34-135	4

Date of Report: 08/05/19
Date Received: 07/24/19
Project: Precision Engineering 1803.01.01, F&BI 907410

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

Laboratory Code: 907431-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	103	10-172
Chloromethane	ug/L (ppb)	50	<10	94	25-166
Vinyl chloride	ug/L (ppb)	50	<0.2	102	36-166
Bromomethane	ug/L (ppb)	50	<1	94	47-169
Chloroethane	ug/L (ppb)	50	<1	96	46-160
Trichlorofluoromethane	ug/L (ppb)	50	<1	103	44-165
Acetone	ug/L (ppb)	250	<50	55	10-182
1,1-Dichloroethene	ug/L (ppb)	50	<1	98	60-136
Hexane	ug/L (ppb)	50	<1	89	52-150
Methylene chloride	ug/L (ppb)	50	<5	96	67-132
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	100	74-127
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	99	72-129
1,1-Dichloroethane	ug/L (ppb)	50	<1	99	70-128
2,2-Dichloropropane	ug/L (ppb)	50	<1	73	36-154
cis-1,2-Dichloroethene	ug/L (ppb)	50	2.6	102	71-127
Chloroform	ug/L (ppb)	50	<1	100	65-132
2-Butanone (MEK)	ug/L (ppb)	250	<10	80	10-129
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	100	48-149
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	101	60-146
1,1-Dichloropropene	ug/L (ppb)	50	<1	101	69-133
Carbon tetrachloride	ug/L (ppb)	50	<1	101	56-152
Benzene	ug/L (ppb)	50	<0.35	100	76-125
Trichloroethene	ug/L (ppb)	50	15	99 b	66-135
1,2-Dichloropropane	ug/L (ppb)	50	<1	102	78-125
Bromodichloromethane	ug/L (ppb)	50	<1	103	61-150
Dibromomethane	ug/L (ppb)	50	<1	106	66-141
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	110	10-185
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	102	72-132
Toluene	ug/L (ppb)	50	<1	95	76-122
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	99	76-130
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	105	68-131
2-Hexanone	ug/L (ppb)	250	<10	101	10-185
1,3-Dichloropropane	ug/L (ppb)	50	<1	104	71-128
Tetrachloroethene	ug/L (ppb)	50	<1	99	10-226
Dibromochloromethane	ug/L (ppb)	50	<1	106	70-139
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	104	69-134
Chlorobenzene	ug/L (ppb)	50	<1	102	77-122
Ethylbenzene	ug/L (ppb)	50	<1	98	69-135
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	107	73-137
m,p-Xylene	ug/L (ppb)	100	<2	100	69-135
o-Xylene	ug/L (ppb)	50	<1	99	60-140
Styrene	ug/L (ppb)	50	<1	98	71-133
Isopropylbenzene	ug/L (ppb)	50	<1	101	65-142
Bromoform	ug/L (ppb)	50	<1	107	65-142
n-Propylbenzene	ug/L (ppb)	50	<1	101	58-144
Bromobenzene	ug/L (ppb)	50	<1	103	75-124
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	102	66-137
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	110	51-154
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	105	53-150
2-Chlorotoluene	ug/L (ppb)	50	<1	101	66-127
4-Chlorotoluene	ug/L (ppb)	50	<1	101	65-130
tert-Butylbenzene	ug/L (ppb)	50	<1	102	65-137
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	101	59-146
sec-Butylbenzene	ug/L (ppb)	50	<1	102	64-140
p-Isopropyltoluene	ug/L (ppb)	50	<1	101	65-141
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	102	72-123
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	98	69-126
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	102	69-128
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	105	32-164
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	103	66-136
Hexachlorobutadiene	ug/L (ppb)	50	<1	96	60-143
Naphthalene	ug/L (ppb)	50	<1	103	44-164
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	103	69-148

Date of Report: 08/05/19
Date Received: 07/24/19
Project: Precision Engineering 1803.01.01, F&BI 907410

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	101	102	25-158	1
Chloromethane	ug/L (ppb)	50	98	98	45-156	0
Vinyl chloride	ug/L (ppb)	50	105	107	50-154	2
Bromomethane	ug/L (ppb)	50	100	102	55-143	2
Chloroethane	ug/L (ppb)	50	98	100	58-146	2
Trichlorofluoromethane	ug/L (ppb)	250	107	108	50-150	1
Acetone	ug/L (ppb)	250	61	61	53-131	0
1,1-Dichloroethene	ug/L (ppb)	50	99	102	67-136	3
Hexane	ug/L (ppb)	50	98	98	57-137	0
Methylene chloride	ug/L (ppb)	50	93	105	39-148	12
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	103	105	64-147	2
trans-1,2-Dichloroethene	ug/L (ppb)	50	101	104	68-128	3
1,1-Dichloroethane	ug/L (ppb)	50	100	102	79-121	2
2,2-Dichloropropane	ug/L (ppb)	50	114	114	55-143	0
cis-1,2-Dichloroethene	ug/L (ppb)	50	105	106	80-123	1
Chloroform	ug/L (ppb)	50	102	102	80-121	0
2-Butanone (MEK)	ug/L (ppb)	250	83	83	57-149	0
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	100	100	73-132	0
1,1,1-Trichloroethane	ug/L (ppb)	50	103	106	81-125	3
1,1-Dichloropropene	ug/L (ppb)	50	103	103	77-129	0
Carbon tetrachloride	ug/L (ppb)	50	104	104	75-158	0
Benzene	ug/L (ppb)	50	100	100	69-134	0
Trichloroethene	ug/L (ppb)	50	100	99	79-113	1
1,2-Dichloropropane	ug/L (ppb)	50	101	101	77-123	0
Bromodichloromethane	ug/L (ppb)	50	103	103	81-133	0
Dibromomethane	ug/L (ppb)	50	106	106	82-125	0
4-Methyl-2-pentanone	ug/L (ppb)	250	111	109	65-138	2
cis-1,3-Dichloropropene	ug/L (ppb)	50	108	107	82-132	1
Toluene	ug/L (ppb)	50	94	94	72-122	0
trans-1,3-Dichloropropene	ug/L (ppb)	50	104	102	80-136	2
1,1,2-Trichloroethane	ug/L (ppb)	50	104	103	75-124	1
2-Hexanone	ug/L (ppb)	250	101	99	60-136	2
1,3-Dichloropropane	ug/L (ppb)	50	102	101	76-126	1
Tetrachloroethene	ug/L (ppb)	50	100	101	76-121	1
Dibromochloromethane	ug/L (ppb)	50	106	105	84-133	1
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	104	103	82-115	1
Chlorobenzene	ug/L (ppb)	50	101	101	83-114	0
Ethylbenzene	ug/L (ppb)	50	99	99	77-124	0
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	107	107	84-127	0
m,p-Xylene	ug/L (ppb)	100	100	100	81-112	0
o-Xylene	ug/L (ppb)	50	100	100	81-121	0
Styrene	ug/L (ppb)	50	103	103	84-119	0
Isopropylbenzene	ug/L (ppb)	50	102	103	80-117	1
Bromoform	ug/L (ppb)	50	109	108	74-136	1
n-Propylbenzene	ug/L (ppb)	50	103	103	74-126	0
Bromobenzene	ug/L (ppb)	50	103	102	80-121	1
1,3,5-Trimethylbenzene	ug/L (ppb)	50	103	103	78-123	0
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	110	109	66-126	1
1,2,3-Trichloropropane	ug/L (ppb)	50	105	104	67-124	1
2-Chlorotoluene	ug/L (ppb)	50	102	102	77-127	0
4-Chlorotoluene	ug/L (ppb)	50	102	101	78-128	1
tert-Butylbenzene	ug/L (ppb)	50	103	102	80-123	1
1,2,4-Trimethylbenzene	ug/L (ppb)	50	103	103	79-122	0
sec-Butylbenzene	ug/L (ppb)	50	103	103	80-116	0
p-Isopropyltoluene	ug/L (ppb)	50	104	103	81-123	1
1,3-Dichlorobenzene	ug/L (ppb)	50	104	103	83-113	1
1,4-Dichlorobenzene	ug/L (ppb)	50	98	98	83-107	0
1,2-Dichlorobenzene	ug/L (ppb)	50	103	103	84-112	0
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	110	109	57-141	1
1,2,4-Trichlorobenzene	ug/L (ppb)	50	106	107	72-130	1
Hexachlorobutadiene	ug/L (ppb)	50	101	102	53-141	1
Naphthalene	ug/L (ppb)	50	106	106	64-133	0
1,2,3-Trichlorobenzene	ug/L (ppb)	50	104	105	65-136	1

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

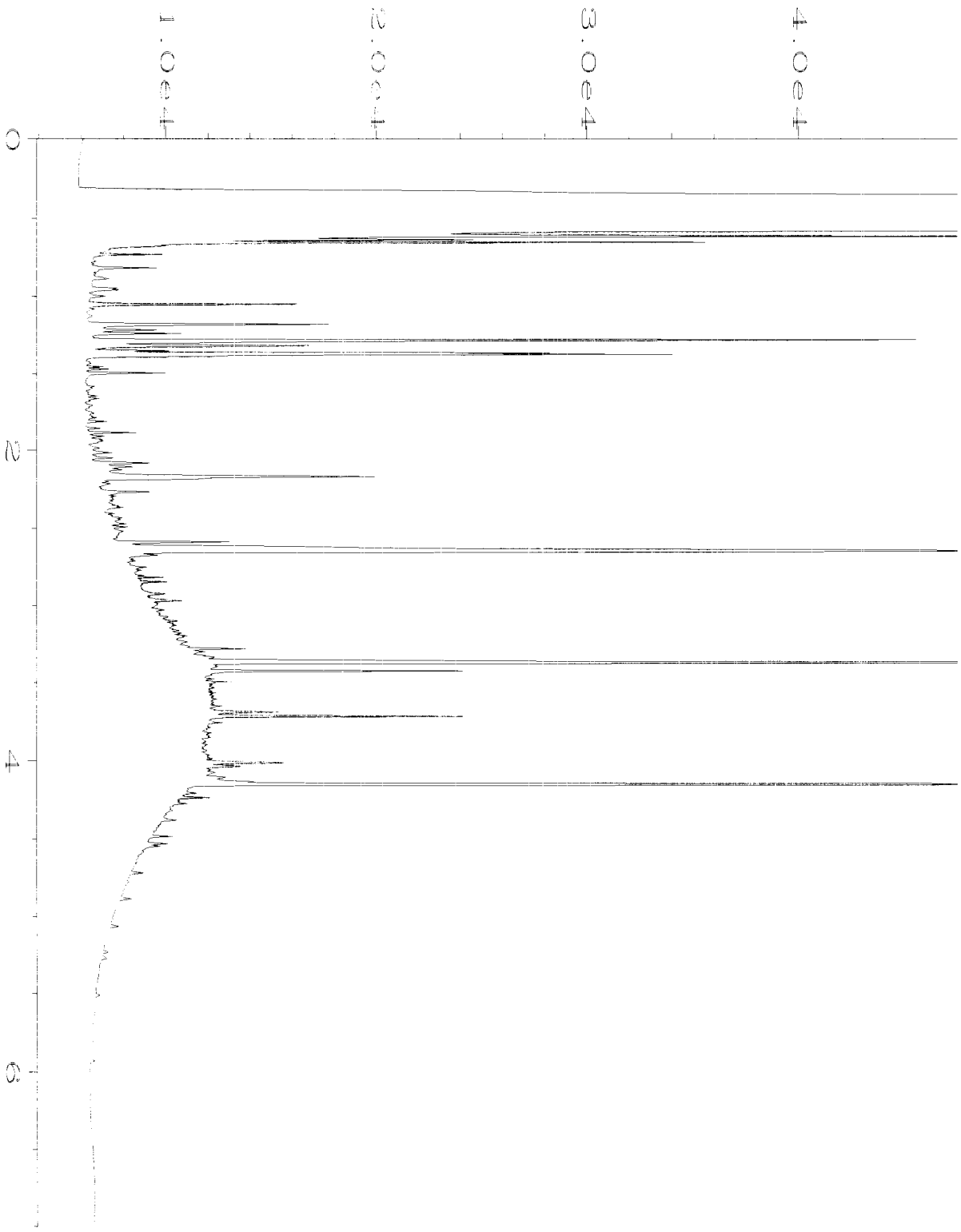
nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



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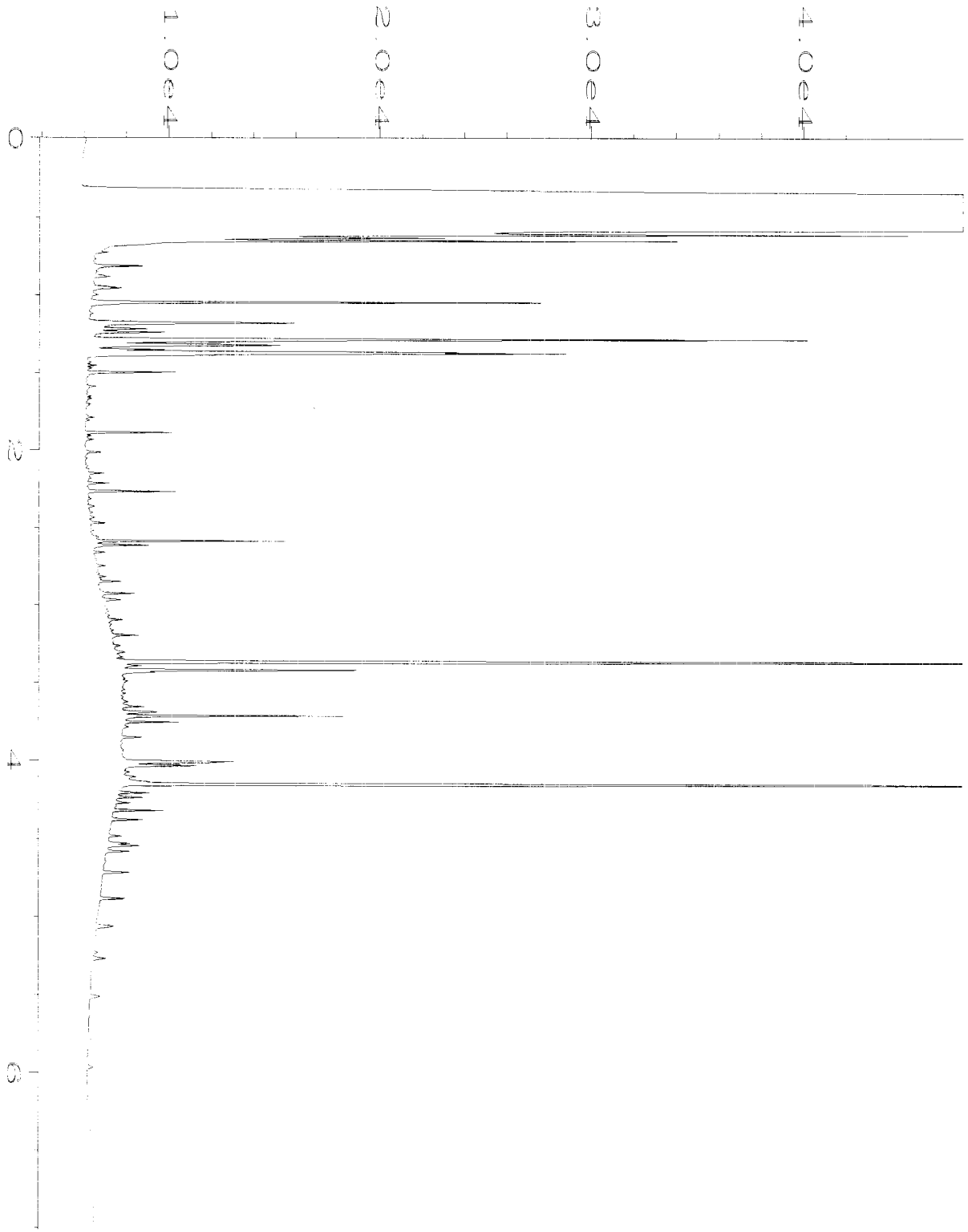
Operator : TL
Instrument : GC6
Sample Name : 907410-01
Run Time Bar Code:
Acquired on : 24 Jul 19 04:08 PM
Report Created on: 25 Jul 19 10:41 AM

Page Number : 1
Vial Number : 30
Injection Number : 1
Sequence Line : 8
Instrument Method: DX.MTH
Analysis Method : DX.MTH



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Instrument	: GC6	Vial Number	: 31
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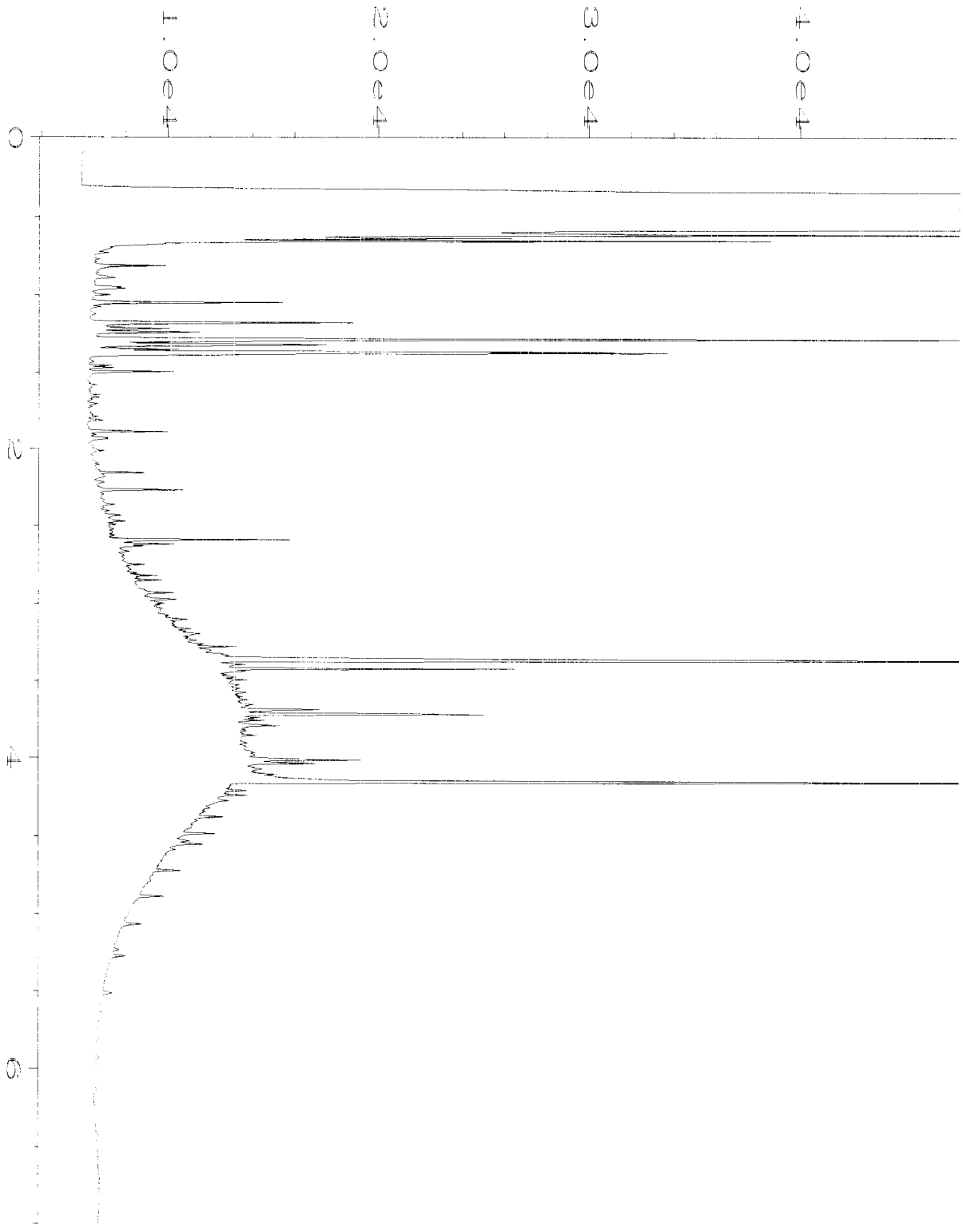
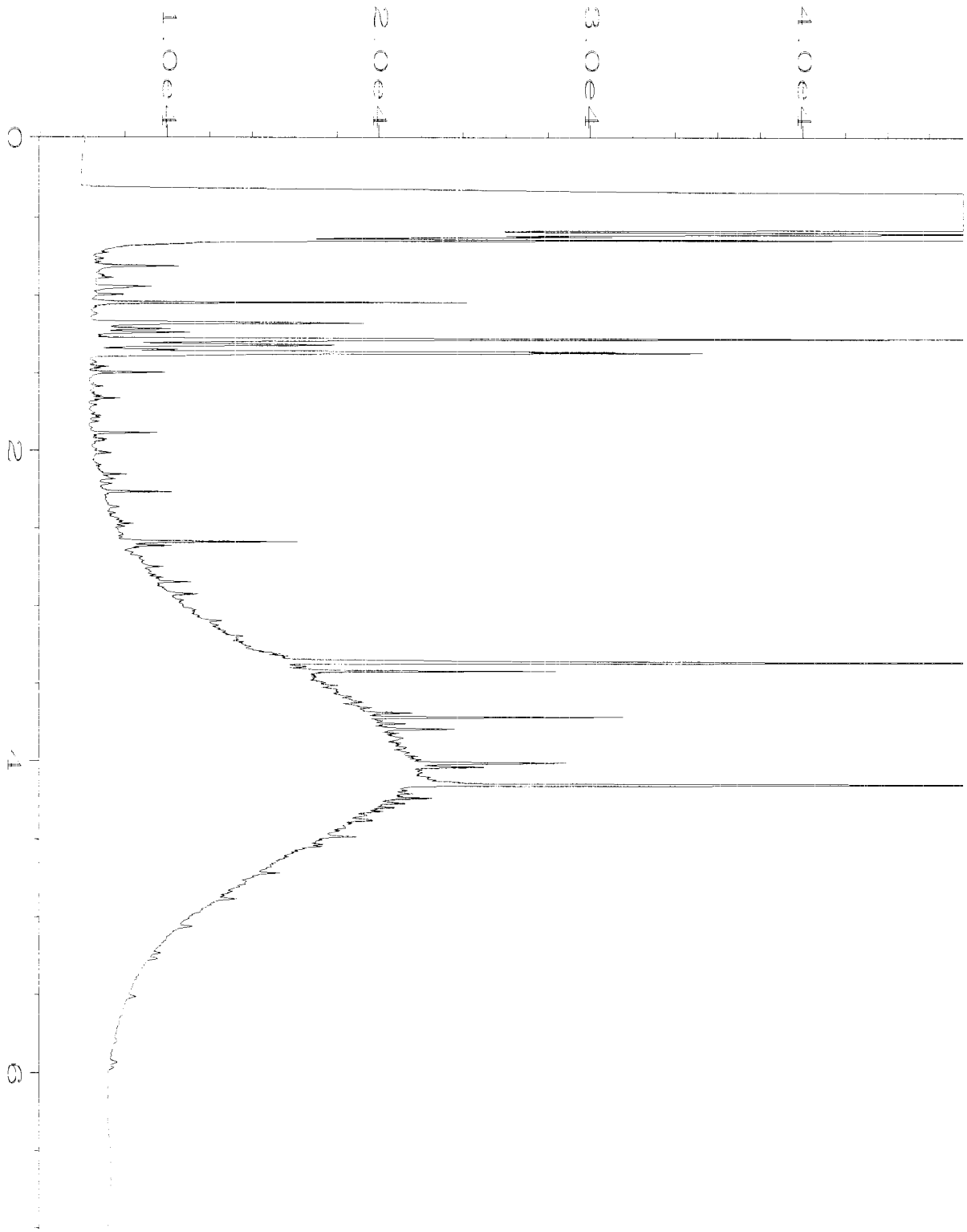
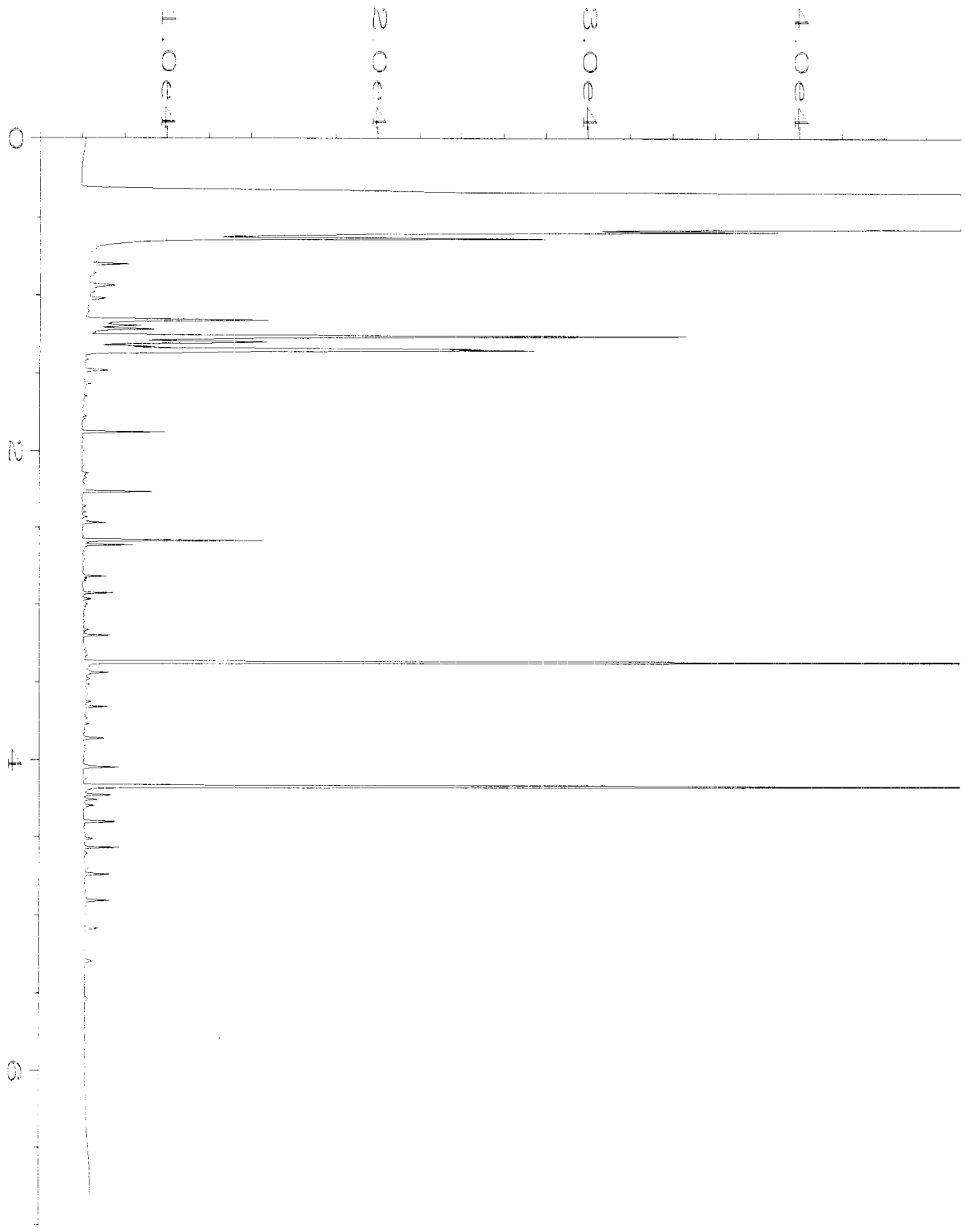
Run Time Bar Code:		Sequence Line	: 8
Acquired on	: 24 Jul 19 04:19 PM	Instrument Method	: DX.MTH
Report Created on	: 25 Jul 19 10:41 AM	Analysis Method	: DX.MTH



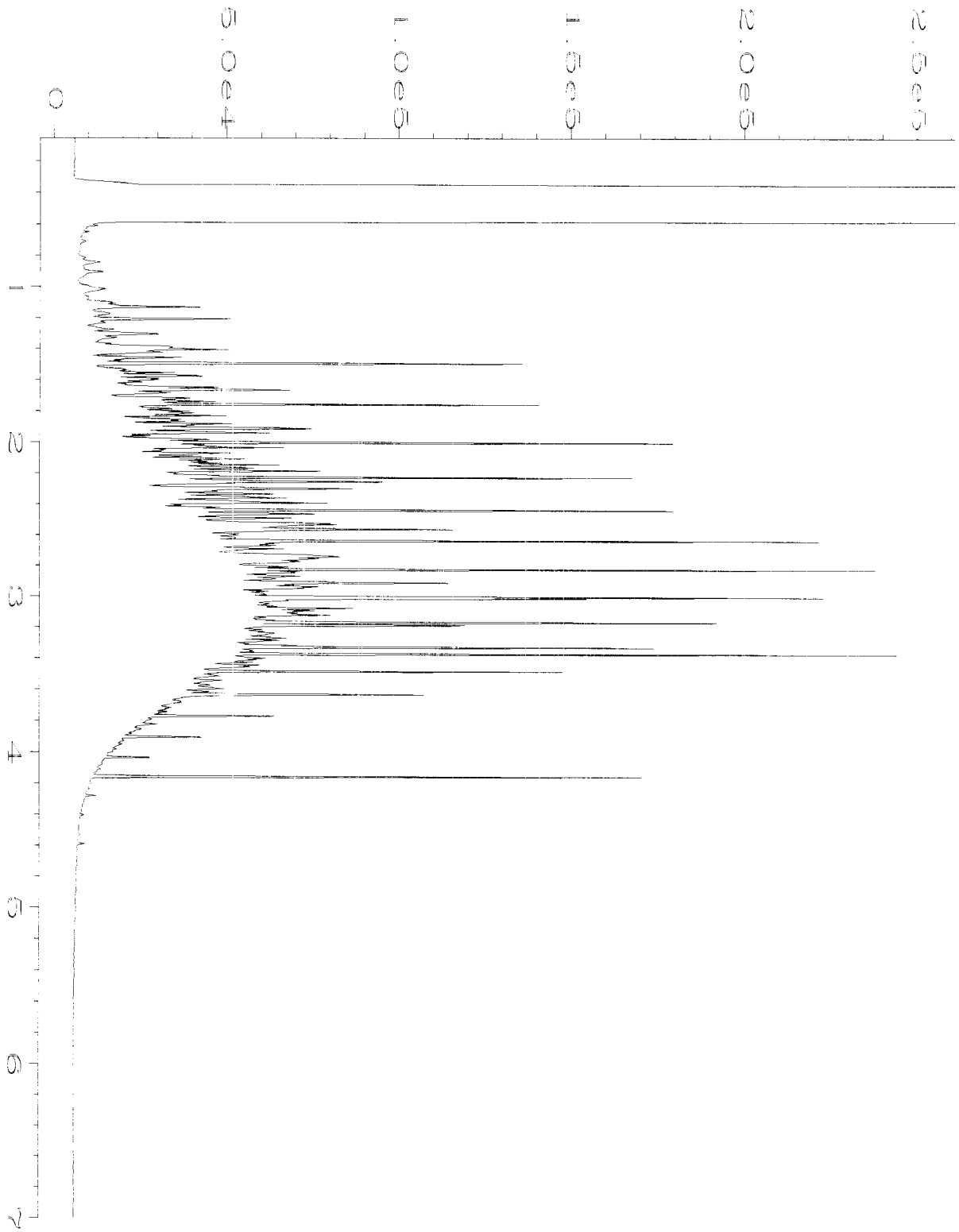
Data File Name	: C:\HPCHEM\6\DATA\07-24-19\032F0801.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 32
Sample Name	: 907410-03	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 8
Acquired on	: 24 Jul 19 04:31 PM	Instrument Method	: DX.MTH
Report Created on	: 25 Jul 19 10:41 AM	Analysis Method	: DX.MTH



Data File Name	: C:\HPCHEM\6\DATA\07-24-19\033F0801.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 33
Sample Name	: 907410-04	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 8
Acquired on	: 24 Jul 19 04:42 PM	Instrument Method	: DX.MTH
Report Created on	: 25 Jul 19 10:53 AM	Analysis Method	: DX.MTH



Data File Name	: C:\HPCHEM\6\DATA\07-24-19\020F0501.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 20
Sample Name	: 09-1784 mb	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 5
Acquired on	: 24 Jul 19 01:41 PM	Instrument Method	: DX.MTH
Report Created on	: 25 Jul 19 10:40 AM	Analysis Method	: DX.MTH



Data File Name : C:\HPCHEM\6\DATA\07-24-19\005F0701.D

Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 5
Sample Name	: 1000 Dx 57-78B	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 7
Acquired on	: 24 Jul 19 03:32 PM	Instrument Method	: DX.MTH
Report Created on	: 25 Jul 19 10:40 AM	Analysis Method	: DX.MTH

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

Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 907410
Work Order Number: 1907319

July 31, 2019

Attention Michael Erdahl:

Fremont Analytical, Inc. received 4 sample(s) on 7/24/2019 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *07/31/2019*

CLIENT: Friedman & Bruya
Project: 907410
Work Order: 1907319

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1907319-001	MW8-W-19.0	07/23/2019 1:30 PM	07/24/2019 10:11 AM
1907319-002	MW9-W-33.0	07/23/2019 2:55 PM	07/24/2019 10:11 AM
1907319-003	MW10-W-15.0	07/23/2019 4:10 PM	07/24/2019 10:11 AM
1907319-004	MW6-W-15.0	07/23/2019 6:10 PM	07/24/2019 10:11 AM

Case Narrative

WO#: **1907319**

Date: **7/31/2019**

CLIENT: Friedman & Bruya
Project: 907410

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **1907319**
Date Reported: **7/31/2019**

CLIENT: Friedman & Bruya
Project: 907410

Lab ID: 1907319-001 **Collection Date:** 7/23/2019 1:30:00 PM
Client Sample ID: **MW8-W-19.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R52853		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	7/24/2019 11:37:00 AM

Lab ID: 1907319-002 **Collection Date:** 7/23/2019 2:55:00 PM
Client Sample ID: **MW9-W-33.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R52853		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	7/24/2019 11:17:00 AM

Lab ID: 1907319-003 **Collection Date:** 7/23/2019 4:10:00 PM
Client Sample ID: **MW10-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R52853		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	7/24/2019 11:41:00 AM

Analytical Report

Work Order: **1907319**
Date Reported: **7/31/2019**

CLIENT: Friedman & Bruya
Project: 907410

Lab ID: 1907319-004 **Collection Date:** 7/23/2019 6:10:00 PM
Client Sample ID: **MW6-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R52853		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	7/24/2019 11:47:00 AM

Work Order: 1907319
CLIENT: Friedman & Bruya
Project: 907410

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-R52853**	SampType: **MBLK**			Units: **mg/L**		Prep Date: **7/24/2019**		RunNo: **52853**		
Client ID: **MBLKW**	Batch ID: **R52853**					Analysis Date: **7/24/2019**		SeqNo: **1044492**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-R52853**	SampType: **LCS**			Units: **mg/L**		Prep Date: **7/24/2019**		RunNo: **52853**		
Client ID: **LCSW**	Batch ID: **R52853**					Analysis Date: **7/24/2019**		SeqNo: **1044493**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.248	0.0450	0.2500	0	99.1	90	110				

Sample ID: **1907319-002ADUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **7/24/2019**		RunNo: **52853**		
Client ID: **MW9-W-33.0**	Batch ID: **R52853**					Analysis Date: **7/24/2019**		SeqNo: **1044495**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		30	

Sample ID: **1907319-002AMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **7/24/2019**		RunNo: **52853**		
Client ID: **MW9-W-33.0**	Batch ID: **R52853**					Analysis Date: **7/24/2019**		SeqNo: **1044496**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.308	0.0450	0.2500	0	123	65	135				

Sample ID: **1907319-002AMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **7/24/2019**		RunNo: **52853**		
Client ID: **MW9-W-33.0**	Batch ID: **R52853**					Analysis Date: **7/24/2019**		SeqNo: **1044497**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.262	0.0450	0.2500	0	105	65	135	0.3085	16.2	30	

Sample Log-In Check List

Client Name:	**FB**	Work Order Number:	**1907319**
Logged by:	**Clare Griggs**	Date Received:	**7/24/2019 10:11:00 AM**

Chain of Custody

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

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☑	Not Required ☐
6.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
7.	Were all items received at a temperature of >0°C to 10.0°C *	Yes ☑	No ☐	NA ☐
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
10.	Are samples properly preserved?	Yes ☑	No ☐	
11.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
12.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
14.	Does paperwork match bottle labels?	Yes ☑	No ☐	
15.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
16.	Is it clear what analyses were requested?	Yes ☑	No ☐	
17.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

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

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

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler	4.3
Sample	5.3

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

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

1907319

Page # 1 of 1

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 Fax # (206) 283-5044

SUBCONTRACTER Fremont

PROJECT NAME/NO.	PO #
907410	A-331

REMARKS

Please Email Results

TURNAROUND TIME

☒ ~~Standard (2 Weeks)~~ 1 Week

☐ RUSH

Rush charges authorized by:

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Return samples

☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	cVOC							Notes
MW8-W-19.0		7/23/19	1330	water	1				X							
MW9-W-33.0		"	1455	"	1				X							
MW10-W-15.0		"	1610	"	1				X							
MW6-W-15.0		"	1810	"	1				X							

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

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	7/24/19	0724 AM
Received by:		Eduardo Alcantar	FAI	7/24	1011
Relinquished by:					
Received by:					

90740

SAMPLE CHAIN OF CUSTODY

ME 07-24-19

VW3

Page # _____ of _____

Report To Meridith O'Andrea / Ryan Lewis

Company Maul Foster Alongi

Address 2815 2nd Avenue, Suite 540

City, State, ZIP Seattle, WA 98121

Phone (206) 402-8911 Email mdandrea@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering

PO #: 1903.01.01

REMARKS

INVOICE TO: MFA

TURNAROUND TIME: AI4 B05

☒ Standard Turnaround

☐ RUSH _____

Rush charges authorized by: _____

SAMPLE DISPOSAL

☐ Dispose after 30 days

☐ Archive Samples

☐ Other _____

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel (REO)	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	Hex. Chrom	Dissolved Chromium, As, Cu, Se			Notes
MW8-W-19.0	01A-G	7/23/19	1330	W	7		X			X		X	X	X			
MW9-W-33.0	02	"	1455	W	7		X			X		X	X	X			
MW10-W-15.0	03	"	1610	W	7		X			X		X	X	X			
MW6-W-15.0	04	"	1810	W	7		X			X		X	X	X			

ANALYSES REQUESTED

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Ryan Lewis	MFA	7/24	650
Received by:		James Bruya	F&B	7/24	650
Relinquished by:					
Received by:					

Samples received at 3 °C

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

August 2, 2019

Merideth D'Andrea, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms D'Andrea:

Included are the results from the testing of material submitted on July 23, 2019 from the Precision Engineering 1803.01.01, F&BI 907397 project. There are 19 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Ryan Lewis
MFA0802R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on July 23, 2019 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.01, F&BI 907397 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
907397 -01	MW11-W-15.0
907397 -02	MW3-W-15.0

The samples were sent to Fremont Analytical for hexavalent chromium analysis. The report is enclosed.

The 6020B internal standards failed the acceptance criteria for the samples. The sample was diluted and reanalyzed with acceptable results. Both data sets were reported.

The 6020B arsenic and selenium calibration standard did not pass the acceptance criteria for the full strength analysis due to intereferences from the field samples. The samples were reanalyzed with similar results. The samples were diluted to minimize the intereference. Both data sets were reported.

Dibromochloromethane in the 8260C laboratory control sample and laboratory control sample duplicate exceeded the acceptance criteria. The analyte was not detected in the sample, therefore the data were acceptable.

All other quality control requirements were acceptable.

Date of Report: 08/02/19
Date Received: 07/23/19
Project: Precision Engineering 1803.01.01, F&BI 907397
Date Extracted: 07/24/19
Date Analyzed: 07/24/19

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 51-134)
MW11-W-15.0 907397-01	200 x	<250	95
MW3-W-15.0 907397-02	82 x	<250	93
Method Blank 09-1784 MB	<50	<250	75

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/23/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907397-01
Date Analyzed:	07/30/19	Data File:	907397-01.066
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	6.98 ca
Chromium	2.60 J
Copper	<5 J
Selenium	2.56 ca

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/23/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907397-01 x10
Date Analyzed:	08/01/19	Data File:	907397-01 x10.032
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<10
Chromium	<10
Copper	<50
Selenium	<10

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/23/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907397-02
Date Analyzed:	07/30/19	Data File:	907397-02.067
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	13.3 ca
Chromium	<1 J
Copper	<5 J
Selenium	<1

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/23/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	907397-02 x10
Date Analyzed:	08/01/19	Data File:	907397-02 x10.033
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	13.6
Chromium	<10
Copper	<50
Selenium	<10

Analysis For Dissolved Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/29/19	Lab ID:	I9-457 mb
Date Analyzed:	07/30/19	Data File:	I9-457 mb.040
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Chromium	<1
Copper	<5
Selenium	<1

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/23/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/24/19	Lab ID:	907397-01 1/2
Date Analyzed:	07/25/19	Data File:	072438.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	83	31	160
Benzo(a)anthracene-d12	103	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	1.9
Fluorene	0.23
Phenanthrene	0.10
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/23/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/24/19	Lab ID:	907397-02 1/2
Date Analyzed:	07/25/19	Data File:	072439.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	81	31	160
Benzo(a)anthracene-d12	92	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.4
Acenaphthylene	<0.04
Acenaphthene	<0.04
Fluorene	<0.04
Phenanthrene	<0.04
Anthracene	<0.04
Fluoranthene	<0.04
Pyrene	<0.04
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04
Benzo(g,h,i)perylene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/24/19	Lab ID:	09-1772 mb2
Date Analyzed:	07/25/19	Data File:	072437.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	100	31	160
Benzo(a)anthracene-d12	116	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
Acenaphthylene	<0.02
Acenaphthene	<0.02
Fluorene	<0.02
Phenanthrene	<0.02
Anthracene	<0.02
Fluoranthene	<0.02
Pyrene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02
Benzo(g,h,i)perylene	<0.02

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW11-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/23/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/23/19	Lab ID:	907397-01
Date Analyzed:	07/23/19	Data File:	072335.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	57	121
Toluene-d8	99	63	127
4-Bromofluorobenzene	98	60	133

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW3-W-15.0	Client:	Maul Foster Alongi
Date Received:	07/23/19	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/23/19	Lab ID:	907397-02
Date Analyzed:	07/23/19	Data File:	072336.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	99	63	127
4-Bromofluorobenzene	97	60	133

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

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.01
Date Extracted:	07/23/19	Lab ID:	09-1690 mb
Date Analyzed:	07/23/19	Data File:	072315.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	MS/AEN

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	98	50	150
Toluene-d8	96	50	150
4-Bromofluorobenzene	95	50	150

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

Date of Report: 08/02/19
Date Received: 07/23/19
Project: Precision Engineering 1803.01.01, F&BI 907397

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	72	68	58-134	6

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Project: Precision Engineering 1803.01.01, F&BI 907397

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

Laboratory Code: 907486-04 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	3.72	107	106	75-125	1
Chromium	ug/L (ppb)	20	<1	102	103	75-125	1
Copper	ug/L (ppb)	20	<5	92	92	75-125	0
Selenium	ug/L (ppb)	5	<1	108	107	75-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	106	80-120
Chromium	ug/L (ppb)	20	96	80-120
Copper	ug/L (ppb)	20	95	80-120
Selenium	ug/L (ppb)	5	107	80-120

Date of Report: 08/02/19
Date Received: 07/23/19
Project: Precision Engineering 1803.01.01, F&BI 907397

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270D SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	85	83	57-114	2
Acenaphthylene	ug/L (ppb)	1	87	87	65-119	0
Acenaphthene	ug/L (ppb)	1	88	88	66-118	0
Fluorene	ug/L (ppb)	1	87	88	64-125	1
Phenanthrene	ug/L (ppb)	1	90	90	67-120	0
Anthracene	ug/L (ppb)	1	90	88	65-122	2
Fluoranthene	ug/L (ppb)	1	93	91	65-127	2
Pyrene	ug/L (ppb)	1	88	83	62-130	6
Benz(a)anthracene	ug/L (ppb)	1	96	92	60-118	4
Chrysene	ug/L (ppb)	1	95	92	66-125	3
Benzo(b)fluoranthene	ug/L (ppb)	1	87	89	55-135	2
Benzo(k)fluoranthene	ug/L (ppb)	1	89	91	62-125	2
Benzo(a)pyrene	ug/L (ppb)	1	87	88	58-127	1
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	81	79	36-142	2
Dibenz(a,h)anthracene	ug/L (ppb)	1	81	79	37-133	2
Benzo(g,h,i)perylene	ug/L (ppb)	1	79	76	34-135	4

Date of Report: 08/02/19
Date Received: 07/23/19
Project: Precision Engineering 1803.01.01, F&BI 907397

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

Laboratory Code: 907380-16 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	50	<1	117	10-172
Chloromethane	ug/L (ppb)	50	<10	100	25-166
Vinyl chloride	ug/L (ppb)	50	<0.2	110	36-166
Bromomethane	ug/L (ppb)	50	<1	104	47-169
Chloroethane	ug/L (ppb)	50	<1	102	46-160
Trichlorofluoromethane	ug/L (ppb)	50	<1	110	44-165
Acetone	ug/L (ppb)	250	<50	56	10-182
1,1-Dichloroethene	ug/L (ppb)	50	<1	101	60-136
Hexane	ug/L (ppb)	50	<1	94	52-150
Methylene chloride	ug/L (ppb)	50	<5	101	67-132
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	<1	105	74-127
trans-1,2-Dichloroethene	ug/L (ppb)	50	<1	103	72-129
1,1-Dichloroethane	ug/L (ppb)	50	<1	102	70-128
2,2-Dichloropropane	ug/L (ppb)	50	<1	97	36-154
cis-1,2-Dichloroethene	ug/L (ppb)	50	<1	107	71-127
Chloroform	ug/L (ppb)	50	<1	103	65-132
2-Butanone (MEK)	ug/L (ppb)	250	<10	79	10-129
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	<1	102	48-149
1,1,1-Trichloroethane	ug/L (ppb)	50	<1	105	60-146
1,1-Dichloropropene	ug/L (ppb)	50	<1	103	69-133
Carbon tetrachloride	ug/L (ppb)	50	<1	103	56-152
Benzene	ug/L (ppb)	50	<0.35	102	76-125
Trichloroethene	ug/L (ppb)	50	<1	101	66-135
1,2-Dichloropropane	ug/L (ppb)	50	<1	103	78-125
Bromodichloromethane	ug/L (ppb)	50	<1	104	61-150
Dibromomethane	ug/L (ppb)	50	<1	108	66-141
4-Methyl-2-pentanone	ug/L (ppb)	250	<10	110	10-185
cis-1,3-Dichloropropene	ug/L (ppb)	50	<1	106	72-132
Toluene	ug/L (ppb)	50	<1	95	76-122
trans-1,3-Dichloropropene	ug/L (ppb)	50	<1	102	76-130
1,1,2-Trichloroethane	ug/L (ppb)	50	<1	105	68-131
2-Hexanone	ug/L (ppb)	250	<10	99	10-185
1,3-Dichloropropane	ug/L (ppb)	50	<1	104	71-128
Tetrachloroethene	ug/L (ppb)	50	<1	102	10-226
Dibromochloromethane	ug/L (ppb)	50	<1	108	70-139
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	<1	105	69-134
Chlorobenzene	ug/L (ppb)	50	<1	103	77-122
Ethylbenzene	ug/L (ppb)	50	<1	100	69-135
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	<1	109	73-137
m,p-Xylene	ug/L (ppb)	100	<2	102	69-135
o-Xylene	ug/L (ppb)	50	<1	101	60-140
Styrene	ug/L (ppb)	50	<1	104	71-133
Isopropylbenzene	ug/L (ppb)	50	<1	104	65-142
Bromoform	ug/L (ppb)	50	<1	108	65-142
n-Propylbenzene	ug/L (ppb)	50	<1	102	58-144
Bromobenzene	ug/L (ppb)	50	<1	104	75-124
1,3,5-Trimethylbenzene	ug/L (ppb)	50	<1	102	66-137
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	<1	109	51-154
1,2,3-Trichloropropane	ug/L (ppb)	50	<1	104	53-150
2-Chlorotoluene	ug/L (ppb)	50	<1	102	66-127
4-Chlorotoluene	ug/L (ppb)	50	<1	102	65-130
tert-Butylbenzene	ug/L (ppb)	50	<1	103	65-137
1,2,4-Trimethylbenzene	ug/L (ppb)	50	<1	102	59-146
sec-Butylbenzene	ug/L (ppb)	50	<1	103	64-140
p-Isopropyltoluene	ug/L (ppb)	50	<1	103	65-141
1,3-Dichlorobenzene	ug/L (ppb)	50	<1	103	72-123
1,4-Dichlorobenzene	ug/L (ppb)	50	<1	99	69-126
1,2-Dichlorobenzene	ug/L (ppb)	50	<1	103	69-128
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	<10	105	32-164
1,2,4-Trichlorobenzene	ug/L (ppb)	50	<1	103	66-136
Hexachlorobutadiene	ug/L (ppb)	50	<1	97	60-143
Naphthalene	ug/L (ppb)	50	<1	103	44-164
1,2,3-Trichlorobenzene	ug/L (ppb)	50	<1	102	69-148

Date of Report: 08/02/19
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Project: Precision Engineering 1803.01.01, F&BI 907397

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	50	94	90	25-158	4
Chloromethane	ug/L (ppb)	50	104	100	45-156	4
Vinyl chloride	ug/L (ppb)	50	108	103	50-154	5
Bromomethane	ug/L (ppb)	50	124	119	55-143	4
Chloroethane	ug/L (ppb)	50	113	108	58-146	5
Trichlorofluoromethane	ug/L (ppb)	250	115	110	50-150	4
Acetone	ug/L (ppb)	250	64	63	53-131	2
1,1-Dichloroethene	ug/L (ppb)	50	112	106	67-136	6
Hexane	ug/L (ppb)	50	82	82	57-137	0
Methylene chloride	ug/L (ppb)	50	93	88	39-148	6
Methyl t-butyl ether (MTBE)	ug/L (ppb)	50	101	96	64-147	5
trans-1,2-Dichloroethene	ug/L (ppb)	50	104	100	68-128	4
1,1-Dichloroethane	ug/L (ppb)	50	102	99	79-121	3
2,2-Dichloropropane	ug/L (ppb)	50	105	98	55-143	7
cis-1,2-Dichloroethene	ug/L (ppb)	50	101	97	80-123	4
Chloroform	ug/L (ppb)	50	107	103	80-121	4
2-Butanone (MEK)	ug/L (ppb)	250	78	81	57-149	4
1,2-Dichloroethane (EDC)	ug/L (ppb)	50	102	101	73-132	1
1,1,1-Trichloroethane	ug/L (ppb)	50	112	108	81-125	4
1,1-Dichloropropene	ug/L (ppb)	50	103	102	77-129	1
Carbon tetrachloride	ug/L (ppb)	50	120	116	75-158	3
Benzene	ug/L (ppb)	50	99	98	69-134	1
Trichloroethene	ug/L (ppb)	50	101	101	79-113	0
1,2-Dichloropropane	ug/L (ppb)	50	100	103	77-123	3
Bromodichloromethane	ug/L (ppb)	50	117	116	81-133	1
Dibromomethane	ug/L (ppb)	50	106	107	82-125	1
4-Methyl-2-pentanone	ug/L (ppb)	250	107	112	65-138	5
cis-1,3-Dichloropropene	ug/L (ppb)	50	111	115	82-132	4
Toluene	ug/L (ppb)	50	104	104	72-122	0
trans-1,3-Dichloropropene	ug/L (ppb)	50	117	121	80-136	3
1,1,2-Trichloroethane	ug/L (ppb)	50	102	104	75-124	2
2-Hexanone	ug/L (ppb)	250	95	103	60-136	8
1,3-Dichloropropane	ug/L (ppb)	50	103	107	76-126	4
Tetrachloroethene	ug/L (ppb)	50	103	101	76-121	2
Dibromochloromethane	ug/L (ppb)	50	136 vo	136 vo	84-133	0
1,2-Dibromoethane (EDB)	ug/L (ppb)	50	107	110	82-115	3
Chlorobenzene	ug/L (ppb)	50	103	103	83-114	0
Ethylbenzene	ug/L (ppb)	50	103	104	77-124	1
1,1,1,2-Tetrachloroethane	ug/L (ppb)	50	127	121	84-127	5
m,p-Xylene	ug/L (ppb)	100	106	107	81-112	1
o-Xylene	ug/L (ppb)	50	106	104	81-121	2
Styrene	ug/L (ppb)	50	107	108	84-119	1
Isopropylbenzene	ug/L (ppb)	50	107	104	80-117	3
Bromoform	ug/L (ppb)	50	126	129	74-136	2
n-Propylbenzene	ug/L (ppb)	50	107	104	74-126	3
Bromobenzene	ug/L (ppb)	50	107	105	80-121	2
1,3,5-Trimethylbenzene	ug/L (ppb)	50	111	105	78-123	6
1,1,2,2-Tetrachloroethane	ug/L (ppb)	50	112	111	66-126	1
1,2,3-Trichloropropane	ug/L (ppb)	50	105	105	67-124	0
2-Chlorotoluene	ug/L (ppb)	50	106	102	77-127	4
4-Chlorotoluene	ug/L (ppb)	50	105	103	78-128	2
tert-Butylbenzene	ug/L (ppb)	50	110	105	80-123	5
1,2,4-Trimethylbenzene	ug/L (ppb)	50	108	104	79-122	4
sec-Butylbenzene	ug/L (ppb)	50	110	104	80-116	6
p-Isopropyltoluene	ug/L (ppb)	50	109	104	81-123	5
1,3-Dichlorobenzene	ug/L (ppb)	50	107	105	83-113	2
1,4-Dichlorobenzene	ug/L (ppb)	50	101	100	83-107	1
1,2-Dichlorobenzene	ug/L (ppb)	50	108	104	84-112	4
1,2-Dibromo-3-chloropropane	ug/L (ppb)	50	127	124	57-141	2
1,2,4-Trichlorobenzene	ug/L (ppb)	50	109	100	72-130	9
Hexachlorobutadiene	ug/L (ppb)	50	103	98	53-141	5
Naphthalene	ug/L (ppb)	50	113	105	64-133	7
1,2,3-Trichlorobenzene	ug/L (ppb)	50	110	101	65-136	9

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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

Friedman & Bruya
Michael Erdahl
3012 16th Ave. W.
Seattle, WA 98119

RE: 907397
Work Order Number: 1907308

July 29, 2019

Attention Michael Erdahl:

Fremont Analytical, Inc. received 2 sample(s) on 7/23/2019 for the analyses presented in the following report.

Hexavalent Chromium by SM 3500 Cr B

This report consists of the following:

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

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

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes
Project Manager

Date: *07/29/2019*

CLIENT: Friedman & Bruya
Project: 907397
Work Order: 1907308

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1907308-001	MW11-W-15.0	07/23/2019 9:00 AM	07/23/2019 3:49 PM
1907308-002	MW3-W-15.0	07/23/2019 11:30 AM	07/23/2019 3:49 PM

Case Narrative

WO#: **1907308**

Date: **7/29/2019**

CLIENT: Friedman & Bruya
Project: 907397

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

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

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

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

Qualifiers:

* - Flagged value is not within established control limits
B - Analyte detected in the associated Method Blank
D - Dilution was required
E - Value above quantitation range
H - Holding times for preparation or analysis exceeded
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below Reporting Limit
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit
R - High relative percent difference observed

Acronyms:

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

Analytical Report

Work Order: **1907308**
Date Reported: **7/29/2019**

CLIENT: Friedman & Bruya
Project: 907397

Lab ID: 1907308-001 **Collection Date:** 7/23/2019 9:00:00 AM
Client Sample ID: **MW11-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R52852		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	7/23/2019 6:56:00 PM

Lab ID: 1907308-002 **Collection Date:** 7/23/2019 11:30:00 AM
Client Sample ID: **MW3-W-15.0** **Matrix:** Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Hexavalent Chromium by SM 3500 Cr B				Batch ID: R52852		Analyst: TN
Chromium, Hexavalent	ND	0.0450		mg/L	1	7/23/2019 7:15:00 PM

Work Order: 1907308
CLIENT: Friedman & Bruya
Project: 907397

QC SUMMARY REPORT

Hexavalent Chromium by SM 3500 Cr B

Sample ID: **MB-R52852** SampType: **MBLK** Units: **mg/L** Prep Date: **7/23/2019** RunNo: **52852**
Client ID: **MBLKW** Batch ID: **R52852** Analysis Date: **7/23/2019** SeqNo: **1044477**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450									

Sample ID: **LCS-R52852** SampType: **LCS** Units: **mg/L** Prep Date: **7/23/2019** RunNo: **52852**
Client ID: **LCSW** Batch ID: **R52852** Analysis Date: **7/23/2019** SeqNo: **1044478**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	0.233	0.0450	0.2500	0	93.1	90	110				

Sample ID: **1907308-001ADUP** SampType: **DUP** Units: **mg/L** Prep Date: **7/23/2019** RunNo: **52852**
Client ID: **MW11-W-15.0** Batch ID: **R52852** Analysis Date: **7/23/2019** SeqNo: **1044480**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450						0		30	

Sample ID: **1907308-001AMS** SampType: **MS** Units: **mg/L** Prep Date: **7/23/2019** RunNo: **52852**
Client ID: **MW11-W-15.0** Batch ID: **R52852** Analysis Date: **7/23/2019** SeqNo: **1044481**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450	0.2500	0	0	65	135				S

NOTES:
S - Outlying spike recovery(ies) observed. A duplicate analysis was performed with similar results indicating a possible matrix effect.

Sample ID: **1907308-001AMSD** SampType: **MSD** Units: **mg/L** Prep Date: **7/23/2019** RunNo: **52852**
Client ID: **MW11-W-15.0** Batch ID: **R52852** Analysis Date: **7/23/2019** SeqNo: **1044482**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chromium, Hexavalent	ND	0.0450	0.2500	0	0	65	135	0		30	S

NOTES:
S - Outlying spike recovery(ies) observed. A duplicate analysis was performed with similar results indicating a possible matrix effect.

Sample Log-In Check List

Client Name:	FB	Work Order Number:	1907308
Logged by:	Carissa True	Date Received:	7/23/2019 3:49:00 PM

Chain of Custody

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

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐	
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐		
5.	Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☑	Not Required ☐	
6.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐	
7.	Were all items received at a temperature of >0°C to 10.0°C *	Yes ☑	No ☐	NA ☐	
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐		
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐		
10.	Are samples properly preserved?	Yes ☑	No ☐		
11.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐	
12.	Is there headspace in the VOA vials?	Yes ☐	No ☐	NA ☑	
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐		
14.	Does paperwork match bottle labels?	Yes ☑	No ☐		
15.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐		
16.	Is it clear what analyses were requested?	Yes ☑	No ☐		
17.	Were all holding times able to be met?	Yes ☑	No ☐		

Special Handling (if applicable)

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

Person Notified: _____ Date: _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

19. Additional remarks:

Item Information

Item #	Temp ºC
Cooler 1	6.3
Sample 1	3.5

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

1907308

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 Fax # (206) 283-5044

SUBCONTRACTER Friedman

PROJECT NAME/NO.	PO #
907397	A-331

REMARKS EDD: EQUIS4

Please Email Results

TURNAROUND TIME

☒ Standard (2 Weeks)

☐ RUSH

Rush charges authorized by:

SAMPLE DISPOSAL

☐ Dispose after 30 days

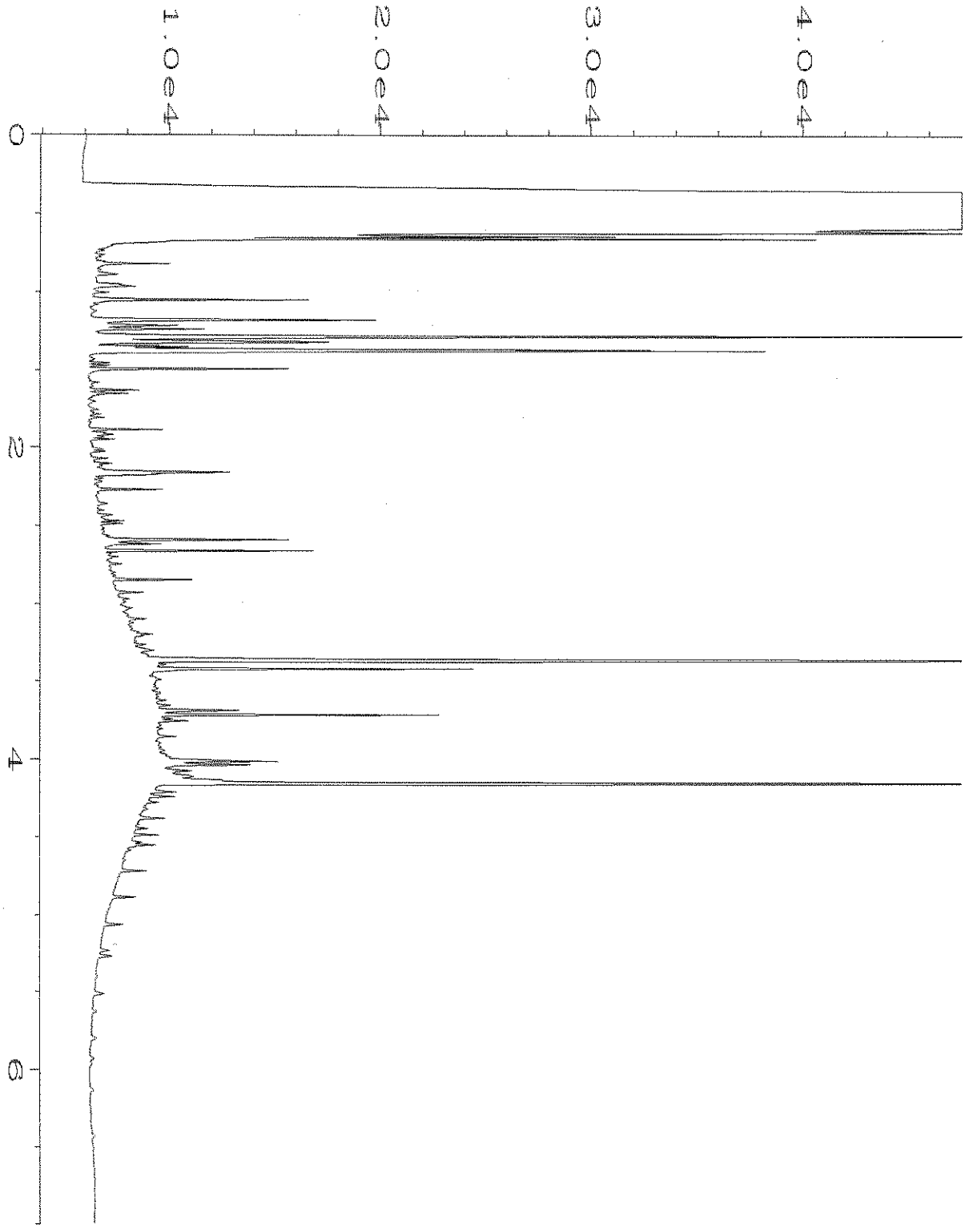
☐ Return samples

☐ Will call with instructions

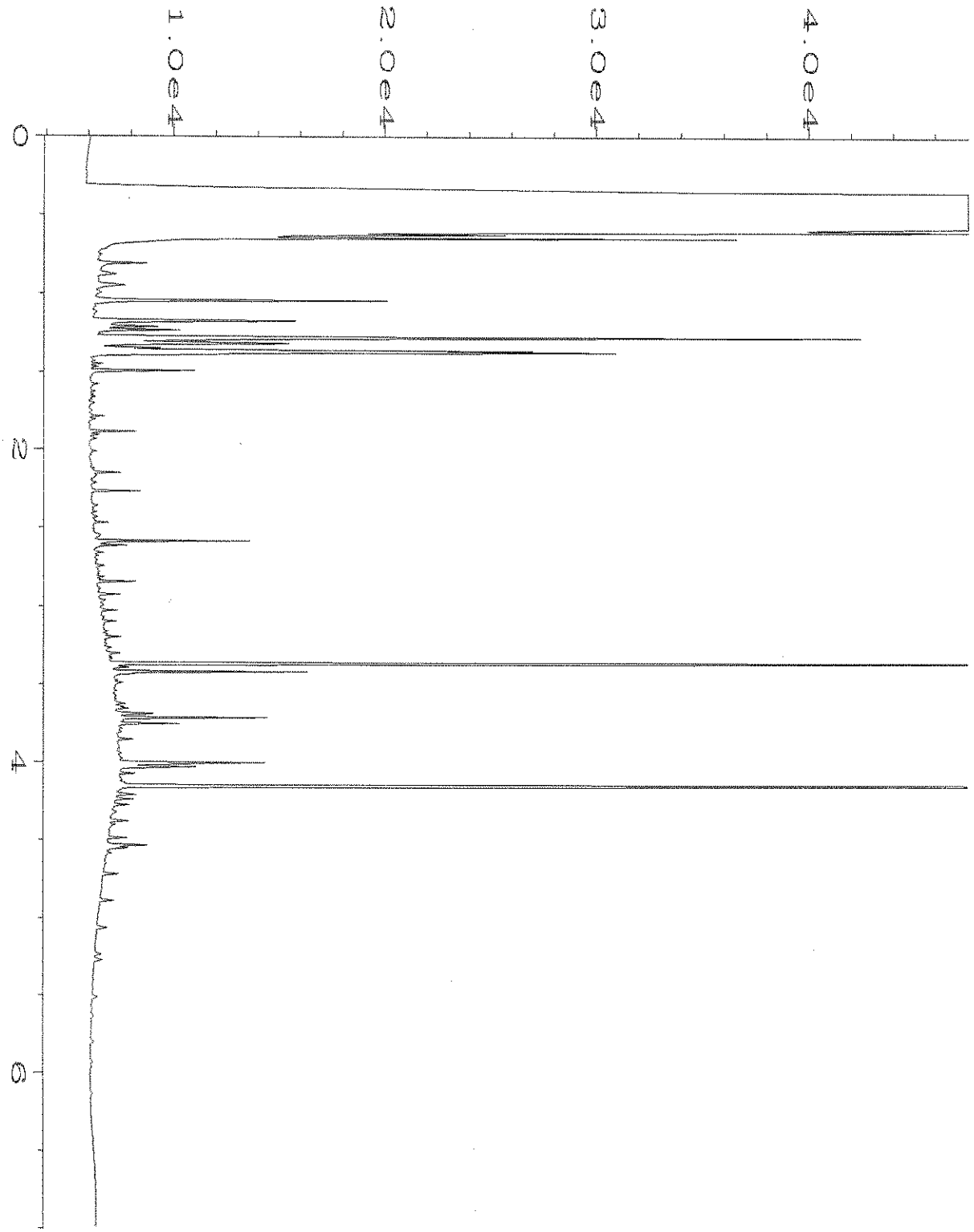
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	ANALYSES REQUESTED: Dioxins/Furans	EPH	VPH	C, VL						Notes
MW11-W-15.0		7/23/14	0900	wtr					X						
MW3-W-15.0		"	1130	"					X						

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

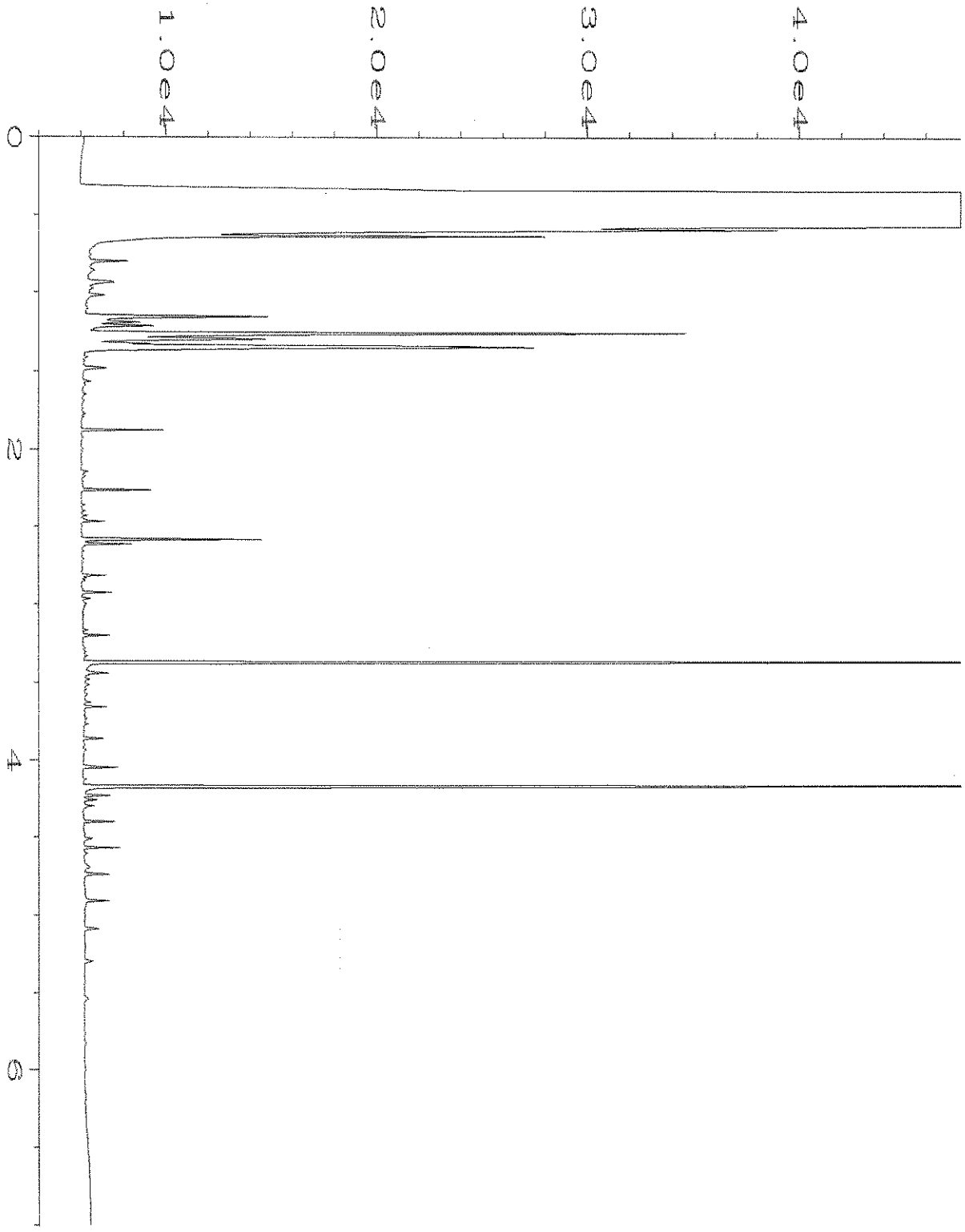
	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Michael Erdahl	Friedman & Bruya	7/23/14	1306
Received by:	Kayla Peto	Kayla Peterson	FAI	7/23/14	1549
Relinquished by:					
Received by:					



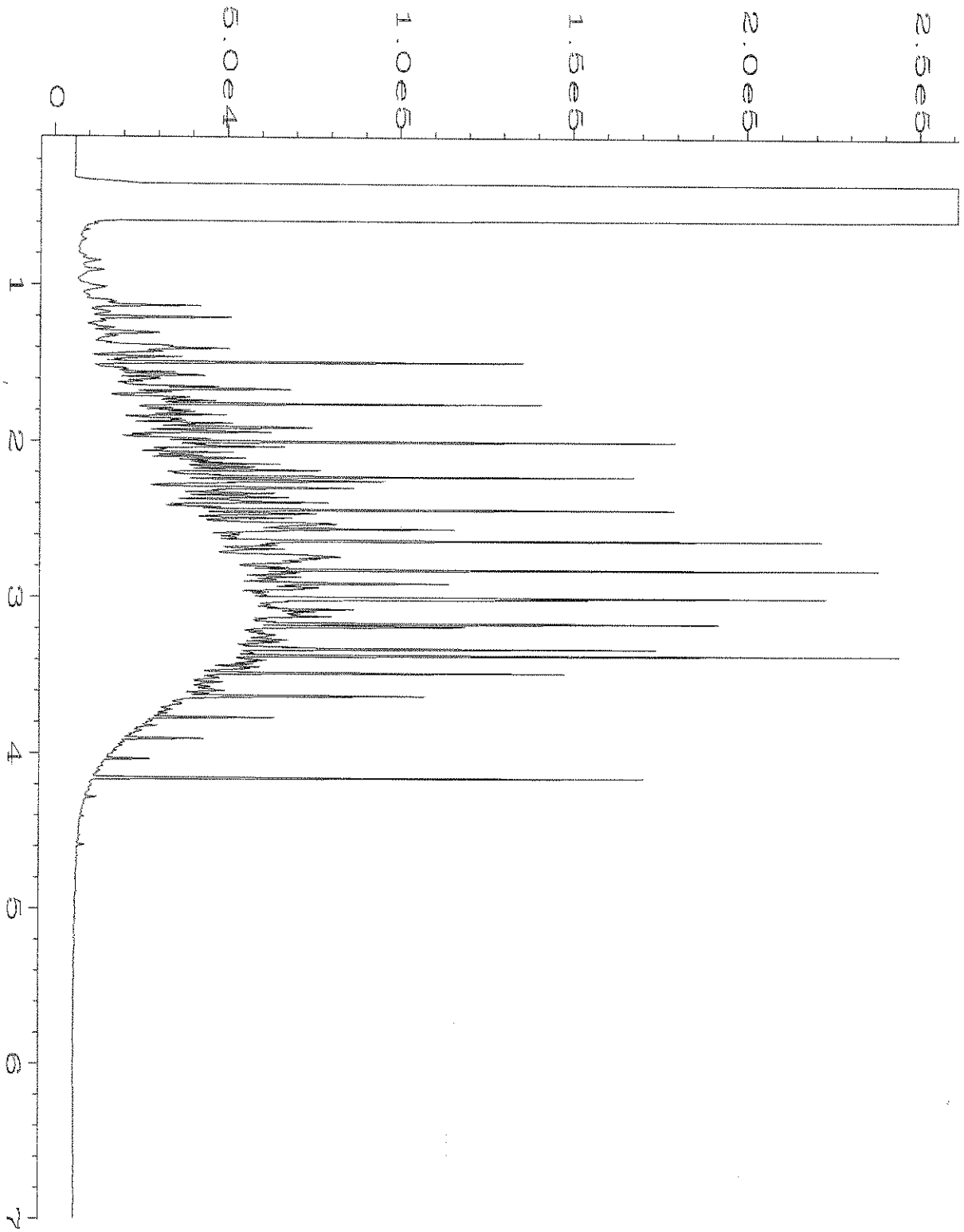
Data File Name	: C:\HPCHEM\6\DATA\07-24-19\028F0801.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 28
Sample Name	: 907397-01	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 8
Acquired on	: 24 Jul 19 03:46 PM	Instrument Method	: DX.MTH
Report Created on	: 25 Jul 19 10:40 AM	Analysis Method	: DX.MTH



Data File Name	: C:\HPCHEM\6\DATA\07-24-19\029F0801.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 29
Sample Name	: 907397-02	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 8
Acquired on	: 24 Jul 19 03:57 PM	Instrument Method:	DX.MTH
Report Created on:	25 Jul 19 10:41 AM	Analysis Method	: DX.MTH



Data File Name	: C:\HPCHEM\6\DATA\07-24-19\020F0501.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 20
Sample Name	: 09-1784 mb	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 5
Acquired on	: 24 Jul 19 01:41 PM	Instrument Method	: DX.MTH
Report Created on	: 25 Jul 19 10:40 AM	Analysis Method	: DX.MTH



Data File Name	: C:\HPCHEM\6\DATA\07-24-19\005F0701.D		
Operator	: TL	Page Number	: 1
Instrument	: GC6	Vial Number	: 5
Sample Name	: 1000 Dx 57-78B	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 7
Acquired on	: 24 Jul 19 03:32 PM	Instrument Method	: DX.MTH
Report Created on	: 25 Jul 19 10:40 AM	Analysis Method	: DX.MTH

907397

SAMPLE CHAIN OF CUSTODY

ME 07-23-19

VW21

Page # _____ of _____

Report To Meridith D'Andrea / Ryan Lewis
Company Maul Foster Alongi
Address 2815 2nd Avenue, Suite 540
City, State, ZIP Seattle, WA 98121
Phone _____ Email mdandrea@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering
PO #: 1803.01.01

REMARKS: NO Gx

INVOICE TO: MFA

TURNAROUND TIME: B04 / A13
- [X] Standard Turnaround
- [ ] RUSH
- Rush charges authorized by: _____

SAMPLE DISPOSAL
- [ ] Dispose after 30 days
- [ ] Archive Samples
- [ ] Other _____

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: TPH-HCID	TPH-Diesel/RRO	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	[illegible]	Hex Cr	Dissolved metals Chromium, As, Cu, Se		Notes
MW11																	
~~MW~~-W-15.0	01 A-G	7/23/19	0900	W	7		X	X		X		X		X	X		
MW3-W-15.0	02	7/23/19	1130	W	7		X	X		X		X		X	X		
																	Samples ~~received~~ at 4 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Ryan	Ryan Lewis	MFA	7/23/19	1250
Received by: Liz D. W. Bruya	Liz Webber-Bruya	F?B	7/23/19	1250
Relinquished by:				
Received by:				

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

eurofins | Air Toxics

2/19/2020
Ms. Heather Good
Maul Foster and Alongi Inc.
1329 North State Street
Suite 301
Bellingham WA 98225

Project Name: Precision Engineering
Project #: 1803.01.02-03
Workorder #: 2002351

Dear Ms. Heather Good

The following report includes the data for the above referenced project for sample(s) received on 2/14/2020 at Air Toxics Ltd.

The data and associated QC analyzed by Passive S.E. RAD130/SKC are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

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WORK ORDER #: 2002351

Work Order Summary

CLIENT:	Ms. Heather Good Maul Foster and Alongi Inc. 1329 North State Street Suite 301 Bellingham, WA 98225	**BILL TO:**	Accounts Payable Maul Foster and Alongi Inc. 400 E. Mill Plain Blvd Suite 400 Vancouver, WA 98660
PHONE:	360-594-6262	**P.O. #**	
FAX:	360-594-6270	**PROJECT #**	1803.01.02-03 Precision Engineering
DATE RECEIVED:	02/14/2020	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	02/19/2020		

FRACTION #	NAME	TEST
01A	RAD1	Passive S.E. RAD130/SKC
02A	RAD2	Passive S.E. RAD130/SKC
03A	RAD3	Passive S.E. RAD130/SKC
04A	Trip Blank	Passive S.E. RAD130/SKC
05A	Lab Blank	Passive S.E. RAD130/SKC
06A	LCS	Passive S.E. RAD130/SKC
06AA	LCSD	Passive S.E. RAD130/SKC

CERTIFIED BY:  DATE: 02/19/20

Technical Director

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 351-8279

LABORATORY NARRATIVE
RAD130 Passive SE by Mod EPA TO-17
Maul Foster and Alongi Inc.
Workorder# 2002351

Four Radiello 130 (Solvent) samples were received on February 14, 2020. The laboratory analyzed the charcoal sorbent bed of the passive sampler following modified method EPA TO-17. The VOCs were chemically extracted using carbon disulfide and an aliquot of the extract was injected into a GC/MS for identification and quantification of volatile organic compounds (VOCs).

The mass of each target compound adsorbed by the sampler was converted to units of concentration using the sample deployment time and the sampling rate for each VOC. If sampling rates were calculated by the lab or the manufacturer, the concentration result has been flagged as an estimated value. Results are not corrected for desorption efficiency.

The reference method used for this procedure is EPA TO-17, which describes the collection of VOCs in ambient air using sorbents and analysis by GC/MS. Because TO-17 describes active sample collection using a pump and thermal desorption as the preparation step, several modifications are required. Modifications to TO-17 are listed in the table below:

Requirement	***TO-17***	***ATL Modifications***
Sample Collection	Pump pulls measured air volume through sorbent tube	VOCs in air adsorbed onto sorbent bed passively through diffusion
Sample Preparation	Thermal extraction	Solvent extraction
Sorbent tube conditioning	Condition newly packed tubes prior to use	Charcoal-based sorbent is a single use media and conditioning is conducted by vendor.
Instrumentation	Thermal desorption introduction system	Liquid injection introduction system
Internal Standard	Gas-phase internal standard introduced on the tube or focusing trap during analysis	Liquid-phase internal standard introduced on the tube at the time of extraction
Media and sample storage	<4 deg C, 30 days	Media shelf life is determined by vendor; sample hold-time is 6 months for the RAD130 and WMS. Sample preservation requirements are storage in a cool, solvent-free refrigerator and optional use of ice during shipping.
Internal Standard Recovery	+/-40% of daily CCV area	-50% to +100% of daily CCV area

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The uptake rates were corrected based on average field temperatures if provided. In the absence of field temperatures, the uptake rates determined at 25 deg C were used.

To calculate ug/m3 concentrations in the Lab Blank and Trip Blank, a sampling duration of 17120 minutes was applied. The assumed temperature used for the uptake rate is listed on the data page. If the field temperatures were provided, the rate was adjusted in the same manner as the field samples.

Definition of Data Qualifying Flags

Ten qualifiers may have been used on the data analysis sheets and indicate as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

C - Estimated concentration due to calculated sampling rate

CN - See case narrative explanation.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
VOCS BY PASSIVE SAMPLER - GC/MS

Client Sample ID: RAD1

Lab ID#: 2002351-01A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	130	110

Client Sample ID: RAD2

Lab ID#: 2002351-02A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	130	110

Client Sample ID: RAD3

Lab ID#: 2002351-03A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	200	170

Client Sample ID: Trip Blank

Lab ID#: 2002351-04A

No Detections Were Found.

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Client Sample ID: RAD1

Lab ID#: 2002351-01A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021722sim**	**Date of Collection: 2/13/20 1:50:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 04:43 PM**	
		Date of Extraction: 2/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	130	110

Temperature = 77.0F , duration time = 17095 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	83	70-130

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Client Sample ID: RAD2

Lab ID#: 2002351-02A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021723sim**	**Date of Collection: 2/13/20 2:12:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 05:08 PM**	
		Date of Extraction: 2/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	130	110

Temperature = 77.0F , duration time = 17120 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	83	70-130

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Client Sample ID: RAD3

Lab ID#: 2002351-03A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021724sim**	**Date of Collection: 2/13/20 2:16:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 05:33 PM**	
		Date of Extraction: 2/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	200	170

Temperature = 77.0F , duration time = 17118 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	81	70-130

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Client Sample ID: Trip Blank

Lab ID#: 2002351-04A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021725sim**	**Date of Collection: 2/13/20**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 05:58 PM**	
		Date of Extraction: 2/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	Not Detected	Not Detected

Temperature = 77.0F , duration time = 17120 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	84	70-130

eurofins | Air Toxics

Client Sample ID: Lab Blank

Lab ID#: 2002351-05A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021705sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 09:32 AM**	
		Date of Extraction: 2/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.085	Not Detected	Not Detected

Temperature = 77.0F , duration time = 17120 minutes.
Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	83	70-130

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Client Sample ID: LCS

Lab ID#: 2002351-06A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021703sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 08:39 AM**	
		Date of Extraction: 2/17/20	

Compound	%Recovery	Method Limits
Trichloroethene	95	70-130

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	85	70-130

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Client Sample ID: LCSD

Lab ID#: 2002351-06AA

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**18021704sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/17/20 09:07 AM**	
		Date of Extraction: 2/17/20	

Compound	%Recovery	Method Limits
Trichloroethene	94	70-130

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	84	70-130

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Passive Sorbent Chain of Custody

WO#: 2002351

Case Seal #: _____

Company: Maul Foster Alongi Project #: 1803.01.02-03 P.O.#

Project Manager: Heather Good Project Name: Precision Engineering

Contact phone/email: hgood@maulfoster.com 360.594.6268 Collected by: Heather Good/Michael Tarbert

Sample Matrix (check one): Indoor/Outdoor Air | Soil Gas | Workplace Monitoring | Other( )

Reporting Units (circle): ppbv ug/m3 ppmv mg/m3 ug ng

Turn Around Time: ☐ Normal ☒ Rush 3 Day (Specify)

Lab ID	Sample Identification	Sampler ID	Date of Deployment (mm/dd/yy)	Time of Deployment (hr:min)	Date of Retrieval (mm/dd/yy)	Time of Retrieval (hr:min)	Indoor/Outdoor Air	Soil Gas	Workplace Monitoring	Other	Analysis Requested	Sample Comments:
01A	RAD1	X683H	02/01/20	16:55	02/13/20	13:50	X				TO-17	only TCE
02A	RAD2	X684H	02/01/20	16:52	02/13/20	14:12	X				TO-17	
03A	RAD3	X685H	02/01/20	16:58	02/13/20	14:16	X				TO-17	
04A	Trip Blank	X686H	02/01/20		02/13/20		X				TO-17	

Relinquished by:	Date	Time	Received by:	Date	Time	Notes to Lab:
Michael Tarbert	2/13/20	3:40pm	Emily Hendrickson	2/13/20	3:40 pm	MRL needed 4 = 0.37 ug/m3
Emily Hendrickson	2/13/20	3:55pm	[signature]	2/14/20	0944	

Relinquishing signature on this document indicates that samples are shipped in compliance with all applicable local, State, Federal, and international laws, regulations, and ordinances of any kind. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Eurofins Air Toxics against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples.

Lab Use Only

Shipper Name: fedex

Air bill #:

Custody Seals Intact? Yes No None

Temperature (°C): NA

Sample Condition Upon Receipt (circle): Good SDR

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3/18/2020
Ms. Heather Good
Maul Foster and Alongi Inc.
1329 North State Street
Suite 301
Bellingham WA 98225

Project Name: Precision Engineering
Project #: 1803.01.02
Workorder #: 2003371

Dear Ms. Heather Good

The following report includes the data for the above referenced project for sample(s) received on 3/13/2020 at Air Toxics Ltd.

The data and associated QC analyzed by Passive S.E. RAD130/SKC are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

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WORK ORDER #: 2003371

Work Order Summary

CLIENT:	Ms. Heather Good Maul Foster and Alongi Inc. 1329 North State Street Suite 301 Bellingham, WA 98225	**BILL TO:**	Accounts Payable Maul Foster and Alongi Inc. 400 E. Mill Plain Blvd Suite 400 Vancouver, WA 98660
PHONE:	360-594-6262	**P.O. #**	
FAX:	360-594-6270	**PROJECT #**	1803.01.02 Precision Engineering
DATE RECEIVED:	03/13/2020	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	03/18/2020		

FRACTION #	NAME	TEST
01A	RAD5	Passive S.E. RAD130/SKC
02A	RAD1-022020	Passive S.E. RAD130/SKC
03A	RAD4	Passive S.E. RAD130/SKC
04A	Trip Blank	Passive S.E. RAD130/SKC
05A	Lab Blank	Passive S.E. RAD130/SKC
06A	LCS	Passive S.E. RAD130/SKC
06AA	LCSD	Passive S.E. RAD130/SKC

CERTIFIED BY: Heidi Hayes

Technical Director

DATE: 03/18/20

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 351-8279

LABORATORY NARRATIVE
RAD130 Passive SE by Mod EPA TO-17
Maul Foster and Alongi Inc.
Workorder# 2003371

Four Radiello 130 (Solvent) samples were received on March 13, 2020. The laboratory analyzed the charcoal sorbent bed of the passive sampler following modified method EPA TO-17. The VOCs were chemically extracted using carbon disulfide and an aliquot of the extract was injected into a GC/MS for identification and quantification of volatile organic compounds (VOCs).

The mass of each target compound adsorbed by the sampler was converted to units of concentration using the sample deployment time and the sampling rate for each VOC. If sampling rates were calculated by the lab or the manufacturer, the concentration result has been flagged as an estimated value. Results are not corrected for desorption efficiency.

The reference method used for this procedure is EPA TO-17, which describes the collection of VOCs in ambient air using sorbents and analysis by GC/MS. Because TO-17 describes active sample collection using a pump and thermal desorption as the preparation step, several modifications are required. Modifications to TO-17 are listed in the table below:

Requirement	***TO-17***	***ATL Modifications***
Sample Collection	Pump pulls measured air volume through sorbent tube	VOCs in air adsorbed onto sorbent bed passively through diffusion
Sample Preparation	Thermal extraction	Solvent extraction
Sorbent tube conditioning	Condition newly packed tubes prior to use	Charcoal-based sorbent is a single use media and conditioning is conducted by vendor.
Instrumentation	Thermal desorption introduction system	Liquid injection introduction system
Internal Standard	Gas-phase internal standard introduced on the tube or focusing trap during analysis	Liquid-phase internal standard introduced on the tube at the time of extraction
Media and sample storage	<4 deg C, 30 days	Media shelf life is determined by vendor; sample hold-time is 6 months for the RAD130 and WMS. Sample preservation requirements are storage in a cool, solvent-free refrigerator and optional use of ice during shipping.
Internal Standard Recovery	+/-40% of daily CCV area	-50% to +100% of daily CCV area

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The uptake rates were corrected based on average field temperatures if provided. In the absence of field temperatures, the uptake rates determined at 25 deg C were used.

To calculate ug/m3 concentrations in the Lab Blank and Trip Blank, a sampling duration of 30475 minutes was applied. The assumed temperature used for the uptake rate is listed on the data page. If the field temperatures were provided, the rate was adjusted in the same manner as the field samples.

Definition of Data Qualifying Flags

Ten qualifiers may have been used on the data analysis sheets and indicate as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

C - Estimated concentration due to calculated sampling rate

CN - See case narrative explanation.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
VOCS BY PASSIVE SAMPLER - GC/MS

Client Sample ID: RAD5

Lab ID#: 2003371-01A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	4.9	2.3

Client Sample ID: RAD1-022020

Lab ID#: 2003371-02A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	2.8	1.3

Client Sample ID: RAD4

Lab ID#: 2003371-03A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	5.4	2.6

Client Sample ID: Trip Blank

Lab ID#: 2003371-04A

No Detections Were Found.

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Client Sample ID: RAD5

Lab ID#: 2003371-01A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031706sim**	**Date of Collection: 3/12/20 12:21:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 11:11 AM**	
		Date of Extraction: 3/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	4.9	2.3

Temperature = 77.0F , duration time = 30456 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	81	70-130

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Client Sample ID: RAD1-022020

Lab ID#: 2003371-02A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031707sim**	**Date of Collection: 3/12/20 12:24:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 11:36 AM**	
		Date of Extraction: 3/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	2.8	1.3

Temperature = 77.0F , duration time = 30474 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

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Client Sample ID: RAD4

Lab ID#: 2003371-03A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031708sim**	**Date of Collection: 3/12/20 12:30:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 12:02 PM**	
		Date of Extraction: 3/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	5.4	2.6

Temperature = 77.0F , duration time = 30475 minutes.
Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

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Client Sample ID: Trip Blank

Lab ID#: 2003371-04A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031709sim**	**Date of Collection: 3/12/20**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 12:28 PM**	
		Date of Extraction: 3/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	Not Detected	Not Detected

Temperature = 77.0F , duration time = 30475 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	82	70-130

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Client Sample ID: Lab Blank

Lab ID#: 2003371-05A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031705sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 10:27 AM**	
		Date of Extraction: 3/17/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	Not Detected	Not Detected

Temperature = 77.0F , duration time = 30475 minutes.
Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

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Client Sample ID: LCS

Lab ID#: 2003371-06A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031703sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 09:31 AM**	
		Date of Extraction: 3/17/20	

Compound	%Recovery	Method Limits
Trichloroethene	100	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	82	70-130

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Client Sample ID: LCSD

Lab ID#: 2003371-06AA

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c031704sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/17/20 09:57 AM**	
		Date of Extraction: 3/17/20	

Compound	%Recovery	Method Limits
Trichloroethene	94	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

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Passive Sorbent Chain of Custody

WO#: 2003371

Case Seal #: _____

Company: Maul Foster & Alongi | Project #: 1803.01.02 | P.O.#

Project Manager: Heather Good | Project Name: Precision Engineering

Contact phone/email: hgood@maulfoster.com 360-594- | Collected by: Evelyn Lundeen

Lab ID	Sample Identification	Sampler ID	Date of Deployment (mm/dd/yy)	Time of Deployment (hr:min)	Date of Retrieval (mm/dd/yy)	Time of Retrieval (hr:min)	Sample Matrix (check one): Indoor/Outdoor Air	Soil Gas	Workplace Monitoring	Other	Analysis Requested	Sample Comments:
01A	RAD5	X951N	2/20/20	845	03/12/20	1221	X				TO-17	only TCE
02A	RAD1-022020	X953N	2/20/20	830	03/12/20	1224	X				TO-17	
03A	RAD4	X952N	02/20/20	835	03/12/20	1230	X				TO-17	
04A	Trip Blank	None *	02/20/20	—	03/12/20	—	X				TO-17	

Reporting Units (circle): ppbv ug/m3 ppmv mg/m3 ug ng

Turn Around Time: ☐ Normal ☒ Rush 3-Day (Specify)

Relinquished by:	Date	Time	Received by:	Date	Time	Notes to Lab:
Evelyn Lundeen	3/12/20	1815	GAC	3/13/20	0905	* did not have extra label sticker for trip blank
Relinquished by:	Date	Time	Received by:	Date	Time	

Relinquishing signature on this document indicates that samples are shipped in compliance with all applicable local, State, Federal, and international laws, regulations, and ordinances of any kind. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Eurofins Air Toxics against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples.

Lab Use Only

Shipper Name: FedEx | Air bill #:

Custody Seals Intact? Yes No (None)

Temperature (°C): NA

Sample Condition Upon Receipt: (circle) (Good) SDR

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6/12/2020
Ms. Heather Good
Maul Foster and Alongi Inc.
1329 North State Street
Suite 301
Bellingham WA 98225

Project Name: Precision Engineering
Project #: 1803.01.02
Workorder #: 2006201

Dear Ms. Heather Good

The following report includes the data for the above referenced project for sample(s) received on 6/9/2020 at Air Toxics Ltd.

The data and associated QC analyzed by Passive S.E. RAD130/SKC are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Alexandra Winslow at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Alexandra Winslow

Project Manager

eurofins | Air Toxics

WORK ORDER #: 2006201

Work Order Summary

CLIENT:	Ms. Heather Good Maul Foster and Alongi Inc. 1329 North State Street Suite 301 Bellingham, WA 98225	**BILL TO:**	Accounts Payable Maul Foster and Alongi Inc. 400 E. Mill Plain Blvd Suite 400 Vancouver, WA 98660
PHONE:	360-594-6262	**P.O. #**	
FAX:	360-594-6270	**PROJECT #**	1803.01.02 Precision Engineering
DATE RECEIVED:	06/09/2020	**CONTACT:**	Alexandra Winslow
DATE COMPLETED:	06/12/2020		

FRACTION #	NAME	TEST
01A	RAD1-051520	Passive S.E. RAD130/SKC
02A	RAD4-051520	Passive S.E. RAD130/SKC
03A	RAD5-051520	Passive S.E. RAD130/SKC
04A	Trip Blank	Passive S.E. RAD130/SKC
05A	Lab Blank	Passive S.E. RAD130/SKC
06A	LCS	Passive S.E. RAD130/SKC
06AA	LCSD	Passive S.E. RAD130/SKC

CERTIFIED BY: Heidi Hayes DATE: 06/12/20

Technical Director

Certification numbers: AZ Licensure AZ0775, FL NELAP – E87680, LA NELAP – 02089, NH NELAP - 209219, NJ NELAP - CA016, NY NELAP - 11291, TX NELAP - T104704434-19-14, UT NELAP – CA009332019-11, VA NELAP - 460197, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005-013, Effective date: 10/18/2019, Expiration date: 10/17/2020.
Eurofins Air Toxics, LLC certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 351-8279

LABORATORY NARRATIVE
RAD130 Passive SE by Mod EPA TO-17
Maul Foster and Alongi Inc.
Workorder# 2006201

Four Radiello 130 (Solvent) samples were received on June 09, 2020. The laboratory analyzed the charcoal sorbent bed of the passive sampler following modified method EPA TO-17. The VOCs were chemically extracted using carbon disulfide and an aliquot of the extract was injected into a GC/MS for identification and quantification of volatile organic compounds (VOCs).

The mass of each target compound adsorbed by the sampler was converted to units of concentration using the sample deployment time and the sampling rate for each VOC. If sampling rates were calculated by the lab or the manufacturer, the concentration result has been flagged as an estimated value. Results are not corrected for desorption efficiency.

The reference method used for this procedure is EPA TO-17, which describes the collection of VOCs in ambient air using sorbents and analysis by GC/MS. Because TO-17 describes active sample collection using a pump and thermal desorption as the preparation step, several modifications are required. Modifications to TO-17 are listed in the table below:

Requirement	***TO-17***	***ATL Modifications***
Sample Collection	Pump pulls measured air volume through sorbent tube	VOCs in air adsorbed onto sorbent bed passively through diffusion
Sample Preparation	Thermal extraction	Solvent extraction
Sorbent tube conditioning	Condition newly packed tubes prior to use	Charcoal-based sorbent is a single use media and conditioning is conducted by vendor.
Instrumentation	Thermal desorption introduction system	Liquid injection introduction system
Internal Standard	Gas-phase internal standard introduced on the tube or focusing trap during analysis	Liquid-phase internal standard introduced on the tube at the time of extraction
Media and sample storage	<4 deg C, 30 days	Media shelf life is determined by vendor; sample hold-time is 6 months for the RAD130 and WMS. Sample preservation requirements are storage in a cool, solvent-free refrigerator and optional use of ice during shipping.
Internal Standard Recovery	+/-40% of daily CCV area	-50% to +100% of daily CCV area

Receiving Notes

The Chain of Custody (COC) was not relinquished properly. A signature, date and time were not provided by the field sampler.

A revised Chain of Custody (COC) was provided by the client on 06/09/20.

Analytical Notes

The uptake rates were corrected based on average field temperatures if provided. In the absence of field temperatures, the uptake rates determined at 25 deg C were used.

To calculate ug/m3 concentrations in the Lab Blank and Trip Blank, a sampling duration of 30238 minutes was applied. The assumed temperature used for the uptake rate is listed on the data page. If the field temperatures were provided, the rate was adjusted in the same manner as the field samples.

Definition of Data Qualifying Flags

Ten qualifiers may have been used on the data analysis sheets and indicate as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV
N - The identification is based on presumptive evidence.
C - Estimated concentration due to calculated sampling rate
CN - See case narrative explanation.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
VOCS BY PASSIVE SAMPLER - GC/MS

Client Sample ID: RAD1-051520

Lab ID#: 2006201-01A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	2.8	1.4

Client Sample ID: RAD4-051520

Lab ID#: 2006201-02A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	5.5	2.6

Client Sample ID: RAD5-051520

Lab ID#: 2006201-03A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	3.6	1.7

Client Sample ID: Trip Blank

Lab ID#: 2006201-04A

No Detections Were Found.

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Client Sample ID: RAD1-051520

Lab ID#: 2006201-01A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061010sim**	**Date of Collection: 6/5/20 3:11:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 11:01 AM**	
		Date of Extraction: 6/10/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	2.8	1.4

Temperature = 77.0F , duration time = 30238 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	79	70-130

eurofins | Air Toxics

Client Sample ID: RAD4-051520

Lab ID#: 2006201-02A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061011sim**	**Date of Collection: 6/5/20 3:15:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 11:28 AM**	
		Date of Extraction: 6/10/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	5.5	2.6

Temperature = 77.0F , duration time = 30235 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

eurofins | Air Toxics

Client Sample ID: RAD5-051520

Lab ID#: 2006201-03A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061012sim**	**Date of Collection: 6/5/20 3:18:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 11:55 AM**	
		Date of Extraction: 6/10/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	3.6	1.7

Temperature = 77.0F , duration time = 30234 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	77	70-130

eurofins | Air Toxics

Client Sample ID: Trip Blank

Lab ID#: 2006201-04A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061013sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 12:22 PM**	
		Date of Extraction: 6/10/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	Not Detected	Not Detected

Temperature = 77.0F , duration time = 30238 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

eurofins | Air Toxics

Client Sample ID: Lab Blank

Lab ID#: 2006201-05A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061005sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 08:47 AM**	
		Date of Extraction: 6/10/20	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Trichloroethene	0.10	0.048	Not Detected	Not Detected

Temperature = 77.0F , duration time = 30238 minutes.

Container Type: Radiello 130 (Solvent)

Surrogates	%Recovery	Method Limits
Toluene-d8	79	70-130

eurofins | Air Toxics

Client Sample ID: LCS

Lab ID#: 2006201-06A

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061003sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 07:54 AM**	
		Date of Extraction: 6/10/20	

Compound	%Recovery	Method Limits
Trichloroethene	98	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	80	70-130

eurofins | Air Toxics

Client Sample ID: LCSD

Lab ID#: 2006201-06AA

VOCS BY PASSIVE SAMPLER - GC/MS

File Name:	**c061004sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/20 08:20 AM**	
		Date of Extraction: 6/10/20	

Compound	%Recovery	Method Limits
Trichloroethene	94	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	79	70-130

Revised COC 6/09/20

eurofins | Air Toxics

Passive Sorbent Chain of Custody

WO#: 2006201

Case Seal #: _____

Company: Maul Foster & Alongi	Project #: 1803.01.02	P.O.#	
Project Manager: Heather Good	Project Name: Precision Engineering		
Contact phone/email: 360.594.6268 hgood@maulfoster.com	Collected by: Evelyn Lundeen		

Lab ID	Sample Identification	Sampler ID	Date of Deployment (mm/dd/yy)	Time of Deployment (hr:min)	Date of Retrieval (mm/dd/yy)	Time of Retrieval (hr:min)	Sample Matrix (check one): Indoor/Outdoor Air	Soil Gas	Workplace Monitoring	Other	Analysis Requested
01A	RAD1-051520	Y714B	05/15/20	15:13	06/05/20	15:11	X				TO-17 TCE ONLY
02A	RAD4-051520	X907U	05/15/20	15:20	06/05/20	15:15	X				TO-17 TCE ONLY
03A	RAD5-051520	Y712B	05/15/20	15:24	06/05/20	15:18	X				TO-17 TCE ONLY
04A	Trip Blank	Y713B	N/A	N/A	N/A	N/A					TO-17 TCE ONLY

Reporting Units (circle): ppbv ug/m3 ppmv mg/m3 ug ng

Turn Around Time: ☐ Normal ☒ Rush 3-day TAT (Specify)

Sample Comments:

Relinquished by:	Date	Time	Received by:	Date	Time
Evelyn Lundeen	06/08/20	13:40	FedEx		
Relinquished by:	Date	Time	Received by:	Date	Time

Notes to Lab: MRL needed </= 0.37 ug/m3

Relinquishing signature on this document indicates that samples are shipped in compliance with all applicable local, State, Federal, and international laws, regulations, and ordinances of any kind. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Eurofins Air Toxics against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples.

Lab Use Only

Shipper Name:	Custody Seals Intact?	Yes	No	None	Sample Condition Upon Receipt: (circle)	Good	SDR
Air bill #:	Temperature (°C)						

eurofins | Air Toxics

Passive Sorbent Chain of Custody

WO#: 200620|

Case Seal #: _____

Company: MacFarlane & Alongi Project #: 1803.01.02 P.O.#

Project Manager: Heather Good Project Name: Precision Engineering

Contact phone/email: hgood@macfarlane.com 360.594.6268 Collected by: Evelyn Lundeen

Lab ID	Sample Identification	Sampler ID	Date of Deployment (mm/dd/yy)	Time of Deployment (hr:min)	Date of Retrieval (mm/dd/yy)	Time of Retrieval (hr:min)	Sample Matrix (check one): Indoor/Outdoor Air	Soil Gas	Workplace Monitoring	Other( )	Analysis Requested	Sample Comments:
	RAD1-051520	Y714B	05/15/20	15:13	06/04/20	15:11	X				TO-17	only TCE
	RAD4-051520	X907U	05/15/20	15:20	06/04/20	15:15	X				TO-17	
	RAD5-051520	Y712B	05/15/20	15:24	06/10/20	15:18	X				TO-17	
	Trip Blank	Y713B	N/A	NA	NA	NA					TO-17	

Reporting Units (circle): ppbv ug/m3 ppmv mg/m3 ug ng

Turn Around Time: ☐ Normal ☒ Rush 3 day (Specify)

Relinquished by:	Date	Time	Received by:	Date	Time	Notes to Lab:
Evelyn Lundeen	6/8/2020	1340		6/8/20	1:40p	MRL needed
Relinquished by:	Date	Time	Received by:	Date	Time	LJ = 0.37 ug/m3
			SEATAC	6/09/20	1038	

Relinquishing signature on this document indicates that samples are shipped in compliance with all applicable local, State, Federal, and international laws, regulations, and ordinances of any kind. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Eurofins Air Toxics against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples.

Lab Use Only

Shipper Name: FedEx	Custody Seals Intact?	Yes	No	None	Sample Condition Upon Receipt: (circle)	Good	SDR
Air bill #:	Temperature (°C)	NA					

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

February 12, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the additional results from the testing of material submitted on February 2, 2020 from the Precision Engineering 1803.01.02, F&BI 002001 project. There are 11 pages included in this report.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: jwetmore@maulfoster.com
MFA0212R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on February 2, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.02, F&BI 002001 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
002001 -01	A10
002001 -02	A9
002001 -03	A8
002001 -04	A11
002001 -05	IA8-020120
002001 -06	IA10
002001 -07	IA9
002001 -08	IA11
002001 -09	IA12
002001 -10	IA13
002001 -11	IA14
002001 -12	IA15
002001 -13	AA1
002001 -14	AA2
002001 -15	AA3
002001 -16	AA4
002001 -17	AA5

All quality control requirements were acceptable.

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA8-020120	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-05 1/10
Date Analyzed:	02/11/20	Data File:	021030.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	103	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	270	51

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA10	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-06 1/10
Date Analyzed:	02/11/20	Data File:	021031.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	340	62

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA9	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-07 1/10
Date Analyzed:	02/11/20	Data File:	021032.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	330	61

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA11	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-08 1/10
Date Analyzed:	02/11/20	Data File:	021033.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	95	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	170	32

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA12	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-09 1/10
Date Analyzed:	02/11/20	Data File:	021034.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	93	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	200	37

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA13	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-10 1/10
Date Analyzed:	02/11/20	Data File:	021035.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	89	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	210	39

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA15	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-12 1/10
Date Analyzed:	02/11/20	Data File:	021036.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	170	32

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.02
Date Collected:	Not Applicable	Lab ID:	00-0332 mb
Date Analyzed:	02/10/20	Data File:	021018.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	96	70	130

	Concentration	
Compounds:	ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Date of Report: 02/12/20
Date Received: 02/02/20
Project: Precision Engineering 1803.01.02, F&BI 002001

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Trichloroethene	ppbv	5	86	70-130

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

SAMPLE CHAIN OF CUSTODY

002001

ME 02-02-20

Page # 1 of 3

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N. State Street, Suite 301

City, State, ZIP Bellingham, WA 98225

Phone (360) 594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering

PO #: 1803.01.02

REPORTING LEVEL
- Indoor Air
- Deep Soil Gas
- Sub Slab/Soil Gas
- SVE/Grab

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
- Standard
- RUSH 3 DAY

Rush charges authorized by:

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

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Modified SIM Full Scan*	TCE by Mod. TO-17	TO-15 cVOCs	He by ASTM D-1946	Notes
A10	01	2299	12	2/1/20	-30	1128	-5	1135	X	X		X	Subslab
A9	02	2304	18	2/1/20	-30	1208	-5	1214	X	X		X	Subslab
A8	03	3230	111	2/1/20	-30	1336	-5	1312	X	X		X	Subslab
~~A12~~ Per HG 2/6/20 A11	04	2434	17	2/1/20	-30	1306	-5	1312	X	X		X	Subslab
~~IA18-020120~~ per HG 2/6/20 IA8-020120	05	23229	NA	2/1/20	-30	1546	-6	1546	X	X			Indoor air Sample ID IA8020120 BB
IA10	06	20550	NA	2/1/20	-29	1548	-8	1548	X	X	2/2/20		Indoor air
IA9	07	21453	NA	2/1/20	-30	1551	-8	1551	X	X	2/2/20		Indoor air
IA11	08	20549	NA	2/1/20	-29	1554	-0	1547	X	X	2/2/20		Indoor air no pressure observed in canister at 1547

Samples received at 17 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/2/20	1742
Received by:	Eric Parnes	FoB	2/2/20	1742
Relinquished by:				
Received by:				

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

FORMS\COC\COCTO-15.DOC

*Note: TO-15 Modified SIM full scan to include the following:, as specified by email: TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chloroethane, and vinyl chloride.

SAMPLE CHAIN OF CUSTODY

007001

ME 02-02-20

Report To Heather Good
Company Maul Foster & Alongi
Address 1329 N. State Street, Suite 301
City, State, ZIP Bellingham, WA 98225
Phone (360) 594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering

PO #: 1803.01.02

REPORTING LEVEL
- Indoor Air
- Deep Soil Gas
- Sub Slab/Soil Gas
- SVE/Grab

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
- Standard
- RUSH 3 DAY

Rush charges authorized by:

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

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Modified SIM Full Scan*	TCE by Mod. TO-17	TO-15 cVOCs	He by ASTM D-1946	Notes
IA12	09	18564	NA	2/1/20	-29	1556	-6	1556	X	X			Indoor air
IA13	10	20546	NA	2/1/20	-30	1557	-7	1557	X	X			Indoor air
IA14	11	18571	NA	2/1/20	-30	1559	-7	1559	X	X			Indoor air
IA15	12	20545	NA	2/1/20	-30	1605	-9	1605	X	X			Indoor air
AA1	13	18569	NA	2/1/20	-30	1630	-6	1630	X	X			Outdoor air
AA2	14	18580	NA	2/1/20	-30	1641	-5	1641	X	X			Outdoor air
AA3	15	20552	NA	2/1/20	-30	1640	-12	1640	X	X			Outdoor air
AA4	16	18579	NA	2/1/20	-30	1637	-7	1637	X	X			Outdoor air

EUB and breakdown products

*TCE by TO15 only - per HG 2/6/20 per HG 2/2/20

30 2/2/20

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/2/20	1742
Received by:	ERIC POWER	FEB	2/2/20	1742
Relinquished by:				
Received by:				

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

FORMS\COC\COCTO-15.DOC

*Note: TO-15 Modified SIM full scan to include the following:, as specified by email: TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chloroethane, and vinyl chloride.

002001

SAMPLE CHAIN OF CUSTODY

ME 02-02-20

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N. State Street, Suite 301

City, State, ZIP Bellingham, WA 98225

Phone (360) 594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)	
PROJECT NAME Precision Engineering	PO # 1803.01.02
REPORTING LEVEL • Indoor Air • Deep Soil Gas • Sub Slab/Soil Gas • SVE/Grab	INVOICE TO accounting@maulfoster.com

TURNAROUND TIME
- Standard
- RUSH 3 DAY

Rush charges authorized by:

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

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Modified SIM Full Scan*	TCE by Mod. TO-15	TO-15 cVOCs	He by ASTM D-1946	Notes
AA5	17	20547	NA	2/1/20	-30	1632	-6	1632	X	X	EA 2/2/20		Outdoor air

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

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/2/20	1747
Received by:	Eric Powell	FCR	2/2/20	1747
Relinquished by:				
Received by:				

FORMS\COC\COCTO-15.DOC

*Note: TO-15 Modified SIM full scan to include the following:, as specified by email: TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chloroethane, and vinyl chloride.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

February 6, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included is the amended report from the testing of material submitted on February 2, 2020 from the Precision Engineering 1803.01.02, F&BI 002001 project. Per your request, sample IDs were amended.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0206R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

February 6, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on February 2, 2020 from the Precision Engineering 1803.01.02, F&BI 002001 project. There are 23 pages included in this report.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0206R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on February 2, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.02, F&BI 002001 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
002001 -01	A10
002001 -02	A9
002001 -03	A8
002001 -04	A11
002001 -05	IA8-020120
002001 -06	IA10
002001 -07	IA9
002001 -08	IA11
002001 -09	IA12
002001 -10	IA13
002001 -11	IA14
002001 -12	IA15
002001 -13	AA1
002001 -14	AA2
002001 -15	AA3
002001 -16	AA4
002001 -17	AA5

The trichloroethene concentration in samples IA8-020120, IA10, IA9, IA11, IA12, IA13, and IA15 exceeded the calibration range of the instrument. The data were flagged accordingly. The overrange samples will be diluted and reanalyzed and the results issued in a separate report.

All other quality control requirements were acceptable.

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	A10	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-01 1/44
Date Analyzed:	02/04/20	Data File:	020337.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	89	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<11	<4.4
Chloroethane	<120	<44
1,1-Dichloroethene	<17	<4.4
trans-1,2-Dichloroethene	<17	<4.4
1,1-Dichloroethane	<18	<4.4
cis-1,2-Dichloroethene	40	10
1,2-Dichloroethane (EDC)	<1.8	<0.44
Trichloroethene	29	5.3

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	A9	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-02 1/16
Date Analyzed:	02/04/20	Data File:	020336.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<4.1	<1.6
Chloroethane	<42	<16
1,1-Dichloroethene	<6.3	<1.6
trans-1,2-Dichloroethene	<6.3	<1.6
1,1-Dichloroethane	<6.5	<1.6
cis-1,2-Dichloroethene	21	5.3
1,2-Dichloroethane (EDC)	<0.65	<0.16
Trichloroethene	1,100	210

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	A8	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-03 1/8.2
Date Analyzed:	02/04/20	Data File:	020335.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	107	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<2.1	<0.82
Chloroethane	<22	<8.2
1,1-Dichloroethene	<3.3	<0.82
trans-1,2-Dichloroethene	<3.3	<0.82
1,1-Dichloroethane	<3.3	<0.82
cis-1,2-Dichloroethene	<3.3	<0.82
1,2-Dichloroethane (EDC)	<0.33	<0.082
Trichloroethene	160	29

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	A11	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-04 1/8.2
Date Analyzed:	02/04/20	Data File:	020333.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<2.1	<0.82
Chloroethane	<22	<8.2
1,1-Dichloroethene	<3.3	<0.82
trans-1,2-Dichloroethene	<3.3	<0.82
1,1-Dichloroethane	14	3.4
cis-1,2-Dichloroethene	<3.3	<0.82
1,2-Dichloroethane (EDC)	<0.33	<0.082
Trichloroethene	82	15

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA8-020120	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-05
Date Analyzed:	02/03/20	Data File:	020320.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	94	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.093	0.023
Trichloroethene	210 ve	40 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA10	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-06
Date Analyzed:	02/04/20	Data File:	020321.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	89	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.089	0.022
Trichloroethene	260 ve	49 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA9	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-07
Date Analyzed:	02/04/20	Data File:	020322.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	78	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.085	0.021
Trichloroethene	250 ve	47 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA11	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-08
Date Analyzed:	02/04/20	Data File:	020323.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	95	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.097	0.024
Trichloroethene	140 ve	26 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA12	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-09
Date Analyzed:	02/04/20	Data File:	020324.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.093	0.023
Trichloroethene	160 ve	30 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA13	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-10
Date Analyzed:	02/04/20	Data File:	020325.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.089	0.022
Trichloroethene	180 ve	34 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA14	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-11
Date Analyzed:	02/04/20	Data File:	020326.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.085	0.021
Trichloroethene	110	21

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA15	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-12
Date Analyzed:	02/04/20	Data File:	020327.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.093	0.023
Trichloroethene	150 ve	28 ve

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AA1	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-13
Date Analyzed:	02/04/20	Data File:	020328.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	105	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.065	0.016
Trichloroethene	<0.16	<0.03

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AA2	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-14
Date Analyzed:	02/04/20	Data File:	020329.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.065	0.016
Trichloroethene	<0.16	<0.03

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AA3	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-15 1/1.6
Date Analyzed:	02/04/20	Data File:	020330.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.41	<0.16
Chloroethane	<4.2	<1.6
1,1-Dichloroethene	<0.63	<0.16
trans-1,2-Dichloroethene	<0.63	<0.16
1,1-Dichloroethane	<0.65	<0.16
cis-1,2-Dichloroethene	<0.63	<0.16
1,2-Dichloroethane (EDC)	0.065	0.016
Trichloroethene	<0.27	<0.05

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AA4	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-16
Date Analyzed:	02/04/20	Data File:	020331.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	93	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.065	0.016
Trichloroethene	<0.16	<0.03

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	AA5	Client:	Maul Foster Alongi
Date Received:	02/02/20	Project:	Precision Engineering 1803.01.02
Date Collected:	02/01/20	Lab ID:	002001-17
Date Analyzed:	02/04/20	Data File:	020332.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	0.065	0.016
Trichloroethene	<0.16	<0.03

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.02
Date Collected:	Not Applicable	Lab ID:	00-0297 mb
Date Analyzed:	02/03/20	Data File:	020319.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	<0.04	<0.01
Trichloroethene	<0.16	<0.03

Date of Report: 02/06/20
Date Received: 02/02/20
Project: Precision Engineering 1803.01.02, F&BI 002001
Date Extracted: 02/05/20
Date Analyzed: 02/05/20

RESULTS FROM THE ANALYSIS OF AIR SAMPLES FOR HELIUM USING METHOD ASTM D1946

Results Reported as % Helium

Sample ID Laboratory ID	Helium
A10 002001-01	<0.6
A9 002001-02	<0.6
A8 002001-03	<0.6
A11 002001-04	<0.6
Method Blank	<0.6

Date of Report: 02/06/20
Date Received: 02/02/20
Project: Precision Engineering 1803.01.02, F&BI 002001

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Vinyl chloride	ppbv	5	80	70-130
Chloroethane	ppbv	5	83	70-130
1,1-Dichloroethene	ppbv	5	85	70-130
trans-1,2-Dichloroethene	ppbv	5	82	70-130
1,1-Dichloroethane	ppbv	5	78	70-130
cis-1,2-Dichloroethene	ppbv	5	83	70-130
1,2-Dichloroethane (EDC)	ppbv	5	80	70-130
Trichloroethene	ppbv	5	81	70-130

Date of Report: 02/06/20
Date Received: 02/02/20
Project: Precision Engineering 1803.01.02, F&BI 002001

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR HELIUM USING METHOD ASTM D1946

Laboratory Code: 002001-04 (Duplicate)

Analyte	Sample Result (%)	Duplicate Result (%)	Relative Percent Difference	Acceptance Criteria
Helium	<0.6	<0.6	nm	0-20

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

SAMPLE CHAIN OF CUSTODY

002001

ME 02-02-20

Page # 1 of 3

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N. State Street, Suite 301

City, State, ZIP Bellingham, WA 98225

Phone (360) 594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering

PO #: 1803.01.02

REPORTING LEVEL
- Indoor Air
- Deep Soil Gas
- Sub Slab/Soil Gas
- SVE/Grab

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
- Standard
- RUSH 3 DAY

Rush charges authorized by:

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

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Modified SIM Full Scan*	TCE by Mod. TO-17	TO-15 cVOCs	He by ASTM D-1946	Notes
A10	01	2299	12	2/1/20	-30	1128	-5	1135	X	X		X	Subslab
A9	02	2304	18	2/1/20	-30	1208	-5	1214	X	X		X	Subslab
A8	03	3230	111	2/1/20	-30	1336	-5	1312	X	X		X	Subslab
~~A12~~ Per HG 2/6/20 A11	04	2434	17	2/1/20	-30	1306	-5	1312	X	X		X	Subslab
~~IA18-020120~~ per HG 2/6/20 IA8-020120	05	23229	NA	2/1/20	-30	1546	-6	1546	X	X			Indoor air Sample ID IA8020120 BB
IA10	06	20550	NA	2/1/20	-29	1548	-8	1548	X	X	2/2/20		Indoor air
IA9	07	21453	NA	2/1/20	-30	1551	-8	1551	X	X	2/2/20		Indoor air
IA11	08	20549	NA	2/1/20	-29	1554	-0	1547	X	X	2/2/20		Indoor air no pressure observed in canister at 1547

Samples received at 17 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/2/20	1742
Received by:	Eric Parnes	FoB	2/2/20	1742
Relinquished by:				
Received by:				

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

FORMS\COC\COCTO-15.DOC

*Note: TO-15 Modified SIM full scan to include the following:, as specified by email: TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chloroethane, and vinyl chloride.

SAMPLE CHAIN OF CUSTODY

007001

ME 02-02-20

Report To Heather Good
Company Maul Foster & Alongi
Address 1329 N. State Street, Suite 301
City, State, ZIP Bellingham, WA 98225
Phone (360) 594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Precision Engineering

PO #: 1803.01.02

REPORTING LEVEL
- Indoor Air
- Deep Soil Gas
- Sub Slab/Soil Gas
- SVE/Grab

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
- Standard
- RUSH 3 DAY

Rush charges authorized by:

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

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Modified SIM Full Scan*	TCE by Mod. TO-17	TO-15 cVOCs	He by ASTM D-1946	Notes
IA12	09	18564	NA	2/1/20	-29	1556	-6	1556	X	X			Indoor air
IA13	10	20546	NA	2/1/20	-30	1557	-7	1557	X	X			Indoor air
IA14	11	18571	NA	2/1/20	-30	1559	-7	1559	X	X			Indoor air
IA15	12	20545	NA	2/1/20	-30	1605	-9	1605	X	X			Indoor air
AA1	13	18569	NA	2/1/20	-30	1630	-6	1630	X	X			Outdoor air
AA2	14	18580	NA	2/1/20	-30	1641	-5	1641	X	X			Outdoor air
AA3	15	20552	NA	2/1/20	-30	1640	-12	1640	X	X			Outdoor air
AA4	16	18579	NA	2/1/20	-30	1637	-7	1637	X	X			Outdoor air

EUB and breakdown products

*TCE by TO15 only - per HG 2/6/20 per HG 2/2/20

30 2/2/20

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/2/20	1742
Received by:	ERIC POWER	FEB	2/2/20	1742
Relinquished by:				
Received by:				

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

FORMS\COC\COCTO-15.DOC

*Note: TO-15 Modified SIM full scan to include the following:, as specified by email: TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chloroethane, and vinyl chloride.

002001

SAMPLE CHAIN OF CUSTODY

ME 02-02-20

Report To Heather Good

Company Maul Foster & Alongi

Address 1329 N. State Street, Suite 301

City, State, ZIP Bellingham, WA 98225

Phone (360) 594-6268 Email hgood@maulfoster.com

SAMPLERS (*signature*)	
PROJECT NAME Precision Engineering	PO # 1803.01.02
REPORTING LEVEL • Indoor Air • Deep Soil Gas • Sub Slab/Soil Gas • SVE/Grab	INVOICE TO accounting@maulfoster.com

TURNAROUND TIME
- Standard
- RUSH 3 DAY

Rush charges authorized by:

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

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Modified SIM Full Scan*	TCE by Mod. TO-15	TO-15 cVOCs	He by ASTM D-1946	Notes
AA5	17	20547	NA	2/1/20	-30	1632	-6	1632	X	X	EA 2/2/20		Outdoor air

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

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/2/20	1747
Received by:	Eric Powell	FCR	2/2/20	1747
Relinquished by:				
Received by:				

FORMS\COC\COCTO-15.DOC

*Note: TO-15 Modified SIM full scan to include the following:, as specified by email: TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chloroethane, and vinyl chloride.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

May 6, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on May 4, 2020 from the Precision Engineering 1803.01.03, F&BI 005024 project. There are 8 pages included in this report.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0506R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on May 4, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering 1803.01.03, F&BI 005024 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
005024 -01	IA16050220
005024 -02	IA17050220
005024 -03	IA18050220
005024 -04	IA19050220

All quality control requirements were acceptable.

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA16050220	Client:	Maul Foster Alongi
Date Received:	05/04/20	Project:	Precision Engineering 1803.01.03
Date Collected:	05/02/20	Lab ID:	005024-01
Date Analyzed:	05/04/20	Data File:	050416.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA17050220	Client:	Maul Foster Alongi
Date Received:	05/04/20	Project:	Precision Engineering 1803.01.03
Date Collected:	05/02/20	Lab ID:	005024-02
Date Analyzed:	05/04/20	Data File:	050413.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	96	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA18050220	Client:	Maul Foster Alongi
Date Received:	05/04/20	Project:	Precision Engineering 1803.01.03
Date Collected:	05/02/20	Lab ID:	005024-03
Date Analyzed:	05/04/20	Data File:	050414.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	83	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA19050220	Client:	Maul Foster Alongi
Date Received:	05/04/20	Project:	Precision Engineering 1803.01.03
Date Collected:	05/02/20	Lab ID:	005024-04
Date Analyzed:	05/04/20	Data File:	050415.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	83	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering 1803.01.03
Date Collected:	Not Applicable	Lab ID:	00-0991 mb
Date Analyzed:	05/04/20	Data File:	050411.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Date of Report: 05/06/20
Date Received: 05/04/20
Project: Precision Engineering 1803.01.03, F&BI 005024

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Trichloroethene	ug/m3	73	80	70-130

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

005024

SAMPLE CHAIN OF CUSTODY ME 05/04/20

Page # 1 of 1

Report To Heather Good

Company Maul Foster + Alongi

Address 1329 North State St., #301

City, State, ZIP Bellingham, WA 98225

Phone 360-929-1309 Email hgood@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME & ADDRESS: Precision Engineering, 1231 S Director St., Seattle, WA 98108

PO # 1803.01.03

NOTES:

INVOICE TO accounting@maulfoster.com

TURNAROUND TIME
- ☐ Standard
- ☒ RUSH 1 business day

Rush charges authorized by: Heather Good

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

SAMPLE INFORMATION										ANALYSIS REQUESTED						
Sample Name	Lab ID	Canister ID	Flow Cont. ID	Reporting Level: IA=Indoor Air SG=Soil Gas (Circle One)	Date Sampled	Initial Vac. ("Hg)	Field Initial Time	Final Vac. ("Hg)	Field Final Time	TO15 Full Scan	TO15 BTEXN	TO15 cVOCs	APH	Helium	TCE by TO15	Notes
IA16050220	01	35338	05351	(IA) / SG	5/2/20	-29.5	1507	-8	1507						X	
IA17050220	02	20554	07870	(IA) / SG	5/2/20	-29	1511	-6	1511						X	
IA18050220	03	20544	06603	(IA) / SG	5/2/20	-30	1515	-7	1515						X	
IA19050220	04	18563	05347	(IA) / SG	5/2/20	-30	1519	-9	1519						X	
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												

Samples received at 16 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	5/4	903
Received by:	Eric Young	EFB	5/4	905
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

February 21, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on February 20, 2020 from the Precision Engineering Indoor Air Sampling 1803.01.02, F&BI 002298 project. There are 7 pages included in this report.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0221R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on February 20, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering Indoor Air Sampling 1803.01.02, F&BI 002298 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
002298 -01	IA16-022020
002298 -02	IA17-022020
002298 -03	IA19-022020

All quality control requirements were acceptable.

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA16-022020	Client:	Maul Foster Alongi
Date Received:	02/20/20	Project:	Precision Engineering Indoor Air 1803.01.02
Date Collected:	02/20/20	Lab ID:	002298-01
Date Analyzed:	02/21/20	Data File:	022021.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	83	70	130

	Concentration	
Compounds:	ug/m3	ppbv
Trichloroethene	1.9	0.35

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA17-022020	Client:	Maul Foster Alongi
Date Received:	02/20/20	Project:	Precision Engineering Indoor Air 1803.01.02
Date Collected:	02/20/20	Lab ID:	002298-02
Date Analyzed:	02/21/20	Data File:	022022.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

	Concentration	
Compounds:	ug/m3	ppbv
Trichloroethene	4.5	0.83

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA19-022020	Client:	Maul Foster Alongi
Date Received:	02/20/20	Project:	Precision Engineering Indoor Air 1803.01.02
Date Collected:	02/20/20	Lab ID:	002298-03
Date Analyzed:	02/21/20	Data File:	022023.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	2.3	0.42

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Precision Engineering Indoor Air 1803.01.02
Date Collected:	Not Applicable	Lab ID:	00-0419 mb
Date Analyzed:	02/20/20	Data File:	022014.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	96	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Date of Report: 02/21/20
Date Received: 02/20/20
Project: Precision Engineering Indoor Air Sampling 1803.01.02, F&BI 002298

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Trichloroethene	ug/m3	73	85	70-130

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

CO2298

SAMPLE CHAIN OF CUSTODY

ME 02/20/20

Page # 1 of 1

Report To Heather Good
Company Maul Foster Alongi
Address 1329 N State St., #301
City, State, ZIP Bellingham, WA 98225
Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (*signature*)	
PROJECT NAME & ADDRESS Precision engineering indoor air sampling	PO # 1803.01.02
NOTES:	INVOICE TO accounting@maulfoster.com

TURNAROUND TIME
☐ Standard
☒ RUSH 1 bus. day (100% MU)
Rush charges authorized by: Heather Good

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

SAMPLE INFORMATION										ANALYSIS REQUESTED						
Sample Name	Lab ID	Canister ID	Flow Cont. ID	Reporting Level: IA=Indoor Air SG=Soil Gas (Circle One)	Date Sampled	Initial Vac. ("Hg)	Field Initial Time	Final Vac. ("Hg)	Field Final Time	TO15 Full Scan	TO15 BTEXN	TO15 cVOCs	APH	Helium	TCE by TO15	Notes
IA16-022020	01	18568	07854	(IA) / SG	02/20/20	-30	755	-6	1555						X	
IA17-022020	02	23235	06607	(IA) / SG	↓	-30	803	-9	1603						X	
IA19-022020	03	23234	07847	(IA) / SG	↓	-30	811	-6	1611						X	
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												

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

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/20	1655
Received by:	Yelena Aravkina	FTB	2/20	16:55
Relinquished by:				
Received by:		Samples received at 20 °C		

FORMS\COC\COCTO-15.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

February 19, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the additional results from the testing of material submitted on February 11, 2020 from the Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154 project. There are 8 pages included in this report.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0219R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on February 11, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
002154 -01	IA16
002154 -02	IA17
002154 -03	IA18
002154 -04	IA19
002154 -05	IA20
002154 -06	EvapPit-W-021120

The arsenic concentration in sample EvapPit-W-021120 was reported between the method detection limit and the standard reporting limit. The sample could not be analyzed at a greater concentration due to matrix interferences.

All other quality control requirements were acceptable.

Date of Report: 02/19/20
Date Received: 02/11/20
Project: Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154
Date Extracted: 02/12/20
Date Analyzed: 02/12/20

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
EvapPit-W-021120 002154-06	3,900 x	2,500 x	68
Method Blank 00-365 MB	<50	<250	95

Analysis For Total Metals By EPA Method 6020B

Client ID:	EvapPit-W-021120	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Extracted:	02/18/20	Lab ID:	002154-06 x40
Date Analyzed:	02/18/20	Data File:	002154-06 x40.052
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	6.08 j

Analysis For Total Metals By EPA Method 6020B

Client ID:	EvapPit-W-021120	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Extracted:	02/18/20	Lab ID:	002154-06 x2000
Date Analyzed:	02/18/20	Data File:	002154-06 x2000.049
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Chromium	994,000

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	NA	Project:	1803.01.02, F&BI 002154
Date Extracted:	02/18/20	Lab ID:	I0-097 mb
Date Analyzed:	02/18/20	Data File:	I0-097 mb.033
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<0.12 j
Chromium	<1

Date of Report: 02/19/20
Date Received: 02/11/20
Project: Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	100	96	63-142	4

Date of Report: 02/19/20
Date Received: 02/11/20
Project: Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154

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

Laboratory Code: 002219-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	1.60	94	93	75-125	1
Chromium	ug/L (ppb)	20	<1	99	98	75-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	96	80-120
Chromium	ug/L (ppb)	20	101	80-120

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

002154

SAMPLE CHAIN OF CUSTODY

ME 02/11/20

RUSH!

VW1/AI2 - (NP) 2/12/20

Page # 2 of 2

Report To Heather Good

Company Maul Foster Alongi

Address 1329 N State St. #201

City, State, ZIP Bellingham, WA 98225

Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (signature)	
PROJECT NAME: Precision Engineering vapor assessment	PO #: 1803.01.02
REPORTING LEVEL: • Indoor Air • Deep Soil Gas • Sub Slab/Soil Gas • SVE/Grab	INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
- Standard as fast as possible
- RUSH
Rush charges authorized by:

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

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Full Scan	TO-15 BTEXN	TO-15 cVOCs	TO-15 - TCE	Notes
IA16	01	20552	07851	2/11/20	-30	8:51	-7	1651				X	
IA17	02	23234	06605	2/11/20		8:58	-9	1658				X	
IA18	03	23235	05356	2/11/20		9:07	-6	1707				X	
IA19	04	20547	05354	2/11/20		9:15	-6	1710				X	
IA20	05	18568	06606	2/11/20	↓	9:30	-12	1730				X	

Samples received at 19 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lindeen	MFA	2/11/20	1800
Received by:	FEDEX TAPE	FBI	↓	↓
Relinquished by:				
Received by:				

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

002154

SAMPLE CHAIN OF CUSTODY

RUSH! (NP) 2/12/20

Page # X2 of 2

Report To Heather Good
Company Maul Foster Alongi
Address 1329 N State St. #301
City, State, ZIP Bellingham, WA 98225
Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (*signature*) ME 02/11/20
PROJECT NAME: Precision engineering vapor assessment
PO #: 1803.01.02
REMARKS: Project specific RLs? - Yes / No
INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME VW1 AZ2
☐ Standard turnaround
☒ RUSH see notes below
Rush charges authorized by:

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	TCE EPA 8260D	total chromium EPA 6020B	arsenic EPA 6020B		Notes
EVAP PIT-W-021120	06A-E	2/11/2020	1015	W	5	X							X	X	X		TCE analysis is needed on the fastest turnaround possible - arsenic, total chromium and NWTPH-Dx results can be on standard turnaround
												Samples received at 3 °C					

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/11/20	1808
Received by:	BISRAT TADESSE	FBI	↓	↓
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

February 12, 2020

Heather Good, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Good:

Included are the results from the testing of material submitted on February 11, 2020 from the Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154 project. There are 12 pages included in this report.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA0212R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on February 11, 2020 by Friedman & Bruya, Inc. from the Maul Foster Alongi Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
002154 -01	IA16
002154 -02	IA17
002154 -03	IA18
002154 -04	IA19
002154 -05	IA20
002154 -06	EvapPit-W-021120

The NWTPH-Dx and metals requested for sample EvapPit-W-021120 will be sent as an additional report.

All quality control requirements were acceptable.

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	EvapPit-W-021120	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Extracted:	02/12/20	Lab ID:	002154-06 1/10
Date Analyzed:	02/12/20	Data File:	021218.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	57	121
Toluene-d8	96	63	127
4-Bromofluorobenzene	96	60	133

Compounds:	Concentration ug/L (ppb)
Trichloroethene	1.4

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	1803.01.02, F&BI 002154
Date Extracted:	02/12/20	Lab ID:	00-334 mb
Date Analyzed:	02/12/20	Data File:	021217.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	94	63	127
4-Bromofluorobenzene	92	60	133

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<0.1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA16	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Collected:	02/11/20	Lab ID:	002154-01
Date Analyzed:	02/11/20	Data File:	021111.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	2.8	0.52

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA17	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Collected:	02/11/20	Lab ID:	002154-02
Date Analyzed:	02/11/20	Data File:	021112.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	82	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	93	17

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA18	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Collected:	02/11/20	Lab ID:	002154-03
Date Analyzed:	02/12/20	Data File:	021113.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	79	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	45	8.3

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA19	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Collected:	02/11/20	Lab ID:	002154-04
Date Analyzed:	02/12/20	Data File:	021114.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	82	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	110	21

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	IA20	Client:	Maul Foster Alongi
Date Received:	02/11/20	Project:	1803.01.02, F&BI 002154
Date Collected:	02/11/20	Lab ID:	002154-05 1/1.4
Date Analyzed:	02/12/20	Data File:	021115.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	78	70	130

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	73	14

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	1803.01.02, F&BI 002154
Date Collected:	02/11/20	Lab ID:	00-0337 mb
Date Analyzed:	02/11/20	Data File:	021110.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

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

Compounds:	Concentration ug/m3	ppbv
Trichloroethene	<0.27	<0.05

Date of Report: 02/12/20
Date Received: 02/11/20
Project: Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154

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

Laboratory Code: 002158-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Trichloroethene	ug/L (ppb)	50	<1	105	66-135

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Trichloroethene	ug/L (ppb)	50	100	103	79-113	3

Date of Report: 02/12/20
Date Received: 02/11/20
Project: Precision Engineering Vapor Assessment 1803.01.02, F&BI 002154

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

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Trichloroethene	ppbv	5	84	70-130

Data Qualifiers & Definitions

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

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

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

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

cf - The sample was centrifuged prior to analysis.

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

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

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

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

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

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

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

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

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

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

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

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

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

002154

SAMPLE CHAIN OF CUSTODY

ME 02/11/20

RUSH!

VW1/AI2 - (NP) 2/12/20

Page # 2 of 2

Report To Heather Good

Company Maul Foster Alongi

Address 1329 N State St. #201

City, State, ZIP Bellingham, WA 98225

Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (signature)	
PROJECT NAME: Precision Engineering vapor assessment	PO #: 1803.01.02
REPORTING LEVEL: • Indoor Air • Deep Soil Gas • Sub Slab/Soil Gas • SVE/Grab	INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME
- Standard as fast as possible
- RUSH
Rush charges authorized by:

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

ANALYSIS REQUESTED

Sample Name	Lab ID	Canister ID	Flow Contr. ID	Date Sampled	Field Initial Press. (Hg)	Field Initial Time	Field Final Press. (Hg)	Field Final Time	TO-15 Full Scan	TO-15 BTEXN	TO-15 cVOCs	TO-15 - TCE	Notes
IA16	01	20552	07851	2/11/20	-30	8:51	-7	1651				X	
IA17	02	23234	06605	2/11/20		8:58	-9	1658				X	
IA18	03	23235	05356	2/11/20		9:07	-6	1707				X	
IA19	04	20547	05354	2/11/20		9:15	-6	1710				X	
IA20	05	18568	06606	2/11/20	↓	9:30	-12	1730				X	

Samples received at 19 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lindeen	MFA	2/11/20	1800
Received by:	FEDEX TAPE	FBI	↓	↓
Relinquished by:				
Received by:				

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

002154

SAMPLE CHAIN OF CUSTODY

RUSH! (NP) 2/12/20

Page # X2 of 2

Report To Heather Good
Company Maul Foster Alongi
Address 1329 N State St. #301
City, State, ZIP Bellingham, WA 98225
Phone 360-927-1309 Email hgood@maulfoster.com

SAMPLERS (*signature*) ME 02/11/20
PROJECT NAME: Precision engineering vapor assessment
PO #: 1803.01.02
REMARKS: Project specific RLs? - Yes / No
INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME VW1 AZ2
☐ Standard turnaround
☒ RUSH see notes below
Rush charges authorized by:

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

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	TCE EPA 8260D	total chromium EPA 6020B	arsenic EPA 6020B		Notes
EVAP PIT-W-021120	06A-E	2/11/2020	1015	W	5	X							X	X	X		TCE analysis is needed on the fastest turnaround possible - arsenic, total chromium and NWTPH-Dx results can be on standard turnaround
												Samples received at 3 °C					

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Evelyn Lundeen	MFA	2/11/20	1808
Received by:	BISRAT TADESSE	FBI	↓	↓
Relinquished by:				
Received by:				

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

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Name Author(s)	**Date**	**Comments**
Mary Benzinger	8/7/2019	Prepare DVM for validation of 907397.
Julianna Wetmore	8/7/2019	Prepare DVM for validation of 907410, 907430, and 907445
Mary Benzinger	2/18/2020	Edit hexavalent chromium validation.
J. Wetmore	2/19/2020	Review hexavalent chromium validation
M. Benzinger	3/27/2020	Address VO'Daniel copy edit redlines and comments.

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Peer Review (may be conducted by senior reviewer)			Mary Benzinger	8/8/2019/ 8/30/2019	Perform QA review of DVM. Review DVM comment.
Senior Review**			H. Good	2/23/21	
Production			S. Larson	3/16/2021	Produce PDF
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DATA QUALITY ASSURANCE/ QUALITY CONTROL REVIEW

PROJECT NO. 1803.01.04 | AUGUST 7, 2019 | PRECISION ENGINEERING, INC.

Maul Foster & Alongi, Inc., conducted an independent review of the quality of analytical results for groundwater samples collected at the Precision Engineering property. The samples were collected in July 2019.

Friedman & Bruya, Inc. (FBI) performed the analyses. FBI report numbers 907397, 907410, 907430, and 907445 were reviewed. Hexavalent chromium analysis was subcontracted by FBI to Fremont Analytical (FA), with FA results appended to the FBI reports. The analyses performed and samples analyzed are listed below.

Analysis	Reference
Diesel- and Motor Oil-Range Hydrocarbons	NWTPH-Dx
Dissolved Metals	EPA Method 6020B
Hexavalent Chromium	SM 3500-Cr-B
Polycyclic Aromatic Hydrocarbons	EPA Method 8270D SIM
Volatile Organic Compounds	EPA Method 8260C

NOTES:
NWTPH = Northwest Total Petroleum Hydrocarbons.
SIM = selected ion monitoring.
EPA = U.S. Environmental Protection Agency.

Samples Analyzed			
Report 907397	**Report 907410**	**Report 907430**	**Report 907445**
MW11-W-15.0	MW-8-W-19.0	MW4-W-20.0	MW5-W-15.0
MW3-W-15.0	MW-9-W-33.0	MWDUP-W-20.0	MW7-W-20.0
--	MW-10-W-15.0	MW1-W-35.0	MW2-W-19.0
--	MW-6-W-15.0	--	--

DATA QUALIFICATIONS

Analytical results were evaluated according to applicable sections of EPA procedures (EPA, 2017a,b) and appropriate laboratory and method-specific guidelines (FA, 2018; FBI, 2016; EPA, 1986).

In reports 907397, 907410, and 907445, FBI indicated that NWTPH-Dx diesel-range hydrocarbon results for samples MW11-W-15.0, MW3-W-15.0, MW-8-W-19.0, MW-9-W-33.0, MW-10-W-15.0, MW-6-W-15.0, MW5-W-15.0, MW7-W-20.0, and MW2-W-19.0 had chromatographic patterns that did not resemble the diesel fuel standard used for quantitation. The results were reported as diesel-range hydrocarbons; thus, qualification was not required.

In reports 907397, 907410, and 907445, FBI reported the dissolved metal results twice: both undiluted and diluted, due to internal standard exceedances associated with the undiluted analyses. Some undiluted results were also flagged due to continuing calibration standard exceedances caused by carryover from the project samples. Results flagged by FBI for internal standard and/or calibration control limit exceedances have been qualified by the reviewer as "not reported." The associated diluted sample results, or undiluted sample results with no exceedance flagging, will be the results of record.

Report	Sample	Component	Not Reported		Result of Record	
			Result (ug/L)	Dilution Factor	Result (ug/L)	Dilution Factor
907397	MW11-W-15.0	Arsenic	6.98	1	< 10	10
		Chromium	2.60	1	< 10	10
		Copper	< 5	1	< 50	10
		Selenium	2.56	1	< 10	10
	MW3-W-15.0	Arsenic	13.3	1	13.6	10
		Chromium	< 1	1	< 10	10
		Copper	< 5	1	< 50	10
		Selenium	<10	10	< 1	1
907410	MW-8-W-19.0	Chromium	7.55	2	8.82	5
907445	MW5-W-15.0	Chromium	82,700	10	132,000	200
		Copper	< 50	10	<1000	200
		Selenium	11.3	10	<200	200

NOTES:
< = less than.
ug/L = micrograms per liter.

In report 907430, FBI indicated that the EPA Method 8260C 2,2-dichloropropane results for samples MW4-W-20.0, MWDUP-W-20.0, and MW1-W-35.0 were estimated due to calibration results for the analyte being outside of acceptance criteria. The associated sample results were non-detect and have been qualified by the reviewer with "J" as estimated, with a final qualification of "UJ" as non-detect and estimated.

Report	Sample	Component	Original Result (ug/L)	Qualified Result (ug/L)
907430	MW4-W-20.0	2,2-Dichloropropane	1 U	1 UJ
	MWDUP-W-20.0	2,2-Dichloropropane	1 U	1 UJ
	MW1-W-35.0	2,2-Dichloropropane	1 U	1 UJ

NOTES:
U = result is non-detect.
ug/L = micrograms per liter.
UJ = result is non-detect and estimated.

Data validation procedures were modified, as appropriate, to accommodate quality-control requirements for methods not specifically addressed by the EPA procedures (e.g., NWTPH-Dx).

The data are considered acceptable for their intended use, with the appropriate data qualifiers assigned.

HOLDING TIMES, PRESERVATION, AND SAMPLE STORAGE

Holding Times

Extractions and analyses were performed within the recommended holding time criteria.

Preservation and Sample Storage

In report 907445, samples MW5-W-15.0, MW7-W-20.0, and MW2-W-19.0 were received by FA without a cooler and above the acceptable temperature. The associated sample results were qualified by the reviewer with "J" as estimated.

Report	Sample	Component	Original Result (mg/L)	Qualified Result (mg/L)
907445	MW5-W-15.0	Hexavalent Chromium	117	117 J
	MW7-W-20.0	Hexavalent Chromium	0.0450 U	0.0450 UJ
	MW2-W-19.0	Hexavalent Chromium	0.0450 U	0.0450 UJ

NOTES:
J = result is estimated.
mg/L = milligrams per liter.
U = result is non-detect.
UJ = result is non-detect and estimated.

The remaining samples were preserved and stored appropriately.

BLANKS

Method Blanks

Laboratory method blank analyses were performed at the required frequencies. For purposes of data qualification, the method blanks were associated with all samples prepared in the analytical batch.

Trip Blanks

Trip blanks were not required for this sampling event.

Equipment Rinsate Blanks

Equipment rinsate blanks were not required for this sampling event, as all samples were collected using dedicated, single-use equipment.

SURROGATE RECOVERY RESULTS

The samples were spiked with surrogate compounds to evaluate laboratory performance on individual samples.

The laboratory appropriately documented and qualified surrogate outliers. Associated batch quality assurance/quality control for samples with surrogate outliers was within acceptance limits. All remaining surrogate recoveries were within acceptance limits.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS

Matrix spike/matrix spike duplicate (MS/MSD) results are used to evaluate laboratory precision and accuracy. All MS/MSD samples were extracted and analyzed at the required frequency.

In report 907397, SM 3500-Cr-B batch R52852 MS and MSD (1907308-001AMS/MSD) recoveries were below the lower control acceptable limit of 65 percent, both at 0 percent. FA noted that a duplicate analysis was performed with similar results, which indicated matrix interference.

EPA national functional guidelines for inorganic data review (EPA, 2017a) recommend qualification of associated non-detect sample results with "R" as rejected when MS recoveries are below 30 percent. However, aqueous matrices are known to reduce hexavalent chromium to trivalent chromium under reactive conditions. The field parameters potential hydrogen (pH) and oxidation reduction potential (ORP) recorded for MW11-W-15.0 are summarized below. Aqueous samples with negative ORP and acidic pH are assumed by the reviewer to be moderately reducing, but additional parameters, such as sulfide and ferrous iron, may be required to conclusively determine if the samples are reactive and/or if the matrices convert hexavalent chromium to trivalent chromium. Since additional reducing agent characterization was not performed, but available field parameters indicate that sample MW11-W-15.0 may reduce spiked hexavalent chromium in the MS to trivalent chromium, all associated sample results were qualified by the reviewer with "UJ" as estimated.

Report	Sample	Final Field pH (S.U.)	Final Field ORP (mV)
907397	MW11-W-15.0	5.22	-6.4

NOTES:
mV = millivolts.
ORP = oxidation reduction potential.
pH = potential hydrogen.
S.U. = standard pH units.

Report	Sample	Component	Original Result (mg/L)	Qualified Result (mg/L)
907397	MW11-W-15.0	Hexavalent Chromium	0.0450 U	0.0450 UJ

NOTES:
mg/L = milligrams per liter.
U = result is non-detect.
UJ = result is non-detect and estimated.

All remaining MS/MSD results were within acceptance limits for percent recovery and relative percent differences (RPDs).

LABORATORY DUPLICATE RESULTS

Duplicate results are used to evaluate laboratory precision. All duplicate samples were extracted and analyzed at the required frequency. Laboratory duplicate results within five times the method reporting limit were not evaluated for precision. All laboratory duplicate RPDs were within acceptance limits.

LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATE RESULTS

A laboratory control sample/laboratory control sample duplicate (LCS/LCSD) is spiked with target analytes to provide information on laboratory precision and accuracy. The LCS/LCSD samples were extracted and analyzed at the required frequency.

In report 907397, EPA Method 8260C both batch LCS and LCSD dibromochloromethane recoveries exceeded the upper control acceptance limit of 133 percent, both at 136 percent. Dibromochloromethane was not detected in the associated samples; thus, no qualifications are necessary.

In report 907445, the EPA Method 8260C LCS acetone recovery exceeded the lower percent recovery acceptance limit of 53 percent, at 51 percent. The LCSD acetone percent recovery and the LCS/LCSD RPD were within control limits; thus, no further qualification was necessary.

All remaining LCS/LCSD results were within acceptance limits for percent recovery and RPD.

FIELD DUPLICATE RESULTS

Field duplicate samples measure both field and laboratory precision. Field duplicate samples were not submitted for analysis.

CONTINUING CALIBRATION VERIFICATION RESULTS

Continuing calibration verification (CCV) results are used to demonstrate instrument precision and accuracy through the end of the sample batch. CCV results were not reported by FBI or FA. Analytical results with CCV exceedances were flagged by the laboratory.

REPORTING LIMITS

FBI and FA used routine reporting limits for non-detect results, except for samples requiring dilutions because of high analyte concentrations and/or matrix interferences.

The reviewer confirmed that EPA Method 6020B sample results were reported at dilutions due to internal standard or CCV percent recovery exceedance.

The reviewer confirmed that EPA Method 8260C sample results were reported from dilutions due to a foamy matrix effect from samples MW5-W-15.0, MW2-W-19.0, and MW-6-W-15.0 in reports 907445 and 907410.

DATA PACKAGE

The data packages were reviewed for transcription errors, omissions, and anomalies. None were found.

REFERENCES

EPA. 1986. Test methods for evaluating solid waste, physical/chemical methods. EPA publication SW-846. 3d ed. U.S. Environmental Protection Agency. Final updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), V (2015), VI phase I (2017), VI phase II (2018), and VI phase III (2019).

EPA. 2017a. EPA contract laboratory program, national functional guidelines for inorganic Superfund methods data review. EPA 540-R-2017-001. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. January.

EPA. 2017b. EPA contract laboratory program, national functional guidelines for Superfund organic methods data review. EPA 540-R-2017-002. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. January.

FA. 2018. Quality assurance. Version 3.2. Fremont Analytical, Seattle, Washington. April 23.

FBI. 2019. Quality assurance manual. Revision 16. Friedman & Bruya, Inc., Seattle, Washington. October 2.

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Document Preparation		
Name Author(s)	**Date**	**Comments**
J. Wetmore	1/13/2020	Created DVM for 912292, 912298, and 912322
J. Wetmore	1/14/2020	Updated DVM after peer review
M. Benzinger	3/27/2020	Address copy edit remarks and redlines made by VO'Daniel.

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Copy Edit			V. O'Daniel	3/27/2020	
Peer Review (may be conducted by senior reviewer)			N Bruneel	1/14/2020	Peer review report for 912292, 912298, and 912322
Senior Review**			H. Good	2/23/21	
Production			S. Larson	3/16/2021	Produce PDF
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DATA QUALITY ASSURANCE/ QUALITY CONTROL REVIEW

PROJECT NO. 1803.01.04 | JANUARY 13, 2020 | PRECISION ENGINEERING, INC.

Maul Foster & Alongi, Inc. (MFA) conducted an independent review of the quality of analytical results for groundwater samples collected at the Precision Engineering property. The samples were collected in December 2019.

Friedman & Bruya, Inc. (FBI) performed the analyses. FBI report numbers 912292, 912298, and 912322 were reviewed. Hexavalent chromium analysis was subcontracted by FBI to Fremont Analytical (FA), with FA results appended to the FBI reports. The analyses performed and samples analyzed are listed below.

Analysis	Reference
Diesel- and Motor Oil-Range Hydrocarbons	NWTPH-Dx
Dissolved Metals	EPA 6020B
Hexavalent Chromium	SM 3500-Cr-B
Polycyclic Aromatic Hydrocarbons	EPA 8270D SIM
Volatile Organic Compounds	EPA 8260C

NOTES:
NWTPH = Northwest Total Petroleum Hydrocarbons.
SIM = selected ion monitoring.
EPA = U.S. Environmental Protection Agency.

Samples Analyzed		
Report 912292	**Report 912298**	**Report 912322**
MW9-W-33.5	MW3-W-15.0	MW10-W-15.0
MW2-W-15.0	MW4-W-20.0	MW8-W-15.0
MW7-W-27.5	--	Trip Blank
MW6-W-15.0	--	MW1-W-32.0
Trip Blank	--	MW5-W-15.0
MW11-W-15.0	--	MWDUP-W-15.0

DATA QUALIFICATIONS

Analytical results were evaluated according to applicable sections of EPA procedures (EPA, 2017a,b) and appropriate laboratory and method-specific guidelines (FA, 2018; FBI, 2019; EPA, 1986).

In reports 912292, 912298, and 912322, FBI indicated that NWTPH-Dx diesel-range hydrocarbon results for samples MW9-W-33.5, MW2-W-15.0, MW7-W-27.5, MW6-W-15.0,

MW11-W-15.0, MW3-W-15.0, MW10-W-15.0, MW8-W-15.0, MW5-W-15.0, and MWDUP-W-15.0 had chromatographic patterns that did not resemble the diesel fuel standard used for quantitation. The results were reported as diesel-range hydrocarbons; thus, qualification was not required.

In report 912292, FBI reported the dissolved metals results twice: both diluted, due to calibration standard failure for sample MW6-W-15.0. Results flagged by FBI for calibration control limit exceedances have been qualified by the reviewer as "not reported." The associated sample results with no exceedance flagging will be the results of record.

Report	Sample	Component	Not Reported	Result of Record
			Result (ug/L)	Result (ug/L)
912292	MW6-W-15.0	Arsenic	41.2	46.4
		Selenium	11.7	13.5

NOTES:
ug/L = micrograms per liter.

In report 912322, FBI reported the dissolved metals results twice: undiluted and diluted, due to internal standard exceedances associated with the undiluted analysis for sample MW8-W-15.0. Some undiluted results were also flagged due to continuing calibration standard exceedances in samples MW5-W-15.0 and MWDUP-W-15.0. Results flagged by FBI for internal standard and/or calibration control limit exceedances have been qualified by the reviewer as "not reported." The associated diluted sample results, or undiluted sample results with no exceedance flagging, will be the results of record.

Report	Sample	Component	Not Reported		Result of Record	
			Result (ug/L)	Dilution Factor	Result (ug/L)	Dilution Factor
912322	MW8-W-15.0	Chromium	4.97	1	< 10	10
		Copper	5 U	1	< 50	10
	MW5-W-15.0	Chromium	35,000	1	38,900	500
	MWDUP-W-15.0	Chromium	36,800	1	35,500	500

NOTES:
< = less than.
ug/L = micrograms per liter.

Data validation procedures were modified, as appropriate, to accommodate quality-control requirements for methods not specifically addressed by the EPA procedures (e.g., NWTPH-Dx).

The data are considered acceptable for their intended use, with the appropriate data qualifiers assigned.

HOLDING TIMES, PRESERVATION, AND SAMPLE STORAGE

Holding Times

Extractions and analyses were performed within the recommended holding time criteria, except for the EPA 3500-CR-B results from samples MW3-W-15.0 and MW4-W-20.0. The samples were analyzed 3 hours outside of the recommended 24-hour hold time. The samples were qualified as estimated with a "J" qualifier, for a final qualification of "UJ" as non-detect and estimated in the table below.

Report	Sample	Component	Original Result (mg/L)	Qualified Result (mg/L)
912298	MW3-W-15.0	Hexavalent Chromium	0.0900 U	0.0900 UJ
	MW4-W-20.0		0.0450 U	0.0450 UJ

NOTES:
mg/L = milligrams per liter.
U = result is non-detect.
UJ = result is non-detect and estimated.

Preservation and Sample Storage

The samples were preserved and stored appropriately.

BLANKS

Method Blanks

Laboratory method blank analyses were performed at the required frequencies. For purposes of data qualification, the method blanks were associated with all samples prepared in the analytical batch.

In report 912298, the EPA 8260C laboratory method blank had a methylene chloride detection of 6.0 ug/L. The lab flagged the methylene chloride as likely due to laboratory contamination. The associated samples were non-detect; thus, no qualifications were necessary.

All remaining method blank results were non-detect to method reporting limits (MRLs).

Trip Blanks

One trip blank was submitted with reports 912322 (Trip Blank) and 912292 (Trip Blank) for EPA 8260C analysis.

In report 912292, the trip blank had a methylene chloride detection of 6.6 ug/L. The lab flagged the methylene chloride as likely due to laboratory contamination. The associated samples were non-detect; thus, no qualifications were necessary.

All remaining trip blank results were non-detect to MRLs.

Equipment Rinsate Blanks

Equipment rinsate blanks were not required for this sampling event, as all samples were collected using dedicated, single-use equipment.

SURROGATE RECOVERY RESULTS

The samples were spiked with surrogate compounds to evaluate laboratory performance on individual samples. All surrogate recoveries were within acceptance limits.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS

Matrix spike/matrix spike duplicate (MS/MSD) results are used to evaluate laboratory precision and accuracy. All MS/MSD samples were extracted and analyzed at the required frequency.

In report 912298, the EPA 8260C matrix spike recoveries had multiple exceedances of the upper control limits. The source sample was non-detect for all analytes, and the associated laboratory control sample (LCS) was within acceptable limits; thus, no qualifications were necessary.

All remaining MS/MSD results were within acceptance limits for percent recovery and relative percent differences (RPDs).

LABORATORY DUPLICATE RESULTS

Duplicate results are used to evaluate laboratory precision. All duplicate samples were extracted and analyzed at the required frequency. Laboratory duplicate results within five times the MRL were not evaluated for precision. All laboratory duplicate RPDs were within acceptance limits.

LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATE RESULTS

An LCS/LCS duplicate (LCSD) is spiked with target analytes to provide information on laboratory precision and accuracy. The LCS/LCSD samples were extracted and analyzed at the required frequency.

In report 912322, the EPA 8260C LCS recoveries had multiple exceedances of the upper control limits. The associated sample results were non-detect for all affected analytes; thus, no qualifications were necessary.

All remaining LCS/LCSD results were within acceptance limits for percent recovery and RPD.

FIELD DUPLICATE RESULTS

Field duplicate samples measure both field and laboratory precision. One field duplicate was submitted for analysis with lab report 912322 (MW5-W-15.0/MWDUP-W-15.0). MFA uses acceptance criteria of 100 percent RPD for results that are less than five times the MRL, or 50 percent RPD for results that are greater than five times the MRL. Non-detect data are not used in the evaluation of field duplicate results. All analytes were within the acceptance criteria.

CONTINUING CALIBRATION VERIFICATION RESULTS

Continuing calibration verification (CCV) results are used to demonstrate instrument precision and accuracy through the end of the sample batch. CCV results were not reported by FBI or FA. Analytical results with CCV exceedances were flagged by the laboratory.

REPORTING LIMITS

FBI and FA used routine reporting limits for non-detect results, except for samples requiring dilutions because of high analyte concentrations and/or matrix interferences.

The reviewer confirmed that EPA Method 6020B sample results were reported at dilutions due to internal standard or CCV percent recovery exceedance.

The reviewer confirmed that EPA Method 8260C and EPA 3500 Cr-B sample results were reported from dilutions due to a foamy matrix effect from samples MW2-W-15.0, MW6-W-15.0, MW10-W-15.0, MW8-W-15.0, MW5-W-15.0, and MWDUP-W-15.0 in reports 912292 and 912322.

DATA PACKAGE

The data packages were reviewed for transcription errors, omissions, and anomalies. None were found.

REFERENCES

EPA. 1986. Test methods for evaluating solid waste, physical/chemical methods. EPA publication SW-846. 3d ed. U.S. Environmental Protection Agency. Final updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), V (2015), VI phase I (2017), VI phase II (2018), and VI phase III (2019).

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EPA. 2017b. EPA contract laboratory program, national functional guidelines for Superfund organic methods data review. EPA 540-R-2017-002. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. January.

FA. 2018. Quality assurance; quality assurance and quality control programs. Version 3.2. Fremont Analytical. Seattle, Washington. April 23.

FBI. 2019. Quality assurance manual. Revision 16. Friedman & Bruya, Inc., Seattle, Washington. October 2.

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Name Author(s)	**Date**	**Comments**
Mary Benzinger	2/11/2020	Prepare DVM for validation of report 001419, 001436, and 001446.
Mary Benzinger	2/18/2020	Review JW comments and edit DVM.
Mary Benzinger	2/27/2020	Edit DVM per ELH copy edit redlines and comments.
Mary Benzinger	7/30/2020	Correct sample name for MW4-W-20.0 (from MW4-W-50.0).

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Copy Edit			ELH	2/26/2020	
Peer Review (may be conducted by senior reviewer)			J. Wetmore	2/18/2020	Peer Review DVM with reports 001419, 001436, and 001446
Senior Review**			H. Good	2/23/21	
Production			S. Larson	3/16/2021	Produce PDF
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DATA QUALITY ASSURANCE/ QUALITY CONTROL REVIEW

PROJECT NO. 1803.01.04 | JANUARY 13, 2020 | PRECISION ENGINEERING, INC.

Maul Foster & Alongi, Inc. (MFA) conducted an independent review of the quality of analytical results for groundwater samples collected at the Precision Engineering property. The samples were collected in January 2020.

Friedman & Bruya, Inc. (FBI) and Fremont Analytical (FA) performed the analyses. FBI report numbers 001419, 001436, and 001446 were reviewed. FBI subcontracted hexavalent chromium analysis to FA and results are appended to the associated FBI reports. The analyses performed and samples analyzed are listed below.

Analysis	Reference
Diesel- and Motor-Oil-Range Hydrocarbons	NWTPH-Dx
Dissolved Metals	EPA 6020B
Dissolved Hexavalent Chromium	SM3500 Cr B
Polycyclic Aromatic Hydrocarbons	EPA 8270E-SIM
Volatile Organic Compounds	EPA 8260D

NOTES:
NWTPH = Northwest Total Petroleum Hydrocarbons.
SIM = selected ion monitoring.
EPA = U.S. Environmental Protection Agency.

Samples Analyzed		
Report 001419	**Report 001436**	**Report 001446**
MW8-W-15.0	MW3-W-15.0	MW4-W-20.0
MW10-W-15.0	MW11-W-15.0	MW1-W-35.0
MW9-W-33.5	Trip Blank	MW5-W-15.0
MW2-W-15.0	-	MWDUP-W-15.0
MW6-W-15.0	-	-
MW7-W-28.5	-	-

DATA QUALIFICATIONS

Analytical results were evaluated according to applicable sections of EPA procedures (EPA, 2017a,b) and appropriate laboratory and method-specific guidelines (FA, 2018; FBI, 2019; EPA, 1986).

In reports 001419, 001436, and 001446 FBI indicated that all detected NWTPH-Dx diesel- and motor-oil-range hydrocarbon results had chromatographic patterns that did not resemble

the diesel fuel standard used for quantitation. The results were reported as diesel- or motor-oil-range hydrocarbons; thus, qualification was not required.

In report 001446, FBI reported dissolved chromium results twice for samples MW5-W-15.0 and MWDUP-W-15.0 due to the results exceeding the upper instrument calibration range. The original results (1:10 dilution analyses) were flagged by FBI and have been qualified by the reviewer as "not reported." The dissolved chromium results from the 1:50 dilution analyses were within instrument calibration range and are the results of record.

Report	Sample	Component	Dilution Factor	Original Result Reported (ug/L)	Qualified Record (ug/L)
001446	MW5-W-15.0	Dissolved Chromium	10	42,200	42,200 NR
			50	42,200	42,200
	MWDUP-W-15.0		10	47,300	47,300 NR
			50	45,200	45,200

NOTES:
NR = not reported.
ug/L = micrograms per liter.

Data validation procedures were modified, as appropriate, to accommodate quality-control requirements for methods not specifically addressed by the EPA procedures (e.g., NWTPH-Dx).

The data are considered acceptable for their intended use, with the appropriate data qualifiers assigned.

HOLDING TIMES, PRESERVATION, AND SAMPLE STORAGE

Holding Times

Extractions and analyses were performed within the recommended holding time criteria.

Preservation and Sample Storage

The samples were preserved and stored appropriately.

BLANKS

Method Blanks

Laboratory method blank analyses were performed at the required frequencies. For purposes of data qualification, the method blanks were associated with all samples prepared in the analytical batch. All method blank results were non-detect to laboratory reporting limits.

Trip Blanks

One trip blank was submitted with report 001436 (sample name Trip Blank) for EPA Method 8260D analysis. The trip blank results were non-detect to laboratory reporting limits.

Equipment Rinsate Blanks

Equipment rinsate blanks were not required for this sampling event, as all samples were collected using dedicated, single-use equipment.

SURROGATE RECOVERY RESULTS

The samples were spiked with surrogate compounds to evaluate laboratory performance on individual samples.

In report 001446, the NWTPH-Dx surrogate percent recovery for sample MW1-W-35.0 exceeded the upper percent recovery limit of 134 percent, at 136 percent. The associated sample results were non-detect; thus, qualification was not required.

All remaining surrogate recoveries were within acceptance limits.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS

Matrix spike/matrix spike duplicate (MS/MSD) results are used to evaluate laboratory precision and accuracy. All MS/MSD samples were extracted and analyzed at the required frequency.

In reports 001419, 001436, and 001446 the EPA Method 6020B MS (001436-01) result for dissolved copper was below the lower percent recovery acceptance limit of 75 percent, at 74 percent. The associated MSD percent recovery and the MS/MSD relative percent difference (RPD) met acceptance criteria; thus, qualification was not required.

In report 001419, the EPA Method 8260D MS (001469-01) results for 1,1-dichloroethene, 1,1-dichloroethane, chloroform, and 1,2-dichloropropane exceeded upper percent recovery acceptance limits, with recoveries ranging from 116 percent to 127 percent. The sample used to prepare the MS was from an unrelated project sample; thus, qualification was not required.

In reports 001436 and 001446, the SM 3500-Cr-B batch R57080 MS/MSD results were below the lower percent recovery acceptance limit of 46.2 percent, at 0 percent (no recovery) and 2.638 percent, respectively. The associated batch laboratory control sample (LCS) had acceptable recovery, and FA noted that the results indicated a possible matrix effect. EPA national functional guidelines for inorganic data review (EPA, 2017a) recommend qualification of associated non-detect sample results with "R" as rejected when MS recoveries are below 30 percent. However, aqueous matrices are known to reduce hexavalent chromium to trivalent chromium under reactive conditions. The field parameters pH and oxidation reduction potential (ORP) recorded for MW3-W-15.0 are summarized below. Aqueous samples with negative ORP and acidic pH are assumed by the reviewer to be moderately reducing, but

additional parameters, such as sulfide and ferrous iron, may be required to conclusively determine if the samples are reactive and/or if the matrices convert hexavalent chromium to trivalent chromium. Because additional reducing agent characterization was not performed but available field parameters indicate that sample MW3-W-15.0 may reduce spiked hexavalent chromium in the MS to trivalent chromium, all associated sample results were qualified by the reviewer with "UJ" as estimated.

Report	Sample	Final Field pH (s.u.)	Final Field ORP (mV)
001436	MW3-W-15.0	6.70	-89.0

NOTES:
mV = millivolts.
ORP = oxidation reduction potential.
s.u. = standard pH units.

Report	Sample	Component	Original Result (ug/L)	Qualified Result (ug/L)
001436	MW3-W-15.0	Hexavalent Chromium	0.0450 U	0.0450 UJ

NOTES:
U = Result is non-detect.
ug/L = micrograms per liter.
UJ = Result is non-detect and estimated.

All remaining MS/MSD results were within acceptance limits for percent recovery and RPDs.

LABORATORY DUPLICATE RESULTS

Duplicate results are used to evaluate laboratory precision. All duplicate samples were extracted and analyzed at the required frequency. Laboratory duplicate results within five times the method reporting limit (MRL) were not evaluated for precision. All laboratory duplicate RPDs were within acceptance limits.

LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATE RESULTS

An LCS/laboratory control sample duplicate (LCSD) is spiked with target analytes to provide information on laboratory precision and accuracy. The LCS/LCSD samples were extracted and analyzed at the required frequency.

In reports 001419, 001436, and 001446, the EPA 8270E LCS/LCSD exceeded the RPD control limit of 20 percent for benzo(g,h,i)perylene, at 21 percent. The associated sample results were non-detect; thus, qualification was not required.

In report 001436, the EPA 8260D LCS exceeded upper percent recovery acceptance limits for 1,1,1-trichloroethane, 1,1,1,2-tetrachloroethane, and isopropylbenzene, with percent recoveries ranging from 121 percent to 137 percent. The associated sample results were non-detect; thus, qualification was not required.

In report 001446, the EPA Method 8260D LCS exceeded the upper percent recovery acceptance limit of 113 percent for trichloroethane, at 115 percent. The associated sample results were non-detect; thus, qualification was not required.

All remaining LCS/LCSD results were within acceptance limits for percent recovery and RPD.

FIELD DUPLICATE RESULTS

Field duplicate samples measure both field and laboratory precision. One field duplicate was submitted for analysis with lab report 001446 (MW5-W-15.0/MWDUP-W-15.0). MFA uses acceptance criteria of 100 percent RPD for results that are less than five times the MRL or 50 percent RPD for results that are greater than five times the MRL. Non-detect data are not used in the evaluation of field duplicate results. All analytes were within the acceptance criteria.

CONTINUING CALIBRATION VERIFICATION RESULTS

Continuing calibration verification (CCV) results are used to demonstrate instrument precision and accuracy through the end of the sample batch. CCV results were not reported by FBI or FA.

REPORTING LIMITS

FBI and FA used routine reporting limits for non-detect results, except for samples requiring dilutions because of high analyte concentrations and/or matrix interferences.

According to the case narrative in report 001419, EPA Method 8260C analysis of samples MW10-W-15.0, MW2-W-15.0, and MW6-W-15.0 was performed with a dilution due to a foamy sample matrix. The associated results were reported with raised reporting limits due to the sample dilutions. No action was required.

DATA PACKAGE

The data packages were reviewed for transcription errors, omissions, and anomalies.

FBI noted on the chain of custody (COC) for report 001419 that EPA Method 8270E-SIM analysis was added to all samples after receipt by FBI. No action was required by the reviewer.

FBI noted on the COC for report 001436 that EPA Method 8260D analysis was added to the trip blank sample after samples were received by FBI. No action was required by the reviewer.

A collection date was not provided on the COC for the trip blank sample in report 001436. The project manager was notified.

No additional issues were found.

REFERENCES

EPA. 1986. Test methods for evaluating solid waste, physical/chemical methods. EPA publication SW-846. 3d ed. U.S. Environmental Protection Agency. Final updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), V (2015), VI phase I (2017), VI phase II (2018), and VI phase III (2019).

EPA. 2017a. EPA contract laboratory program, national functional guidelines for inorganic Superfund methods data review. EPA 540-R-2017-001. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. January.

EPA. 2017b. EPA contract laboratory program, national functional guidelines for Superfund organic methods data review. EPA 540-R-2017-002. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. January.

FA. 2018. Quality Assurance. Version 3.2. Fremont Analytical. Seattle, Washington. April 23.

FBI. 2019. Quality assurance manual. Revision 16 Friedman & Bruya, Inc., Seattle, Washington. October 2.

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Document Preparation		
Name Author(s)	**Date**	**Comments**
Mary Benzinger	5/11/2020	Prepare DVM for validation of report 004316, 004323, and 004344.
M.Benzinger	5/15/2020	Edit DVM per JW review comments.
A. Bixby	2/8/21	Incorporate copy edits.

QA/QC Review

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Reviewer and Responsibilities	Scheduled		Completed		Comments
	Name	Date	Name	Date	
Copy Edit			P. Collins	2/8/21	
Peer Review (may be conducted by senior reviewer)			J. Wetmore	5/13/2020	Peer Review reports 004316, 004323, and 004344
Senior Review**			H. Good	2/23/21	
Production			S. Larson	3/16/2021	Produce PDF
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DATA QUALITY ASSURANCE/ QUALITY CONTROL REVIEW

PROJECT NO. 1803.01.04 | MAY 8, 2020 | PRECISION ENGINEERING, INC.

Maul Foster & Alongi, Inc. (MFA) conducted an independent review of the quality of analytical results for groundwater samples collected at the Precision Engineering property. The samples were collected in April 2020.

Friedman & Bruya, Inc. (FBI) and Fremont Analytical, Inc. (FA) performed the analyses. FBI report numbers 004316, 004323, and 004344 were reviewed. FBI subcontracted hexavalent chromium analysis to FA and results are appended to the associated FBI reports. The analyses performed and samples analyzed are listed below.

Analysis	Reference
Diesel- and Motor-Oil-Range Hydrocarbons	NWTPH-Dx
Dissolved Metals	EPA 6020B
Dissolved Hexavalent Chromium	SM3500 Cr B
Polycyclic Aromatic Hydrocarbons	EPA 8270E-SIM
Volatile Organic Compounds	EPA 8260D

NOTES:
NWTPH = Northwest Total Petroleum Hydrocarbons.
SIM = selected ion monitoring.
EPA = U.S. Environmental Protection Agency.

Samples Analyzed		
Report 004316	**Report 004323**	**Report 004344**
MW10-W-15.0	MW2-W-15.0	MW4-W-20.0
MW9-W-32.5	MW7-W-27.5	MW1-W-35.0
MW8-W-15.0	MW6-W-15.0	MW5-W-15.0
Trip Blank	MW11-W-15.0	MWDUP-W-15.0
--	MW3-W-15.0	Trip Blank
--	Trip Blank	--

DATA QUALIFICATIONS

Analytical results were evaluated according to applicable sections of EPA procedures (EPA, 2017a,b) and appropriate laboratory and method-specific guidelines (FA, 2018; FBI, 2019; EPA, 1986).

In reports 004316, 004344, and 004323 FBI indicated that all detected NWTPH-Dx diesel- and motor-oil-range hydrocarbon results had chromatographic patterns that did not resemble

the diesel fuel standard used for quantitation. The results were reported as diesel- or motor-oil-range hydrocarbons; thus, qualification was not required.

In report 004323, FBI reported two sets of EPA Method 6020B dissolved chromium, copper, and selenium results for sample MW7-W-27.5. The reviewer confirmed that undiluted chromium, copper, and selenium results were associated with internal standard criteria exceedances. These results have been qualified by the reviewer as "not reported." The 1:5 diluted results were associated with acceptable internal standard results and are the results of record. Qualification of the 1:5-diluted results was not required.

Report	Sample (dilution)	Component	Original Result Reported (ug/L)	Qualified Record (ug/L)
004323	MW7-W-27.5	Dissolved Chromium	1.64	1.64 NR
		Dissolved Copper	5.12	5.12 NR
		Dissolved Selenium	3.58	3.58 NR
	MW7-W-27.5 (1:5)	Dissolved Chromium	5 U	--
		Dissolved Copper	25 U	--
		Dissolved Selenium	5 U	--

NOTES:
-- = qualification not required.
NR = not reported.
ug/L = micrograms per liter.

In report 004344, FBI reported two sets of EPA Method 6020B dissolved chromium, results for sample MW5-W-15.0 and the associated field duplicate sample MWDUP-W-15.0. The reviewer confirmed that the chromium results associated with the 1:5 analyses performed on May 1, 2020 exceeded the upper instrument calibration range. These results have been qualified by the reviewer as "not reported." The samples were analyzed at 1:100 dilutions on April 30, 2020 and the associated dissolved chromium results are the result of record. Qualification of the 1:100-diluted results was not required.

Report	Sample (dilution)	Component	Original Result Reported (ug/L)	Qualified Record (ug/L)
004344	MW5-W-15.0 (1:5)	Dissolved Chromium	47,000	47,000 NR
	MW5-W-15.0 (1:100)		44,600	--
	MWDUP-W-15.0 (1:5)		50,300	50,300 NR
	MWDUP-W-15.0 (1:100)		48,000	--

NOTES:
-- = qualification not required.
NR = not reported.
ug/L = micrograms per liter.

Data validation procedures were modified, as appropriate, to accommodate quality-control requirements for methods not specifically addressed by EPA procedures (e.g., NWTPH-Dx).

The data are considered acceptable for their intended use with the appropriate data qualifiers assigned.

HOLDING TIMES, PRESERVATION, AND SAMPLE STORAGE

Holding Times

Extractions and analyses were performed within the recommended holding time criteria.

Preservation and Sample Storage

The samples were preserved and stored appropriately.

According to the chain of custody in reports 004316 and 004323, volatile organic analysis containers for samples MW10-W-15.0 and MW6-W-15.0 were pre-rinsed with sample prior to filling to avoid excessive effervescence by removing the hydrochloric acid preservative. The associated EPA Method 8260D analyses were performed within the recommended 7 day holding time for unpreserved samples. No action by the reviewer was required.

BLANKS

Method Blanks

Laboratory method blank analyses were performed at the required frequencies. For purposes of data qualification, the method blanks were associated with all samples prepared in the analytical batch. All method blank results were non-detect to laboratory reporting limits.

Trip Blanks

Trip blank samples were submitted with reports 004316, 004323, and 004344 for EPA Method 8260D analysis. The trip blank results were non-detect to laboratory reporting limits.

Equipment Rinsate Blanks

Equipment rinsate blanks were not required for this sampling event as all samples were collected using dedicated, single-use equipment.

SURROGATE RECOVERY RESULTS

The samples were spiked with surrogate compounds to evaluate laboratory performance on individual samples.

All surrogate recoveries were within acceptance limits.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS

Matrix spike/matrix spike duplicate (MS/MSD) results are used to evaluate laboratory precision and accuracy. All MS/MSD samples were extracted and analyzed at the required frequency.

All MS/MSD results were within acceptance limits for percent recovery and relative percent differences (RPDs).

LABORATORY DUPLICATE RESULTS

Duplicate results are used to evaluate laboratory precision. All duplicate samples were extracted and analyzed at the required frequency. Laboratory duplicate results within five times the method reporting limit (MRL) were not evaluated for precision. All laboratory duplicate RPDs were within acceptance limits.

LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATE RESULTS

A laboratory control sample/laboratory control sample duplicate (LCS/LCSD) is spiked with target analytes to provide information on laboratory precision and accuracy. The LCS/LCSD samples were extracted and analyzed at the required frequency.

All LCS/LCSD results were within acceptance limits for percent recovery and RPD.

FIELD DUPLICATE RESULTS

Field duplicate samples measure both field and laboratory precision. One field duplicate was submitted for analysis with lab report 004344 (MW5-W-15.0/MWDUP-W-15.0). MFA uses acceptance criteria of 100 percent RPD for results that are less than five times the MRL or 50 percent RPD for results that are greater than five times the MRL. Non-detect data are not used in the evaluation of field duplicate results. All analytes were within the acceptance criteria.

CONTINUING CALIBRATION VERIFICATION RESULTS

Continuing calibration verification (CCV) results are used to demonstrate instrument precision and accuracy through the end of the sample batch. CCV results were not reported by FBI or FA.

REPORTING LIMITS

FBI and FA used routine reporting limits for non-detect results except for samples requiring dilutions because of high analyte concentrations and/or matrix interferences.

According to the case narrative in reports 004316 and 004323, EPA Method 8260D analysis of samples MW10-W-15.0, MW2-W-15.0, and MW6-W-15.0 were performed with dilutions

due to foamy sample matrices. The associated results were reported with raised reporting limits due to the sample dilutions. No action was required.

DATA PACKAGE

The data packages were reviewed for transcription errors, omissions, and anomalies.

FBI noted on the chain of custody (COC) for report 004323 that EPA Method 8270E-SIM analysis was added to all samples after receipt by FBI. No action was required by the reviewer.

FBI noted on the COC for report 004323 that EPA Method 6020B and SM3500CR B analyses was removed from the trip blank sample after samples were received by FBI. No action was required by the reviewer.

No additional issues were found.

REFERENCES

EPA. 1986. Test methods for evaluating solid waste, physical/chemical methods. EPA publication SW-846. 3d ed. U.S. Environmental Protection Agency. Final updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), V (2015), VI phase I (2017), VI phase II (2018), and VI phase III (2019).

EPA. 2017a. EPA contract laboratory program, national functional guidelines for inorganic Superfund methods data review. EPA 540-R-2017-001. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. January.

EPA. 2017b. EPA contract laboratory program, national functional guidelines for Superfund organic methods data review. EPA 540-R-2017-002. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. January.

FA. 2018. Quality Assurance. Version 3.2. Fremont Analytical. Seattle, Washington. April 23.

FBI. 2019. Quality assurance manual. Revision 16. Friedman & Bruya, Inc., Seattle, Washington. October 2.

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Document Preparation		
Name Author(s)	**Date**	**Comments**
M.Benzinger	1/15/2021	Prepare DVM for validation of 2101109.

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Reviewer and Responsibilities	**Scheduled**		**Completed**		**Comments**
	Name	**Date**	**Name**	**Date**	
Copy Edit			P. Collins	1/20/21	**Please request copy edit at time of DVM creation.**
Peer Review (may be conducted by senior reviewer)			J. Wetmore A. Bixby	1/20/2021 1/20/21	Peer review 2101109 Peer review.
Senior Review**			H. Good	1/20/21	
Production			Matyas	1/20/2021	Produce pdf
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DATA QUALITY ASSURANCE/ QUALITY CONTROL REVIEW

PROJECT NO. 1803.01.04 | JANUARY 15, 2021 | PRECISION ENGINEERING, INC.

Maul Foster & Alongi, Inc. (MFA) conducted an independent review of the quality of analytical results for indoor air samples collected at the Precision Engineering, Inc., site located at 1231 S Director Street in Seattle, Washington. The samples were collected from December 17, 2020 to January 7, 2021.

Eurofins Air Toxics (Eurofins) performed the analyses. Eurofins report number 2101109 was reviewed. Analyses performed and samples analyzed are listed in the tables below.

Analysis	Reference
TCE—Radiello 130	EPA TO-17 Modified

NOTES:
EPA = U.S. Environmental Protection Agency.
TCE = trichloroethene.

Report 2101109
Samples Analyzed
RAD1-121720
RAD4-121720
RAD5-121720
Trip Blank

DATA QUALIFICATIONS

Analytical results were evaluated according to applicable sections of U.S. Environmental Protection Agency (EPA) procedures (EPA, 2017) and appropriate laboratory and method-specific guidelines (Eurofins, 2019; EPA, 1986).

The data are considered acceptable for their intended use, with the appropriate data qualifiers assigned.

HOLDING TIMES, PRESERVATION, AND SAMPLE STORAGE

Holding Times

Analyses were performed within the recommended holding time criteria.

Preservation and Sample Storage

The samples were stored appropriately.

BLANKS

Method Blanks

Laboratory method blank analyses were performed at the required frequencies. For purposes of data qualification, the method blanks were associated with all samples prepared in the analytical batch.

All laboratory method blanks were non-detect.

Trip Blanks

According to report 2101109, a trip blank sample was submitted to Eurofins for EPA Method TO-17 modified analysis. Eurofins noted that the trip blank sample volume was calculated based on a sampling duration of 30,245 minutes, or three weeks and five minutes, which was the sampling duration used for all associated project samples.

The trip blank was non-detect.

SURROGATE RECOVERY RESULTS

The samples were spiked with surrogate compounds to evaluate laboratory performance on individual samples. All surrogate recoveries were within acceptance limits.

LABORATORY DUPLICATE RESULTS

Duplicate results are used to evaluate laboratory precision. Laboratory duplicate results were not reported.

LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATE RESULTS

A laboratory control sample/laboratory control sample duplicate (LCS/LCSD) is spiked with target analytes to provide information on laboratory precision and accuracy. The LCS/LCSD samples were extracted and analyzed at the required frequency. All LCS and LCSD results were within acceptance limits for percent recovery and RPD.

FIELD DUPLICATE RESULTS

Field duplicate samples measure both field and laboratory precision. No field duplicates were submitted for analysis.

REPORTING LIMITS

Eurofins used routine reporting limits for non-detect results.

DATA PACKAGE

The data packages were reviewed for transcription errors, omissions, and anomalies.

No issues were found.

REFERENCES

EPA. 1986. Test methods for evaluating solid waste, physical/chemical methods. EPA publication SW-846. 3d ed. U.S. Environmental Protection Agency. Final updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), V (2015), VI phase I (2017), VI phase II (2018), and VI phase III (2019).

EPA. 2017. EPA contract laboratory program, national functional guidelines for Superfund organic methods data review. EPA 540-R-2017-002. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. January.

Eurofins. 2019. Laboratory quality assurance manual. Revision 13. Eurofins Air Toxics. Folsom, California. September 9.

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Document Preparation		
First Initial/ Last Name Author(s)	**Date**	**Comments**
Please request copy edit at time of DVM creation.		
F. Bellows	10/18/21	Prepare DVM of report 2110248R1.
F. Bellows	10/19/21	Accept changes from peer review.
F. Bellows	10/27/21	Accept changes from copy edit.

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Reviewer and Responsibilities	**Completed**		**Comments**
	First Initial/ Last Name	**Date**	
Peer Review	B. Fauth	10/19/2021	Review DVM (Report 2110248R1)
Senior Review*	H. Good	11/12/2021	
Copy Edit	P. Collins	10/27/21	
Production	E. Fix	12/01/21	

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DATA QUALITY ASSURANCE/QUALITY CONTROL REVIEW

PROJECT NO. 1803.01.05 | DECEMBER 1, 2021 | PRECISION ENGINEERING, INC.

Maul Foster & Alongi, Inc. (MFA), conducted an independent stage 2A review of the quality of analytical results for indoor air samples and associated quality control samples collected at the Precision Engineering, Inc., property at 1231 S Director Street, Seattle, Washington. Samples were collected from September 20 to October 11, 2021.

Eurofins Air Toxics, LLC (Eurofins), performed the analyses. Eurofins report number 2110248R1 was reviewed. The analyses performed and samples analyzed are listed below.

Analysis	Reference
TCE—Radiello 130	EPA TO-17 Modified
NOTES: EPA = U.S. Environmental Protection Agency. TCE = trichloroethene.	

Samples Analyzed
Report 2110248R1
RAD4-092021 (Sewing Room)
RAD1-092021 (Office)
RAD5-092021 (Warehouse 1)
TRIP BLANK

DATA QUALIFICATION

Analytical results were evaluated according to applicable sections of U.S. Environmental Protection Agency (EPA) guidelines for data review (EPA, 2020) and appropriate laboratory- and method-specific guidelines (EPA, 1986; Eurofins, 2021).

Based on the results of the data quality review procedures described below, the data are considered acceptable for their intended use, with the appropriate final data qualifiers assigned. Final data qualifiers represent qualifiers originating from the laboratory and accepted by the reviewer, as well as any data qualifiers assigned by the reviewer during validation.

- Final data qualifier:
  - "U" = result is non-detect at the method reporting limit (MRL).

HOLDING TIMES, PRESERVATION, AND SAMPLE STORAGE

Holding Times

Extractions and analyses were performed within the recommended holding time criteria.

Preservation and Sample Storage

The samples were preserved and stored appropriately.

BLANKS

Method Blanks

Laboratory method blanks are used to assess whether laboratory contamination was introduced during sample preparation and analysis. Laboratory method blank analysis was performed at the required frequency. For purposes of data qualification, the laboratory method blank was associated with all samples prepared in the analytical batch.

The laboratory method blank result was non-detect to the MRL.

Equipment Rinsate Blanks

Equipment rinsate blanks are used to evaluate field equipment decontamination. These blanks were not required for this sampling event.

Trip Blanks

Trip blanks are used to evaluate whether volatile organic compound contamination was introduced during sample storage and shipment between the sampling location and the laboratory.

A trip blank was submitted with the sample delivery group 2110248R1 for EPA method TO-17 analysis. Eurofins noted that the trip blank sample volume was calculated based on a sampling duration of 30,240 minutes (three weeks).

The trip blank result was non-detect to the MRL.

LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATE RESULTS

A laboratory control sample (LCS) and a laboratory control sample duplicate (LCSD) are spiked with target analytes to provide information about laboratory precision and accuracy. The LCS/LCSD samples were extracted and analyzed at the required frequency.

All LCS/LCSD results were within acceptance limits for percent recovery and relative percent difference.

LABORATORY DUPLICATE RESULTS

Laboratory duplicate results are used to evaluate laboratory precision. Laboratory duplicate analysis was not required for EPA method TO-17. Batch precision was evaluated using LCS/LCSD results.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS

Matrix spike/matrix spike duplicate (MS/MSD) results are used to evaluate laboratory precision and accuracy as well as the effect of the sample matrix on sample preparation and analysis. MS/MSD analysis was not required for EPA method TO-17. Batch precision and accuracy were evaluated using LCS/LCSD results.

SURROGATE RECOVERY RESULTS

The samples were spiked with surrogate compounds to evaluate laboratory performance for individual samples.

All surrogate results were within percent recovery acceptance limits.

CONTINUING CALIBRATION VERIFICATION RESULTS

Continuing calibration verification (CCV) results are used to demonstrate instrument precision and accuracy through the end of the sample batch. CCV results were not required for validation but were reviewed when provided.

The CCV result was within percent recovery acceptance limits.

FIELD DUPLICATE RESULTS

Field duplicate samples measure both field and laboratory precision. No field duplicate samples were submitted for analysis.

REPORTING LIMITS

Eurofins used routine MRLs for non-detect results. According to the chain of custody accompanying report 2110248R1, MFA requested an MRL of equal to or less than 0.37 micrograms per cubic meter. Eurofins reported trichloroethene at an MRL of 0.048 micrograms per cubic meter for all samples.

DATA PACKAGE

The data package was reviewed for transcription errors, omissions, and anomalies.

According to report 2110248R1, the report was reissued on October 15, 2021, to update several sample names. Samples were listed on the chain of custody form accompanying report

2110248R1 as "Sewing Room," "Office," and "Warehouse 1." These sample names were updated and reported as "RAD4-092021," "RAD1-092021," and "RAD5-092021," respectively, at the request of MFA.

No other issues were found.

REFERENCES

EPA. 1986. Test methods for evaluating solid waste, physical/chemical methods. EPA publication SW-846. 3d ed. U.S. Environmental Protection Agency. Final updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), V (2015), VI phase I (2017), VI phase II (2018), VI phase III (2019).

EPA. 2020. EPA contract laboratory program, national functional guidelines for Superfund organic methods data review. EPA 540-R-20-005. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. November.

Eurofins. 2021. Laboratory quality assurance manual. Revision 32. Eurofins Air Toxics, LLC. Folsom, California. January 4.

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Document Preparation		
Name Author(s)	**Date**	**Comments**
M.Benzinger	7/15/2021	Prepare DVM for validation of report 2107237.
M.Benzinger	7/15/2021	Edit DVM per JW peer review comments.
E. Lundeen	7/30/2021	Incorporate copy edit comments

QA/QC Review

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Reviewer and Responsibilities	**Scheduled**		**Completed**		**Comments**
	Name	**Date**	**Name**	**Date**	
Copy Edit			Afleming	7/29/2021	
Peer Review (may be conducted by senior reviewer)			J. Wetmore	7/15/2021	Peer review DVM (2107237)
Senior Review**			Steve T.	8/3/21	
Production			Matyas	8/3/2021	Produce pdf
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DATA QUALITY ASSURANCE/QUALITY CONTROL REVIEW

PROJECT NO. 1803.01.05 | JULY 15, 2021 | PRECISION ENGINEERING, INC.

Maul Foster & Alongi, Inc., conducted an independent review of the quality of analytical results for indoor air samples collected at the Precision Engineering, Inc., site located at 1231 S Director Street in Seattle, Washington. The samples were collected from June 21 to July 12, 2021.

Eurofins Air Toxics (Eurofins) performed the analyses. Eurofins report number 2107237 was reviewed. The analyses performed and samples analyzed are listed in the tables below.

Analysis	Reference
TCE—Radiello 130	EPA TO-17 Modified
NOTES: EPA = U.S. Environmental Protection Agency. TCE = trichloroethene.	

Report 2107237
Samples Analyzed
RAD1-062121
RAD4-062121
RAD5-062121
TRIP BLANK

DATA QUALIFICATIONS

Analytical results were evaluated according to applicable sections of U.S. Environmental Protection Agency (EPA) procedures (EPA, 2017) and appropriate laboratory and method-specific guidelines (EPA, 1986; Eurofins, 2021).

The data are considered acceptable for their intended use, with the appropriate data qualifiers assigned.

HOLDING TIMES, PRESERVATION, AND SAMPLE STORAGE

Holding Times

Analyses were performed within the recommended holding time criteria.

Preservation and Sample Storage

The samples were stored appropriately.

BLANKS

Method Blanks

Laboratory method blank analyses were performed at the required frequencies. For purposes of data qualification, the method blanks were associated with all samples prepared in the analytical batch.

The laboratory method blank was non-detect to the laboratory reporting limit for trichloroethene.

Trip Blanks

According to report 2107237, a trip blank sample was submitted to Eurofins for EPA Method TO-17 modified analysis. Eurofins noted that the trip blank sample volume was calculated based on a sampling duration of 30,240 minutes (three weeks).

The trip blank was non-detect to the method reporting limit.

SURROGATE RECOVERY RESULTS

The samples were spiked with surrogate compounds to evaluate laboratory performance on individual samples. All surrogate recoveries were within acceptance limits.

LABORATORY DUPLICATE RESULTS

Duplicate results are used to evaluate laboratory precision. Laboratory duplicate results were not reported.

LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATE RESULTS

A laboratory control sample/laboratory control sample duplicate (LCS/LCSD) is spiked with target analytes to provide information on laboratory precision and accuracy. The LCS/LCSD samples were extracted and analyzed at the required frequency.

All LCS and LCSD results were within acceptance limits for percent recovery and relative percent difference.

FIELD DUPLICATE RESULTS

Field duplicate samples measure both field and laboratory precision. No field duplicates were submitted for analysis.

CONTINUING CALIBRATION VERIFICATION RESULTS

Continuing calibration verification (CCV) results are used to demonstrate instrument precision and accuracy through the end of the sample batch.

The CCV result was within percent recovery acceptance limits.

REPORTING LIMITS

Eurofins used routine reporting limits for non-detect results.

DATA PACKAGE

The data packages were reviewed for transcription errors, omissions, and anomalies. No issues were found.

REFERENCES

EPA. 1986. Test methods for evaluating solid waste, physical/chemical methods. EPA publication SW-846. 3d ed. U.S. Environmental Protection Agency. Final updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), V (2015), VI phase I (2017), VI phase II (2018), and VI phase III (2019).

EPA. 2017. EPA contract laboratory program, national functional guidelines for Superfund organic methods data review. EPA 540-R-2017-002. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. January.

Eurofins. 2021. Laboratory quality assurance manual. Rev. 32. Eurofins Air Toxics, Folsom, California. January 4.

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Document Preparation		
Name Author(s)	**Date**	**Comments**
M.Benzinger	4/15/2021	Prepare DVM for validation of 2104244.
M.Benzinger	4/16/2021	Edit DVM per BF peer review comments.
M.Benzinger	4/16/2021	Edit DVM per AFleming copy edit note.

QA/QC Review

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	Name	**Date**	**Name**	**Date**	
Copy Edit			Afleming	4/16/2021	I left one question—re singular or plural RPD(s).
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			A. Bixby	4/19/21	Peer review.
Senior Review**			H. Good	4/28/21	
Production			L.Jensen	5/7/21	Produce PDF
			L.Jensen	5/14/21	Re-produce PDF with new date.
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DATA QUALITY ASSURANCE/QUALITY CONTROL REVIEW

PROJECT NO. 1803.01.05 | APRIL 15, 2021 | PRECISION ENGINEERING, INC.

Maul Foster & Alongi, Inc., conducted an independent review of the quality of analytical results for indoor air samples collected at the Precision Engineering, Inc., site located at 1231 S Director Street in Seattle, Washington. The samples were collected from March 22 to April 12, 2021.

Eurofins Air Toxics (Eurofins) performed the analyses. Eurofins report number 2104244 was reviewed. The analyses performed and samples analyzed are listed in the tables below.

Analysis	Reference
TCE—Radiello 130	EPA TO-17 Modified
NOTES: EPA = U.S. Environmental Protection Agency. TCE = trichloroethene.	

Report 2104244
Samples Analyzed
RAD1-032221
RAD4-032221
RAD5-032221
Trip Blank

DATA QUALIFICATIONS

Analytical results were evaluated according to applicable sections of U.S. Environmental Protection Agency (EPA) procedures (EPA, 2017) and appropriate laboratory and method-specific guidelines (EPA, 1986; Eurofins, 2021).

The data are considered acceptable for their intended use, with the appropriate data qualifiers assigned.

HOLDING TIMES, PRESERVATION, AND SAMPLE STORAGE

Holding Times

Analyses were performed within the recommended holding time criteria.

Preservation and Sample Storage

The samples were stored appropriately.

BLANKS

Method Blanks

Laboratory method blank analyses were performed at the required frequencies. For purposes of data qualification, the method blanks were associated with all samples prepared in the analytical batch.

The laboratory method blank was non-detect to the laboratory reporting limit for trichloroethene.

Trip Blanks

According to report 2104244, a trip blank sample was submitted to Eurofins for EPA Method TO-17 modified analysis. Eurofins noted that the trip blank sample volume was calculated based on a sampling duration of 30,240 minutes (3 weeks).

The trip blank was non-detect to the method reporting limit.

SURROGATE RECOVERY RESULTS

The samples were spiked with surrogate compounds to evaluate laboratory performance on individual samples. All surrogate recoveries were within acceptance limits.

LABORATORY DUPLICATE RESULTS

Duplicate results are used to evaluate laboratory precision. Laboratory duplicate results were not reported.

LABORATORY CONTROL SAMPLE/LABORATORY CONTROL SAMPLE DUPLICATE RESULTS

A laboratory control sample/laboratory control sample duplicate (LCS/LCSD) is spiked with target analytes to provide information on laboratory precision and accuracy. The LCS/LCSD samples were extracted and analyzed at the required frequency.

All LCS and LCSD results were within acceptance limits for percent recovery and relative percent difference.

FIELD DUPLICATE RESULTS

Field duplicate samples measure both field and laboratory precision. No field duplicates were submitted for analysis.

REPORTING LIMITS

Eurofins used routine reporting limits for non-detect results.

DATA PACKAGE

The data packages were reviewed for transcription errors, omissions, and anomalies. No issues were found.

REFERENCES

EPA. 1986. Test methods for evaluating solid waste, physical/chemical methods. EPA publication SW-846. 3d ed. U.S. Environmental Protection Agency. Final updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), V (2015), VI phase I (2017), VI phase II (2018), and VI phase III (2019).

EPA. 2017. EPA contract laboratory program, national functional guidelines for Superfund organic methods data review. EPA 540-R-2017-002. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. January.

Eurofins. 2021. Laboratory quality assurance manual. Rev. 32. Eurofins Air Toxics, Folsom, California. January 4.

APPENDIX F
Former Kaspac/Chiyoda Property Documents

\\FWY01\data\Projects\2013\1396024.00 Ecology Precision Engineering\GIS\Events\RIReport\Fig8_SeattleLimo.mxd

Legend

- Seattle Limousine Monitoring Well
- Seattle Limousine Soil Boring
- Seattle Limousine Excavation Soil Sample
- Precision Engineering Deep Monitoring Well
- Precision Engineering Shallow Monitoring Well
- Seattle Limousine Excavations
- Parcel Boundary

Notes:

1. All locations are approximate.

Imagery Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.
Seattle Limousine Map Sources: EMCON, Independent Remedial Action Report, Chiyoda International Property. 14 November 1995. and EMCON, Addendum to Independent Remedial Action Report, Chiyoda International Corporation Property. 9 September 1996.

N

0 17.5 35
Feet

Kennedy/ Jenks Consultants

Former Precision Engineering Property
Seattle, Washington

Seattle Limousine Property Sampling Locations

Figure 8

K/J Project Number 1396024.00
August 2015

Table A9: Historical Offsite Soil Analytical Results

Sample Location	Sample Depth (ft bgs)	Date	Hydrocarbons (mg/kg)				Metals (mg/kg)											VOCs (mg/kg)						
			Diesel-range	Oil-range	Gasoline-range	Total Petroleum Hydrocarbons (undifferentiated)	Antimony	Arsenic	Beryllium	Cadmium	Total Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc	Acetone	Benzene	Bromo-dichloro-methane	Bromo-form	Bromo-methane	2-Butanone	Carbon Disulfide
1	6.0	9/19/1989	57		20														<0.025					
2	6.0	9/19/1989	<5		<5														0.079					
3	11.0	9/19/1989	26		<5														0.058					
4	6.0	9/19/1989	214		<5														<0.025					
5	5.0	9/19/1989	<5		<5														<0.025					
B10-2	4.0	12/6/1994				27	<4.78	<4.78	<2.39	<2.39	20.6	14.4	7.66	<1.0	25.4	<4.78	<0.96	29.7		<0.50					
B10-4	6.0	12/6/1994				60														<0.50					
B10-8	11.0	12/6/1994				19														<0.50					
B11-1	2.0	12/6/1994				77	<4.78	<4.32	<2.16	<2.16	37.2	28.5	7.35	<1.0	47.5	<4.32	<0.86	43.2		<0.50					
B11-2	5.0	12/6/1994				17														<0.50					
B11-5	12.0	12/6/1994				19														<0.50					
B12-1	2..0	12/7/1994				120	<4.88	<4.89	<2.44	<2.44	15.6	24.4	9.77	<1.0	14.7	<4.88	<0.98	45.9		<0.50					
B12-4	7.0	12/7/1994				65														<0.50					
B12-7	12.0	12/7/1994				48														<0.50					
B7	0.5	8/28/1990																	<100	<5.0	<5.0	<25	<50	<50	<5.0
	1.5	8/28/1990																	<100	<5.0	<5.0	<25	<50	<50	<5.0
B-7 COMP	NA	4/18/1991																		<0.036	<0.014	<0.014	<0.036		
B-8 COMP	NA	4/18/1991																		<0.036	<0.014	<0.014	<0.036		
B-9 COMP	NA	4/18/1991																		<0.025	<0.010	<0.010	<0.050		
GB-1	1.5	6/6/1996	130	420	<20														2.90	0.074				1.00	
	3.0	6/6/1996	30	<100	<5														0.74	<0.005				0.28	
GB-2	1.5	6/6/1996	50	200	<5														0.25	<0.005				<0.10	
	3.0	6/6/1996	26	<100	<5														<0.10	<0.005				<0.10	
GB-3	1.5	6/6/1996	50	160	<5														0.38	<0.005				<0.10	
	3.0	6/6/1996	<25	<100	<5														0.26	<0.005				<0.10	
GB-4	1.5	6/6/1996						3		<1	10	10	<20					72	<0.10	<0.005				<0.10	
	3.0	6/6/1996	60	140				2		<1	7	8	<20					32	<0.10	<0.005				<0.10	
GB-5	3.0	6/6/1996	60	140	<5								25							<0.05					
GB-6	4.0	6/6/1996	60	120	<5								26							<0.05					
GB-7	4.0	6/6/1996	<25	<100	<5								17							<0.05					
GB-8	4.0	6/6/1996	100	100	237								16							0.12					
GB-9	4.0	6/6/1996	50	180	<5								<10							<0.05					
LD-EW-1	1.0	8/22/1996	262	1,162																					
LD-EW-2	1.0	8/26/1996	152	850																					
LD-EW2-1	1.0	1/2/1997	107	207 [a]																<0.05					
LD-EW3-1	1.0	1/4/1997		179																					
LD-FS-2	2.0	8/22/1996	31	131																					
LD-NW-1	1.0	8/22/1996	103	631																					
LD-NW-2	1.0	8/26/1996	54	190																					
LD-SW-1	1.0	8/22/1996	230	1,046																					
LD-SW-2	1.0	8/26/1996	172	558																					
LD-SW2-1	1.0	1/2/1997	97	194 [a]																0.32					
LD-WW-1	1.0	8/22/1996	148	505																					
LD-WW-2	1.0	8/236/1996	40	178																					
MW-3	8.5	1/26/1990			12																				
SP1	NA	4/17/1991	9 [b]		12															<0.025					
SP2	NA	4/17/1991	8 [b]		5															<0.025					
T1	NA	8/27/1990	<5		10															<0.025					
T2	NA	8/27/1990	<5		<5															<0.025					
T3	NA	8/27/1990	<5		<5															0.036					
T-NW-3.5	3.5	8/22/1996			<5															<0.05					
T-WW-3.5	3.5	8/22/1996			<5															<0.05					
T-EW-3.5	3.5	8/22/1996			<5															<0.05					
T-SW-3.5	3.5	8/22/1996			<5															<0.05					
B1-S1-D9	9.0	1/26/1990	<5		<5																				
B2-S1-D6	6.0	1/26/1990	<5		<5																				
B2-S2-D9	9.0	1/26/1990	<5		<5																				
B3-S1-D8.5	8.5	1/26/1990	<5		12																<0.010	<0.010	<0.025		

Table A9: Historical Offsite Soil Analytical Results

Sample Location	Sample Depth (ft bgs)	Date	VOCs (mg/kg)																								
			Carbon Tetra Chloride	Chloro-benzene	Chloro-ethane	Chloro-form	Chloro-methane	Dibromo-chloro-methane	1,2-Dichloro-benzene	1,3-Dichloro-benzene	1,4-Dichloro-benzene	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	cis-1,2-Dichloro-ethylene	1,2-Dichloro-ethane	1,2-Dichloro-propane	trans-1,3-Dichloro-propene	cis-1,3-Dichloro-propene	Ethyl-benzene	Methylene Chloride	4-Methyl-2-Pentanone	Naph-thalene	Styrene	Toluene	1,1,2,2-Tetra chloro-ethane	Tetra-chloro-ethylene	1,1,1-Trichloro-ethane
1	6.0	9/19/1989																		<0.025					<0.025			
2	6.0	9/19/1989																		0.072					<0.025			
3	11.0	9/19/1989																		0.094					0.12			
4	6.0	9/19/1989																		<0.025					<0.025			
5	5.0	9/19/1989																		<0.025					<0.025			
B10-2	4.0	12/6/1994		<0.50					<1.0	<1.0	<1.0									<0.50					<0.50			
B10-4	6.0	12/6/1994		<0.50					<1.0	<1.0	<1.0									<0.50					<0.50			
B10-8	11.0	12/6/1994		<0.50					<1.0	<1.0	<1.0									<0.50					<0.50			
B11-1	2.0	12/6/1994		<0.50					<1.0	<1.0	<1.0									<0.50					<0.50			
B11-2	5.0	12/6/1994		<0.50					<1.0	<1.0	<1.0									<0.50					<0.50			
B11-5	12.0	12/6/1994		<0.50					<1.0	<1.0	<1.0									<0.50					<0.50			
B12-1	2..0	12/7/1994		<0.50					<1.0	<1.0	<1.0									<0.50					<0.50			
B12-4	7.0	12/7/1994		<0.50					<1.0	<1.0	<1.0									<0.50					<0.50			
B12-7	12.0	12/7/1994		<0.50					<1.0	<1.0	<1.0									<0.50					<0.50			
B7	0.5	8/28/1990	<5.0	<5.0	<5.0	<5.0	<50	<5.0				<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<25	<50		<5.0	4700 E	<5.0	<5.0	<5.0
	1.5	8/28/1990	<5.0	<5.0	<5.0	<5.0	<50	<5.0				<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<25	<50	30 E	<5.0	820 E	<5.0	<5.0	<5.0
B-7 COMP	NA	4/18/1991	<0.014	<0.036	<0.036	<0.014	<0.14	<0.014	<0.036	<0.036	<0.036	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	<0.036	<0.14				<0.036	<0.014	<0.014	<0.014
B-8 COMP	NA	4/18/1991	<0.014	<0.036	<0.036	<0.014	<0.14	<0.014	<0.036	<0.036	<0.036	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	<0.036	<0.14				0.053	<0.014	<0.014	<0.014
B-9 COMP	NA	4/18/1991	<0.010	<0.025	<0.040	<0.010	<0.10	<0.010	<0.025	<0.025	<0.025	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.025	<0.10				0.26	<0.010	<0.010	<0.010
GB-1	1.5	6/6/1996													0.074					1.40					980		1.90	
	3.0	6/6/1996													<0.005					0.031					9.20		0.017	
GB-2	1.5	6/6/1996													<0.005					<0.005					0.08		<0.005	
	3.0	6/6/1996													<0.005					<0.005					0.03		<0.005	
GB-3	1.5	6/6/1996													<0.005					<0.005					0.008		<0.005	
	3.0	6/6/1996													<0.005					<0.005					0.014		<0.005	
GB-4	1.5	6/6/1996													<0.005					<0.005					<0.005		<0.005	
	3.0	6/6/1996													<0.005					<0.005					<0.005		<0.005	
GB-5	3.0	6/6/1996																		<0.1					<0.1			
GB-6	4.0	6/6/1996																		<0.1					<0.1			
GB-7	4.0	6/6/1996																		<0.1					<0.1			
GB-8	4.0	6/6/1996																		0.2					0.3			
GB-9	4.0	6/6/1996																		<0.1					<0.1			
LD-EW-1	1.0	8/22/1996																										
LD-EW-2	1.0	8/26/1996																										
LD-EW2-1	1.0	1/2/1997																		<0.1					1.0			
LD-EW3-1	1.0	1/4/1997																										
LD-FS-2	2.0	8/22/1996																										
LD-NW-1	1.0	8/22/1996																										
LD-NW-2	1.0	8/26/1996																										
LD-SW-1	1.0	8/22/1996																										
LD-SW-2	1.0	8/26/1996																										
LD-SW2-1	1.0	1/2/1997																		3.2					6000			
LD-WW-1	1.0	8/22/1996																										
LD-WW-2	1.0	8/236/1996																										
MW-3	8.5	1/26/1990																										
SP1	NA	4/17/1991																		0.046					<0.025			
SP2	NA	4/17/1991																		0.046					<0.025			
T1	NA	8/27/1990		<0.025					<0.025	<0.025	<0.025									0.068					0.027			
T2	NA	8/27/1990		<0.025					<0.025	<0.025	<0.025									<0.025					0.13			
T3	NA	8/27/1990		<0.025					<0.025	<0.025	<0.025									1.1					0.35			
T-NW-3.5	3.5	8/22/1996																		<0.01					<0.01			
T-WW-3.5	3.5	8/22/1996																		<0.01					<0.01			
T-EW-3.5	3.5	8/22/1996																		<0.01					<0.01			
T-SW-3.5	3.5	8/22/1996																		<0.01					<0.01			
B1-S1-D9	9.0	1/26/1990																										
B2-S1-D6	6.0	1/26/1990																										
B2-S2-D9	9.0	1/26/1990																										
B3-S1-D8.5	8.5	1/26/1990	<0.010	<0.025	<0.025	<0.010	<0.10	<0.010				<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		<0.10					<0.010	<0.010	<0.010

Table A9: Historical Offsite Soil Analytical Results

Sample Location	Sample Depth (ft bgs)	Date	VOCs (mg/kg) 1,1,2-Trichloro-ethane	Trichloro-ethylene	Trichloro-fluoro-methane	Vinyl Acetate	Vinyl Chloride	Total Xylenes	DATA SOURCE
1	6.0	9/19/1989						0.10	GeoEngineers 1989b
2	6.0	9/19/1989						1.62	GeoEngineers 1989b
3	11.0	9/19/1989						0.57	GeoEngineers 1989b
4	6.0	9/19/1989						<0.025	GeoEngineers 1989b
5	5.0	9/19/1989						<0.025	GeoEngineers 1989b
B10-2	4.0	12/6/1994						<0.50	Pacific Testing Labs 1995
B10-4	6.0	12/6/1994						<0.50	Pacific Testing Labs 1995
B10-8	11.0	12/6/1994						<0.50	Pacific Testing Labs 1995
B11-1	2.0	12/6/1994						<0.50	Pacific Testing Labs 1995
B11-2	5.0	12/6/1994						<0.50	Pacific Testing Labs 1995
B11-5	12.0	12/6/1994						<0.50	Pacific Testing Labs 1995
B12-1	2..0	12/7/1994						<0.50	Pacific Testing Labs 1995
B12-4	7.0	12/7/1994						<0.50	Pacific Testing Labs 1995
B12-7	12.0	12/7/1994						<0.50	Pacific Testing Labs 1995
B7	0.5	8/28/1990	<5.0	<5.0		<50	<5.0	30	Applied Consultants 1990b
	1.5	8/28/1990	<5.0	<5.0		<50	<5.0	<5.0	Applied Consultants 1990b
B-7 COMP	NA	4/18/1991	<0.014	<0.014	<0.036		<0.036	<0.036	Applied Consultants 1991
B-8 COMP	NA	4/18/1991	<0.014	<0.014	<0.036		<0.036	<0.036	Applied Consultants 1991
B-9 COMP	NA	4/18/1991	<0.010	<0.010	<0.025		<0.050	0.49	Applied Consultants 1991
GB-1	1.5	6/6/1996						10.0	EMCON 1996
	3.0	6/6/1996						0.110	EMCON 1996
GB-2	1.5	6/6/1996						<0.005	EMCON 1996
	3.0	6/6/1996						0.017	EMCON 1996
GB-3	1.5	6/6/1996						0.014	EMCON 1996
	3.0	6/6/1996						0.006	EMCON 1996
GB-4	1.5	6/6/1996						<0.005	EMCON 1996
	3.0	6/6/1996						<0.005	EMCON 1996
GB-5	3.0	6/6/1996						<0.1	EMCON 1996
GB-6	4.0	6/6/1996						<0.1	EMCON 1996
GB-7	4.0	6/6/1996						<0.1	EMCON 1996
GB-8	4.0	6/6/1996						1.4	EMCON 1996
GB-9	4.0	6/6/1996						<0.1	EMCON 1996
LD-EW-1	1.0	8/22/1996							EMCON 1996
LD-EW-2	1.0	8/26/1996							EMCON 1996
LD-EW2-1	1.0	1/2/1997						0.1	EMCON 1997
LD-EW3-1	1.0	1/4/1997							EMCON 1997
LD-FS-2	2.0	8/22/1996							EMCON 1996
LD-NW-1	1.0	8/22/1996							EMCON 1996
LD-NW-2	1.0	8/26/1996							EMCON 1996
LD-SW-1	1.0	8/22/1996							EMCON 1996
LD-SW-2	1.0	8/26/1996							EMCON 1996
LD-SW2-1	1.0	1/2/1997						9.7	EMCON 1997
LD-WW-1	1.0	8/22/1996							EMCON 1996
LD-WW-2	1.0	8/236/1996							EMCON 1996
MW-3	8.5	1/26/1990							Applied Consultants 1990a
SP1	NA	4/17/1991						0.41	Applied Consultants 1991
SP2	NA	4/17/1991						0.12	Applied Consultants 1991
T1	NA	8/27/1990						1.5	Applied Consultants 1990b
T2	NA	8/27/1990						0.14	Applied Consultants 1990b
T3	NA	8/27/1990						3.3	Applied Consultants 1990b
T-NW-3.5	3.5	8/22/1996						<0.01	EMCON 1996
T-WW-3.5	3.5	8/22/1996						<0.01	EMCON 1996
T-EW-3.5	3.5	8/22/1996						<0.01	EMCON 1996
T-SW-3.5	3.5	8/22/1996						<0.01	EMCON 1996
B1-S1-D9	9.0	1/26/1990							Applied Consultants 1990a
B2-S1-D6	6.0	1/26/1990							Applied Consultants 1990a
B2-S2-D9	9.0	1/26/1990							Applied Consultants 1990a
B3-S1-D8.5	8.5	1/26/1990	<0.010	<0.010	<0.025		<0.025		Applied Consultants 1990a

Notes:

(a) Sample contained components that eluted in oil range, but the chromatogram did not match the typical oil fingerprint.

(b) Sample contained components that eluted in diesel range, but the chromatogram did not match the typical diesel fingerprint.

"<" indicates analyte was not detected above the specified laboratory reporting limit.

Q qualifier indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria.

B qualifier indicates analyte detected in an associated method blank at a concentration greater than 1/2 the laboratory reporting limit or 5 percent of either the regulatory limit or analyte concentration in the sample.

E qualifier indicates an estimated value.

Indicates analysis not performed/reported.

VOCs = volatile organic compounds

ft bgs = feet below ground surface

mg/kg = milligrams per kilogram

Table A10: Historical Offsite Groundwater Analytical Results

		Hydrocarbons (µg/L)				Total Metals (µg/L)										VOCs (µg/L)				
Sample ID	Date	Diesel-range	Oil-range	Gasoline-range	Total Petroleum Hydrocarbons (undifferentiated)	Arsenic	Beryllium	Cadmium	Total Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc	Acetone	Benzene	Bromo-dichloro-methane	Bromoform	Bromo-methane
MW-1	1/31/1990																	<0.5	<0.2	<0.2	<0.5
MW-2	2/1/1990																	<0.5	<0.2	<0.2	<0.5
MW-3	2/1/1990																	46	<1.0	<1.0	<2.5
	3/29/1990																	75			
MW-4	8/28/1990	<1,000		<1,000														0.7	<0.2	<0.2	<0.5
	8/16/1995	280	<750	<50		22											<100	<0.5	<5	<5	<10
MW-5	8/28/1990	<1,000		<1,000														<0.5	<0.2	<0.2	<0.5
MW-6	8/28/1990	<1,000		26000 [a]														7.0	<1.0	<1.0	<2.5
	4/19/1991																	<2,500	<1,000	<1,000	<5,000
	12/2/1994	<250			6,900	41	4.5	5.0	118	280	126	<1.0	113	<2.5	9.5	450		9.0			
	12/15/1994																	8.1			
	5/9/1995	2080 [b]	1300 [c]			23		<3	24	40	20					116		13/ <25			
	7/31/1995	890 [b]	<750	640		23											<100	20	<5	<5	<10
MW-7	4/19/1991																	<0.5	<0.2	<0.2	<1.0
	12/2/1994	<250			4,630	273	9.5	9.4	345	936	289	<1.0	165	<2.5	<2.5	10,000		<1.0			
	12/15/1994																	<0.5			
	5/9/1995	400 [b]	<750			104		<3	94	168	76					1,240		<5			
	7/31/1995	340 [b]	<750	<50		43											<100	<5	<5	<5	<10
	1/2/1997	360	<750	<50														<0.5			
MW-8	4/19/1991																	<0.5	<0.2	<0.2	<1.0
	12/2/1994	<250			3,180	50	5.7	5.6	257	574	128	<1.0	242	<2.5	51	602		<1.0			
	12/15/1994																	<0.5			
	5/9/1995	650 [b]	840 [a]			38		<3	62	86	14					99		<5			
	7/31/1995	<250	<750	<50		45											<100	<5	<5	<5	<10
	1/2/1997	340	<750	330														9.9			
MW-9	4/19/1991																	1.4	<0.2	<0.2	<1.0
	12/2/1994	<250			3,180	27	2.3	2.9	96	276	87	<1.0	100	28	4.7	350		<1.0			
	12/15/1994																	<0.5			
	5/9/1995	1470 [b]	980 [a]			9		<3	16	39	9					53		<5			
	7/31/1995	730 [b]	<750	<50		<5											<100	<5	<5	<5	<10
	1/2/1997	920	<750	3,930														1.8			
	4/8/1997																	1.8			
	6/23/1997																	1.0			
	9/30/1997																	8.9			
MW-10	12/15/1994																	<0.5			
	5/9/1995	850 [b]	940 [a]			22		<3	77	142	40					138		<5			
	7/31/1995	<250	<750	<50		6											<100	<5	<5	<5	<10
	1/2/1997	340	<750	<50														<0.5			
	4/8/1997																	<0.5			
	6/23/1997																	<0.5			
	9/30/1997																	<0.5			
MW-11	12/15/1994																	5.1			
	5/9/1995	700 [b]	<750			52		<3	70	85	32					108		<5			
	7/31/1995	430 [b]	<750	<50		50											<100	<5	<5	<5	<10
	4/14/1997																	6.0			
	6/23/1997																	4.3			
	9/30/1997																	<0.5			
MW-12	12/15/1994																	<0.5			
	5/9/1995	<250	<750			42		<3	27	47	8					55		<5			
	7/31/1995	310 [b]	<750	<50		29											<100	<5	<5	<5	<10
	1/2/1997	<250	<750	<50														<0.5			
GB-4-WS	6/6/1996	690	<750	<50		<5		<4	11	12	<2					23		<5			
GB-5-WS	6/6/1996	990	<750	70														<5			
OB-1	4/19/1991																	14	<0.2	<0.2	<1.0
RW-1	8/28/1990	<1,000		3,000														1.9	<0.2	<0.2	<0.5
	4/19/1991	<1,000		<1,000														4.8			

Table A10: Historical Offsite Groundwater Analytical Results

Sample ID	Date	VOCs (µg/L)																	
		2-Butanone	Carbon Disulfide	Carbon Tetrachloride	Chloro-benzene	Chloro-ethane	2-Chloroethyl Vinyl Ether	Chloroform	Chloro-methane	Dibromo-chloro-methane	1,2-Dichloro-benzene	1,3-Dichloro-benzene	1,4-Dichloro-benzene	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	cis-1,3-Dichloro-propene
MW-1	1/31/1990			<0.2	<0.5	<0.5		<0.2	<2.0	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-2	2/1/1990			<0.2	<0.5	<0.5		<0.2	<2.0	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-3	2/1/1990			<1.0	<2.5	<2.5		<1.0	<10	<1.0	<2.5	<2.5	<2.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	3/29/1990																		
MW-4	8/28/1990			<0.2	<0.5	<0.5		<0.2	<2.0	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	8/16/1995	<100	<100	<5	<5	<10	<10	<5	<10	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW-5	8/28/1990			<0.2	<0.5	<0.5		<0.2	<2.0	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-6	8/28/1990			<1.0	<2.5	<2.5		<1.0	<10	<1.0	<2.5	<2.5	<2.5	<1.0	<1.0	<1.0	1.0	<1.0	<1.0
	4/19/1991			<1,000	<2,500	<5,000		<1,000	<10,000	<1,000	<2,500	<2,500	<2,500	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
	12/2/1994																		
	12/15/1994																		
	5/9/1995																		
	7/31/1995	<100	<100	<5	<5	<10	<10	<5	<10	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW-7	4/19/1991			<0.2	<0.5	<1.0		<0.2	<2.0	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	12/2/1994																		
	12/15/1994																		
	5/9/1995																		
	7/31/1995	<100	<100	<5	<5	<10	<10	<5	<10	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	1/2/1997																		
MW-8	4/19/1991			<0.2	<0.5	<1.0		<0.2	<2.0	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	12/2/1994																		
	12/15/1994																		
	5/9/1995																		
	7/31/1995	<100	<100	<5	<5	<10	<10	<5	<10	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	1/2/1997																		
MW-9	4/19/1991			<0.2	<0.5	<1.0		<0.2	<2.0	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	1.2	<0.2	<0.2
	12/2/1994																		
	12/15/1994																		
	5/9/1995																		
	7/31/1995	<100	<100	<5	<5	<10	<10	<5	<10	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	1/2/1997																		
	4/8/1997																		
	6/23/1997																		
	9/30/1997																		
MW-10	12/15/1994																		
	5/9/1995																		
	7/31/1995	<100	<100	<5	<5	<10	<10	<5	<10	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	1/2/1997																		
	4/8/1997																		
	6/23/1997																		
	9/30/1997																		
MW-11	12/15/1994																		
	5/9/1995																		
	7/31/1995	<100	<100	<5	<5	<10	<10	<5	<10	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	4/14/1997																		
	6/23/1997																		
	9/30/1997																		
MW-12	12/15/1994																		
	5/9/1995																		
	7/31/1995	<100	<100	<5	<5	<10	<10	<5	<10	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	1/2/1997																		
GB-4-WS	6/6/1996																		
GB-5-WS	6/6/1996																		
OB-1	4/19/1991			<0.2	<0.5	<1.0		<0.2	<2.0	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
RW-1	8/28/1990			<0.2	<0.5	<0.5		<0.2	<2.0	<0.2	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	4/19/1991																		

Table A10: Historical Offsite Groundwater Analytical Results

Sample ID	Date	VOCs (µg/L)													
		trans-1.3-Dichloro-propene	1,2-Dichloro-propane	Ethylbenzene	2-Hexanone	Methylene Chloride	4-Methyl-2-pentanone	Styrene	Tetrachloro-ethylene	1,1,2,2-Tetrochloro-ethane	Toluene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethylene	Trichloro-fluoro-methane
MW-1	1/31/1990	<0.2	<0.2	<0.5		<2.0			<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.5
MW-2	2/1/1990	<0.2	<0.2	<0.5		<2.0			<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.5
MW-3	2/1/1990	<1.0	<1.0	11		<10			<1.0	<1.0	<2.5	<1.0	<1.0	6.2	<2.5
	3/29/1990			11							490				
MW-4	8/28/1990	<0.2	<0.2	<0.5		<2.0			<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.5
	8/16/1995	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<10
MW-5	8/28/1990	<0.2	<0.2	<0.5		<2.0			<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.5
MW-6	8/28/1990	<1.0	<1.0	29		<10			10.0	<1.0	15,000	<1.0	<1.0	<1.0	<2.5
	4/19/1991	<1,000	1,200	<2,500		<10,000			<1,000	<1,000	430,000	<1,000	<1,000	<1,000	<2,500
	12/2/1994			<50							15,036				
	12/15/1994			57							10,000				
	5/9/1995			76/ 63							4,400/ 4,300				
	7/31/1995	<5	<5	22	<50	<5	<50	<5	<5	<5	630	<5	<5	<5	<10
MW-7	4/19/1991	<0.2	<0.2	<0.5		<2.0			<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.5
	12/2/1994			3.0							215				
	12/15/1994			<0.5							<0.5				
	5/9/1995			<5							<5				
	7/31/1995	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<10
	1/2/1997			<1							<1				
MW-8	4/19/1991	<0.2	<0.2	<0.5		<2.0			<0.2	<0.2	0.9	<0.2	<0.2	<0.2	<0.5
	12/2/1994			<1.0							8.0				
	12/15/1994			<0.5							10				
	5/9/1995			<5							<5				
	7/31/1995	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<10
	1/2/1997			4							36				
MW-9	4/19/1991	<0.2	<0.2	1.9		<2.0			1.6	<0.2	560	<0.2	<0.2	0.3	<0.5
	12/2/1994			<1.0							31				
	12/15/1994			<0.5							0.61				
	5/9/1995			<5							<5				
	7/31/1995	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<10
	1/2/1997			240							14,000				
	4/8/1997			75							27,000				
	6/23/1997			25							3,950				
	9/30/1997			<1.0							3.0				
MW-10	12/15/1994			<0.5							1.4				
	5/9/1995			<5							<5				
	7/31/1995	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<10
	1/2/1997			<1							<1				
	4/8/1997			<1.0							<1.0				
	6/23/1997			<1.0							<1.0				
	9/30/1997			<1.0							<1.0				
MW-11	12/15/1994			1.6							560				
	5/9/1995			<5							<5				
	7/31/1995	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<10
	4/14/1997			1.0							121				
	6/23/1997			<1.0							<1.0				
	9/30/1997			1.0							53				
MW-12	12/15/1994			<0.5							<0.5				
	5/9/1995			<5							<5				
	7/31/1995	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<10
	1/2/1997			<1							<1				
GB-4-WS	6/6/1996			<5							<5				
GB-5-WS	6/6/1996			<5							<5				
OB-1	4/19/1991	<0.2	<0.2	45		<2.0			<0.2	<0.2	170	<0.2	<0.2	<0.2	<0.5
RW-1	8/28/1990	<0.2	<0.2	<0.5		<2.0			<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.5
	4/19/1991			14							<0.5				

Table A10: Historical Offsite Groundwater Analytical Results

Sample ID	Date	VOCs (µg/L)			DATA SOURCE
		Total Xylenes	Vinyl Acetate	Vinyl Chloride	
MW-1	1/31/1990	<0.5		<0.5	Applied Consultants 1990a
MW-2	2/1/1990	<0.5		<0.5	Applied Consultants 1990a
MW-3	2/1/1990	390		<2.5	Applied Consultants 1990a
	3/29/1990	490			Chiyoda 1992b
MW-4	8/28/1990	<0.5		<0.5	Applied Consultants 1990b
	8/16/1995	<5	<50	<10	EMCON 1995b
MW-5	8/28/1990	<0.5		<0.5	Applied Consultants 1990b
MW-6	8/28/1990	130		<2.5	Applied Consultants 1990b
	4/19/1991	<2,500		<5,000	Applied Consultants 1991
	12/2/1994	<50			Pacific Testing Labs 1995
	12/15/1994	430			Pacific Testing Labs 1995
	5/9/1995	510/ 570			EMCON 1995a
	7/31/1995	160	<50	<10	EMCON 1995b
MW-7	4/19/1991	<0.5		<1.0	Pacific Testing Labs 1995
	12/2/1994	9.0			Pacific Testing Labs 1995
	12/15/1994	<1.0			Pacific Testing Labs 1995
	5/9/1995	<5			EMCON 1995a
	7/31/1995	<5	<50	<10	EMCON 1995b
	1/2/1997	<1			EMCON 1997
MW-8	4/19/1991	1.5		<1.0	Applied Consultants 1991
	12/2/1994	<1.0			Pacific Testing Labs 1995
	12/15/1994	<1.0			Pacific Testing Labs 1995
	5/9/1995	<5			EMCON 1995a
	7/31/1995	<5	<50	<10	EMCON 1995b
	1/2/1997	30			EMCON 1997
MW-9	4/19/1991	14		<1.0	Applied Consultants 1991
	12/2/1994	<1.0			Pacific Testing Labs 1995
	12/15/1994	<1.0			Pacific Testing Labs 1995
	5/9/1995	<5			EMCON 1995a
	7/31/1995	<5	<50	<10	EMCON 1995b
	1/2/1997	1,100			EMCON 1997
	4/8/1997	344			EMCON 1998
	6/23/1997	122			EMCON 1998
	9/30/1997	6.0			EMCON 1998
MW-10	12/15/1994	<0.5			Pacific Testing Labs 1995
	5/9/1995	<5			Pacific Testing Labs 1995
	7/31/1995	<5	<50	<10	EMCON 1995b
	1/2/1997	<1			EMCON 1997
	4/8/1997	<1.0			EMCON 1998
	6/23/1997	<1.0			EMCON 1998
	9/30/1997	<1.0			EMCON 1998
MW-11	12/15/1994	13			Pacific Testing Labs 1995
	5/9/1995	<5			Pacific Testing Labs 1995
	7/31/1995	<5	<50	<10	EMCON 1995b
	4/14/1997	9.0			EMCON 1998
	6/23/1997	3.0			EMCON 1998
	9/30/1997	5..0			EMCON 1998
MW-12	12/15/1994	<1.0			Pacific Testing Labs 1995
	5/9/1995	<5			Pacific Testing Labs 1995
	7/31/1995	<5	<50	<10	EMCON 1995b
	1/2/1997	<1			EMCON 1997
GB-4-WS	6/6/1996	<5			EMCON 1996
GB-5-WS	6/6/1996	9			EMCON 1996
OB-1	4/19/1991	330		<1.0	Applied Consultants 1991
RW-1	8/28/1990	180		<0.5	Applied Consultants 1990b
	4/19/1991	180			Applied Consultants 1991

Notes:

(a) Sample contained components that eluted in oil range, but the chromatogram did not match the typical oil fingerprint.

(b) Sample contained components that eluted in diesel range, but the chromatogram did not match the typical diesel fingerprint.

(c) Sample contained components that eluted in gasoline range, but the chromatogram did not match the typical gasoline fingerprint.

"<" indicates analyte was not detected above the specified laboratory reporting limit.

Indicates analysis not performed/reported.

VOCs = volatile organic compounds

µg/L = micrograms per liter

APPENDIX G
Terrestrial Ecological Evaluation

Table
Simplified TEE Scoresheet
Precision Engineering, Inc., Site
Seattle, Washington

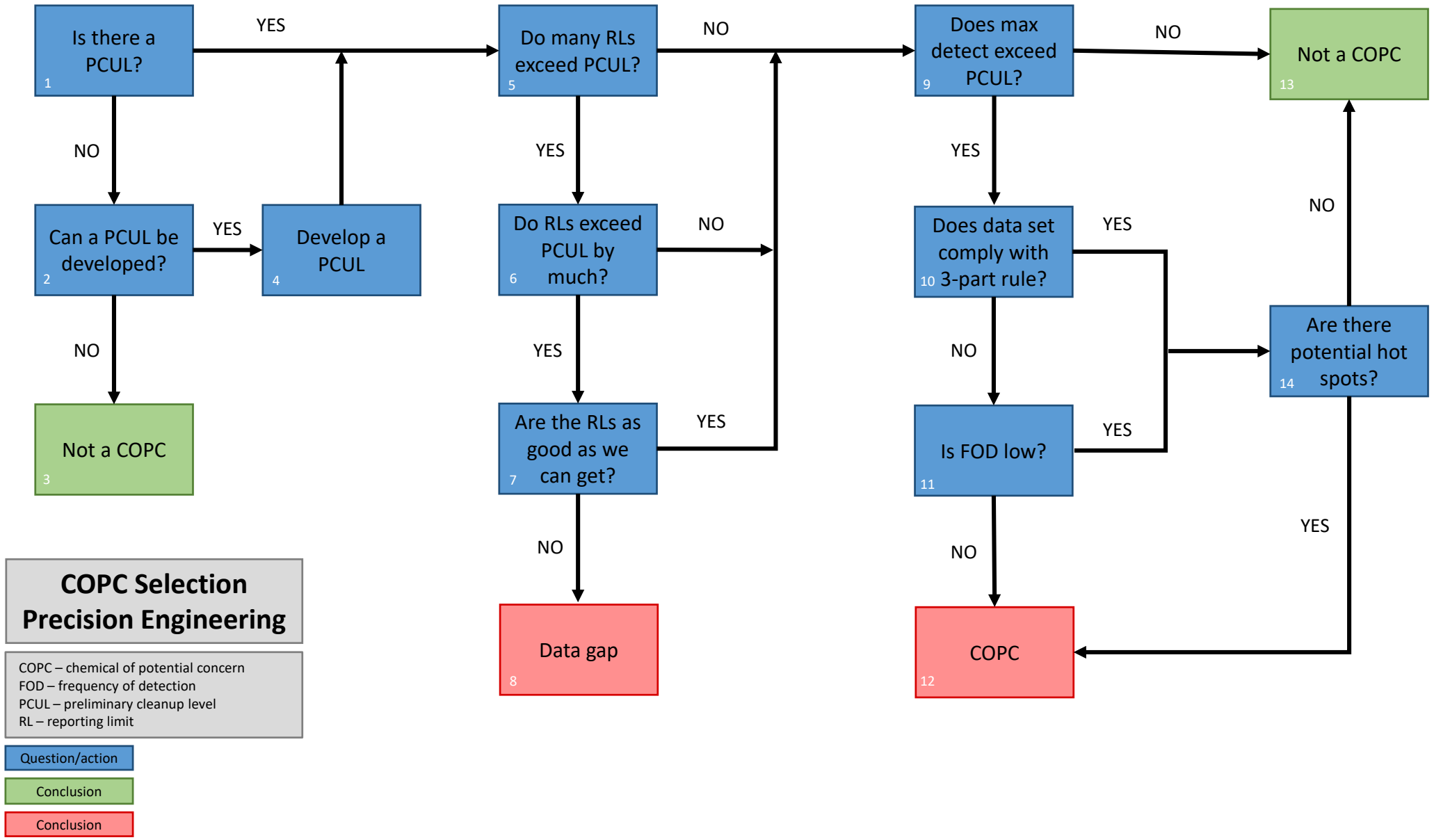
Line Number	Scoring Parameters	Score	Rationale
1	Estimate the area of contiguous (connected) undeveloped land on the site or within 500 feet of any area of the site to the nearest 1/2 acre (1/4 acre if the area is less than 0.5 acre). From the table below, find the number of points corresponding to the area and enter this number in the field to the right. Area (acres) — Points 0.25 or less — 4 0.5 — 5 1.0 — 6 1.5 — 7 2.0 — 8 2.5 — 9 3.0 — 10 3.5 — 11 4.0 or more — 12	8	The approximately 3.5-acre Property associated with the Site is entirely developed (i.e., paved and/or covered by buildings). Approximately 2 acres of grassy land is present along the eastern, southern, and western borders of the property. About 500 feet northwest of the Site, undeveloped areas associated with the Sea Mar Community Center, an adult care facility, are present. However, these areas are not contiguous with the Site and were not included in this evaluation.
2	Is this an industrial or commercial property? If yes, enter a score of 3. If no, enter a score of 1.	3	The Property is zoned for industrial use and is currently an active industrial supply store.
3	Enter a score in the box to the right for the habitat quality of the site, using the following rating system: High=1, Intermediate=2, Low=3.	3	The Site is entirely paved and/or covered by buildings and is located in industrial south Seattle, near the Highway 99 on-ramp.
4	Is the undeveloped land likely to attract wildlife? If yes, enter a score of 1 in the box to the right. If no, enter a score of 2.	2	The Site is entirely developed, in close proximity to Highway 99, and surrounded by industrial operations; therefore, it is unlikely to attract wildlife. Other undeveloped areas in the vicinity of the Site (over 500 feet away) would be more attractive wildlife habitat, such as the Lower Duwamish River, forested corridors near Highway 509 to the west, and golf courses to the south.
5	Are any of the following soil contaminants present: chlorinated dioxins/furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, pentachlorobenzene? If yes, enter a score of 1 in the box to the right. If no, enter a score of 4.	4	None of the listed soil contaminants have been detected at the Site.

Table
Simplified TEE Scoresheet
Precision Engineering, Inc., Site
Seattle, Washington

Line Number	Scoring Parameters	Score	Rationale
	Add the numbers in the boxes on lines 2–5 and enter this number in the box to the right. If this number is larger than the number in the box on line 1, the simplified evaluation may be ended.	12	Simplified evaluation ended. Total score exceeds 8.

NOTES:
Table adapted from Model Toxics Control Act Table 749-1.
TEE = terrestrial ecological evaluation.

APPENDIX H
COPC Selection Documents


Is there a PCUL?
1
YES
Do many RLs exceed PCUL?
5
NO
Does max detect exceed PCUL?
9
NO
Not a COPC
13
NO
Can a PCUL be developed?
2
YES
Develop a PCUL
4
YES
Do RLs exceed PCUL by much?
6
NO
Does data set comply with 3-part rule?
10
YES
NO
Are there potential hot spots?
14
NO
Not a COPC
3
NO
YES
Are the RLs as good as we can get?
7
YES
Is FOD low?
11
YES
NO
Data gap
8
NO
COPC
12
YES
COPC Selection Precision Engineering
COPC – chemical of potential concern
FOD – frequency of detection
PCUL – preliminary cleanup level
RL – reporting limit
Question/action
Conclusion
Conclusion

Flowchart for Selection of Chemicals of Potential Concern (COPCs)

Precision Engineering

Abbreviations

95UCL – upper 95 percent confidence limit on the mean concentration
COPC – chemical of potential concern
FOD – frequency of detection
PCUL – preliminary cleanup level
RL – reporting limit

Flowchart Box		Answer Yes If	Answer No If	Discussion
1	Is there a PCUL?	The PCUL Workbook contains a PCUL.	The PCUL Workbook does not contain a PCUL.	Use this flowchart for all analytes regardless of whether they are detected.
2	Can a PCUL be developed?	The Ecology site manager determines that a PCUL can be developed.	The Ecology site manager determines that a PCUL cannot be developed.	Ecology site manager may decide not to develop a PCUL for chemicals of low concern or chemicals not associated with site operations.
3	Not a COPC	--	--	No PCUL available.
4	Develop a PCUL	--	--	Obtain PCUL from Ecology site manager.
5	Do many RLs exceed PCUL?	Frequency of exceedance for RLs > 10%	Frequency of exceedance for RLs $\leq$ 10%	--
6	Do RLs exceed PCUL by much?	Maximum exceedance ratio for RLs > 5	Maximum exceedance ratio for RLs $\leq$ 5	--
7	Are the RLs as good as we can get?	Maximum RL $\leq$ 5 times achievable RL.	Maximum RL > 5 times achievable RL.	Obtain achievable RLs from Ecology site manager.
8	Data gap	--	--	RLs are poor and better RLs are possible. This data gap is most important for chemicals known to be associated with site operations. After identifying this

Flowchart Box		Answer Yes If	Answer No If	Discussion
				data gap, the Ecology site manager may decide to evaluate the detected results using the remainder of the flowchart.
9	Does max detect exceed PCUL?	Maximum detected concentration > PCUL.	Maximum detected concentration ≤ PCUL or analyte was never detected.	--
10	Does data set comply with 3-part rule?	Complete data set, including detected results and RLs for non-detected results, meets all three of the following criteria: 1. Maximum concentration ≤ 2xPCUL 2. Not more than 10% of results > PCUL 3. 95UCL ≤ PCUL.	Any one of the following is true: 1. One or more results > 2xPCUL 2. More than 10% of results > PCUL 3. 95UCL > PCUL.	Evaluate criteria 1 and 2 first. If the data set fails one of these criteria it is not necessary to calculate the 95UCL. ProUCL is recommended for calculating the 95UCL. Consult with Ecology site manager on how to handle non-detected results.
11	Is FOD low?	FOD ≤ 5%.	FOD > 5%.	--
12	COPC	--	--	Sufficient results exceeding PCUL and/or evidence of a hot spot.
13	Not a COPC	--	--	Insufficient results exceeding PCUL and no evidence of a hot spot.
14	Are there potential hot spots?	Spatial pattern indicates localized detections and/or exceedances.	Spatial pattern does not indicate localized detections or exceedances.	Ecology site manager will determine the answer based on maps of detections and exceedances.

The Ecology site manager may adjust any of the decisions in the flow chart on a chemical-specific basis using professional judgement.

If historical RLs are higher than recent RLs, a data set composed of only recent RLs may be evaluated for flowchart boxes 5 through 7 and 10. However, before a chemical is eliminated on this basis, the spatial coverage of the data set must be evaluated. It may be necessary to fill spatial data gaps by conducting additional sampling with lower RLs.

To assist Ecology in evaluating the COPC selection process, provide a spreadsheet with the following columns:

1. Analyte name
2. PCUL (provided by Ecology)
3. Number of samples analyzed
4. Number of detected results
5. Frequency of detection
6. Number of RLs exceeding PCUL
7. Frequency of exceedance for RLs
8. Maximum RL
9. Ratio of maximum RL to PCUL
10. Achievable RL (provided by Ecology)
11. Ratio of maximum RL to achievable RL
12. Maximum detected concentration
13. Ratio of maximum detect to PCUL
14. Frequency of exceedance for detected concentrations
15. Frequency of exceedance for entire data set (detected results and RLs)
16. 95UCL (calculate only if needed)
17. Ratio of 95UCL to PCUL.

Table G2-1
Vadose Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	Calculated Values					COPC Selection				
	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[(a)]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[(b)]	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?
1,1,1,2-Tetrachloroethane	0	0	0	0	0	Yes	No	No	NA	No
1,1,1-Trichloroethane	0	0	0	0	0	Yes	No	No	NA	No
1,1,2,2-Tetrachloroethane	0	0	87	0	87	Yes	Yes	Yes	No	No
1,1,2-Trichloroethane	0	0	60	0	60	Yes	Yes	Yes	No	No
1,1-Dichloroethane	0	0	40	0	40	Yes	Yes	No	NA	No
1,1-Dichloroethene	0	7	0	0	0	Yes	No	No	NA	No
1,1-Dichloropropene	0	0	0	0	0	No	No	No	NA	No
1,2,3-Trichlorobenzene	0	0	0	0	0	No	No	No	NA	No
1,2,3-Trichloropropane	0	0	73	0	73	Yes	Yes	No	NA	No
1,2,4-Trichlorobenzene	0	0	60	0	60	Yes	Yes	No	NA	No
1,2,4-Trimethylbenzene	0	0	0	0	0	Yes	No	No	NA	No
1,2-Dibromo-3-chloropropane	0	0	0	0	0	Yes	No	No	NA	No
1,2-Dibromoethane	0	0	100	0	100	Yes	Yes	Yes	No	No
1,2-Dichlorobenzene	0	0	53	0	53	Yes	Yes	No	NA	No
1,2-Dichloroethane	0	0	0	0	0	Yes	No	No	NA	No
1,2-Dichloropropane	0	0	7	0	7	Yes	No	No	NA	No
1,3,5-Trichlorobenzene	0	0	0	0	0	No	No	No	NA	No
1,3,5-Trimethylbenzene	0	0	0	0	0	Yes	No	No	NA	No
1,3-Dichlorobenzene	0	0	0	0	0	No	No	No	NA	No
1,3-Dichloropropane	0	0	0	0	0	No	No	No	NA	No
1,4-Dichlorobenzene	0	0	0	0	0	Yes	No	No	NA	No
1-Methylnaphthalene	0	10	0	0	0	Yes	No	No	NA	No
2,2-Dichloropropane	0	0	0	0	0	No	No	No	NA	No
2-Butanone	0	23	0	0	0	Yes	No	No	NA	No
2-Chlorotoluene	0	0	0	0	0	Yes	No	No	NA	No
2-Hexanone	0	0	0	0	0	Yes	No	No	NA	No
2-Methylnaphthalene	0	10	0	0	0	Yes	No	No	NA	No
4-Chlorotoluene	0	0	0	0	0	No	No	No	NA	No
4-Isopropyltoluene	0	0	0	0	0	No	No	No	NA	No
4-Methyl-2-pentanone	0	0	0	0	0	Yes	No	No	NA	No
Acenaphthene	0	0	0	0	0	Yes	No	No	NA	No
Acenaphthylene	0	0	0	0	0	Yes	No	No	NA	No
Acetone	0	0	0	0	0	Yes	No	No	NA	No
Anthracene	0	10	0	0	0	Yes	No	No	NA	No
Antimony	0	0	0	0	0	Yes	No	No	NA	No
Arsenic	28	95	0	47	45	Yes	No	No	NA	Yes
Benzene	0	0	31	0	31	Yes	Yes	No	NA	No
Benzo(a)anthracene	0	20	0	0	0	Yes	No	No	NA	No
Benzo(a)pyrene	0	10	0	0	0	Yes	No	No	NA	No
Benzo(b)fluoranthene	0	40	0	0	0	No	No	No	NA	No
Benzo(b,k)fluoranthene	0	50	0	0	0	No	No	No	NA	No
Benzo(ghi)perylene	0	10	0	0	0	Yes	No	No	NA	No
Benzo(k)fluoranthene	0	40	0	0	0	No	No	No	NA	No
Beryllium	0	0	0	0	0	Yes	No	No	NA	No
Bromobenzene	0	0	0	0	0	Yes	No	No	NA	No
Bromodichloromethane	0	0	60	0	60	Yes	Yes	Yes	No	No

Table G2-1
Vadose Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	Calculated Values					COPC Selection				
	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[(a)]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[(b)]	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?
Bromoform	0	0	7	0	7	Yes	No	No	NA	No
Bromomethane	0	0	20	0	20	Yes	Yes	No	NA	No
C10-C12 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No	NA	No
C10-C12 Aromatic Hydrocarbons	0	0	0	0	0	No	No	No	NA	No
C12-C16 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No	NA	No
C12-C16 Aromatic Hydrocarbons	0	0	0	0	0	No	No	No	NA	No
C16-C21 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No	NA	No
C16-C21 Aromatic Hydrocarbons	0	0	0	0	0	No	No	No	NA	No
C21-C34 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No	NA	No
C21-C34 Aromatic Hydrocarbons	0	0	0	0	0	No	No	No	NA	No
C8-C10 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No	NA	No
C8-C10 Aromatic Hydrocarbons	0	0	0	0	0	No	No	No	NA	No
Cadmium	2	27	0	50	13	Yes	No	No	NA	Yes
Carbon disulfide	0	0	0	0	0	Yes	No	No	NA	No
Carbon tetrachloride	0	0	87	0	87	Yes	Yes	Yes	No	No
Chlorobenzene	0	0	0	0	0	Yes	No	No	NA	No
Chlorobromomethane	0	0	0	0	0	No	No	No	NA	No
Chloroethane	0	0	0	0	0	No	No	No	NA	No
Chloroform	0	0	7	0	7	Yes	No	No	NA	No
Chloromethane	0	0	0	0	0	No	No	No	NA	No
Chromium, Hexavalent	8	51	0	36	19	Yes	No	No	NA	Yes
Chromium, Total	6	100	0	16	16	Yes	Yes	No	NA	Yes
Chromium, Trivalent	6	100	0	16	16	Yes	Yes	No	NA	Yes
Chrysene	0	60	0	0	0	Yes	No	No	NA	No
cis-1,2-Dichloroethene	0	3	3	0	3	Yes	No	No	NA	No
cis-1,3-Dichloropropene	0	0	87	0	87	Yes	Yes	Yes	No	No
Copper	4	100	0	27	27	Yes	Yes	No	NA	Yes
cPAH TEQ	6	60	100	100	100	Yes	Yes	Yes	Yes	Yes
Dibenzo(a,h)anthracene	0	10	0	0	0	Yes	No	No	NA	No
Dibromochloromethane	0	0	60	0	60	Yes	Yes	Yes	No	No
Dibromomethane	0	0	0	0	0	Yes	No	No	NA	No
Dichlorodifluoromethane (Freon 12)	0	0	0	0	0	Yes	No	No	NA	No
Diesel Range Hydrocarbons	1	67	0	7	5	Yes	No	No	NA	Yes
Ethylbenzene	0	0	0	0	0	Yes	No	No	NA	No
Fluoranthene	0	70	0	0	0	Yes	No	No	NA	No
Fluorene	0	0	0	0	0	Yes	No	No	NA	No
Gasoline Range Hydrocarbons	0	20	0	0	0	Yes	No	No	NA	No
Hexachlorobutadiene	0	0	60	0	60	Yes	Yes	Yes	No	No
Indeno(1,2,3-cd)pyrene	0	10	0	0	0	Yes	No	No	NA	No
Isopropylbenzene	0	0	0	0	0	Yes	No	No	NA	No
Lead	7	98	0	11	11	Yes	No	No	NA	Yes
m,p-Xylene	0	0	0	0	0	Yes	No	No	NA	No
Mercury	4	29	100	100	100	Yes	Yes	No	NA	Yes
Methyl tert-butyl ether	0	0	0	0	0	Yes	No	No	NA	No
Methylene chloride	0	7	0	0	0	Yes	No	No	NA	No
Naphthalene	0	5	35	0	33	Yes	Yes	No	NA	No

Table G2-1
Vadose Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	Calculated Values					COPC Selection				
	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[(a)]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[(b)]	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?
n-Butylbenzene	0	0	0	0	0	Yes	No	No	NA	No
Nickel	0	100	0	0	0	Yes	Yes	No	NA	No
n-Propylbenzene	0	0	0	0	0	Yes	No	No	NA	No
Oil Range Hydrocarbons	2	67	0	14	10	Yes	No	No	NA	Yes
o-Xylene	0	0	0	0	0	Yes	No	No	NA	No
Phenanthrene	0	50	0	0	0	Yes	No	No	NA	No
Pyrene	0	60	0	0	0	Yes	No	No	NA	No
sec-Butylbenzene	0	0	0	0	0	Yes	No	No	NA	No
Selenium	0	0	0	0	0	Yes	No	No	NA	No
Silver	0	0	100	0	100	Yes	Yes	No	NA	No
Styrene	0	0	0	0	0	Yes	No	No	NA	No
tert-Butylbenzene	0	0	0	0	0	Yes	No	No	NA	No
Tetrachloroethene	0	0	0	0	0	Yes	No	No	NA	No
Thallium	0	0	100	0	100	Yes	Yes	Yes	No	No
Toluene	0	0	0	0	0	Yes	No	No	NA	No
Total benzofluoranthenes	0	40	0	0	0	Yes	No	No	NA	No
Total Diesel + Oil	2	67	0	14	10	Yes	No	No	NA	Yes
Total Extractable Hydrocarbons	0	0	0	0	0	No	No	No	NA	No
Total HPAHs	0	70	0	0	0	Yes	No	No	NA	No
Total LPAHs	0	50	0	0	0	Yes	No	No	NA	No
Total naphthalenes	1	10	0	100	10	Yes	No	No	NA	Yes
trans-1,2-Dichloroethene	0	0	0	0	0	Yes	No	No	NA	No
trans-1,3-Dichloropropene	0	0	60	0	60	Yes	Yes	Yes	No	No
Trichloroethene	3	14	25	60	30	Yes	Yes	No	NA	Yes
Trichlorofluoromethane (Freon 11)	0	0	0	0	0	Yes	No	No	NA	No
Vinyl chloride	0	0	95	0	95	Yes	Yes	Yes	No	No
Xylenes, total	0	0	0	0	0	Yes	No	No	NA	No
Zinc	3	100	0	21	21	Yes	Yes	No	NA	Yes
Gasoline Range Hydrocarbons (HCID)	0	0	0	0	0	No	No	No	NA	No
Diesel Range Hydrocarbons (HCID)	0	0	0	0	0	No	No	No	NA	No
Oil Range Hydrocarbons (HCID)	0	0	0	0	0	No	No	No	NA	No

Table G2-1
Vadose Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)									
	10. Does data set comply with 3-Part Rule?					11. Is FOD low (Frequency of detection <= 5%)?	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)
	1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[c]	3. 95 UCL <= PCUL[d]	Does data set comply with 3-part rule?					
1,1,1,2-Tetrachloroethane	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
1,1,1-Trichloroethane	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
1,1,2,2-Tetrachloroethane	No	No	No	NA	No	Yes	Retain	Data Gap	Data Gap	Data Gap
1,1,2-Trichloroethane	No	No	No	NA	No	Yes	Retain	Data Gap	Data Gap	Data Gap
1,1-Dichloroethane	Yes	No	No	NA	No	Yes	Retain	Retain	Not a COPC	Not a COPC
1,1-Dichloroethene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
1,1-Dichloropropene	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
1,2,3-Trichlorobenzene	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
1,2,3-Trichloropropane	No	No	No	NA	No	Yes	Retain	Retain	Not a COPC	Not a COPC
1,2,4-Trichlorobenzene	No	No	No	NA	No	Yes	Retain	Retain	Not a COPC	Not a COPC
1,2,4-Trimethylbenzene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
1,2-Dibromo-3-chloropropane	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
1,2-Dibromoethane	No	No	No	NA	No	Yes	Retain	Data Gap	Data Gap	Data Gap
1,2-Dichlorobenzene	No	No	No	NA	No	Yes	Retain	Retain	Not a COPC	Not a COPC
1,2-Dichloroethane	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
1,2-Dichloropropane	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
1,3,5-Trichlorobenzene	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
1,3,5-Trimethylbenzene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
1,3-Dichlorobenzene	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
1,3-Dichloropropane	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
1,4-Dichlorobenzene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
1-Methylnaphthalene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
2,2-Dichloropropane	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
2-Butanone	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
2-Chlorotoluene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
2-Hexanone	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
2-Methylnaphthalene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
4-Chlorotoluene	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
4-Isopropyltoluene	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
4-Methyl-2-pentanone	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Acenaphthene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Acenaphthylene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Acetone	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Anthracene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Antimony	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Arsenic	No	No	No	NA	No	No	Retain	Retain	Retain	COPC
Benzene	No	No	No	NA	No	Yes	Retain	Retain	Not a COPC	Not a COPC
Benzo(a)anthracene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Benzo(a)pyrene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Benzo(b)fluoranthene	Yes	Yes	No	NA	Yes	No	Not a COPC	Not a COPC	Not a COPC	Not a COPC
Benzo(b,k)fluoranthene	Yes	Yes	No	NA	Yes	No	Not a COPC	Not a COPC	Not a COPC	Not a COPC
Benzo(ghi)perylene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Benzo(k)fluoranthene	Yes	Yes	No	NA	Yes	No	Not a COPC	Not a COPC	Not a COPC	Not a COPC
Beryllium	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Bromobenzene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Bromodichloromethane	No	No	No	NA	No	Yes	Retain	Data Gap	Data Gap	Data Gap

Table G2-1
Vadose Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)									
	10. Does data set comply with 3-Part Rule?					11. Is FOD low (Frequency of detection <= 5%)?	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)
	1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[c]	3. 95 UCL <= PCUL[d]	Does data set comply with 3-part rule?					
Bromoform	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Bromomethane	Yes	No	No	NA	No	Yes	Retain	Retain	Not a COPC	Not a COPC
C10-C12 Aliphatic Hydrocarbons	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
C10-C12 Aromatic Hydrocarbons	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
C12-C16 Aliphatic Hydrocarbons	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
C12-C16 Aromatic Hydrocarbons	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
C16-C21 Aliphatic Hydrocarbons	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
C16-C21 Aromatic Hydrocarbons	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
C21-C34 Aliphatic Hydrocarbons	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
C21-C34 Aromatic Hydrocarbons	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
C8-C10 Aliphatic Hydrocarbons	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
C8-C10 Aromatic Hydrocarbons	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
Cadmium	Yes	No	No	NA	No	No	Retain	Retain	Retain	COPC
Carbon disulfide	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Carbon tetrachloride	No	No	No	NA	No	Yes	Retain	Data Gap	Data Gap	Data Gap
Chlorobenzene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Chlorobromomethane	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
Chloroethane	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
Chloroform	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Chloromethane	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
Chromium, Hexavalent	No	No	No	NA	No	No	Retain	Retain	Retain	COPC
Chromium, Total	No	No	No	NA	No	No	Retain	Retain	Retain	COPC
Chromium, Trivalent	No	No	No	NA	No	No	Retain	Retain	Retain	COPC
Chrysene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
cis-1,2-Dichloroethene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
cis-1,3-Dichloropropene	No	No	No	NA	No	Yes	Retain	Data Gap	Data Gap	Data Gap
Copper	No	No	No	NA	No	No	Retain	Retain	Retain	COPC
cPAH TEQ	No	No	No	NA	No	No	Retain	Retain	Retain	COPC
Dibenzo(a,h)anthracene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Dibromochloromethane	No	No	No	NA	No	Yes	Retain	Data Gap	Data Gap	Data Gap
Dibromomethane	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Dichlorodifluoromethane (Freon 12)	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Diesel Range Hydrocarbons	No	Yes	No	NA	No	No	Retain	Retain	Retain	COPC
Ethylbenzene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Fluoranthene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Fluorene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Gasoline Range Hydrocarbons	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Hexachlorobutadiene	No	No	No	NA	No	Yes	Retain	Data Gap	Data Gap	Data Gap
Indeno(1,2,3-cd)pyrene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Isopropylbenzene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Lead	No	No	No	NA	No	No	Retain	Retain	Retain	COPC
m,p-Xylene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Mercury	No	No	No	NA	No	No	Retain	Retain	Retain	COPC
Methyl tert-butyl ether	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Methylene chloride	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Naphthalene	No	No	No	NA	No	Yes	Retain	Retain	Not a COPC	Not a COPC

Table G2-1
Vadose Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)									
	10. Does data set comply with 3-Part Rule?					11. Is FOD low (Frequency of detection <= 5%)?	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)
	1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[c]	3. 95 UCL <= PCUL[d]	Does data set comply with 3-part rule?					
n-Butylbenzene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Nickel	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
n-Propylbenzene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Oil Range Hydrocarbons	No	Yes	No	NA	No	No	Retain	Retain	Retain	COPC
o-Xylene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Phenanthrene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Pyrene	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
sec-Butylbenzene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Selenium	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Silver	No	No	No	NA	No	Yes	Retain	Retain	Not a COPC	Not a COPC
Styrene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
tert-Butylbenzene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Tetrachloroethene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Thallium	No	No	No	NA	No	Yes	Retain	Data Gap	Data Gap	Data Gap
Toluene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Total benzofluoranthenes	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Total Diesel + Oil	No	Yes	No	NA	No	No	Retain	Retain	Retain	COPC
Total Extractable Hydrocarbons	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
Total HPAHs	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Total LPAHs	Yes	Yes	No	NA	Yes	No	Retain	Retain	Not a COPC	Not a COPC
Total naphthalenes	Yes	Yes	Yes	No	No	No	Retain	Retain	Retain	COPC
trans-1,2-Dichloroethene	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
trans-1,3-Dichloropropene	No	No	No	NA	No	Yes	Retain	Data Gap	Data Gap	Data Gap
Trichloroethene	No	No	No	NA	No	No	Retain	Retain	Retain	COPC
Trichlorofluoromethane (Freon 11)	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Vinyl chloride	No	No	No	NA	No	Yes	Retain	Data Gap	Data Gap	Data Gap
Xylenes, total	Yes	Yes	No	NA	Yes	Yes	Retain	Retain	Not a COPC	Not a COPC
Zinc	No	No	No	NA	No	No	Retain	Retain	Retain	COPC
Gasoline Range Hydrocarbons (HCID)	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
Diesel Range Hydrocarbons (HCID)	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC
Oil Range Hydrocarbons (HCID)	Yes	Yes	No	NA	Yes	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC

Table G2-1
Vadose Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)			
	14. Are there potential hot spots?			8. Data Gap 12. COPC 3., 13. Not a COPC
	Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	
1,1,1,2-Tetrachloroethane	No	NA	NA	Not a COPC
1,1,1-Trichloroethane	No	NA	NA	Not a COPC
1,1,2,2-Tetrachloroethane	No	NA	NA	Data Gap
1,1,2-Trichloroethane	No	NA	NA	Data Gap
1,1-Dichloroethane	No	NA	NA	Not a COPC
1,1-Dichloroethene	No	NA	NA	Not a COPC
1,1-Dichloropropene	No	NA	NA	Not a COPC
1,2,3-Trichlorobenzene	No	NA	NA	Not a COPC
1,2,3-Trichloropropane	No	NA	NA	Not a COPC
1,2,4-Trichlorobenzene	No	NA	NA	Not a COPC
1,2,4-Trimethylbenzene	No	NA	NA	Not a COPC
1,2-Dibromo-3-chloropropane	No	NA	NA	Not a COPC
1,2-Dibromoethane	No	NA	NA	Data Gap
1,2-Dichlorobenzene	No	NA	NA	Not a COPC
1,2-Dichloroethane	No	NA	NA	Not a COPC
1,2-Dichloropropane	No	NA	NA	Not a COPC
1,3,5-Trichlorobenzene	No	NA	NA	Not a COPC
1,3,5-Trimethylbenzene	No	NA	NA	Not a COPC
1,3-Dichlorobenzene	No	NA	NA	Not a COPC
1,3-Dichloropropane	No	NA	NA	Not a COPC
1,4-Dichlorobenzene	No	NA	NA	Not a COPC
1-Methylnaphthalene	No	NA	NA	Not a COPC
2,2-Dichloropropane	No	NA	NA	Not a COPC
2-Butanone	No	NA	NA	Not a COPC
2-Chlorotoluene	No	NA	NA	Not a COPC
2-Hexanone	No	NA	NA	Not a COPC
2-Methylnaphthalene	No	NA	NA	Not a COPC
4-Chlorotoluene	No	NA	NA	Not a COPC
4-Isopropyltoluene	No	NA	NA	Not a COPC
4-Methyl-2-pentanone	No	NA	NA	Not a COPC
Acenaphthene	No	NA	NA	Not a COPC
Acenaphthylene	No	NA	NA	Not a COPC
Acetone	No	NA	NA	Not a COPC
Anthracene	No	NA	NA	Not a COPC
Antimony	No	NA	NA	Not a COPC
Arsenic	No	NA	NA	COPC
Benzene	No	NA	NA	Not a COPC
Benzo(a)anthracene	No	NA	NA	Not a COPC
Benzo(a)pyrene	No	NA	NA	Not a COPC
Benzo(b)fluoranthene	No	NA	NA	Not a COPC
Benzo(b,k)fluoranthene	No	NA	NA	Not a COPC
Benzo(ghi)perylene	No	NA	NA	Not a COPC
Benzo(k)fluoranthene	No	NA	NA	Not a COPC
Beryllium	No	NA	NA	Not a COPC
Bromobenzene	No	NA	NA	Not a COPC
Bromodichloromethane	No	NA	NA	Data Gap

Table G2-1
Vadose Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)			
	14. Are there potential hot spots?			8. Data Gap 12. COPC 3., 13. Not a COPC
	Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	
Bromoform	No	NA	NA	Not a COPC
Bromomethane	No	NA	NA	Not a COPC
C10-C12 Aliphatic Hydrocarbons	No	NA	NA	Not a COPC
C10-C12 Aromatic Hydrocarbons	No	NA	NA	Not a COPC
C12-C16 Aliphatic Hydrocarbons	No	NA	NA	Not a COPC
C12-C16 Aromatic Hydrocarbons	No	NA	NA	Not a COPC
C16-C21 Aliphatic Hydrocarbons	No	NA	NA	Not a COPC
C16-C21 Aromatic Hydrocarbons	No	NA	NA	Not a COPC
C21-C34 Aliphatic Hydrocarbons	No	NA	NA	Not a COPC
C21-C34 Aromatic Hydrocarbons	No	NA	NA	Not a COPC
C8-C10 Aliphatic Hydrocarbons	No	NA	NA	Not a COPC
C8-C10 Aromatic Hydrocarbons	No	NA	NA	Not a COPC
Cadmium	No	NA	NA	COPC
Carbon disulfide	No	NA	NA	Not a COPC
Carbon tetrachloride	No	NA	NA	Data Gap
Chlorobenzene	No	NA	NA	Not a COPC
Chlorobromomethane	No	NA	NA	Not a COPC
Chloroethane	No	NA	NA	Not a COPC
Chloroform	No	NA	NA	Not a COPC
Chloromethane	No	NA	NA	Not a COPC
Chromium, Hexavalent	No	NA	NA	COPC
Chromium, Total	No	NA	NA	COPC
Chromium, Trivalent	No	NA	NA	COPC
Chrysene	No	NA	NA	Not a COPC
cis-1,2-Dichloroethene	No	NA	NA	Not a COPC
cis-1,3-Dichloropropene	No	NA	NA	Data Gap
Copper	No	NA	NA	COPC
cPAH TEQ	No	NA	NA	COPC
Dibenzo(a,h)anthracene	No	NA	NA	Not a COPC
Dibromochloromethane	No	NA	NA	Data Gap
Dibromomethane	No	NA	NA	Not a COPC
Dichlorodifluoromethane (Freon 12)	No	NA	NA	Not a COPC
Diesel Range Hydrocarbons	No	NA	NA	COPC
Ethylbenzene	No	NA	NA	Not a COPC
Fluoranthene	No	NA	NA	Not a COPC
Fluorene	No	NA	NA	Not a COPC
Gasoline Range Hydrocarbons	No	NA	NA	Not a COPC
Hexachlorobutadiene	No	NA	NA	Data Gap
Indeno(1,2,3-cd)pyrene	No	NA	NA	Not a COPC
Isopropylbenzene	No	NA	NA	Not a COPC
Lead	No	NA	NA	COPC
m,p-Xylene	No	NA	NA	Not a COPC
Mercury	No	NA	NA	COPC
Methyl tert-butyl ether	No	NA	NA	Not a COPC
Methylene chloride	No	NA	NA	Not a COPC
Naphthalene	No	NA	NA	Not a COPC

Table G2-1
Vadose Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)			
	14. Are there potential hot spots?			8. Data Gap 12. COPC 3., 13. Not a COPC
	Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	
n-Butylbenzene	No	NA	NA	Not a COPC
Nickel	No	NA	NA	Not a COPC
n-Propylbenzene	No	NA	NA	Not a COPC
Oil Range Hydrocarbons	No	NA	NA	COPC
o-Xylene	No	NA	NA	Not a COPC
Phenanthrene	No	NA	NA	Not a COPC
Pyrene	No	NA	NA	Not a COPC
sec-Butylbenzene	No	NA	NA	Not a COPC
Selenium	No	NA	NA	Not a COPC
Silver	No	NA	NA	Not a COPC
Styrene	No	NA	NA	Not a COPC
tert-Butylbenzene	No	NA	NA	Not a COPC
Tetrachloroethene	No	NA	NA	Not a COPC
Thallium	No	NA	NA	Data Gap
Toluene	No	NA	NA	Not a COPC
Total benzofluoranthenes	No	NA	NA	Not a COPC
Total Diesel + Oil	No	NA	NA	COPC
Total Extractable Hydrocarbons	No	NA	NA	Not a COPC
Total HPAHs	No	NA	NA	Not a COPC
Total LPAHs	No	NA	NA	Not a COPC
Total naphthalenes	No	NA	NA	COPC
trans-1,2-Dichloroethene	No	NA	NA	Not a COPC
trans-1,3-Dichloropropene	No	NA	NA	Data Gap
Trichloroethene	No	NA	NA	COPC
Trichlorofluoromethane (Freon 11)	No	NA	NA	Not a COPC
Vinyl chloride	No	NA	NA	Data Gap
Xylenes, total	No	NA	NA	Not a COPC
Zinc	No	NA	NA	COPC
Gasoline Range Hydrocarbons (HCID)	No	NA	NA	Not a COPC
Diesel Range Hydrocarbons (HCID)	No	NA	NA	Not a COPC
Oil Range Hydrocarbons (HCID)	No	NA	NA	Not a COPC

Table G2-1
Vadose Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

NOTES:

% = percent.

COPC = chemical of potential concern.

cPAH TEQ = carcinogenic PAH toxic equivalency quotient.

FOD = frequency of detection.

HCID = hydrocarbon identification.

HPAHs = high molecular weight PAHs.

LPAHs = low molecular weight PAHs.

NA = not applicable.

MTCA = Model Toxics Control Act.

No. = number.

PAHs = polycyclic aromatic hydrocarbons.

PCUL = preliminary cleanup level.

RL = reporting limit.

UCL = upper confidence limit.

[(a)]If no. 1 is "No," this column displays as "No" rather than "NA" to simplify the COPC selection formulas.

[(b)]If no. 5 is "No", this column displays as "No" rather than "NA" to simplify the COPC selection formulas.

[(c)]A UCL is calculated if the chemical has not already been eliminated from consideration as a COPC or a data gap and no. 1 and 2 are both "Yes."

[(d)]Due to small sample size, no 95 UCL was calculated for total naphthalenes. The maximum detected concentration was used instead, per MTCA guidance.

Table G2-2
Saturated Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	Calculated Values					COPC Selection		
Analyte Name	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[a]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[b]
1,1,1,2-Tetrachloroethane	0	0	0	0	0	Yes	No	No
1,1,1-Trichloroethane	0	0	0	0	0	Yes	No	No
1,1,2,2-Tetrachloroethane	0	0	100	0	100	Yes	Yes	Yes
1,1,2-Trichloroethane	0	0	100	0	100	Yes	Yes	Yes
1,1-Dichloroethane	0	0	24	0	24	Yes	Yes	Yes
1,1-Dichloroethene	0	0	24	0	24	Yes	Yes	No
1,1-Dichloropropene	0	0	0	0	0	No	No	No
1,2,3-Trichlorobenzene	0	0	0	0	0	No	No	No
1,2,3-Trichloropropane	0	0	24	0	24	Yes	Yes	No
1,2,4-Trichlorobenzene	0	0	98	0	98	Yes	Yes	Yes
1,2,4-Trimethylbenzene	0	2	0	0	0	Yes	No	No
1,2-Dibromo-3-chloropropane	0	0	0	0	0	Yes	No	No
1,2-Dibromoethane	0	0	100	0	100	Yes	Yes	Yes
1,2-Dichlorobenzene	0	0	24	0	24	Yes	Yes	Yes
1,2-Dichloroethane	0	0	29	0	29	Yes	Yes	Yes
1,2-Dichloropropane	0	0	73	0	73	Yes	Yes	Yes
1,3,5-Trichlorobenzene	0	0	0	0	0	No	No	No
1,3,5-Trimethylbenzene	0	2	0	0	0	Yes	No	No
1,3-Dichlorobenzene	0	0	0	0	0	No	No	No
1,3-Dichloropropane	0	0	0	0	0	No	No	No
1,4-Dichlorobenzene	0	0	24	0	24	Yes	Yes	Yes
1-Methylnaphthalene	0	0	0	0	0	Yes	No	No
2,2-Dichloropropane	0	0	0	0	0	No	No	No
2-Butanone	0	15	0	0	0	Yes	No	No
2-Chloroethylvinyl ether	0	0	0	0	0	No	No	No
2-Chlorotoluene	0	0	0	0	0	Yes	No	No
2-Hexanone	0	0	0	0	0	Yes	No	No
2-Methylnaphthalene	0	0	0	0	0	Yes	No	No
4-Chlorotoluene	0	0	0	0	0	No	No	No
4-Isopropyltoluene	0	2	0	0	0	No	No	No
4-Methyl-2-pentanone	0	0	0	0	0	Yes	No	No
Acenaphthene	0	0	0	0	0	Yes	No	No
Acenaphthylene	0	0	0	0	0	Yes	No	No
Acetone	0	77	0	0	0	Yes	No	No
Acrolein	0	0	0	0	0	Yes	No	No
Acrylonitrile	0	0	0	0	0	Yes	No	No
Anthracene	0	0	0	0	0	Yes	No	No
Arsenic	2	51	6	11	9	Yes	No	No
Benzene	2	5	100	100	100	Yes	Yes	Yes
Benzo(a)anthracene	0	50	0	0	0	Yes	No	No
Benzo(a)pyrene	0	25	0	0	0	Yes	No	No

Table G2-2
Saturated Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	Calculated Values					COPC Selection		
Analyte Name	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[a]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[b]
Benzo(b)fluoranthene	0	25	0	0	0	No	No	No
Benzo(b,k)fluoranthene	0	50	0	0	0	No	No	No
Benzo(ghi)perylene	0	0	0	0	0	Yes	No	No
Benzo(k)fluoranthene	0	25	0	0	0	No	No	No
Bromobenzene	0	0	24	0	24	Yes	Yes	No
Bromodichloromethane	0	0	85	0	85	Yes	Yes	Yes
Bromoethane	0	0	0	0	0	No	No	No
Bromoform	0	0	24	0	24	Yes	Yes	Yes
Bromomethane	0	0	24	0	24	Yes	Yes	Yes
C10-C12 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No
C10-C12 Aromatic Hydrocarbons	0	0	0	0	0	No	No	No
C12-C16 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No
C12-C16 Aromatic Hydrocarbons	0	0	0	0	0	No	No	No
C16-C21 Aliphatic Hydrocarbons	0	100	0	0	0	No	Yes	No
C16-C21 Aromatic Hydrocarbons	0	100	0	0	0	No	Yes	No
C21-C34 Aliphatic Hydrocarbons	0	100	0	0	0	No	Yes	No
C21-C34 Aromatic Hydrocarbons	0	100	0	0	0	No	Yes	No
C8-C10 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No
C8-C10 Aromatic Hydrocarbons	0	0	0	0	0	No	No	No
Cadmium	0	0	0	0	0	Yes	No	No
Carbon disulfide	0	70	0	0	0	Yes	No	No
Carbon tetrachloride	0	0	100	0	100	Yes	Yes	Yes
Chlorobenzene	0	0	0	0	0	Yes	No	No
Chlorobromomethane	0	0	0	0	0	No	No	No
Chloroethane	0	0	0	0	0	No	No	No
Chloroform	0	0	24	0	24	Yes	Yes	Yes
Chloromethane	0	7	0	0	0	No	No	No
Chromium, Hexavalent	7	15	30	78	37	Yes	Yes	No
Chromium, Total	4	100	0	6	6	Yes	Yes	No
Chromium, Trivalent	23	100	0	37	37	Yes	Yes	No
Chrysene	0	50	0	0	0	Yes	No	No
cis-1,2-Dichloroethene	3	5	18	100	22	Yes	Yes	Yes
cis-1,3-Dichloropropene	0	0	100	0	100	Yes	Yes	Yes
cPAH TEQ	2	50	100	100	100	Yes	Yes	Yes
Dibenzo(a,h)anthracene	0	0	100	0	100	Yes	Yes	No
Dibromochloromethane	0	0	95	0	95	Yes	Yes	Yes
Dibromomethane	0	0	0	0	0	Yes	No	No
Dichlorodifluoromethane (Freon 12)	0	0	0	0	0	Yes	No	No
Diesel Range Hydrocarbons	1	33	0	7	2	Yes	No	No
Ethylbenzene	1	2	25	100	27	Yes	Yes	No
Fluoranthene	0	50	0	0	0	Yes	No	No

Table G2-2
Saturated Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	Calculated Values					COPC Selection		
Analyte Name	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[a]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[b]
Fluorene	0	0	0	0	0	Yes	No	No
Freon 113	0	0	0	0	0	Yes	No	No
Gasoline Range Hydrocarbons	0	0	0	0	0	Yes	No	No
Hexachlorobutadiene	0	0	100	0	100	Yes	Yes	Yes
Indeno(1,2,3-cd)pyrene	0	0	0	0	0	Yes	No	No
Isopropylbenzene	0	2	0	0	0	Yes	No	No
Lead	0	58	0	0	0	Yes	No	No
m,p-Xylene	0	2	0	0	0	Yes	No	No
Methyl iodide	0	0	0	0	0	No	No	No
Methylene chloride	23	56	94	100	98	Yes	Yes	Yes
Naphthalene	1	2	98	100	98	Yes	Yes	Yes
n-Butylbenzene	0	5	0	0	0	Yes	No	No
n-Propylbenzene	0	2	0	0	0	Yes	No	No
Oil Range Hydrocarbons	1	45	0	5	2	Yes	No	No
o-Xylene	0	0	0	0	0	Yes	No	No
Phenanthrene	0	50	0	0	0	Yes	No	No
Pyrene	0	50	0	0	0	Yes	No	No
sec-Butylbenzene	0	5	0	0	0	Yes	No	No
Selenium	1	3	100	100	100	Yes	Yes	Yes
Styrene	0	0	0	0	0	Yes	No	No
tert-Butylbenzene	0	0	0	0	0	Yes	No	No
Tetrachloroethene	0	0	29	0	29	Yes	Yes	Yes
Toluene	0	5	0	0	0	Yes	No	No
Total benzofluoranthenes	0	25	0	0	0	Yes	No	No
Total Diesel + Oil	2	48	0	10	5	Yes	No	No
Total Extractable Hydrocarbons	0	100	0	0	0	No	Yes	No
Total HPAHs	0	50	0	0	0	Yes	No	No
Total LPAHs	0	50	0	0	0	Yes	No	No
Total naphthalenes	0	0	100	0	100	Yes	Yes	Yes
trans-1,2-Dichloroethene	0	0	17	0	17	Yes	Yes	No
trans-1,3-Dichloropropene	0	0	100	0	100	Yes	Yes	Yes
trans-1,4-Dichloro-2-butene	0	0	0	0	0	No	No	No
Trichloroethene	2	3	100	100	100	Yes	Yes	Yes
Trichlorofluoromethane (Freon 11)	0	0	0	0	0	Yes	No	No
Vinyl Acetate	0	0	0	0	0	Yes	No	No
Vinyl chloride	0	0	100	0	100	Yes	Yes	Yes
Xylenes, total	0	2	0	0	0	Yes	No	No
Gasoline Range Hydrocarbons (HCID)	0	0	0	0	0	No	No	No
Diesel Range Hydrocarbons (HCID)	0	0	0	0	0	No	No	No
Oil Range Hydrocarbons (HCID)	0	0	0	0	0	No	No	No

Table G2-2
Saturated Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	COPC Selection (Continued)							
			10. Does data set comply with 3-Part Rule?					
Analyte Name	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?	1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[c]	3. 95UCL <= PCUL	Does data set comply with 3-part rule?	11. Is FOD low (Frequency of detection <= 5%)?
1,1,1,2-Tetrachloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,1,1-Trichloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,1,2,2-Tetrachloroethane	Yes	No	No	No	No	NA	No	Yes
1,1,2-Trichloroethane	No	No	No	No	No	NA	No	Yes
1,1-Dichloroethane	No	No	No	No	No	NA	No	Yes
1,1-Dichloroethene	NA	No	No	No	No	NA	No	Yes
1,1-Dichloropropene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2,3-Trichlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2,3-Trichloropropane	NA	No	Yes	No	No	NA	No	Yes
1,2,4-Trichlorobenzene	No	No	No	No	No	NA	No	Yes
1,2,4-Trimethylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2-Dibromo-3-chloropropane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2-Dibromoethane	Yes	No	No	No	No	NA	No	Yes
1,2-Dichlorobenzene	No	No	No	No	No	NA	No	Yes
1,2-Dichloroethane	No	No	No	No	No	NA	No	Yes
1,2-Dichloropropane	No	No	No	No	No	NA	No	Yes
1,3,5-Trichlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,3,5-Trimethylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,3-Dichlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,3-Dichloropropane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,4-Dichlorobenzene	No	No	No	No	No	NA	No	Yes
1-Methylnaphthalene	NA	No	Yes	Yes	No	NA	Yes	Yes
2,2-Dichloropropane	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Butanone	NA	No	Yes	Yes	No	NA	Yes	No
2-Chloroethylvinyl ether	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Chlorotoluene	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Hexanone	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Methylnaphthalene	NA	No	Yes	Yes	No	NA	Yes	Yes
4-Chlorotoluene	NA	No	Yes	Yes	No	NA	Yes	Yes
4-Isopropyltoluene	NA	No	Yes	Yes	No	NA	Yes	Yes
4-Methyl-2-pentanone	NA	No	Yes	Yes	No	NA	Yes	Yes
Acenaphthene	NA	No	Yes	Yes	No	NA	Yes	Yes
Acenaphthylene	NA	No	Yes	Yes	No	NA	Yes	Yes
Acetone	NA	No	Yes	Yes	No	NA	Yes	No
Acrolein	NA	No	Yes	Yes	No	NA	Yes	Yes
Acrylonitrile	NA	No	Yes	Yes	No	NA	Yes	Yes
Anthracene	NA	No	Yes	Yes	No	NA	Yes	Yes
Arsenic	NA	Yes	Yes	Yes	Yes	Yes	Yes	No
Benzene	No	Yes	No	No	No	NA	No	Yes
Benzo(a)anthracene	NA	No	Yes	Yes	No	NA	Yes	No
Benzo(a)pyrene	NA	No	Yes	Yes	No	NA	Yes	No

Table G2-2
Saturated Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	COPC Selection (Continued)							
			10. Does data set comply with 3-Part Rule?					
Analyte Name	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?	1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[(c)]	3. 95UCL <= PCUL	Does data set comply with 3-part rule?	11. Is FOD low (Frequency of detection <= 5%)?
Benzo(b)fluoranthene	NA	No	Yes	Yes	No	NA	Yes	No
Benzo(b,k)fluoranthene	NA	No	Yes	Yes	No	NA	Yes	No
Benzo(ghi)perylene	NA	No	Yes	Yes	No	NA	Yes	Yes
Benzo(k)fluoranthene	NA	No	Yes	Yes	No	NA	Yes	No
Bromobenzene	NA	No	Yes	No	No	NA	No	Yes
Bromodichloromethane	No	No	No	No	No	NA	No	Yes
Bromoethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Bromoform	No	No	No	No	No	NA	No	Yes
Bromomethane	No	No	No	No	No	NA	No	Yes
C10-C12 Aliphatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C10-C12 Aromatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C12-C16 Aliphatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C12-C16 Aromatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C16-C21 Aliphatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	No
C16-C21 Aromatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	No
C21-C34 Aliphatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	No
C21-C34 Aromatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	No
C8-C10 Aliphatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C8-C10 Aromatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
Cadmium	NA	No	Yes	Yes	No	NA	Yes	Yes
Carbon disulfide	NA	No	Yes	Yes	No	NA	Yes	No
Carbon tetrachloride	No	No	No	No	No	NA	No	Yes
Chlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Chlorobromomethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Chloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Chloroform	No	No	No	No	No	NA	No	Yes
Chloromethane	NA	No	Yes	Yes	No	NA	Yes	No
Chromium, Hexavalent	NA	Yes	No	No	No	NA	No	No
Chromium, Total	NA	Yes	No	Yes	No	NA	No	No
Chromium, Trivalent	NA	Yes	No	No	No	NA	No	No
Chrysene	NA	No	Yes	Yes	No	NA	Yes	No
cis-1,2-Dichloroethene	No	Yes	No	No	No	NA	No	No
cis-1,3-Dichloropropene	No	No	No	No	No	NA	No	Yes
cPAH TEQ	Yes	Yes	No	No	No	NA	No	No
Dibenzo(a,h)anthracene	NA	No	Yes	No	No	NA	No	Yes
Dibromochloromethane	No	No	No	No	No	NA	No	Yes
Dibromomethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Dichlorodifluoromethane (Freon 12)	NA	No	Yes	Yes	No	NA	Yes	Yes
Diesel Range Hydrocarbons	NA	Yes	No	Yes	No	NA	No	No
Ethylbenzene	NA	Yes	No	No	No	NA	No	Yes
Fluoranthene	NA	No	Yes	Yes	No	NA	Yes	No

Table G2-2
Saturated Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)							
	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?	10. Does data set comply with 3-Part Rule?					11. Is FOD low (Frequency of detection <= 5%)?
			1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[(c)]	3. 95UCL <= PCUL	Does data set comply with 3-part rule?	
Fluorene	NA	No	Yes	Yes	No	NA	Yes	Yes
Freon 113	NA	No	Yes	Yes	No	NA	Yes	Yes
Gasoline Range Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
Hexachlorobutadiene	No	No	No	No	No	NA	No	Yes
Indeno(1,2,3-cd)pyrene	NA	No	Yes	Yes	No	NA	Yes	Yes
Isopropylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Lead	NA	No	Yes	Yes	No	NA	Yes	No
m,p-Xylene	NA	No	Yes	Yes	No	NA	Yes	Yes
Methyl iodide	NA	No	Yes	Yes	No	NA	Yes	Yes
Methylene chloride	Yes	Yes	No	No	No	NA	No	No
Naphthalene	No	Yes	No	No	No	NA	No	Yes
n-Butylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
n-Propylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Oil Range Hydrocarbons	NA	Yes	No	Yes	No	NA	No	No
o-Xylene	NA	No	Yes	Yes	No	NA	Yes	Yes
Phenanthrene	NA	No	Yes	Yes	No	NA	Yes	No
Pyrene	NA	No	Yes	Yes	No	NA	Yes	No
sec-Butylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Selenium	No	Yes	No	No	No	NA	No	Yes
Styrene	NA	No	Yes	Yes	No	NA	Yes	Yes
tert-Butylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Tetrachloroethene	No	No	No	No	No	NA	No	Yes
Toluene	NA	No	Yes	Yes	No	NA	Yes	Yes
Total benzofluoranthenes	NA	No	Yes	Yes	No	NA	Yes	No
Total Diesel + Oil	NA	Yes	No	Yes	No	NA	No	No
Total Extractable Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	No
Total HPAHs	NA	No	Yes	Yes	No	NA	Yes	No
Total LPAHs	NA	No	Yes	Yes	No	NA	Yes	No
Total naphthalenes	Yes	No	No	No	No	NA	No	Yes
trans-1,2-Dichloroethene	NA	No	Yes	No	No	NA	No	Yes
trans-1,3-Dichloropropene	No	No	No	No	No	NA	No	Yes
trans-1,4-Dichloro-2-butene	NA	No	Yes	Yes	No	NA	Yes	Yes
Trichloroethene	No	Yes	No	No	No	NA	No	Yes
Trichlorofluoromethane (Freon 11)	NA	No	Yes	Yes	No	NA	Yes	Yes
Vinyl Acetate	NA	No	Yes	Yes	No	NA	Yes	Yes
Vinyl chloride	No	No	No	No	No	NA	No	Yes
Xylenes, total	NA	No	Yes	Yes	No	NA	Yes	Yes
Gasoline Range Hydrocarbons (HCID)	NA	No	Yes	Yes	No	NA	Yes	Yes
Diesel Range Hydrocarbons (HCID)	NA	No	Yes	Yes	No	NA	Yes	Yes
Oil Range Hydrocarbons (HCID)	NA	No	Yes	Yes	No	NA	Yes	Yes

Table G2-2
Saturated Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	COPC Selection (Continued)							
					14. Are there potential hot spots?			
Analyte Name	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)	Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	8. Data Gap 12. COPC 3., 13. Not a COPC
1,1,1,2-Tetrachloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,1-Trichloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,2,2-Tetrachloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,2-Trichloroethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,1-Dichloroethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,1-Dichloroethene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1-Dichloropropene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,3-Trichlorobenzene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,3-Trichloropropane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,4-Trichlorobenzene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,2,4-Trimethylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dibromo-3-chloropropane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dibromoethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dichlorobenzene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,2-Dichloroethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,2-Dichloropropane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,3,5-Trichlorobenzene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,3,5-Trimethylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,3-Dichlorobenzene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,3-Dichloropropane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,4-Dichlorobenzene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1-Methylnaphthalene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2,2-Dichloropropane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Butanone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Chloroethylvinyl ether	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Chlorotoluene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Hexanone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Methylnaphthalene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Chlorotoluene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Isopropyltoluene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Methyl-2-pentanone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acenaphthene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acenaphthylene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acetone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acrolein	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acrylonitrile	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Anthracene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Arsenic	Retain	Retain	Retain	Retain	Yes	No	Only one exceedance, off-Property (SB13); on-Property data sufficient and of sufficient quality.	Not a COPC
Benzene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
Benzo(a)anthracene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzo(a)pyrene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC

Table G2-2
Saturated Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)							
	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)	14. Are there potential hot spots?			8. Data Gap 12. COPC 3., 13. Not a COPC
					Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	
Benzo(b)fluoranthene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzo(b,k)fluoranthene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzo(ghi)perylene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzo(k)fluoranthene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromodichloromethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Bromoethane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromoform	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Bromomethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
C10-C12 Aliphatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C10-C12 Aromatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C12-C16 Aliphatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C12-C16 Aromatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C16-C21 Aliphatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C16-C21 Aromatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C21-C34 Aliphatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C21-C34 Aromatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C8-C10 Aliphatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C8-C10 Aromatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Cadmium	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Carbon disulfide	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Carbon tetrachloride	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Chlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chlorobromomethane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloroethane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloroform	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Chloromethane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chromium, Hexavalent	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Chromium, Total	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Chromium, Trivalent	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Chrysene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
cis-1,2-Dichloroethene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
cis-1,3-Dichloropropene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
cPAH TEQ	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Dibenzo(a,h)anthracene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Dibromochloromethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Dibromomethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Dichlorodifluoromethane (Freon 12)	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Diesel Range Hydrocarbons	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Ethylbenzene	Retain	Retain	Retain	Retain	Yes	No	Only one exceedance, off-Property (SB14); on-Property data sufficient and of sufficient quality	Not a COPC
Fluoranthene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC

Table G2-2
Saturated Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)							
	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)	14. Are there potential hot spots?			8. Data Gap 12. COPC 3., 13. Not a COPC
					Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	
Fluorene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Freon 113	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Gasoline Range Hydrocarbons	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Hexachlorobutadiene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Indeno(1,2,3-cd)pyrene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Isopropylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Lead	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
m,p-Xylene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Methyl iodide	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Methylene chloride	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Naphthalene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
n-Butylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
n-Propylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Oil Range Hydrocarbons	Retain	Retain	Retain	COPC	No	NA	NA	COPC
o-Xylene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Phenanthrene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Pyrene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
sec-Butylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Selenium	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
Styrene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
tert-Butylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Tetrachloroethene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Toluene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Total benzofluoranthenes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Total Diesel + Oil	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Total Extractable Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Total HPAHs	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Total LPAHs	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Total naphthalenes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
trans-1,2-Dichloroethene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
trans-1,3-Dichloropropene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
trans-1,4-Dichloro-2-butene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Trichloroethene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
Trichlorofluoromethane (Freon 11)	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Vinyl Acetate	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Vinyl chloride	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Xylenes, total	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Gasoline Range Hydrocarbons (HCID)	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Diesel Range Hydrocarbons (HCID)	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Oil Range Hydrocarbons (HCID)	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC

Table G2-2
Saturated Soil COPC Selection
Precision Engineering, Inc.
Seattle, Washington

NOTES:

Gray highlighting indicates a hand-entered column.

% = percent.

COPC = chemical of potential concern.

cPAH TEQ = carcinogenic PAH toxic equivalency quotient.

FOD = frequency of detection.

HCID = hydrocarbon identification.

HPAHs = high molecular weight PAHs.

LPAHs = low molecular weight PAHs.

NA = not applicable.

No. = number.

PAHs = polycyclic aromatic hydrocarbons.

PCUL = preliminary cleanup level.

RL = reporting limit.

UCL = upper confidence limit.

[a]If no. 1 is "No," this column displays as "No" rather than "NA" to simplify the COPC selection formulas.

[b]If no. 5 is "No", this column displays as "No" rather than "NA" to simplify the COPC selection formulas.

[c]A UCL is calculated if the chemical has not already been eliminated from consideration as a COPC or a data gap and no. 1 and 2 are both "Yes."

Table G2-3
Shallow Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	Calculated Values					COPC Selection		
Analyte Name	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[a]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[b]
1,1,1,2-Tetrachloroethane	0	0	31	0	31	Yes	Yes	Yes
1,1,1-Trichloroethane	0	0	0	0	0	Yes	No	No
1,1,2,2-Tetrachloroethane	0	0	100	0	100	Yes	Yes	Yes
1,1,2-Trichloroethane	0	0	100	0	100	Yes	Yes	Yes
1,1-Dichloroethane	0	0	17	0	17	Yes	Yes	No
1,1-Dichloroethene	0	0	17	0	17	Yes	Yes	No
1,1-Dichloropropene	0	0	0	0	0	No	No	No
1,2,3-Trichlorobenzene	0	0	0	0	0	No	No	No
1,2,3-Trichloropropane	0	0	100	0	100	Yes	Yes	Yes
1,2,4-Trichlorobenzene	0	0	100	0	100	Yes	Yes	Yes
1,2,4-Trimethylbenzene	0	1	0	0	0	Yes	No	No
1,2-Dibromo-3-chloropropane	0	0	100	0	100	Yes	Yes	Yes
1,2-Dibromoethane	0	0	100	0	100	Yes	Yes	Yes
1,2-Dichlorobenzene	0	0	31	0	31	Yes	Yes	No
1,2-Dichloroethane	0	0	31	0	31	Yes	Yes	No
1,2-Dichloropropane	0	0	31	0	31	Yes	Yes	Yes
1,3,5-Trimethylbenzene	0	1	0	0	0	Yes	No	No
1,3-Dichlorobenzene	0	0	31	0	31	Yes	Yes	Yes
1,3-Dichloropropane	0	0	0	0	0	No	No	No
1,4-Dichlorobenzene	0	0	31	0	31	Yes	Yes	No
1-Methylnaphthalene	0	28	0	0	0	Yes	No	No
2,2-Dichloropropane	0	0	0	0	0	No	No	No
2-Butanone	0	6	0	0	0	Yes	No	No
2-Chloroethylvinyl ether	0	0	0	0	0	No	No	No
2-Chloronaphthalene	0	0	0	0	0	Yes	No	No
2-Chlorotoluene	0	0	0	0	0	Yes	No	No
2-Hexanone	0	0	20	0	20	Yes	Yes	No
2-Methylnaphthalene	0	29	0	0	0	Yes	No	No
4-Chlorotoluene	0	0	0	0	0	No	No	No
4-Isopropyltoluene	0	0	0	0	0	No	No	No
4-Methyl-2-pentanone	0	0	0	0	0	Yes	No	No
Acenaphthene	0	17	0	0	0	Yes	No	No
Acenaphthylene	0	3	0	0	0	No	No	No
Acetone	0	0	0	0	0	Yes	No	No
Acrolein	0	0	100	0	100	Yes	Yes	Yes
Acrylonitrile	0	0	100	0	100	Yes	Yes	Yes
Anthracene	0	5	0	0	0	Yes	No	No
Antimony	0	0	0	0	0	Yes	No	No
Aroclor 1016	0	0	0	0	0	No	No	No
Aroclor 1221	0	0	0	0	0	No	No	No
Aroclor 1232	0	0	0	0	0	No	No	No
Aroclor 1242	0	0	0	0	0	No	No	No
Aroclor 1248	0	0	0	0	0	No	No	No
Aroclor 1254	0	0	0	0	0	No	No	No
Aroclor 1260	0	0	0	0	0	No	No	No
Arsenic	45	70	97	64	74	Yes	Yes	Yes

Table G2-3
Shallow Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	Calculated Values					COPC Selection		
Analyte Name	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[a]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[b]
Benzene	0	0	31	0	31	Yes	Yes	Yes
Benzo(a)anthracene	1	2	100	100	100	Yes	Yes	Yes
Benzo(a)pyrene	0	0	100	0	100	Yes	Yes	Yes
Benzo(b)fluoranthene	0	0	100	0	100	Yes	Yes	Yes
Benzo(b,k)fluoranthene	0	0	100	0	100	Yes	Yes	Yes
Benzo(ghi)perylene	0	0	0	0	0	No	No	No
Benzo(k)fluoranthene	0	0	100	0	100	Yes	Yes	Yes
Beryllium	0	0	0	0	0	Yes	No	No
Bromobenzene	0	0	0	0	0	Yes	No	No
Bromodichloromethane	0	0	31	0	31	Yes	Yes	Yes
Bromoethane	0	0	0	0	0	No	No	No
Bromoform	0	0	1	0	1	Yes	No	No
Bromomethane	0	0	1	0	1	Yes	No	No
C10-C12 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No
C10-C12 Aromatic Hydrocarbons	0	0	0	0	0	No	No	No
C12-C16 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No
C12-C16 Aromatic Hydrocarbons	0	0	0	0	0	No	No	No
C16-C21 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No
C16-C21 Aromatic Hydrocarbons	0	0	0	0	0	No	No	No
C21-C34 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No
C21-C34 Aromatic Hydrocarbons	0	0	0	0	0	No	No	No
C8-C10 Aliphatic Hydrocarbons	0	0	0	0	0	No	No	No
Cadmium	0	0	0	0	0	Yes	No	No
Carbon disulfide	0	0	0	0	0	Yes	No	No
Carbon tetrachloride	0	0	100	0	100	Yes	Yes	Yes
Chlorobenzene	0	0	0	0	0	Yes	No	No
Chlorobromomethane	0	0	0	0	0	No	No	No
Chloroethane	0	0	0	0	0	Yes	No	No
Chloroform	0	0	31	0	31	Yes	Yes	Yes
Chloromethane	0	0	0	0	0	Yes	No	No
Chromium, Hexavalent	23	32	16	66	32	Yes	Yes	Yes
Chromium, Total	26	75	0	31	24	Yes	No	No
Chromium, Trivalent	28	63	0	41	25	Yes	No	No
Chrysene	0	0	67	0	67	Yes	Yes	Yes
cis-1,2-Dichloroethene	2	8	1	22	3	Yes	No	No
cis-1,3-Dichloropropene	0	0	100	0	100	Yes	Yes	Yes
Copper	5	16	74	56	71	Yes	Yes	Yes
cPAH TEQ	0	2	100	0	98	Yes	Yes	Yes
Dibenzo(a,h)anthracene	0	0	100	0	100	Yes	Yes	Yes
Dibromochloromethane	0	0	31	0	31	Yes	Yes	Yes
Dibromomethane	0	0	0	0	0	Yes	No	No
Dichlorodifluoromethane (Freon 12)	0	0	33	0	33	Yes	Yes	No
Diesel Range Hydrocarbons	16	74	0	21	16	Yes	No	No
Ethylbenzene	0	1	0	0	0	Yes	No	No
Fluoranthene	0	9	0	0	0	Yes	No	No
Fluorene	0	9	0	0	0	Yes	No	No

Table G2-3
Shallow Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	Calculated Values					COPC Selection		
Analyte Name	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[a]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[b]
Freon 113	0	0	0	0	0	Yes	No	No
Gasoline Range Hydrocarbons	0	33	0	0	0	Yes	No	No
Hexachlorobutadiene	0	0	100	0	100	Yes	Yes	Yes
Indeno(1,2,3-cd)pyrene	0	0	100	0	100	Yes	Yes	Yes
Isopropylbenzene	0	1	0	0	0	Yes	No	No
Lead	9	18	53	75	57	Yes	Yes	No
m,p-Xylene	0	1	0	0	0	Yes	No	No
Mercury	0	0	100	0	100	Yes	Yes	Yes
Methyl iodide	0	0	0	0	0	No	No	No
Methyl tert-butyl ether	0	0	0	0	0	Yes	No	No
Methylene chloride	0	0	30	0	30	Yes	Yes	Yes
Naphthalene	4	15	47	25	44	Yes	Yes	Yes
n-Butylbenzene	0	0	0	0	0	Yes	No	No
n-Hexane	0	0	0	0	0	No	No	No
Nickel	2	100	0	29	29	Yes	Yes	No
n-Propylbenzene	0	1	0	0	0	Yes	No	No
Oil Range Hydrocarbons	19	41	10	46	25	Yes	No	No
o-Xylene	0	1	0	0	0	Yes	No	No
Phenanthrene	0	9	0	0	0	No	No	No
Pyrene	0	0	0	0	0	Yes	No	No
sec-Butylbenzene	0	0	0	0	0	Yes	No	No
Selenium	0	28	6	0	4	Yes	No	Yes
Silver	0	0	0	0	0	Yes	No	No
Styrene	0	0	0	0	0	Yes	No	No
tert-Butylbenzene	0	0	0	0	0	Yes	No	No
Tetrachloroethene	0	0	31	0	31	Yes	Yes	Yes
Thallium	0	0	100	0	100	Yes	Yes	Yes
Toluene	0	1	0	0	0	Yes	No	No
Total Diesel + Oil	44	74	12	59	47	Yes	Yes	No
Total naphthalenes	2	71	0	13	10	Yes	No	No
Total PCBs	0	0	100	0	100	Yes	Yes	Yes
trans-1,2-Dichloroethene	0	2	0	0	0	Yes	No	No
trans-1,3-Dichloropropene	0	0	100	0	100	Yes	Yes	Yes
trans-1,4-Dichloro-2-butene	0	0	0	0	0	No	No	No
Trichloroethene	14	14	84	93	85	Yes	Yes	Yes
Trichlorofluoromethane (Freon 11)	0	0	0	0	0	Yes	No	No
Vinyl Acetate	0	0	0	0	0	Yes	No	No
Vinyl chloride	4	4	95	100	95	Yes	Yes	Yes
Xylenes, total	0	1	0	0	0	Yes	No	No
Zinc	0	14	0	0	0	Yes	No	No
Gasoline Range Hydrocarbons (HCID)	0	29	0	0	0	No	No	No
Diesel Range Hydrocarbons (HCID)	0	43	0	0	0	No	No	No
Oil Range Hydrocarbons (HCID)	0	29	0	0	0	No	No	No

Table G2-3
Shallow Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)							
	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?	10. Does data set comply with 3-Part Rule?					11. Is FOD low (Frequency of detection <= 5%)?
			1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[c]	3. 95UCL <= PCUL	Does data set comply with 3-part rule?	
1,1,1,2-Tetrachloroethane	No	No	No	No	No	NA	No	Yes
1,1,1-Trichloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,1,2,2-Tetrachloroethane	No	No	No	No	No	NA	No	Yes
1,1,2-Trichloroethane	No	No	No	No	No	NA	No	Yes
1,1-Dichloroethane	NA	No	No	No	No	NA	No	Yes
1,1-Dichloroethene	NA	No	No	No	No	NA	No	Yes
1,1-Dichloropropene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2,3-Trichlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2,3-Trichloropropane	No	No	No	No	No	NA	No	Yes
1,2,4-Trichlorobenzene	No	No	No	No	No	NA	No	Yes
1,2,4-Trimethylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2-Dibromo-3-chloropropane	No	No	No	No	No	NA	No	Yes
1,2-Dibromoethane	No	No	No	No	No	NA	No	Yes
1,2-Dichlorobenzene	NA	No	No	No	No	NA	No	Yes
1,2-Dichloroethane	NA	No	No	No	No	NA	No	Yes
1,2-Dichloropropane	No	No	No	No	No	NA	No	Yes
1,3,5-Trimethylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,3-Dichlorobenzene	No	No	No	No	No	NA	No	Yes
1,3-Dichloropropane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,4-Dichlorobenzene	NA	No	No	No	No	NA	No	Yes
1-Methylnaphthalene	NA	No	Yes	Yes	No	NA	Yes	No
2,2-Dichloropropane	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Butanone	NA	No	Yes	Yes	No	NA	Yes	No
2-Chloroethylvinyl ether	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Chloronaphthalene	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Chlorotoluene	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Hexanone	NA	No	No	No	No	NA	No	Yes
2-Methylnaphthalene	NA	No	Yes	Yes	No	NA	Yes	No
4-Chlorotoluene	NA	No	Yes	Yes	No	NA	Yes	Yes
4-Isopropyltoluene	NA	No	Yes	Yes	No	NA	Yes	Yes
4-Methyl-2-pentanone	NA	No	Yes	Yes	No	NA	Yes	Yes
Acenaphthene	NA	No	Yes	Yes	No	NA	Yes	No
Acenaphthylene	NA	No	Yes	Yes	No	NA	Yes	Yes
Acetone	NA	No	Yes	Yes	No	NA	Yes	Yes
Acrolein	No	No	No	No	No	NA	No	Yes
Acrylonitrile	No	No	No	No	No	NA	No	Yes
Anthracene	NA	No	Yes	Yes	No	NA	Yes	No
Antimony	NA	No	Yes	Yes	No	NA	Yes	Yes
Aroclor 1016	NA	No	Yes	Yes	No	NA	Yes	Yes
Aroclor 1221	NA	No	Yes	Yes	No	NA	Yes	Yes
Aroclor 1232	NA	No	Yes	Yes	No	NA	Yes	Yes
Aroclor 1242	NA	No	Yes	Yes	No	NA	Yes	Yes
Aroclor 1248	NA	No	Yes	Yes	No	NA	Yes	Yes
Aroclor 1254	NA	No	Yes	Yes	No	NA	Yes	Yes
Aroclor 1260	NA	No	Yes	Yes	No	NA	Yes	Yes
Arsenic	No	Yes	No	No	No	NA	No	No

Table G2-3
Shallow Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	COPC Selection (Continued)							
			10. Does data set comply with 3-Part Rule?					
Analyte Name	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?	1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[c]	3. 95UCL <= PCUL	Does data set comply with 3-part rule?	11. Is FOD low (Frequency of detection <= 5%)?
Benzene	No	No	No	No	No	NA	No	Yes
Benzo(a)anthracene	No	Yes	No	No	No	NA	No	Yes
Benzo(a)pyrene	No	No	No	No	No	NA	No	Yes
Benzo(b)fluoranthene	Yes	No	No	No	No	NA	No	Yes
Benzo(b,k)fluoranthene	No	No	No	No	No	NA	No	Yes
Benzo(ghi)perylene	NA	No	Yes	Yes	No	NA	Yes	Yes
Benzo(k)fluoranthene	Yes	No	No	No	No	NA	No	Yes
Beryllium	NA	No	Yes	Yes	No	NA	Yes	Yes
Bromobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Bromodichloromethane	No	No	No	No	No	NA	No	Yes
Bromoethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Bromoform	NA	No	Yes	Yes	No	NA	Yes	Yes
Bromomethane	NA	No	Yes	Yes	No	NA	Yes	Yes
C10-C12 Aliphatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C10-C12 Aromatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C12-C16 Aliphatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C12-C16 Aromatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C16-C21 Aliphatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C16-C21 Aromatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C21-C34 Aliphatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C21-C34 Aromatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
C8-C10 Aliphatic Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	Yes
Cadmium	NA	No	Yes	Yes	No	NA	Yes	Yes
Carbon disulfide	NA	No	Yes	Yes	No	NA	Yes	Yes
Carbon tetrachloride	No	No	No	No	No	NA	No	Yes
Chlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Chlorobromomethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Chloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Chloroform	No	No	No	No	No	NA	No	Yes
Chloromethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Chromium, Hexavalent	No	Yes	No	No	No	NA	No	No
Chromium, Total	NA	Yes	No	No	No	NA	No	No
Chromium, Trivalent	NA	Yes	No	No	No	NA	No	No
Chrysene	No	No	No	No	No	NA	No	Yes
cis-1,2-Dichloroethene	NA	Yes	No	Yes	No	NA	No	No
cis-1,3-Dichloropropene	No	No	No	No	No	NA	No	Yes
Copper	No	Yes	No	No	No	NA	No	No
cPAH TEQ	No	No	No	No	No	NA	No	Yes
Dibenzo(a,h)anthracene	No	No	No	No	No	NA	No	Yes
Dibromochloromethane	No	No	No	No	No	NA	No	Yes
Dibromomethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Dichlorodifluoromethane (Freon 12)	NA	No	No	No	No	NA	No	Yes
Diesel Range Hydrocarbons	NA	Yes	No	No	No	NA	No	No
Ethylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Fluoranthene	NA	No	Yes	Yes	No	NA	Yes	No
Fluorene	NA	No	Yes	Yes	No	NA	Yes	No

Table G2-3
Shallow Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)							
	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?	10. Does data set comply with 3-Part Rule?					11. Is FOD low (Frequency of detection <= 5%)?
			1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[(c)]	3. 95UCL <= PCUL	Does data set comply with 3-part rule?	
Freon 113	NA	No	Yes	Yes	No	NA	Yes	Yes
Gasoline Range Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	No
Hexachlorobutadiene	No	No	No	No	No	NA	No	Yes
Indeno(1,2,3-cd)pyrene	No	No	No	No	No	NA	No	Yes
Isopropylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Lead	NA	Yes	No	No	No	NA	No	No
m,p-Xylene	NA	No	Yes	Yes	No	NA	Yes	Yes
Mercury	Yes	No	No	No	No	NA	No	Yes
Methyl iodide	NA	No	Yes	Yes	No	NA	Yes	Yes
Methyl tert-butyl ether	NA	No	Yes	Yes	No	NA	Yes	Yes
Methylene chloride	No	No	No	No	No	NA	No	Yes
Naphthalene	No	Yes	No	No	No	NA	No	No
n-Butylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
n-Hexane	NA	No	Yes	Yes	No	NA	Yes	Yes
Nickel	NA	Yes	No	No	No	NA	No	No
n-Propylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Oil Range Hydrocarbons	NA	Yes	No	No	No	NA	No	No
o-Xylene	NA	No	Yes	Yes	No	NA	Yes	Yes
Phenanthrene	NA	No	Yes	Yes	No	NA	Yes	No
Pyrene	NA	No	Yes	Yes	No	NA	Yes	Yes
sec-Butylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Selenium	NA	No	No	Yes	No	NA	No	No
Silver	NA	No	Yes	Yes	No	NA	Yes	Yes
Styrene	NA	No	Yes	Yes	No	NA	Yes	Yes
tert-Butylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Tetrachloroethene	No	No	No	No	No	NA	No	Yes
Thallium	No	No	No	No	No	NA	No	Yes
Toluene	NA	No	Yes	Yes	No	NA	Yes	Yes
Total Diesel + Oil	NA	Yes	No	No	No	NA	No	No
Total naphthalenes	NA	Yes	No	Yes	No	NA	No	No
Total PCBs	Yes	No	No	No	No	NA	No	Yes
trans-1,2-Dichloroethene	NA	No	Yes	Yes	No	NA	Yes	Yes
trans-1,3-Dichloropropene	No	No	No	No	No	NA	No	Yes
trans-1,4-Dichloro-2-butene	NA	No	Yes	Yes	No	NA	Yes	Yes
Trichloroethene	No	Yes	No	No	No	NA	No	No
Trichlorofluoromethane (Freon 11)	NA	No	Yes	Yes	No	NA	Yes	Yes
Vinyl Acetate	NA	No	Yes	Yes	No	NA	Yes	Yes
Vinyl chloride	No	Yes	No	No	No	NA	No	Yes
Xylenes, total	NA	No	Yes	Yes	No	NA	Yes	Yes
Zinc	NA	No	Yes	Yes	No	NA	Yes	No
Gasoline Range Hydrocarbons (HCID)	NA	No	Yes	Yes	No	NA	Yes	No
Diesel Range Hydrocarbons (HCID)	NA	No	Yes	Yes	No	NA	Yes	No
Oil Range Hydrocarbons (HCID)	NA	No	Yes	Yes	No	NA	Yes	No

Table G2-3
Shallow Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	COPC Selection (Continued)							
					14. Are there potential hot spots?			
Analyte Name	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)	Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	8. Data Gap 12. COPC 3., 13. Not a COPC
1,1,1,2-Tetrachloroethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,1,1-Trichloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,2,2-Tetrachloroethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,1,2-Trichloroethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,1-Dichloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1-Dichloroethene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1-Dichloropropene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,3-Trichlorobenzene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,3-Trichloropropane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,2,4-Trichlorobenzene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,2,4-Trimethylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dibromo-3-chloropropane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,2-Dibromoethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,2-Dichlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dichloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dichloropropane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,3,5-Trimethylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,3-Dichlorobenzene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,3-Dichloropropane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,4-Dichlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1-Methylnaphthalene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2,2-Dichloropropane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Butanone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Chloroethylvinyl ether	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Chloronaphthalene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Chlorotoluene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Hexanone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Methylnaphthalene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Chlorotoluene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Isopropyltoluene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Methyl-2-pentanone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acenaphthene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acenaphthylene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acetone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acrolein	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Acrylonitrile	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Anthracene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Antimony	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Aroclor 1016	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Aroclor 1221	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Aroclor 1232	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Aroclor 1242	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Aroclor 1248	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Aroclor 1254	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Aroclor 1260	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Arsenic	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC

Table G2-3
Shallow Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	COPC Selection (Continued)							
					14. Are there potential hot spots?			
Analyte Name	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)	Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	8. Data Gap 12. COPC 3., 13. Not a COPC
Benzene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Benzo(a)anthracene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
Benzo(a)pyrene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Benzo(b)fluoranthene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzo(b,k)fluoranthene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Benzo(ghi)perylene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzo(k)fluoranthene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Beryllium	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromodichloromethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Bromoethane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromoform	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromomethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C10-C12 Aliphatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C10-C12 Aromatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C12-C16 Aliphatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C12-C16 Aromatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C16-C21 Aliphatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C16-C21 Aromatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C21-C34 Aliphatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C21-C34 Aromatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
C8-C10 Aliphatic Hydrocarbons	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Cadmium	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Carbon disulfide	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Carbon tetrachloride	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Chlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chlorobromomethane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloroform	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Chloromethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chromium, Hexavalent	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
Chromium, Total	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Chromium, Trivalent	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Chrysene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
cis-1,2-Dichloroethene	Retain	Retain	Retain	COPC	No	NA	NA	COPC
cis-1,3-Dichloropropene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Copper	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
cPAH TEQ	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Not a COPC
Dibenzo(a,h)anthracene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Dibromochloromethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Dibromomethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Dichlorodifluoromethane (Freon 12)	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Diesel Range Hydrocarbons	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Ethylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Fluoranthene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Fluorene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC

Table G2-3
Shallow Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	COPC Selection (Continued)							
					14. Are there potential hot spots?			
Analyte Name	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)	Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	8. Data Gap 12. COPC 3., 13. Not a COPC
Freon 113	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Gasoline Range Hydrocarbons	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Hexachlorobutadiene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Indeno(1,2,3-cd)pyrene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Isopropylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Lead	Retain	Retain	Retain	COPC	No	NA	NA	COPC
m,p-Xylene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Mercury	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Methyl iodide	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Methyl tert-butyl ether	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Methylene chloride	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Naphthalene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
n-Butylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
n-Hexane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Nickel	Retain	Retain	Retain	COPC	No	NA	NA	COPC
n-Propylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Oil Range Hydrocarbons	Retain	Retain	Retain	COPC	No	NA	NA	COPC
o-Xylene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Phenanthrene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Pyrene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
sec-Butylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Selenium	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Silver	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Styrene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
tert-Butylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Tetrachloroethene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Thallium	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Toluene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Total Diesel + Oil	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Total naphthalenes	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Total PCBs	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
trans-1,2-Dichloroethene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
trans-1,3-Dichloropropene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
trans-1,4-Dichloro-2-butene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Trichloroethene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
Trichlorofluoromethane (Freon 11)	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Vinyl Acetate	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Vinyl chloride	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
Xylenes, total	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Zinc	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Gasoline Range Hydrocarbons (HCID)	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Diesel Range Hydrocarbons (HCID)	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Oil Range Hydrocarbons (HCID)	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC

Table G2-3
Shallow Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

NOTES:

Gray highlighting indicates a hand-entered column.

% = percent.

COPC = chemical of potential concern.

cPAH TEQ = carcinogenic PAH toxic equivalency quotient.

FOD = frequency of detection.

HCID = hydrocarbon identification.

NA = not applicable.

No. = number.

PCUL = preliminary cleanup level.

RL = reporting limit.

UCL = upper confidence limit.

[a] If no. 1 is "No," this column displays as "No" rather than "NA" to simplify the COPC selection formulas.

[b] If no. 5 is "No", this column displays as "No" rather than "NA" to simplify the COPC selection formulas.

[c] A UCL is calculated if the chemical has not already been eliminated from consideration as a COPC or a data gap and no. 1 and 2 are both "Yes."

Table G2-4
Deep Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	Calculated Values					COPC Selection		
Analyte Name	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[a]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[b]
1,1,1,2-Tetrachloroethane	0	0	0	0	0	Yes	No	No
1,1,1-Trichloroethane	0	0	0	0	0	Yes	No	No
1,1,2,2-Tetrachloroethane	0	0	89	0	89	Yes	Yes	No
1,1,2-Trichloroethane	0	0	82	0	82	Yes	Yes	No
1,1-Dichloroethane	0	0	0	0	0	Yes	No	No
1,1-Dichloroethene	0	0	0	0	0	Yes	No	No
1,1-Dichloropropene	0	0	0	0	0	No	No	No
1,2,3-Trichlorobenzene	0	0	0	0	0	No	No	No
1,2,3-Trichloropropane	0	0	100	0	100	Yes	Yes	Yes
1,2,4-Trichlorobenzene	0	0	89	0	89	Yes	Yes	Yes
1,2,4-Trimethylbenzene	0	4	0	0	0	Yes	No	No
1,2-Dibromo-3-chloropropane	0	0	100	0	100	Yes	Yes	Yes
1,2-Dibromoethane	0	0	100	0	100	Yes	Yes	Yes
1,2-Dichlorobenzene	0	0	0	0	0	Yes	No	No
1,2-Dichloroethane	0	0	0	0	0	Yes	No	No
1,2-Dichloropropane	0	0	0	0	0	Yes	No	No
1,3,5-Trimethylbenzene	0	4	0	0	0	Yes	No	No
1,3-Dichlorobenzene	0	0	0	0	0	Yes	No	No
1,3-Dichloropropane	0	4	0	0	0	No	No	No
1,4-Dichlorobenzene	0	0	0	0	0	Yes	No	No
1-Methylnaphthalene	0	0	0	0	0	Yes	No	No
2,2-Dichloropropane	0	0	0	0	0	No	No	No
2-Butanone	0	0	0	0	0	Yes	No	No
2-Chloroethylvinyl ether	0	0	0	0	0	No	No	No
2-Chlorotoluene	0	4	0	0	0	Yes	No	No
2-Hexanone	0	0	0	0	0	Yes	No	No
2-Methylnaphthalene	0	17	0	0	0	Yes	No	No
4-Chlorotoluene	0	0	0	0	0	No	No	No
4-Isopropyltoluene	0	0	0	0	0	No	No	No
4-Methyl-2-pentanone	0	0	0	0	0	Yes	No	No
Acenaphthene	0	15	0	0	0	Yes	No	No
Acenaphthylene	0	10	0	0	0	No	No	No
Acetone	0	11	0	0	0	Yes	No	No
Acrolein	0	0	100	0	100	Yes	Yes	Yes
Acrylonitrile	0	0	100	0	100	Yes	Yes	Yes
Anthracene	0	15	0	0	0	Yes	No	No
Antimony	0	0	0	0	0	Yes	No	No
Arsenic	25	82	100	78	82	Yes	Yes	Yes
Benzene	0	0	0	0	0	Yes	No	No
Benzo(a)anthracene	2	10	100	100	100	Yes	Yes	Yes
Benzo(a)pyrene	0	0	100	0	100	Yes	Yes	Yes
Benzo(b)fluoranthene	0	0	100	0	100	Yes	Yes	Yes
Benzo(b,k)fluoranthene	0	0	100	0	100	Yes	Yes	Yes
Benzo(ghi)perylene	0	0	0	0	0	No	No	No
Benzo(k)fluoranthene	0	0	100	0	100	Yes	Yes	Yes
Beryllium	0	0	0	0	0	Yes	No	No

Table G2-4
Deep Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	Calculated Values					COPC Selection		
Analyte Name	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[a]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[b]
Bromobenzene	0	0	0	0	0	Yes	No	No
Bromodichloromethane	0	0	0	0	0	Yes	No	No
Bromoethane	0	0	0	0	0	No	No	No
Bromoform	0	4	0	0	0	Yes	No	No
Bromomethane	0	0	0	0	0	Yes	No	No
Cadmium	0	0	0	0	0	Yes	No	No
Carbon disulfide	0	0	0	0	0	Yes	No	No
Carbon tetrachloride	0	0	89	0	89	Yes	Yes	No
Chlorobenzene	0	0	0	0	0	Yes	No	No
Chlorobromomethane	0	0	0	0	0	No	No	No
Chloroethane	0	0	0	0	0	Yes	No	No
Chloroform	0	7	0	0	0	Yes	No	No
Chloromethane	0	0	0	0	0	Yes	No	No
Chromium, Hexavalent	1	6	0	50	3	Yes	No	No
Chromium, Total	5	58	0	22	13	Yes	No	No
Chromium, Trivalent	5	53	0	28	15	Yes	No	No
Chrysene	0	10	67	0	60	Yes	Yes	No
cis-1,2-Dichloroethene	0	0	0	0	0	Yes	No	No
cis-1,3-Dichloropropene	0	0	82	0	82	Yes	Yes	No
Copper	2	37	83	29	63	Yes	Yes	Yes
cPAH TEQ	2	10	100	100	100	Yes	Yes	Yes
Dibenzo(a,h)anthracene	1	5	100	100	100	Yes	Yes	Yes
Dibromochloromethane	0	0	0	0	0	Yes	No	No
Dibromomethane	0	0	0	0	0	Yes	No	No
Dichlorodifluoromethane (Freon 12)	0	0	0	0	0	Yes	No	No
Diesel Range Hydrocarbons	0	49	0	0	0	Yes	No	No
Ethylbenzene	0	4	0	0	0	Yes	No	No
Fluoranthene	0	20	0	0	0	Yes	No	No
Fluorene	0	5	0	0	0	Yes	No	No
Freon 113	0	0	0	0	0	Yes	No	No
Gasoline Range Hydrocarbons	0	20	0	0	0	Yes	No	No
Hexachlorobutadiene	0	0	100	0	100	Yes	Yes	Yes
Indeno(1,2,3-cd)pyrene	2	10	100	100	100	Yes	Yes	Yes
Isopropylbenzene	0	4	0	0	0	Yes	No	No
Lead	5	41	44	45	44	Yes	Yes	No
m,p-Xylene	0	4	0	0	0	Yes	No	No
Mercury	0	0	100	0	100	Yes	Yes	Yes
Methyl iodide	0	0	0	0	0	No	No	No

Table G2-4
Deep Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	Calculated Values					COPC Selection		
Analyte Name	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[a]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[b]
Methyl tert-butyl ether	0	0	0	0	0	Yes	No	No
Methylene chloride	0	0	0	0	0	Yes	No	No
Naphthalene	0	17	33	0	28	Yes	Yes	No
n-Butylbenzene	0	6	0	0	0	Yes	No	No
n-Hexane	0	0	0	0	0	No	No	No
Nickel	1	50	0	100	50	Yes	No	No
n-Propylbenzene	0	4	0	0	0	Yes	No	No
Oil Range Hydrocarbons	0	6	9	0	9	Yes	No	No
o-Xylene	0	0	0	0	0	Yes	No	No
Phenanthrene	0	15	0	0	0	No	No	No
Pyrene	0	10	0	0	0	Yes	No	No
sec-Butylbenzene	0	0	0	0	0	Yes	No	No
Selenium	0	28	0	0	0	Yes	No	No
Silver	0	0	0	0	0	Yes	No	No
Styrene	0	0	0	0	0	Yes	No	No
tert-Butylbenzene	0	0	0	0	0	Yes	No	No
Tetrachloroethene	0	0	0	0	0	Yes	No	No
Thallium	0	0	100	0	100	Yes	Yes	Yes
Toluene	0	0	0	0	0	Yes	No	No
Total Diesel + Oil	2	49	17	12	14	Yes	Yes	No
Total naphthalenes	0	67	0	0	0	Yes	No	No
trans-1,2-Dichloroethene	0	0	0	0	0	Yes	No	No
trans-1,3-Dichloropropene	0	0	82	0	82	Yes	Yes	No
trans-1,4-Dichloro-2-butene	0	0	0	0	0	No	No	No
Trichloroethene	0	0	64	0	64	Yes	Yes	No
Trichlorofluoromethane (Freon 11)	0	0	0	0	0	Yes	No	No
Vinyl Acetate	0	0	0	0	0	Yes	No	No
Vinyl chloride	0	0	92	0	92	Yes	Yes	Yes
Xylenes, total	0	4	0	0	0	Yes	No	No
Zinc	0	50	0	0	0	Yes	No	No

Table G2-4
Deep Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	COPC Selection (Continued)							
			10. Does data set comply with 3-Part Rule?					
Analyte Name	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?	1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[c]	3. 95UCL <= PCUL	Does data set comply with 3-part rule?	11. Is FOD low (Frequency of detection <= 5%)?
1,1,1,2-Tetrachloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,1,1-Trichloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,1,2,2-Tetrachloroethane	NA	No	No	No	No	NA	No	Yes
1,1,2-Trichloroethane	NA	No	Yes	No	No	NA	No	Yes
1,1-Dichloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,1-Dichloroethene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,1-Dichloropropene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2,3-Trichlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2,3-Trichloropropane	Yes	No	No	No	No	NA	No	Yes
1,2,4-Trichlorobenzene	Yes	No	No	No	No	NA	No	Yes
1,2,4-Trimethylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2-Dibromo-3-chloropropane	No	No	No	No	No	NA	No	Yes
1,2-Dibromoethane	Yes	No	No	No	No	NA	No	Yes
1,2-Dichlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2-Dichloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2-Dichloropropane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,3,5-Trimethylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,3-Dichlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,3-Dichloropropane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,4-Dichlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1-Methylnaphthalene	NA	No	Yes	Yes	No	NA	Yes	Yes
2,2-Dichloropropane	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Butanone	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Chloroethylvinyl ether	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Chlorotoluene	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Hexanone	NA	No	Yes	Yes	No	NA	Yes	Yes
2-Methylnaphthalene	NA	No	Yes	Yes	No	NA	Yes	No
4-Chlorotoluene	NA	No	Yes	Yes	No	NA	Yes	Yes
4-Isopropyltoluene	NA	No	Yes	Yes	No	NA	Yes	Yes
4-Methyl-2-pentanone	NA	No	Yes	Yes	No	NA	Yes	Yes
Acenaphthene	NA	No	Yes	Yes	No	NA	Yes	No
Acenaphthylene	NA	No	Yes	Yes	No	NA	Yes	No
Acetone	NA	No	Yes	Yes	No	NA	Yes	No
Acrolein	Yes	No	No	No	No	NA	No	Yes
Acrylonitrile	Yes	No	No	No	No	NA	No	Yes
Anthracene	NA	No	Yes	Yes	No	NA	Yes	No
Antimony	NA	No	Yes	Yes	No	NA	Yes	Yes
Arsenic	No	Yes	No	No	No	NA	No	No
Benzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Benzo(a)anthracene	Yes	Yes	No	No	No	NA	No	No
Benzo(a)pyrene	Yes	No	No	No	No	NA	No	Yes
Benzo(b)fluoranthene	Yes	No	No	No	No	NA	No	Yes
Benzo(b,k)fluoranthene	Yes	No	No	No	No	NA	No	Yes
Benzo(ghi)perylene	NA	No	Yes	Yes	No	NA	Yes	Yes
Benzo(k)fluoranthene	Yes	No	No	No	No	NA	No	Yes
Beryllium	NA	No	Yes	Yes	No	NA	Yes	Yes

Table G2-4
Deep Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)							
	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?	10. Does data set comply with 3-Part Rule?					11. Is FOD low (Frequency of detection <= 5%)?
			1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[c]	3. 95UCL <= PCUL	Does data set comply with 3-part rule?	
Bromobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Bromodichloromethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Bromoethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Bromoform	NA	No	Yes	Yes	No	NA	Yes	Yes
Bromomethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Cadmium	NA	No	Yes	Yes	No	NA	Yes	Yes
Carbon disulfide	NA	No	Yes	Yes	No	NA	Yes	Yes
Carbon tetrachloride	NA	No	No	No	No	NA	No	Yes
Chlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Chlorobromomethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Chloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Chloroform	NA	No	Yes	Yes	No	NA	Yes	No
Chloromethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Chromium, Hexavalent	NA	Yes	No	Yes	No	NA	No	No
Chromium, Total	NA	Yes	No	No	No	NA	No	No
Chromium, Trivalent	NA	Yes	No	No	No	NA	No	No
Chrysene	NA	No	No	No	No	NA	No	No
cis-1,2-Dichloroethene	NA	No	Yes	Yes	No	NA	Yes	Yes
cis-1,3-Dichloropropene	NA	No	No	No	No	NA	No	Yes
Copper	No	Yes	No	No	No	NA	No	No
cPAH TEQ	Yes	Yes	No	No	No	NA	No	No
Dibenzo(a,h)anthracene	Yes	Yes	No	No	No	NA	No	Yes
Dibromochloromethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Dibromomethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Dichlorodifluoromethane (Freon 12)	NA	No	Yes	Yes	No	NA	Yes	Yes
Diesel Range Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	No
Ethylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Fluoranthene	NA	No	Yes	Yes	No	NA	Yes	No
Fluorene	NA	No	Yes	Yes	No	NA	Yes	Yes
Freon 113	NA	No	Yes	Yes	No	NA	Yes	Yes
Gasoline Range Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	No
Hexachlorobutadiene	Yes	No	No	No	No	NA	No	Yes
Indeno(1,2,3-cd)pyrene	Yes	Yes	No	No	No	NA	No	No
Isopropylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Lead	NA	Yes	No	No	No	NA	No	No
m,p-Xylene	NA	No	Yes	Yes	No	NA	Yes	Yes
Mercury	Yes	No	No	No	No	NA	No	Yes
Methyl iodide	NA	No	Yes	Yes	No	NA	Yes	Yes

Table G2-4
Deep Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)							
	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?	10. Does data set comply with 3-Part Rule?					11. Is FOD low (Frequency of detection <= 5%)?
			1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[(c)]	3. 95UCL <= PCUL	Does data set comply with 3-part rule?	
Methyl tert-butyl ether	NA	No	Yes	Yes	No	NA	Yes	Yes
Methylene chloride	NA	No	Yes	Yes	No	NA	Yes	Yes
Naphthalene	NA	No	No	No	No	NA	No	No
n-Butylbenzene	NA	No	Yes	Yes	No	NA	Yes	No
n-Hexane	NA	No	Yes	Yes	No	NA	Yes	Yes
Nickel	NA	Yes	Yes	No	No	NA	No	No
n-Propylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Oil Range Hydrocarbons	NA	No	Yes	Yes	No	NA	Yes	No
o-Xylene	NA	No	Yes	Yes	No	NA	Yes	Yes
Phenanthrene	NA	No	Yes	Yes	No	NA	Yes	No
Pyrene	NA	No	Yes	Yes	No	NA	Yes	No
sec-Butylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Selenium	NA	No	Yes	Yes	No	NA	Yes	No
Silver	NA	No	Yes	Yes	No	NA	Yes	Yes
Styrene	NA	No	Yes	Yes	No	NA	Yes	Yes
tert-Butylbenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Tetrachloroethene	NA	No	Yes	Yes	No	NA	Yes	Yes
Thallium	No	No	No	No	No	NA	No	Yes
Toluene	NA	No	Yes	Yes	No	NA	Yes	Yes
Total Diesel + Oil	NA	Yes	Yes	No	No	NA	No	No
Total naphthalenes	NA	No	Yes	Yes	No	NA	Yes	No
trans-1,2-Dichloroethene	NA	No	Yes	Yes	No	NA	Yes	Yes
trans-1,3-Dichloropropene	NA	No	No	No	No	NA	No	Yes
trans-1,4-Dichloro-2-butene	NA	No	Yes	Yes	No	NA	Yes	Yes
Trichloroethene	NA	No	Yes	No	No	NA	No	Yes
Trichlorofluoromethane (Freon 11)	NA	No	Yes	Yes	No	NA	Yes	Yes
Vinyl Acetate	NA	No	Yes	Yes	No	NA	Yes	Yes
Vinyl chloride	Yes	No	No	No	No	NA	No	Yes
Xylenes, total	NA	No	Yes	Yes	No	NA	Yes	Yes
Zinc	NA	No	Yes	Yes	No	NA	Yes	No

Table G2-4
Deep Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	COPC Selection (Continued)				COPC Selection (Continued)			
					14. Are there potential hot spots?			8. Data Gap 12. COPC 3., 13. Not a COPC
Analyte Name	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)	Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	
1,1,1,2-Tetrachloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,1-Trichloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,2,2-Tetrachloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,2-Trichloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1-Dichloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1-Dichloroethene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1-Dichloropropene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,3-Trichlorobenzene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,3-Trichloropropane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,4-Trichlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,4-Trimethylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dibromo-3-chloropropane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,2-Dibromoethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dichlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dichloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dichloropropane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,3,5-Trimethylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,3-Dichlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,3-Dichloropropane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,4-Dichlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1-Methylnaphthalene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2,2-Dichloropropane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Butanone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Chloroethylvinyl ether	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Chlorotoluene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Hexanone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Methylnaphthalene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Chlorotoluene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Isopropyltoluene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Methyl-2-pentanone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acenaphthene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acenaphthylene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acetone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acrolein	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acrylonitrile	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Anthracene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Antimony	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Arsenic	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
Benzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzo(a)anthracene	Retain	Retain	Retain	COPC	No	NA	NA	Not a COPC
Benzo(a)pyrene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzo(b)fluoranthene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzo(b,k)fluoranthene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzo(ghi)perylene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzo(k)fluoranthene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Beryllium	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC

Table G2-4
Deep Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	COPC Selection (Continued)				COPC Selection (Continued)			
					14. Are there potential hot spots?			
Analyte Name	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)	Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	8. Data Gap 12. COPC 3., 13. Not a COPC
Bromobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromodichloromethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromoethane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromoform	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromomethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Cadmium	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Carbon disulfide	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Carbon tetrachloride	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chlorobromomethane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloroform	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloromethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chromium, Hexavalent	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Chromium, Total	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Chromium, Trivalent	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Chrysene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
cis-1,2-Dichloroethene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
cis-1,3-Dichloropropene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Copper	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	COPC
cPAH TEQ	Retain	Retain	Retain	COPC	No	NA	NA	Not a COPC
Dibenzo(a,h)anthracene	Retain	Retain	Retain	Retain	Yes	No	Only one detection, in MW7 in 2006. Non-detect in recent monitoring data. Based on last four quarters of results, not a COPC based on max detected does not exceed PCUL; therefore, no hot spot evaluation needed.	Not a COPC
Dibromochloromethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Dibromomethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Dichlorodifluoromethane (Freon 12)	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Diesel Range Hydrocarbons	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Ethylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Fluoranthene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Fluorene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Freon 113	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Gasoline Range Hydrocarbons	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Hexachlorobutadiene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Indeno(1,2,3-cd)pyrene	Retain	Retain	Retain	COPC	No	NA	NA	Not a COPC
Isopropylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Lead	Retain	Retain	Retain	COPC	No	NA	NA	Not a COPC
m,p-Xylene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Mercury	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Methyl iodide	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC

Table G2-4
Deep Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	COPC Selection (Continued)				COPC Selection (Continued)			
					14. Are there potential hot spots?			
Analyte Name	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)	Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	8. Data Gap 12. COPC 3., 13. Not a COPC
Methyl tert-butyl ether	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Methylene chloride	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Naphthalene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
n-Butylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
n-Hexane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Nickel	Retain	Retain	Retain	COPC	No	NA	NA	COPC
n-Propylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Oil Range Hydrocarbons	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
o-Xylene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Phenanthrene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Pyrene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
sec-Butylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Selenium	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Silver	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Styrene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
tert-Butylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Tetrachloroethene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Thallium	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Toluene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Total Diesel + Oil	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Total naphthalenes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
trans-1,2-Dichloroethene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
trans-1,3-Dichloropropene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
trans-1,4-Dichloro-2-butene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Trichloroethene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Trichlorofluoromethane (Freon 11)	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Vinyl Acetate	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Vinyl chloride	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Xylenes, total	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Zinc	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC

Table G2-4
Deep Groundwater COPC Selection
Precision Engineering, Inc.
Seattle, Washington

NOTES:

Gray highlighting indicates a hand-entered column.

% = percent.

COPC = chemical of potential concern.

cPAH TEQ = carcinogenic PAH toxic equivalency quotient.

FOD = frequency of detection.

NA = not applicable.

No. = number.

PCUL = preliminary cleanup level.

RL = reporting limit.

UCL = upper confidence limit.

[(a)]If no. 1 is "No," this column displays as "No" rather than "NA" to simplify the COPC selection formulas.

[(b)]If no. 5 is "No", this column displays as "No" rather than "NA" to simplify the COPC selection formulas.

[(c)]A UCL is calculated if the chemical has not already been eliminated from consideration as a COPC or a data gap and no. 1 and 2 are both "Yes."

Table G2-5
Soil Gas COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	Calculated Values					COPC Selection		
Analyte Name	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?
1,1,1,2-Tetrachloroethane	0	0	0	0	0	Yes	No	No
1,1,1-Trichloroethane	0	100	0	0	0	Yes	Yes	No
1,1,2,2-Tetrachloroethane	0	0	100	0	100	Yes	Yes	No
1,1,2-Trichloroethane	0	0	0	0	0	Yes	No	No
1,1-Dichloroethane	0	20	0	0	0	Yes	No	No
1,1-Dichloroethene	0	0	0	0	0	Yes	No	No
1,2,4-Trichlorobenzene	0	0	0	0	0	Yes	No	No
1,2,4-Trimethylbenzene	0	100	0	0	0	Yes	Yes	No
1,2-Dibromoethane	0	0	100	0	100	Yes	Yes	Yes
1,2-Dichlorobenzene	0	0	0	0	0	Yes	No	No
1,2-Dichloroethane	0	0	0	0	0	Yes	No	No
1,2-Dichloropropane	0	0	0	0	0	Yes	No	No
1,3,5-Trimethylbenzene	0	0	0	0	0	No	No	No
1,3-Dichlorobenzene	0	0	0	0	0	No	No	No
1,4-Dichlorobenzene	0	0	0	0	0	Yes	No	No
2-Butanone	0	100	0	0	0	Yes	Yes	No
2-Hexanone	0	0	0	0	0	No	No	No
4-Ethyltoluene	0	0	0	0	0	No	No	No
4-Methyl-2-pentanone	0	100	0	0	0	Yes	Yes	No
Acetone	0	100	0	0	0	No	Yes	No
Benzene	0	100	0	0	0	Yes	Yes	No
Bromodichloromethane	0	0	100	0	100	Yes	Yes	No
Bromoform	0	0	0	0	0	Yes	No	No
Bromomethane	0	0	0	0	0	Yes	No	No
Butane	0	67	0	0	0	No	No	No
Carbon disulfide	0	100	0	0	0	Yes	Yes	No
Carbon tetrachloride	0	0	0	0	0	Yes	No	No
Chlorobenzene	0	0	0	0	0	Yes	No	No
Chloroethane	0	0	0	0	0	Yes	No	No
Chloroform	0	0	0	0	0	Yes	No	No
Chloromethane	0	0	0	0	0	Yes	No	No
cis-1,2-Dichloroethene	0	36	0	0	0	No	No	No
cis-1,3-Dichloropropene	0	0	0	0	0	No	No	No
Dibromochloromethane	0	0	0	0	0	No	No	No
Dichlorodifluoromethane (Freon 12)	0	0	0	0	0	Yes	No	No
Ethylbenzene	0	100	0	0	0	Yes	Yes	No
Freon 113	0	0	0	0	0	Yes	No	No
Freon 114	0	0	0	0	0	No	No	No
Hexachlorobutadiene	0	0	100	0	100	Yes	Yes	No
Isobutane	0	83	0	0	0	No	No	No
m,p-Xylene	0	100	0	0	0	Yes	Yes	No
Methylene chloride	0	0	0	0	0	Yes	No	No
o-Xylene	0	100	0	0	0	Yes	Yes	No
Styrene	0	100	0	0	0	Yes	Yes	No
Tetrachloroethene	0	100	0	0	0	Yes	Yes	No
Toluene	0	100	0	0	0	Yes	Yes	No
trans-1,2-Dichloroethene	0	0	0	0	0	No	No	No
trans-1,3-Dichloropropene	0	0	0	0	0	No	No	No
Trichloroethene	7	64	0	100	64	Yes	No	No
Trichlorofluoromethane (Freon 11)	0	0	0	0	0	Yes	No	No
Vinyl chloride	1	9	10	100	18	Yes	No	No
Xylenes, total	0	100	0	0	0	Yes	Yes	No

Table G2-5
Soil Gas COPC Selection
Precision Engineering, Inc.
Seattle, Washington

	COPC Selection (Continued)						
			10. Does data set comply with 3-Part Rule?				
Analyte Name	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?	1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?	3. 95UCL <= PCUL	Does data set comply with 3-part rule?
1,1,1,2-Tetrachloroethane	NA	No	Yes	Yes	No	NA	Yes
1,1,1-Trichloroethane	NA	No	Yes	Yes	No	NA	Yes
1,1,2,2-Tetrachloroethane	NA	No	Yes	No	No	NA	No
1,1,2-Trichloroethane	NA	No	Yes	Yes	No	NA	Yes
1,1-Dichloroethane	NA	No	Yes	Yes	No	NA	Yes
1,1-Dichloroethene	NA	No	Yes	Yes	No	NA	Yes
1,2,4-Trichlorobenzene	NA	No	Yes	Yes	No	NA	Yes
1,2,4-Trimethylbenzene	NA	No	Yes	Yes	No	NA	Yes
1,2-Dibromoethane	No	No	No	No	No	NA	No
1,2-Dichlorobenzene	NA	No	Yes	Yes	No	NA	Yes
1,2-Dichloroethane	NA	No	Yes	Yes	No	NA	Yes
1,2-Dichloropropane	NA	No	Yes	Yes	No	NA	Yes
1,3,5-Trimethylbenzene	NA	No	Yes	Yes	No	NA	Yes
1,3-Dichlorobenzene	NA	No	Yes	Yes	No	NA	Yes
1,4-Dichlorobenzene	NA	No	Yes	Yes	No	NA	Yes
2-Butanone	NA	No	Yes	Yes	No	NA	Yes
2-Hexanone	NA	No	Yes	Yes	No	NA	Yes
4-Ethyltoluene	NA	No	Yes	Yes	No	NA	Yes
4-Methyl-2-pentanone	NA	No	Yes	Yes	No	NA	Yes
Acetone	NA	No	Yes	Yes	No	NA	Yes
Benzene	NA	No	Yes	Yes	No	NA	Yes
Bromodichloromethane	NA	No	Yes	No	No	NA	No
Bromoform	NA	No	Yes	Yes	No	NA	Yes
Bromomethane	NA	No	Yes	Yes	No	NA	Yes
Butane	NA	No	Yes	Yes	No	NA	Yes
Carbon disulfide	NA	No	Yes	Yes	No	NA	Yes
Carbon tetrachloride	NA	No	Yes	Yes	No	NA	Yes
Chlorobenzene	NA	No	Yes	Yes	No	NA	Yes
Chloroethane	NA	No	Yes	Yes	No	NA	Yes
Chloroform	NA	No	Yes	Yes	No	NA	Yes
Chloromethane	NA	No	Yes	Yes	No	NA	Yes
cis-1,2-Dichloroethene	NA	No	Yes	Yes	No	NA	Yes
cis-1,3-Dichloropropene	NA	No	Yes	Yes	No	NA	Yes
Dibromochloromethane	NA	No	Yes	Yes	No	NA	Yes
Dichlorodifluoromethane (Freon 12)	NA	No	Yes	Yes	No	NA	Yes
Ethylbenzene	NA	No	Yes	Yes	No	NA	Yes
Freon 113	NA	No	Yes	Yes	No	NA	Yes
Freon 114	NA	No	Yes	Yes	No	NA	Yes
Hexachlorobutadiene	NA	No	No	No	No	NA	No
Isobutane	NA	No	Yes	Yes	No	NA	Yes
m,p-Xylene	NA	No	Yes	Yes	No	NA	Yes
Methylene chloride	NA	No	Yes	Yes	No	NA	Yes
o-Xylene	NA	No	Yes	Yes	No	NA	Yes
Styrene	NA	No	Yes	Yes	No	NA	Yes
Tetrachloroethene	NA	No	Yes	Yes	No	NA	Yes
Toluene	NA	No	Yes	Yes	No	NA	Yes
trans-1,2-Dichloroethene	NA	No	Yes	Yes	No	NA	Yes
trans-1,3-Dichloropropene	NA	No	Yes	Yes	No	NA	Yes
Trichloroethene	NA	Yes	No	No	No	NA	No
Trichlorofluoromethane (Freon 11)	NA	No	Yes	Yes	No	NA	Yes
Vinyl chloride	NA	Yes	No	No	No	NA	No
Xylenes, total	NA	No	Yes	Yes	No	NA	Yes

Table G2-5
Soil Gas COPC Selection
Precision Engineering, Inc.
Seattle, Washington

		COPC Selection (Continued)							
						14. Are there potential hot spots?			
Analyte Name	11. Is FOD low (Frequency of detection <= 5%)?	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)	Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	8. Data Gap 12. COPC 3., 13. Not a COPC
1,1,1,2-Tetrachloroethane	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,1-Trichloroethane	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,2,2-Tetrachloroethane	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,2-Trichloroethane	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1-Dichloroethane	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1-Dichloroethene	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,4-Trichlorobenzene	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,4-Trimethylbenzene	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dibromoethane	Yes	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,2-Dichlorobenzene	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dichloroethane	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dichloropropane	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,3,5-Trimethylbenzene	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,3-Dichlorobenzene	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,4-Dichlorobenzene	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Butanone	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Hexanone	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Ethyltoluene	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Methyl-2-pentanone	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acetone	No	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzene	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromodichloromethane	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromoform	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromomethane	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Butane	No	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Carbon disulfide	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Carbon tetrachloride	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chlorobenzene	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloroethane	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloroform	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloromethane	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
cis-1,2-Dichloroethene	No	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
cis-1,3-Dichloropropene	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Dibromochloromethane	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Dichlorodifluoromethane (Freon 12)	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Ethylbenzene	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Freon 113	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Freon 114	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Hexachlorobutadiene	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Isobutane	No	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
m,p-Xylene	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Methylene chloride	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
o-Xylene	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Styrene	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Tetrachloroethene	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Toluene	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
trans-1,2-Dichloroethene	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
trans-1,3-Dichloropropene	Yes	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Trichloroethene	No	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Trichlorofluoromethane (Freon 11)	Yes	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Vinyl chloride	No	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Xylenes, total	No	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC

Table G2-5
Soil Gas COPC Selection
Precision Engineering, Inc.
Seattle, Washington

NOTES:

% = percent.

COPC = chemical of potential concern.

cPAH TEQ = carcinogenic PAH toxic equivalency quotient.

FOD = frequency of detection.

HCID = hydrocarbon identification.

HPAHs = high molecular weight PAHs.

LPAHs = low molecular weight PAHs.

NA = not applicable.

MTCA = Model Toxics Control Act.

No. = number.

PAHs = polycyclic aromatic hydrocarbons.

PCUL = preliminary cleanup level.

RL = reporting limit.

UCL = upper confidence limit.

[a]If no. 1 is "No," this column displays as "No" rather than "NA" to simplify the COPC selection formulas.

[b]If no. 5 is "No", this column displays as "No" rather than "NA" to simplify the COPC selection formulas.

[c]A UCL is calculated if the chemical has not already been eliminated from consideration as a COPC or a data gap and no. 1 and 2 are both "Yes."

Table G2-6
Air COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	Calculated Values					COPC Selection		
	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[a]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[b]
1,1,1,2-Tetrachloroethane	0	0	100	0	100	Yes	Yes	No
1,1,1-Trichloroethane	0	0	0	0	0	Yes	No	No
1,1,2,2-Tetrachloroethane	0	0	100	0	100	Yes	Yes	Yes
1,1,2-Trichloroethane	0	0	100	0	100	Yes	Yes	Yes
1,1-Dichloroethane	0	0	0	0	0	Yes	No	No
1,1-Dichloroethene	0	0	0	0	0	Yes	No	No
1,2,4-Trichlorobenzene	0	0	100	0	100	Yes	Yes	No
1,2,4-Trimethylbenzene	0	50	0	0	0	Yes	No	No
1,2-Dibromoethane	0	0	100	0	100	Yes	Yes	Yes
1,2-Dichlorobenzene	0	0	0	0	0	Yes	No	No
1,2-Dichloroethane	1	87	100	8	20	Yes	Yes	No
1,2-Dichloropropane	0	0	0	0	0	Yes	No	No
1,3,5-Trimethylbenzene	0	50	0	0	0	Yes	No	No
1,3-Dichlorobenzene	0	0	0	0	0	No	No	No
1,4-Dichlorobenzene	0	0	100	0	100	Yes	Yes	No
2-Butanone	0	100	0	0	0	Yes	Yes	No
2-Hexanone	0	0	0	0	0	Yes	No	No
4-Ethyltoluene	0	50	0	0	0	No	No	No
4-Methyl-2-pentanone	0	50	0	0	0	Yes	No	No
Acetone	0	100	0	0	0	Yes	Yes	No
Benzene	2	100	0	100	100	Yes	Yes	No
Bromodichloromethane	0	0	100	0	100	Yes	Yes	Yes
Bromoform	0	0	0	0	0	Yes	No	No
Bromomethane	0	50	0	0	0	Yes	No	No
Carbon disulfide	0	50	0	0	0	Yes	No	No
Carbon tetrachloride	1	100	0	50	50	Yes	Yes	No
Chlorobenzene	0	0	0	0	0	Yes	No	No
Chloroethane	0	0	0	0	0	Yes	No	No
Chloroform	0	0	100	0	100	Yes	Yes	No
Chloromethane	0	100	0	0	0	Yes	Yes	No
cis-1,2-Dichloroethene	0	0	0	0	0	No	No	No
cis-1,3-Dichloropropene	0	0	0	0	0	No	No	No
Dibromochloromethane	0	0	0	0	0	No	No	No
Dichlorodifluoromethane (Freon 12)	0	100	0	0	0	Yes	Yes	No
Ethylbenzene	0	50	0	0	0	Yes	No	No
Freon 113	0	0	0	0	0	Yes	No	No
Freon 114	0	0	0	0	0	No	No	No
Hexachlorobutadiene	0	0	100	0	100	Yes	Yes	Yes
m,p-Xylene	0	100	0	0	0	Yes	Yes	No
Methylene chloride	0	50	0	0	0	Yes	No	No
o-Xylene	0	50	0	0	0	Yes	No	No
Styrene	0	50	0	0	0	Yes	No	No
Tetrachloroethene	0	50	0	0	0	Yes	No	No
Toluene	0	100	0	0	0	Yes	Yes	No
trans-1,2-Dichloroethene	0	0	0	0	0	No	No	No
trans-1,3-Dichloropropene	0	0	0	0	0	No	No	No
Trichloroethene	27	80	0	77	61	Yes	No	No

Table G2-6
Air COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	Calculated Values					COPC Selection		
	No. Detect Exceedances	Detection Frequency (%)	RL Exceedance Frequency (%)	Detections Exceedance Frequency (%)	Exceedance Frequency (Total) (%)	1. Is there a PCUL?	5. Do many RLs exceed PCUL? (Frequency of exceedance for RLs > 10%)?[a]	6. Do RLs exceed PCUL by much (Maximum exceedance ratio for RLs >5)?[b]
Trichlorofluoromethane (Freon 11)	0	100	0	0	0	Yes	Yes	No
Vinyl chloride	0	4	5	0	4	Yes	No	No
Xylenes, total	0	100	0	0	0	Yes	Yes	No

Table G2-6
Air COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)							
	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?	10. Does data set comply with 3-Part Rule?					11. Is FOD low (Frequency of detection <= 5%)?
			1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[c]	3. 95UCL <= PCUL	Does data set comply with 3-part rule?	
1,1,1,2-Tetrachloroethane	NA	No	No	No	No	NA	No	Yes
1,1,1-Trichloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,1,2,2-Tetrachloroethane	Yes	No	No	No	No	NA	No	Yes
1,1,2-Trichloroethane	No	No	No	No	No	NA	No	Yes
1,1-Dichloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,1-Dichloroethene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2,4-Trichlorobenzene	NA	No	No	No	No	NA	No	Yes
1,2,4-Trimethylbenzene	NA	No	Yes	Yes	No	NA	Yes	No
1,2-Dibromoethane	No	No	No	No	No	NA	No	Yes
1,2-Dichlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,2-Dichloroethane	NA	Yes	No	No	No	NA	No	No
1,2-Dichloropropane	NA	No	Yes	Yes	No	NA	Yes	Yes
1,3,5-Trimethylbenzene	NA	No	Yes	Yes	No	NA	Yes	No
1,3-Dichlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
1,4-Dichlorobenzene	NA	No	No	No	No	NA	No	Yes
2-Butanone	NA	No	Yes	Yes	No	NA	Yes	No
2-Hexanone	NA	No	Yes	Yes	No	NA	Yes	Yes
4-Ethyltoluene	NA	No	Yes	Yes	No	NA	Yes	No
4-Methyl-2-pentanone	NA	No	Yes	Yes	No	NA	Yes	No
Acetone	NA	No	Yes	Yes	No	NA	Yes	No
Benzene	NA	Yes	No	No	No	NA	No	No
Bromodichloromethane	No	No	No	No	No	NA	No	Yes
Bromoform	NA	No	Yes	Yes	No	NA	Yes	Yes
Bromomethane	NA	No	Yes	Yes	No	NA	Yes	No
Carbon disulfide	NA	No	Yes	Yes	No	NA	Yes	No
Carbon tetrachloride	NA	Yes	Yes	No	No	NA	No	No
Chlorobenzene	NA	No	Yes	Yes	No	NA	Yes	Yes
Chloroethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Chloroform	NA	No	No	No	No	NA	No	Yes
Chloromethane	NA	No	Yes	Yes	No	NA	Yes	No
cis-1,2-Dichloroethene	NA	No	Yes	Yes	No	NA	Yes	Yes
cis-1,3-Dichloropropene	NA	No	Yes	Yes	No	NA	Yes	Yes
Dibromochloromethane	NA	No	Yes	Yes	No	NA	Yes	Yes
Dichlorodifluoromethane (Freon 12)	NA	No	Yes	Yes	No	NA	Yes	No
Ethylbenzene	NA	No	Yes	Yes	No	NA	Yes	No
Freon 113	NA	No	Yes	Yes	No	NA	Yes	Yes
Freon 114	NA	No	Yes	Yes	No	NA	Yes	Yes
Hexachlorobutadiene	No	No	No	No	No	NA	No	Yes
m,p-Xylene	NA	No	Yes	Yes	No	NA	Yes	No
Methylene chloride	NA	No	Yes	Yes	No	NA	Yes	No
o-Xylene	NA	No	Yes	Yes	No	NA	Yes	No
Styrene	NA	No	Yes	Yes	No	NA	Yes	No
Tetrachloroethene	NA	No	Yes	Yes	No	NA	Yes	No
Toluene	NA	No	Yes	Yes	No	NA	Yes	No
trans-1,2-Dichloroethene	NA	No	Yes	Yes	No	NA	Yes	Yes
trans-1,3-Dichloropropene	NA	No	Yes	Yes	No	NA	Yes	Yes
Trichloroethene	NA	Yes	No	No	No	NA	No	No

Table G2-6
Air COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)							
	7. Are the RLs as good as we can get (Maximum RL <= 5 times achievable RL)?	9. Maximum detected concentration > PCUL?	10. Does data set comply with 3-Part Rule?					11. Is FOD low (Frequency of detection <= 5%)?
			1. Maximum concentration </= 2xPCUL?	2. Not more than 10% of results > PCUL?	Need to calculate a 95UCL?[c]	3. 95UCL <= PCUL	Does data set comply with 3-part rule?	
Trichlorofluoromethane (Freon 11)	NA	No	Yes	Yes	No	NA	Yes	No
Vinyl chloride	NA	No	Yes	Yes	No	NA	Yes	Yes
Xylenes, total	NA	No	Yes	Yes	No	NA	Yes	No

Table G2-6
Air COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)							
	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)	14. Are there potential hot spots?			8. Data Gap 12. COPC 3., 13. Not a COPC
					Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	
1,1,1,2-Tetrachloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,1-Trichloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,2,2-Tetrachloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1,2-Trichloroethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,1-Dichloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,1-Dichloroethene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,4-Trichlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2,4-Trimethylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dibromoethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
1,2-Dichlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,2-Dichloroethane	Retain	Retain	Retain	COPC	No	NA	NA	COPC
1,2-Dichloropropane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,3,5-Trimethylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,3-Dichlorobenzene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
1,4-Dichlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Butanone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
2-Hexanone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Ethyltoluene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
4-Methyl-2-pentanone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Acetone	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Benzene	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Bromodichloromethane	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
Bromoform	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Bromomethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Carbon disulfide	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Carbon tetrachloride	Retain	Retain	Retain	COPC	No	NA	NA	COPC
Chlorobenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloroethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloroform	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Chloromethane	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
cis-1,2-Dichloroethene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
cis-1,3-Dichloropropene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Dibromochloromethane	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Dichlorodifluoromethane (Freon 12)	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Ethylbenzene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Freon 113	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Freon 114	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Hexachlorobutadiene	Retain	Data Gap	Data Gap	Data Gap	No	NA	NA	Data Gap
m,p-Xylene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Methylene chloride	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
o-Xylene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Styrene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Tetrachloroethene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Toluene	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
trans-1,2-Dichloroethene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
trans-1,3-Dichloropropene	Not a COPC	Not a COPC	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Trichloroethene	Retain	Retain	Retain	COPC	No	NA	NA	COPC

Table G2-6
Air COPC Selection
Precision Engineering, Inc.
Seattle, Washington

Analyte Name	COPC Selection (Continued)							
	3. Not a COPC (Preliminary, see note)	8. Data Gap	13. Not a COPC	12. COPC (Preliminary, see notes)	14. Are there potential hot spots?			8. Data Gap 12. COPC 3., 13. Not a COPC
					Conduct potential hot spot analysis?	Are there potential hot spots?	Hot spot comments	
Trichlorofluoromethane (Freon 11)	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Vinyl chloride	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC
Xylenes, total	Retain	Retain	Not a COPC	Not a COPC	No	NA	NA	Not a COPC

Table G2-6
Air COPC Selection
Precision Engineering, Inc.
Seattle, Washington

NOTES:

% = percent.

COPC = chemical of potential concern.

cPAH TEQ = carcinogenic PAH toxic equivalency quotient.

FOD = frequency of detection.

NA = not applicable.

MTCA = Model Toxics Control Act.

No. = number.

PCUL = preliminary cleanup level.

RL = reporting limit.

UCL = upper confidence limit.

[(a)]If no. 1 is "No," this column displays as "No" rather than "NA" to simplify the COPC selection formulas.

[(b)]If no. 5 is "No", this column displays as "No" rather than "NA" to simplify the COPC selection formulas.

[(c)]A UCL is calculated if the chemical has not already been eliminated from consideration as a COPC or a data gap and no. 1 and 2 are both "Yes."

STATISTICAL ANALYSIS

PROJECT NO. 1803.01.04 | MARCH 18, 2021 | DICK MORGAN

Maul Foster & Alongi, Inc. calculated upper confidence limit (UCL) values for select chemicals for the Precision Engineering, Inc. site (Site) in Seattle, Washington. UCLs were calculated for use in the preliminary chemical of potential concern (COPC) selection process in the remedial investigation (RI) work plan for comparison with preliminary cleanup levels (PCULs). The UCL calculation process described in this memorandum was conducted in accordance with Washington State Department of Ecology (Ecology) draft ProUCL guidelines.[1]

COPC SELECTION

To assess if a chemical should be considered a preliminary COPC, step 10 of the COPC flowchart (included as Appendix G-1) requires evaluating the three-part rule. A chemical is not a preliminary COPC if it meets the three-part rule criteria below:

- The maximum concentration is less than or equal to two times the PCUL
- Not more than 10 percent of results exceed the PCUL
- The 95 UCL is less than or equal to the PCUL

An initial COPC selection evaluation was performed on historical data in all media to identify locations where maximum detected concentrations or 95 UCLs were needed to determine compliance with PCULs. Based on the initial COPC selection process, the following chemicals/media required further evaluation:

- Arsenic in saturated soil
- Total naphthalenes in vadose soil

The sample size for total naphthalenes in vadose soil was insufficient for a 95 UCL calculation; therefore, the maximum detected value was used for comparison to the PCUL. The 95 UCL for arsenic in saturated soil was calculated consistent with Ecology guidance, as described in the next section.

UPPER CONFIDENCE LIMIT CALCULATION

A 95 UCL was calculated for arsenic in saturated soil using the U.S. Environmental Protection Agency's ProUCL program, in accordance with Ecology's ProUCL guidelines. Full method detection limits were used in ProUCL calculations in all cases where concentrations were below detection limits. A goodness-of-fit test was performed using ProUCL to determine whether the dataset fit a normal, gamma, lognormal, or nonparametric distribution. The dataset fit a normal distribution (see ProUCL goodness-of-fit outputs, attached). Using Ecology guidance, the 95% Kaplan-Meier t(UCL) of 4.97 milligrams per kilogram (mg/kg) was selected as the 95 UCL for arsenic in saturated soil at the Site (see ProUCL UCL statistics outputs, attached). The 95 UCL is below the arsenic saturated soil PCUL

[1] Ecology. 2017. ProUCL draft guidelines. Washington State Department of Ecology, Olympia, Washington. January 17.

of 7.3 mg/kg. Please note that the 95 UCL presented here is subject to change with the collection of additional data during the RI or if additional guidance is received from Ecology.

Attachment: ProUCL Outputs

Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.12/11/2021 1:55:15 PM
From File	Input_Saturated Soil Arsenic.xls
Full Precision	OFF
Confidence Coefficient	0.95

As

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	35	0	35	18	17	48.57%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	17	4.99	8	5.999	6	1.001
Statistics (Non-Detects Only)	18	2.1	10	5.022	5.25	2.222
Statistics (All: NDs treated as DL value)	35	2.1	10	5.497	5.6	1.785
Statistics (All: NDs treated as DL/2 value)	35	2.1	10	4.04	3.5	1.907
Statistics (Normal ROS Imputed Data)	35	1.474	10	4.332	4.064	1.905
Statistics (Gamma ROS Imputed Data)	35	1.928	10	4.286	3.825	1.871
Statistics (Lognormal ROS Imputed Data)	35	2.1	10	4.264	3.711	1.855

	K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV
Statistics (Non-Detects Only)	5.251	4.413	0.956	1.516	0.467	0.308
Statistics (NDs = DL)	8.4	7.699	0.654	1.643	0.374	0.227
Statistics (NDs = DL/2)	5.754	5.28	0.702	1.307	0.411	0.315
Statistics (Gamma ROS Estimates)	6.06	5.56	0.707	1.371	0.413	0.302
Statistics (Lognormal ROS Estimates)	--	--	--	1.368	0.402	0.294

Normal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.971	0.977	0.907	0.968

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.938	0.897	Data Appear Normal
Shapiro-Wilk (NDs = DL)	0.954	0.934	Data Appear Normal
Shapiro-Wilk (NDs = DL/2)	0.823	0.934	Data Not Normal
Shapiro-Wilk (Normal ROS Estimates)	0.938	0.934	Data Appear Normal
Lilliefors (Detects Only)	0.14	0.202	Data Appear Normal
Lilliefors (NDs = DL)	0.148	0.148	Data Not Normal
Lilliefors (NDs = DL/2)	0.24	0.148	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.0977	0.148	Data Appear Normal

Gamma GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.983	0.967	0.964	0.989

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.442	0.743	
Kolmogorov-Smirnov (Detects Only)	0.155	0.204	Detected Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	1.167	0.749	
Kolmogorov-Smirnov (NDs = DL)	0.194	0.149	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	1.584	0.75	

56	Kolmogorov-Smirnov (NDs = DL/2)				0.206	0.149	Data Not Gamma Distributed					
57	Anderson-Darling (Gamma ROS Estimates)				0.37	0.749						
58	Kolmogorov-Smirnov (Gamma ROS Est.)				0.103	0.149	Data Appear Gamma Distributed					
59												
60	**Lognormal GOF Test Results**											
61												
62					No NDs	NDs = DL	NDs = DL/2	Log ROS				
63	Correlation Coefficient R				0.976	0.949	0.955	0.987				
64												
65					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)					
66	Shapiro-Wilk (Detects Only)				0.942	0.897	Data Appear Lognormal					
67	Shapiro-Wilk (NDs = DL)				0.898	0.934	Data Not Lognormal					
68	Shapiro-Wilk (NDs = DL/2)				0.901	0.934	Data Not Lognormal					
69	Shapiro-Wilk (Lognormal ROS Estimates)				0.963	0.934	Data Appear Lognormal					
70	Lilliefors (Detects Only)				0.171	0.202	Data Appear Lognormal					
71	Lilliefors (NDs = DL)				0.221	0.148	Data Not Lognormal					
72	Lilliefors (NDs = DL/2)				0.181	0.148	Data Not Lognormal					
73	Lilliefors (Lognormal ROS Estimates)				0.0971	0.148	Data Appear Lognormal					
74												
75	**Note: Substitution methods such as DL or DL/2 are not recommended.**											

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.19/28/2020 1:32:20 PM
From File	Input_Saturated Soil Arsenic.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

As

General Statistics

Total Number of Observations	35	Number of Distinct Observations	19
Number of Detects	18	Number of Non-Detects	17
Number of Distinct Detects	16	Number of Distinct Non-Detects	5
Minimum Detect	2.1	Minimum Non-Detect	4.99
Maximum Detect	10	Maximum Non-Detect	8
Variance Detects	4.936	Percent Non-Detects	48.57%
Mean Detects	5.022	SD Detects	2.222
Median Detects	5.25	CV Detects	0.442
Skewness Detects	0.534	Kurtosis Detects	-0.128
Mean of Logged Detects	1.516	SD of Logged Detects	0.467

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.897	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.14	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.202	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	4.301	KM Standard Error of Mean	0.397
KM SD	1.925	95% KM (BCA) UCL	4.936
95% KM (t) UCL	4.972	95% KM (Percentile Bootstrap) UCL	4.961
95% KM (z) UCL	4.954	95% KM Bootstrap t UCL	5
90% KM Chebyshev UCL	5.491	95% KM Chebyshev UCL	6.03
97.5% KM Chebyshev UCL	6.778	99% KM Chebyshev UCL	8.248

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.442	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.155	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.204	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	5.251	k star (bias corrected MLE)	4.413
Theta hat (MLE)	0.956	Theta star (bias corrected MLE)	1.138
nu hat (MLE)	189	nu star (bias corrected)	158.9
Mean (detects)	5.022		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	1.928				Mean	4.286	
59					Maximum	10				Median	3.825	
60					SD	1.871				CV	0.437	
61					k hat (MLE)	6.06				k star (bias corrected MLE)	5.56	
62					Theta hat (MLE)	0.707				Theta star (bias corrected MLE)	0.771	
63					nu hat (MLE)	424.2				nu star (bias corrected)	389.2	
64					Adjusted Level of Significance (β)	0.0425						
65					Approximate Chi Square Value (389.19, α)	344.5				Adjusted Chi Square Value (389.19, β)	342.5	
66					95% Gamma Approximate UCL (use when n>=50)	4.842				95% Gamma Adjusted UCL (use when n<50)	4.87	
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69					Mean (KM)	4.301				SD (KM)	1.925	
70					Variance (KM)	3.704				SE of Mean (KM)	0.397	
71					k hat (KM)	4.994				k star (KM)	4.585	
72					nu hat (KM)	349.6				nu star (KM)	321	
73					theta hat (KM)	0.861				theta star (KM)	0.938	
74					80% gamma percentile (KM)	5.838				90% gamma percentile (KM)	6.992	
75					95% gamma percentile (KM)	8.047				99% gamma percentile (KM)	10.29	
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78					Approximate Chi Square Value (320.96, α)	280.5				Adjusted Chi Square Value (320.96, β)	278.7	
79					95% Gamma Approximate KM-UCL (use when n>=50)	4.922				95% Gamma Adjusted KM-UCL (use when n<50)	4.954	
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82					Shapiro Wilk Test Statistic	0.942				**Shapiro Wilk GOF Test**		
83					5% Shapiro Wilk Critical Value	0.897				Detected Data appear Lognormal at 5% Significance Level		
84					Lilliefors Test Statistic	0.171				**Lilliefors GOF Test**		
85					5% Lilliefors Critical Value	0.202				Detected Data appear Lognormal at 5% Significance Level		
86	**Detected Data appear Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89					Mean in Original Scale	4.264				Mean in Log Scale	1.368	
90					SD in Original Scale	1.855				SD in Log Scale	0.402	
91					95% t UCL (assumes normality of ROS data)	4.794				95% Percentile Bootstrap UCL	4.778	
92					95% BCA Bootstrap UCL	4.828				95% Bootstrap t UCL	4.922	
93					95% H-UCL (Log ROS)	4.847						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96					KM Mean (logged)	1.365				KM Geo Mean	3.915	
97					KM SD (logged)	0.431				95% Critical H Value (KM-Log)	1.89	
98					KM Standard Error of Mean (logged)	0.0958				95% H-UCL (KM -Log)	4.938	
99					KM SD (logged)	0.431				95% Critical H Value (KM-Log)	1.89	
100					KM Standard Error of Mean (logged)	0.0958						
101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**									**DL/2 Log-Transformed**		
104					Mean in Original Scale	4.04				Mean in Log Scale	1.307	
105					SD in Original Scale	1.907				SD in Log Scale	0.411	
106					95% t UCL (Assumes normality)	4.585				95% H-Stat UCL	4.59	
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Normal Distributed at 5% Significance Level**											

	A	B	C	D	E	F	G	H	I	J	K	L
111												
112	**Suggested UCL to Use**											
113					95% KM (t) UCL	4.972						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

Figure G4-1
Ethylbenzene in Saturated Soil

Precision Engineering, Inc.
Seattle, Washington

Legend

Previous Sample Locations

- Ambient
- Boring
- Deep Monitoring Well
- Hand
- Indoor
- Passive Indoor
- Shallow Monitoring Well
- Sub-Slab Soil Gas
- Surface Soil

Sample Results

Media

- Saturated Soil (<=20 ft-bgs)
- Saturated Soil (>20 ft-bgs)

Result

- Detected Exceedance
- ND Exceedance
- ND Non-Exceedance
- Not Sampled

NOTES:
This figure includes ethylbenzene results for saturated soil for use in the hot spot analysis step of the COPC selection process.
Exceedances are relative to the PCULs for each COI included in the analyte group.
ft bgs = feet below ground surface.
Gray symbols represent locations that were not sampled.
COI = chemical of interest.
COPC = chemical of potential concern.
ND = non-detect.
PCUL = preliminary cleanup level.

0 25 50
Feet

Source:
Aerial photograph obtained from King County (2019).

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APPENDIX I
Sampling and Analysis Plan & Quality Assurance Project Plan

1.0 INTRODUCTION

GeoEngineers has prepared this sampling and analysis plan and quality assurance project plan (SAP/QAPP) consistent with the requirements of Washington Administrative Code (WAC) 173-340-820 on behalf of Dick Morgan (the Client) to guide aspects of the remedial investigation (RI) field and laboratory analytical activities associated sample collection at the Precision Engineering, Inc. (Precision) site (the Site). The Site is defined by the extent of hazardous substance releases associated with Precision's historical operations. The Site includes the property located at 1231 S Director Street in Seattle, Washington (the Property) and may include portions of adjoining properties. This document meets the requirements of Agreed Order No. DE 18079 between the Washington State Department of Ecology (Ecology) and the potentially liable parties, including the Client, CL Frazier Properties, LLC, and Precision. Mr. Lee Frazier is the owner of CL Frazier Properties, LLC, the Property owner, and the owner of Pacific Industrial Supply, Inc., which currently runs an industrial supply store on the Property.

This SAP/QAPP has been prepared consistent with the requirements of Ecology's Guidance on Sampling and Data Analysis Methods (Ecology, 1995), Guidance for Preparing Quality Assurance Project Plans for Environmental Studies (Ecology, 2004), and the 1993 Model Toxics Control Act (MTCA) (WAC Chapter 173-340). This SAP/QAPP provides details on analytical methods and associated laboratory reporting- and detection-limit needs and defines field and laboratory quality assurance and quality control (QA/QC) requirements and procedures.

Property history is included in Section 2.2 of the RI work plan. This SAP/QAPP is an appendix to the RI work plan. Extensive site characterization activities have been conducted at the Site beginning in 1986 and are summarized in Section 2.5 of the RI work plan.

1.1. Investigation Objectives

The primary objective of the RI is to address data gaps to further characterize the nature and extent of environmental impacts at the Site. The RI work plan references relevant procedures and protocols from this SAP/QAPP, specifies media to be sampled, and identifies the proposed sample locations. This SAP/QAPP is meant to ensure that data collected during the RI are of sufficient quality to support of the Site characterization and development of remedial actions protective of human health and the environment.

An addendum describing the specific revision(s) may be prepared if a phase of work or an otherwise unforeseen change in methodology requires modification to this SAP/QAPP, or the alternative procedures used will be documented in the RI report. Procedures described in this SAP/QAPP will be used to direct the investigation process so that the following conditions are met:

- Data collected are of high quality, representative, and verifiable.
- Use of resources is cost effective.
- Data can be used to support the Site characterization and selection and implementation of remedial actions if such actions are necessary.

This SAP/QAPP describes methods and procedures for sampling environmental media, decontaminating equipment, managing investigation-derived waste (IDW), and collecting, analyzing, and evaluating useful

data. This SAP/QAPP includes quality assurance (QA) procedures for field activities, laboratory quality control (QC) procedures, and data validation.

2.0 ORGANIZATION AND SCHEDULE

The RI work plan provides the project management plan, including key project personnel and a schedule of deliverables. Additional key project personnel are included in the RI work plan that include the GeoEngineers communications lead, human health toxicity lead, and supporting field personnel.

2.1. Project Team Organization

This section provides the organizational structure, lines of authority, and responsibilities of key project roles. Project activities will be performed within the framework of the organization and functions presented in this section. The organizational structure will provide clear lines of responsibility and authority with the following objectives:

- Identify appropriate lines of communication and coordination.
- Monitor project schedules and performance of subcontractors.
- Coordinate support functions such as laboratory analysis and data management.

Contact information for key project individuals is provided in Table 2-1. The GeoEngineers project manager is responsible for distributing copies of the final SAP/QAPP to individuals on the distribution list.

2.1.1. Ecology Site Manager Responsibilities

Ecology is the lead regulatory agency for the Site with Priscilla Tomlinson as the lead Ecology site manager. Ecology will oversee activities associated with the RI fieldwork and data collection, as described in the RI work plan. Ecology will provide recommendations and guidance to the GeoEngineers project manager on conducting the RI in accordance with MTCA requirements. Ecology will review and approve the RI work plan and associated appendices including this SAP/QAPP.

2.1.2. GeoEngineers Personnel

GeoEngineers personnel include Terry McPhetridge as the principal in charge of the project and Garrett Leque as the project manager. The principal will assist the project manager with overall programmatic planning for the technical components of the RI and oversee the development of scopes, schedules, and budgets.

2.1.3. GeoEngineers Project Manager Responsibilities

The investigation project manager is Mr. Leque. Mr. Leque will provide direction to GeoEngineers staff and subcontractors to complete the investigation in accordance with this SAP/QAPP. He will be responsible for the aspects of project implementation and is the primary GeoEngineers point of contact with Ecology and the Ecology-identified potentially liable parties.

2.1.4. Field Coordinator/On-Site Safety Officer Responsibilities

The field coordinator and on-site safety officer will be Paul Robinette. The field coordinator is responsible for leading field investigation activities, including verifying that procedures for field activities are executed in the proper manner, activities are properly documented, the prescribed scope of work is completed, and communication protocols are met. The field coordinator will report directly to the project manager. Additionally, as the on-site safety officer, Mr. Robinette will ensure that the appropriate health and safety requirements associated with physical and chemical hazards and COVID-19 are in place during the field investigation, as outlined in the health and safety plan (Appendix J of the RI work plan). The Property owner, Mr. Lee Frazier, will grant the field coordinator, field staff, and subcontractors access to the Property to conduct sample collection described in this SAP/QAPP.

2.1.5. Quality Assurance Manager Responsibilities

The GeoEngineers quality assurance managers include Mr. Leque and Denell Warren. The managers will provide QA oversight for both the field sampling and laboratory programs, confirming that samples are collected and documented appropriately; coordinating with analytical laboratories; reviewing data quality; conducting data validation; and supervising project QA coordination. The managers oversee the management of analytics, field logs, spatial data, and other data transferred to or managed by GeoEngineers and is responsible for the performing independent reviews of the laboratory data packages for the data verification and validation criteria. Mr. Leque will report directly to the principal, and Mr. Leque will have a direct line of communication with the Ecology project manager.

2.1.6. Analytical Laboratory Responsibilities

The contracted laboratories are responsible for the following.

- Performing analyses based on methods described in this SAP/QAPP, including the methods referenced for each procedure.
- Following documentation, custody, and sample logbook procedures.
- Meeting reporting and QA/QC requirements.
- Providing electronic data files as specified.

The laboratory subcontractors are responsible for notifying Mr. Leque about issues relating to laboratory analysis. The analytical laboratories will provide applicable analytical data to the database administrator at the conclusion of work. Laboratories shall be certified to provide analytical laboratory services for the project-specific methods and matrices under the Washington branch of the National Environmental Laboratory Accreditation Program (including the Washington Environmental Laboratory Accreditation Program). Specific analytical methods, performance criteria, and reporting and detection limits that analytical laboratories are required to meet are described in this SAP. The primary analytical laboratory responsible for sample analysis will be Analytical Resources in Tukwila, Washington.

2.2. Schedule

Tier 1 fieldwork is anticipated to be completed by April 22, 2022, as required under the Site Agreed Order and as modified in communications between the Client (via GeoEngineers) and Ecology.

3.0 ACCESS AND SITE PREPARATION

3.1. Access

The current Property owner, Mr. Lee Frazier, has agreed to grant reasonable access for performing fieldwork on the Property. GeoEngineers will coordinate fieldwork logistics with Mr. Frazier prior to finalizing a field schedule and will notify Mr. Frazier of the final field schedule at least one week prior to beginning work on the Property. Permits and access authorization for monitoring well installation and sampling activities conducted near public rights-of-way will be obtained as needed.

3.2. Site Preparation

Abundant inventory associated with the industrial supply store is present in the building and may impede access to areas of the warehouses. GeoEngineers will work with Pacific Industrial Supply, Inc. staff to clear proposed sample locations of inventory and other obstructions prior to fieldwork whenever feasible. If sample locations are inaccessible due to Pacific Industrial Supply, Inc.'s operations, GeoEngineers will work with Mr. Frazier and the Client to identify potential solutions. GeoEngineers will notify Ecology in writing of the change as soon as practicable and no longer than two business days later if no solutions are identified and sample locations need to be moved.

Site preparation activities will also include utility locates to identify the presence of subsurface utilities prior to drilling (as discussed below), electromagnetic and ground-penetrating radar surveys to assess the potential presence of underground storage tanks in the former boiler room, and a ground-penetrating radar survey to evaluate the concrete slab thicknesses and potential presence of rebar in the slab to identify locations where concrete cutting may be infeasible to gain access for drilling beneath the slab.

Public and private utility-locating services will check for underground utilities and features (e.g., pipelines) near the proposed sample locations (see standard operating procedure [SOP] 18 in Appendix A) before drilling activities begin at the Site. Additionally, GeoEngineers has identified possible on-site utilities, piping, and other subsurface obstructions from historical plan sets and publicly available information (see Figure 2-3 of the RI work plan).

4.0 SCOPE OF WORK

The RI work plan identifies data gaps to be addressed during the RI. Sample locations proposed to address data gaps are summarized in Tables 9-1 and 9-2 of the RI work plan. Section 9 of the RI work plan identifies the scope of work that will include the following RI activities:

- Stormwater system cleanout and inspection.
- Soil sampling of the vadose soil and saturated soil at a minimum from shallow and deep borings and proposed monitoring wells.
- Installation of shallow and deep monitoring wells.
- Groundwater sampling of existing and proposed monitoring wells.

The proposed sample locations and a summary of sampling details and proposed analyses are provided in Figure 9-1 and Tables 9-1 and 9-2 of the RI work plan. The sample depths may be altered and/or additional

samples added to collect samples in and/or beneath the potentially impacted areas if field screening evidence of contamination is observed in the field. Additional analyses may be recommended based on field observations.

5.0 SOIL ASSESSMENT

5.1. Soil Borings

Concrete coring will be necessary prior to advancing soil borings in the building. A ground-penetrating radar survey will be conducted to evaluate the concrete slab thicknesses within the building that was reported to be approximately 6 inches thick in "GP" boring logs performed in 2005. Subsurface soil samples will be collected from borings inside and outside the building using a direct-push drill rig (i.e., SB20, SB21 etc.). Hollow-stem auger (HSA) or sonic drilling methods may be used at boring locations if target depths (generally 15 feet to 40 feet below ground surface [bgs]) cannot be achieved using the direct-push rig. The drilling equipment will be operated by a Washington State-certified driller using industry-standard techniques.

Soil sampling equipment used by the specific drilling methods generally include the following:

- Direct Push. Split spoon (e.g. "Macrocore" sampler with disposable plastic liners)
- HSA. Split spoon (e.g. SPT, "California")
- Sonic. Core barrel with sample extruded into plastic sleeve

The workspace will be ventilated with portable fans and the air will be monitored using a PID as described in the HASP. Trichloroethene (TCE) was detected in sub-slab soil gas at concentrations up to 37,000 micrograms per cubic meter (6.9 ppm) during previous environmental investigations (MFA, 2008). The boreholes will be covered with a temporary solid cover when not being actively worked and the borings will be backfilled as soon as practicable following completion of each boring to protect human health. The HASP contains additional discussion regarding procedures to protect human health.

Two water-bearing zones (WBZs) have been identified beneath the Site. A confining glacial till unit hydraulically separates the WBZs. Drillers must take care to ensure boreholes do not act as preferential pathways for cross- contamination between WBZs when drilling into the deep WBZ. The potential hydraulic connection from the shallow WBZ to the deep WBZ will be sealed off to help prevent cross-contamination when advancing borings for the deep monitoring wells. This will be accomplished by drilling into the top of the aquitard with larger diameter tooling, provide a seal into the aquitard, and "telescoping" through and beneath the aquitard using smaller diameter tooling. Additionally, the downhole drilling equipment will be steam-cleaned or pressure-washed after use in each boring or monitoring well. Decontamination fluids will be transferred to drums approved by the Washington State Department of Transportation and will be managed according to the procedures outlined in Section 7. Each boring that is no longer needed following drilling will be decommissioned with bentonite chips or bentonite grout in accordance with the WAC for Minimum Standards for Construction and Maintenance of Wells (WAC 173-160, 1998) and SOP 11 (see Appendix A).

Soil conditions observed in borings will be logged in accordance with SOP 2 and recorded on boring log forms. The locations of the borings and other features of interest will be recorded by measuring from existing

Site features or surveying the locations using a global positioning unit (e.g., Trimble™) capable of submeter accuracy. The newly installed monitoring wells will be surveyed by a licensed surveyor.

5.2. Soil Sampling Procedure

Soil samples will be collected for lithologic description, field screening, and chemical analyses. The anticipated sampling intervals, depths, and sample analysis schedule are specified Table 9-1 of the RI work plan. Soil sample material will be collected, screened for visual indications of contamination, and headspace vapor analysis will be conducted using a photoionization detector (PID) in accordance with SOP 3 (see Appendix A). Additional soil samples may be collected if soil exhibits visual and/or olfactory indications of impacts (i.e., high PID readings, staining, sheen, odor). Any additional samples collected will be submitted to and preserved at the laboratory pending potential analysis.

Samples will be prepared, handled, and documented in accordance with SOP 4. Soil sampling requiring the use of a 5035 kit will be conducted in accordance with SOP 5 (see Appendix A). Non-disposable sampling equipment and reusable materials that contact the soil will be decontaminated before and after each sample and sampling location. Decontamination methods are described in SOP 1 (see Appendix A). IDW (soil cuttings and decontamination fluids) will be transferred to drums and managed in accordance with Section 7.

5.3. Nomenclature

Soil samples will be labeled with a prefix to refer to the location identification number, an “S” to indicate a soil sample matrix, and the sample depth in feet bgs. The depth interval will be specified as follows: a soil sample collected from soil boring location SB20 with a sampling interval from 2 to 3 feet bgs will have the sample nomenclature ofSB20-S-2-3.

Duplicate soil samples will not be collected because VOCs are to be analyzed. Duplicate groundwater samples will be collected as described below.

6.0 GROUNDWATER ASSESSMENT

Groundwater samples will be collected from new and existing monitoring wells at the Site.

6.1. Grab Sampling

Field staff will collect a “grab” groundwater sample from the vault if groundwater seepage is observed in the hydraulic cylinder test vault. The grab sample may be collected with either a peristaltic pump and weighted tubing or disposable bailers depending on access restraints and depth of water in the vault.

6.2. Monitoring Well Installation

The monitoring wells proposed in the RI work plan will be constructed in accordance with the Washington well construction standards (WAC Chapter 173-160). Monitoring wells will be installed as flush-mount installations using IHSA or sonic drilling methods. Monitoring well installation procedures are described in SOP 11 (see Appendix A). Monitoring well locations will be surveyed by a licensed surveyor to obtain the 0.01-foot vertical accuracy needed for measuring groundwater elevations. The surveyor will obtain the elevation of the water level measuring point (i.e., the north side of the PVC casing) and the top of the monument.

6.3. Monitoring Well Development

Each new well will be developed following installation by surging, bailing, or pumping to remove sediment that may have accumulated during installation and to improve the hydraulic connection with the WBZ. Monitoring well development procedures are described in SOP 12 (see Appendix A). The well will be allowed to set at least 24 hours following development and prior to sampling.

6.4. Monitoring Well Groundwater Sampling

Low-flow groundwater sampling and water level measurements will be conducted in accordance with SOPs 9 and 13, respectively (see Appendix A). Groundwater samples will be collected from monitoring wells using a peristaltic pump and disposable polyethylene tubing. A submersible pump will be used if a peristaltic pump is unable to extract groundwater (typically at depths of 30 feet bgs or deeper).

The water level will be measured (see SOP 13 in Appendix A) and the monitoring well will be purged before collection of groundwater samples. The well will be purged at a low flow rate (e.g., 0.1 to 0.5 liter per minute). A minimum of one well volume will be purged before sample collection or purging will continue until selected water quality field parameters (e.g., temperature, specific conductance, pH, turbidity) have stabilized. A sample may be collected if the well goes dry during purging once recharge occurs providing enough water in the well for sampling. The flow rates, water levels, and water quality parameters will be recorded during purging on an appropriate field form or in the field notes. Groundwater samples to be analyzed for dissolved metals will be filtered using a disposable 0.45-micron filter before being transferred into a laboratory-supplied container. The other groundwater samples will be transferred directly into laboratory-supplied containers specific to the analysis required.

Non-disposable sampling equipment and reusable materials that contact the water will be decontaminated before and after each sample and sampling location. Decontamination methods are described in SOP 1 (see Appendix A). IDW that includes purge water and decontamination fluids will be transferred to drums and managed in accordance with Section 7.

6.5. Nomenclature

Groundwater samples will be labeled with a prefix to describe the type of location, a location identification number, a “W” to indicate a groundwater sample matrix, and the date. For example, a groundwater sample collected from monitoring well MW12 on April 11, 2022 will have the sample number MW12-W-20220411.

Duplicate groundwater samples will replace the location number with “DUP,” and the sample will have the same sample time as the primary sample. A duplicate sample of the abovementioned sample would appear as MWDUP-W-20220411.

Relevant sample information will be documented on a water field sampling data sheet. Documentation may include items such as the screened interval or open space, equipment used, water quality field parameters, and the volume of water purged before sampling.

7.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

IDW generated during the RI may include items such as soil cuttings, purge water, decontamination fluids, sampling debris, and personal protective equipment. The IDW will be separated into solids, liquids, and

sampling debris (e.g., personal protective equipment). IDW will be stored in a designated area on the Property in secure drums. Drums will be labeled with their contents, the approximate volume of material, the date of collection, and the origin of the material as described in SOP 1.

The drums will be sealed, secured, and transferred to a designated area on the Property pending characterization. Analytical data from the soil and groundwater sampling activities may be used to characterize the soil cuttings, purge water, sampling debris, and decontamination fluids generated during the investigation. Historically, high levels of chromium in soil and groundwater have resulted in a hazardous waste characterization. Hazardous waste will be stored, managed, and disposed appropriately as required under WAC 173-303-141. Hazardous waste generated at the Site will be documented in the annual dangerous waste report through TurboWaste.

8.0 ANALYTICAL METHODS

8.1. Chemicals of Interest

The contaminants of interest (COIs) for the Site are generally grouped into the following categories based on the results of the historical characterization activities.

- Metals (primarily chromium).
- TCE and breakdown products.
- Petroleum hydrocarbons.

Soil and groundwater samples will be analyzed for the COIs referenced above. Selected samples will also be analyzed for polychlorinated biphenyls (PCBs), full-suite volatile organic compounds (VOCs), full-suite semivolatile organic compounds (SVOCs), and perfluoroalkyl substances (PFAS). Special PFAS protocols will be followed in SOP 14.

Groundwater samples from select monitoring wells will be analyzed for geochemical parameters in addition to COI analysis as specified in Table 9-2 of the RI work plan. Field testing will also be conducted using a field test kit to measure ferrous iron concentrations and a water quality meter to measure dissolved oxygen, pH, and oxidation reduction potential in addition to laboratory analysis for total organic carbon, nitrate as nitrogen, sulfate, and dissolved manganese. Soil and/or groundwater samples from select locations will also be analyzed for extractable petroleum hydrocarbons and volatile petroleum hydrocarbons as specified in Tables 9-1 and 9-2 of the RI work plan.

8.2. Laboratory Analytical Methods and Reporting Limits

An accredited laboratory will perform the soil and groundwater analyses in accordance with the laboratory analytical methods and QA/QC requirements set forth in this SAP/QAPP as summarized in Tables 8-1 through 8-3. Tables 8-1 through 8-3 identify preferred analytical methods and QA/QC requirements for the COIs and PFAS. Compounds included in the laboratory standard reports for each laboratory method will be analyzed and reported in addition to those compounds listed. Actual methods used may deviate from those provided as long as the selected method meets the requirements of this SAP/QAPP. Laboratory methods were selected with the goal of providing sample results at reporting limits less than or equal to preliminary

cleanup levels. Where this is not feasible, reporting limits are within the range of target practical quantitation limits (PQLs) in Ecology's PQL Compendium.

8.3. Quality Assurance and Quality Control Samples Generated in Field

Sample collection and measurement methods will follow procedures documented in Section 8.9 to ensure that field samples and quantitative field measurements are representative of the media collected and conditions being measured. QC samples collected in the field include trip blanks, field duplicates, equipment rinsate blanks, and filter blanks as outlined in Table 8-4. Field QC samples will be identified in the field notebook. Trip blanks, equipment rinsate blanks, and filter blanks assess the potential for contamination introduced by field procedures. Field duplicates indicate precision in both field and laboratory procedures.

8.4. Laboratory Operations

QC samples in the laboratory may include matrix spike and matrix spike duplicate (MS/MSD) samples, laboratory control samples (LCSs), surrogate spike samples, and method blanks, as well as other QC samples and procedures as required by the individual methods as outlined in Table 8-5.

8.5. Sample Containers, Preservations, and Handling

8.5.1. Preservation

Samples will be collected in laboratory-supplied containers with method-specific preservatives as generally specified in Tables 8-6 and 8-7. Soil and groundwater samples will be stored in iced coolers at approximately 4 degrees Celsius.

8.5.2. Sample Packaging and Shipping

Soil and groundwater samples will be packed to avoid cross-contamination and/or breakage of containers and shipped in coolers packed with ice to the analytical laboratory.

8.6. Sample Custody

Sample custody will be tracked from point of origin through analysis and disposal using a chain-of- custody (COC) form filled out with the appropriate sample and analytical information after samples are collected.

The following items will be recorded on the COC form:

- Project name
- Project number
- GeoEngineers project manager
- Sampler name(s)
- Sample identification, date and time collected, media, number of bottles submitted
- Requested analyses for each sample
- Turnaround requirements

- Signature, printed name, and organization name of persons having custody of samples, and date and time of transfer
- Additional instructions or considerations that would affect analysis (e.g., archiving)

Persons in possession of the samples will be required to sign and date the COC form whenever samples are transferred between individuals or organizations. The COC will be included in the shipping containers. The laboratory will implement its in-house custody procedures that will begin when sample custody is transferred to laboratory personnel.

The signed COC(s) will be packed in shipping containers with the samples if samples are shipped via air or ground transportation (by a third party) and a custody seal will be placed on the container. A designated sample custodian at the analytical laboratory will accept custody of the samples and will verify that the COC form matches the samples received. The shipping container or set of containers is given a laboratory identification number, and each sample is assigned a unique sequential identification number.

8.7. Instrumentation

8.7.1. Field Instrumentation

Field instruments may be used during the investigations. The following field equipment may require calibration before use and periodically during sampling activities:

- Water quality meter
- Turbidimeter
- PID

Field-instrument calibration and preventive maintenance will follow the manufacturers' guidelines. Deviations from the established guidelines will be documented.

8.7.1.1. Field Calibration

Generally, field instruments will be calibrated daily before work begins. Field personnel may decide to calibrate more than once a day if inconsistent or unusual readings occur, or if conditions warrant more frequent calibration. Calibration activities will be recorded in logbooks or field notebooks. The following procedures will be used to ensure that field instruments are properly calibrated and remain operable.

- Operation, maintenance, and calibration will be performed in accordance with the instrument manufacturers' specifications.
- Standards used to calibrate field instruments will meet the minimum requirements for source and purity recommended in the equipment operation manual. Standards will be checked for expiration dates that may be printed on the bottle. Standards that have expired will not be used.
- Acceptable criteria for calibration will be based on the limits set in the operations manual. A schedule of preventive maintenance activities will be followed to minimize downtime and ensure the accuracy of measurement systems. Maintenance will be documented in the field notebook.
- Users of the equipment will be trained in the proper calibration and operation of the instrument.

- Operation and maintenance manuals for each field instrument will be available to persons using the equipment.
- Field instruments will be inspected before they are taken to the site.
- Calibration procedures (including items such as time, standards used, and calibration results) will be recorded in a field notebook. The information will be available if problems are encountered.

8.7.2. Laboratory Instrumentation

Specific laboratory instrument calibration procedures, frequency of calibration, and preparation of calibration standards will be according to the method requirements as developed by the U.S. Environmental Protection Agency (EPA) following procedures presented in SW-846 (EPA, 1986).

Preventive maintenance of laboratory equipment will be the responsibility of the laboratory personnel and analysts. This maintenance includes routine care and cleaning of instruments and inspection and monitoring of carrier gases, solvents, and glassware used in analyses. The preventive-maintenance approach for specific equipment will follow the manufacturers' specifications, good laboratory practices, and industry standard techniques.

Precision and accuracy data will be examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance will be performed when an instrument begins to change, as indicated by the degradation of peak resolution, shift in calibration curves, decrease in sensitivity, or failure to meet any QC criterion.

8.8. Laboratory Quality Assurance and Quality Control Samples

The laboratory QC samples will be used to assess the accuracy and precision of the laboratory analysis (see Table 8-5). Each category of laboratory QA/QC will be performed by the laboratory as required by method-specific guidelines. The acceptance criteria presented in the guidelines will be adhered to and samples that do not meet the criteria will be reanalyzed or qualified as appropriate.

8.8.1. Calibration Verification

Instruments will initially be calibrated at the start of the project or sample run, as required, and when any ongoing calibration does not meet control criteria. The number of points used in the initial calibration is defined in the analytical method. Calibration will be continued as specified in the analytical method to track instrument performance. Analysis of project samples will be suspended if a continuing calibration does not meet control limits until the source of the control failure is either eliminated or reduced to within control specifications.

8.8.2. Matrix Spike/Matrix Spike Duplicate

MS samples are analyzed to assess the matrix effects on the accuracy of analytical measurements. MS/MSD samples will be prepared by spiking investigative samples with known amounts of analytes before extraction and preparation and analysis. The recoveries for the MS/MSD samples will be used to assess the accuracy and precision in the analytical method by measuring how well the analytical method recovers the target compounds in the investigative matrices. For each matrix type, at least one set of MS/MSD samples will be analyzed for each batch of samples for every 20 (or fewer) samples received.

8.8.3. Method Blanks

Method blanks are prepared using analyte-free (reagent) water and are processed with the same methodology (e.g., extraction, digestion) as the associated investigative samples. Method blanks are used to document contamination resulting in the laboratory from the analytical process. A method blank shall be prepared and analyzed in every analytical batch. The method blank results are used to verify that reagents and preparation do not impart unacceptable bias to the investigative sample results. The presence of analytes in the method blank sample will be evaluated against method-specific thresholds. Corrective action will be taken to eliminate the source of contamination before proceeding with analysis if analytes are present in the method blank above the method-specific threshold.

Investigative samples of an analytical batch associated with method blank results outside acceptance limits will be qualified as appropriate by the data validation contractor.

8.8.4. Laboratory Control Samples

LCSs are prepared by spiking laboratory-certified, reagent-grade water with the analytes of interest or a certified reference material that has been prepared and analyzed. The result for percent recovery of the LCS is a data quality indicator of the accuracy of the analytical method and laboratory performance.

8.8.4.1. Laboratory Duplicate Samples

Laboratory duplicate samples (LDSs) are prepared by the laboratory by splitting an investigative sample into two separate aliquots and performing separate sample preparation and analysis on each aliquot. The results for relative percent difference of the primary investigative sample and the respective LDSs are used to measure precision in the analytical method and laboratory performance. For nonaqueous matrices, sample heterogeneity may affect the measured precision for the LDSs.

8.9. Field QC

The following samples will be prepared by the sampling personnel in the field and submitted to the laboratory (see Table 8-3):

- Trip Blanks—Trip blanks monitor the potential for sample contamination during sample collection and transport. A trip blank consists of reagent-grade water in a new sample container prepared at the same time as the samples. The trip blank will accompany the samples throughout collection, shipment, and storage. At least one trip blank will be included with each cooler in which samples for volatile organic compound analyses are stored. Trip blanks will be labeled as "TB" to indicate a trip blank sample matrix, an identification number, and the date (MMDDYY). For example, the second trip blank collected on April 11, 2022, would be named TB2-041122.
- Field Duplicates—Field duplicates are collected to measure sampling and laboratory precision. One duplicate groundwater sample will be collected per 20 primary samples.
- Equipment Rinsate Blanks—Equipment rinsate blanks will help to assess the efficiency of equipment decontamination procedures. Equipment blanks will be collected by pouring laboratory-certified distilled water over or through reusable decontaminated sampling equipment. Equipment rinsate blanks will be labeled with an "EB" to indicate an equipment blank sample matrix, an identification number, and the date (MMDDYY). For example, the second equipment rinsate blank collected on April 11, 2022, would be named EB2-041122.

- **Filter Blanks**—Aqueous filter blanks are collected to assess the potential for contamination of aqueous samples via the filters used for dissolved analyses.

Aqueous filter blanks will be collected by laboratory-certified distilled water into a sample container through a filter. Filter blanks will be labeled with an "FB" to indicate a filter blank sample matrix, an identification number, and the date (MMDDYY). For example, the second filter blank collected on July 2, 2022, would be named FB2-070222.

8.10. Data Reduction, Validation, and Reporting

The analytical laboratory will submit analytical data packages that include laboratory QA/QC results to permit independent and conclusive determination of data quality. GeoEngineers will determine data quality, using the data evaluation procedures described in this section. The results of the GeoEngineers evaluation will be used to determine if the project data quality objectives are met.

8.10.1. Field Data Reduction

Daily internal QC checks will be performed for field activities. Checks will consist of reviewing field notes and field activity memoranda to confirm that the specified measurements, calibrations, and procedures are being followed. The need for corrective action will be assessed on an ongoing basis, in consultation with the project manager.

8.10.2. Laboratory Evaluation

Initial data reduction, evaluation, and reporting at the analytical laboratory will be carried out as described in EPA SW-846 manuals for analyses (EPA, 1986), as appropriate. Additional laboratory data qualifiers may be defined and reported to further explain the laboratory's QC concerns about a particular sample result. Additional data qualifiers will be defined in the laboratory's case narrative reports.

8.10.3. Data Deliverables

Laboratory data deliverables are listed below. Electronic deliverables will contain the same data that are presented in the hardcopy report.

- Transmittal cover letter
- Case narrative
- Analytical results
- COC
- Surrogate recoveries
- Method blank results
- MS/MSD results
- Laboratory duplicate results

8.10.4. Data Evaluation

8.10.4.1. Data QA/QC Review

GeoEngineers will evaluate the laboratory data for precision, completeness, accuracy, and compliance with the analytical method. GeoEngineers will review data according to applicable sections of EPA inorganics and organics procedures (EPA, 2020a, b), as well as appropriate laboratory-method-specific guidelines (EPA, 1986).

Data qualifiers, as defined by the EPA, are used to classify sample data according to their conformance to QC requirements. Common qualifiers are listed below:

- J—Estimate, qualitatively correct but quantitatively suspect.
- R—Reject, data not suitable for any purpose.
- U—Not detected at a specified reporting limit.

Poor surrogate recovery, blank contamination, or calibration problems, among other things, can require qualification of the sample data. The reasons for sample qualification will be stated in the data evaluation report.

QC criteria not defined in the guidelines for evaluating analytical data are adopted, where appropriate, from the analytical method.

The following information will be reviewed during data evaluation, as applicable:

- Sampling locations and blind sample numbers
- Sampling dates
- Requested analysis
- COC documentation
- Sample preservation
- Holding times
- Method blanks
- Surrogate recoveries
- MS/MSD results
- Laboratory duplicates (if analyzed)
- Field duplicates
- Field blanks
- LCSs
- Method reporting limits above requested levels
- Additional comments or difficulties reported by the laboratory
- Overall assessment

The results of the data evaluation review will be summarized for each data package. Data qualifiers will be assigned to sample results based on EPA guidelines (EPA 2020a, b; 1986), as applicable.

8.10.4.2. Data Management and Reduction

The data management system EQuIS™ will be used to manage laboratory data in a project-specific database. The laboratory will provide the analytical results in electronic, EQuIS-compatible format. Following data evaluation, data qualifiers will be entered into the database.

Data may be reduced to prepare summary data sets and to aid interpretation of the results. Statistical analyses may also be applied to results. Data reduction QC checks will be performed on hand-entered data, calculations, and data graphically displayed. Data may be further reduced and managed using one or more of the following computer software applications:

- Microsoft excel (spreadsheet)
- EQuIS (database)
- Microsoft Access (database)
- AutoCAD and/or ArcGIS (graphics)
- EPA ProUCL (statistical software)

9.0 REPORTING

GeoEngineers will summarize and screen the data against applicable criteria for inclusion in a RI report after the data are received. This RI report will be transmitted to Ecology, the Client, and the distribution list within 90 days of receiving final laboratory data as required under the Agreed Order. Analytical results will be uploaded to Ecology's Environmental Information Management database within 45 days from completion of data validation as required under the Agreed Order.

Table 2-1
Contact List
Precision Engineering Site
Dick Morgan
Seattle, Washington

Name	Title	Affiliation	Telephone	Email
Terry McPhetridge	Principal	GeoEngineers, Inc.	(253) 383-4940	tmcphetridge@geoengineers.com
Garrett Leque	Project Manager	GeoEngineers, Inc.	(360) 647-1510	gleque@geoengineers.com
Garrett Leque	Quality Assurance Manager	GeoEngineers, Inc.	(360) 647-1510	gleque@geoengineers.com
Paul Robinette	Field Coordinator/ On-Site Safety Officer	GeoEngineers, Inc.	(253) 383-4940	probinette@geoengineers.com
Sue Dunnihoo	Laboratory Project Manager	Analytical Resources Inc.	(206) 695-6207	limsadm@arilabs.com
Priscilla Tomlinson	Site Manager	Washington State Department of Ecology	(425) 649-7135	ptom461@ecy.wa.gov
Lee Frazier	Property Owner	Pacific Industrial Supply, Inc.	(206) 910-4554	lee@pacificindustrial.com

Table 8-1

Soil Reporting Limits, PCULs, Performance Criteria, and Analytical Method

Precision Engineering Site
Dick Morgan
Seattle, Washington

Analyte	Detection Limit (mg/kg)	Reporting Limit (mg/kg)	Soil PCUL[1]	Duplicate RPD	Matrix Spike		Blank Spike		Analytical Method
					%R	RPD	%R	RPD	
Metals (mg/kg)									
Arsenic	0.0380	0.200	7.30	20	75-125	20	80-120	20	EPA 6020B UCT-KED
Cadmium	0.0300	0.100	0.77	20	75-125	20	80-120	20	EPA 6020B UCT-KED
Chromium	0.260	0.500	48.15	20	75-125	20	80-120	20	EPA 6020B
Hexavalent Chromium	0.400	0.400	0.00089	30	75-125	30	80-120	20	EPA 7196A
Copper	0.216	0.500	36.38	20	75-125	20	80-120	20	EPA 6020B
Lead	0.0520	0.100	50	20	75-125	20	80-120	20	EPA 6020B
Mercury	0.00525	0.0250	0.07	20	75-125	20	80-120	20	EPA 7471B
Nickel	0.220	0.500	48	20	75-125	20	80-120	20	EPA 6020B UCT-KED
Selenium	0.180	0.500	0.264	20	75-125	20	80-120	20	EPA 6020B UCT-KED
Thallium	0.220	0.500	0.00441	20	75-125	20	80-120	20	EPA 6020B
Zinc	2.92	6.00	85.06	20	75-125	20	80-120	20	EPA 6020B UCT-KED
HCID (mg/kg)									
Gasoline range organics	10.0	10.0	NA	NA	NA	NA	NA	NA	NWTPH-HCID
Oil range organics	50.0	50.0	NA	NA	NA	NA	NA	NA	NWTPH-HCID
Total Petroleum Hydrocarbons (mg/kg)									
Gasoline-range petroleum hydrocarbons	2.5	5	30/100	30	28-162	30	70-121	30	NWTPH-G
Diesel-range petroleum hydrocarbons	2.50	5.00	260	30	30-160	30	30-160	30	NWTPH-Dx
Oil-range petroleum hydrocarbons	5.00	10.0	260	30	30-160	30	30-160	30	NWTPH-Dx
VPH/EPH (mg/kg)									
VPH	4.5	9	NA	30	52-120	30	52-120	30	NWTPH-VPH
EPH	1	2	NA	30	20-130	30	20-130	30	NWTPH-EPH
VOCs (mg/kg)									
1,1,1,2-Tetrachloroethane	0.000354	0.001	0.000627	30	80-120	30	80-120	30	EPA 8260D
1,1,1-Trichloroethane	0.000598	0.001	0.0843	30	78-133	30	78-133	30	EPA 8260D
1,1,2,2-Tetrachloroethane	0.000274	0.001	0.0000800	30	74-120	30	74-120	30	EPA 8260D
1,1,2-Trichloroethane	0.000268	0.001	0.000326	30	79-120	30	79-120	30	EPA 8260D
1,1-Dichloroethane	0.000283	0.001	0.00261	30	80-126	30	80-126	30	EPA 8260D
1,1-Dichloropropene	0.000282	0.001	NA	30	63-145	30	63-145	30	EPA 8260D
1,2,3-Trichlorobenzene	0.00232	0.005	0.011	30	68-132	30	68-132	30	EPA 8260D
1,2,3-Trichloropropane	0.0015	0.002	0.000000153	30	73-120	30	73-120	30	EPA 8260D
1,2,4-Trichlorobenzene	0.00182	0.005	0.0000720	30	66-140	30	66-140	30	EPA 8260D
1,2,4-Trimethylbenzene	0.000265	0.001	0.0721	30	75-121	30	75-121	30	EPA 8260D
1,2-Dibromo-3-chloropropane	0.00236	0.005	0.0000560	30	72-136	30	72-136	30	EPA 8260D
1,2-Dichlorobenzene	0.000653	0.001	0.00299	30	76-120	30	76-120	30	EPA 8260D
1,2-Dichloroethane	0.000234	0.001	0.0016	30	76-120	30	76-120	30	EPA 8260D
1,2-Dichloropropane	0.000332	0.001	0.00103	30	79-120	30	79-120	30	EPA 8260D
1,3,5-Trimethylbenzene	0.000253	0.001	0.0711	30	74-122	30	74-122	30	EPA 8260D
1,3-Dichlorobenzene	0.000244	0.001	0.00132	30	75-120	30	75-120	30	EPA 8260D
1,3-Dichloropropane	0.000234	0.001	0.0574	30	78-120	30	78-120	30	EPA 8260D
1,4-Dichlorobenzene	0.000431	0.001	0.00807	30	73-120	30	73-120	30	EPA 8260D
2,2-Dichloropropane	0.000307	0.001	NA	30	77-138	30	77-138	30	EPA 8260D
2-Chloroethyl vinyl ether	0.00302	0.005	NA	30	51-129	30	51-129	30	EPA 8260D
2-Chlorotoluene	0.000216	0.001	0.107	30	75-120	30	75-120	30	EPA 8260D
2-Hexanone	0.00127	0.005	0.0121	30	68-122	30	68-122	30	EPA 8260D
2-Pentanone	0.00215	0.005	NA	30	77-120	30	77-120	30	EPA 8260D
4-Chlorotoluene	0.000292	0.001	NA	30	69-124	30	69-124	30	EPA 8260D
4-Isopropyl Toluene	0.00029	0.001	NA	30	75-125	30	75-125	30	EPA 8260D
Acetone	0.00634	0.01	2.1	30	48-137	30	48-137	30	EPA 8260D
Acrolein	0.00175	0.005	0.00032	30	59-140	30	59-140	30	EPA 8260D
Acrylonitrile	0.00198	0.005	0.00000826	30	69-134	30	69-134	30	EPA 8260D
Benzene	0.000165	0.001	0.00056	30	80-120	30	80-120	30	EPA 8260D
Bromobenzene	0.000247	0.001	0.0333	30	76-120	30	76-120	30	EPA 8260D
Bromochloromethane	0.000395	0.001	NA	30	80-129	30	80-129	30	EPA 8260D
Bromoform	0.000462	0.001	0.0050	30	64-128	30	64-128	30	EPA 8260D
Bromomethane	0.000389	0.001	0.00331	30	53-144	30	53-144	30	EPA 8260D
Carbon Disulfide	0.000331	0.001	0.250	30	71-137	30	71-137	30	EPA 8260D
Carbon tetrachloride	0.000312	0.001	0.000154	30	71-129	30	71-129	30	EPA 8260D
Chlorobenzene	0.000207	0.001	0.0511	30	78-120	30	78-120	30	EPA 8260D
Chloroethane	0.00124	0.002	NA	30	55-149	30	55-149	30	EPA 8260D
Chloroform	0.000288	0.001	0.0048	30	80-126	30	80-126	30	EPA 8260D
cis-1,2-Dichloroethene	0.000257	0.001	0.0052	30	80-125	30	80-125	30	EPA 8260D
cis-1,3-Dichloropropene	0.000262	0.001	0.00014	30	80-120	30	80-120	30	EPA 8260D
Dibromochloromethane	0.000267	0.001	0.0007	30	74-125	30	74-125	30	EPA 8260D
Dibromomethane	0.000356	0.001	0.0280	30	80-120	30	80-120	30	EPA 8260D
Dichlorodifluoromethane	0.000403	0.001	0.53	30	67-142	30	67-142	30	EPA 8260D
Ethylbenzene	0.000227	0.001	0.01	30	80-125	30	80-125	30	EPA 8260D
Hexachlorobutadiene	0.00481	0.02	0.000540	30	37-120	30	37-120	30	EPA 8260D
Isopropyl Benzene	0.000262	0.001	0.79	30	74-121	30	74-121	30	EPA 8260D
2-Butanone	0.00244	0.005	1.40	30	70-132	30	70-132	30	EPA 8260D
4-Methyl-2-Pentanone	0.00136	0.005	0.192	30	73-121	30	73-121	30	EPA 8260D
Methylene Chloride	0.00436	0.005	0.0015	30	69-129	30	69-129	30	EPA 8260D
Methyl tert-butyl Ether	0.000254	0.001	0.00723	30	79-127	30	79-127	30	EPA 8260D
Naphthalene	0.00246	0.005	0.0021	30	69-125	30	69-125	30	EPA 8260D
n-Butylbenzene	0.00028	0.001	0.71	30	73-130	30	73-130	30	EPA 8260D
n-Hexane	0.001	0.001	1.8	30	30-160	30	30-160	30	EPA 8260D
n-Propylbenzene	0.000236	0.001	0.88	30	72-124	30	72-124	30	EPA 8260D
s-Butylbenzene	0.000241	0.001	1.3	30	70-128	30	70-128	30	EPA 8260D
Styrene	0.000246	0.001	0.120	30	80-120	30	80-120	30	EPA 8260D
t-Butylbenzene	0.000251	0.001	1.0	30	72-122	30	72-122	30	EPA 8260D
Tetrachloroethene	0.000198	0.001	0.00160	30	74-124	30	74-124	30	EPA 8260D
Toluene	0.000247	0.001	0.044	30	75-120	30	75-120	30	EPA 8260D
Xylenes, total	0.000697	0.002	0.0551	30	67-132	30	67-132	30	EPA 8260D
trans-1,2-Dichloroethene	0.000525	0.001	0.032	30	79-130	30	79-130	30	EPA 8260D
trans-1,3-Dichloropropene	0.00041	0.001	0.00014	30	80-124	30	80-124	30	EPA 8260D
trans-1,4-Dichloro 2-Butene	0.00275	0.005	NA	30	65-125	30	65-125	30	EPA 8260D
Trichloroethene	0.000255	0.001	0.00027	30	80-120	30	80-120	30	EPA 8260D
Trichlorofluoromethane	0.000975	0.002	0.793	30	61-164	30	61-164	30	EPA 8260D
Vinyl Acetate	0.00325	0.005	2.3	30	66-141	30	66-141	30	EPA 8260D
Vinyl Chloride	0.000336	0.001	0.000056	30	74-135	30	74-135	30	EPA 8260D

Analyte	Detection Limit (mg/kg)	Reporting Limit (mg/kg)	Soil PCUL[1]	Duplicate RPD	Matrix Spike		Blank Spike		Analytical Method
					%R	RPD	%R	RPD	
SVOCs - SIM (mg/kg)									
1-Methylnaphthalene	0.000401	0.005	0.00425	30	39-120	30	39-120	30	EPA 8270E-SIM
2-Methylnaphthalene	0.0011	0.005	0.0388	30	35-120	30	35-120	30	EPA 8270E-SIM
Acenaphthene	0.000571	0.005	0.028	30	39-120	30	39-120	30	EPA 8270E-SIM
Acenaphthylene	0.00108	0.005	1.3	30	35-120	30	35-120	30	EPA 8270E-SIM
Anthracene	0.000871	0.005	0.0511	30	36-120	30	36-120	30	EPA 8270E-SIM
Benzo(a)anthracene	0.000824	0.005	NA	30	42-120	30	42-120	30	EPA 8270E-SIM
Benzo(a)pyrene	0.000614	0.005	0.000016	30	36-120	30	36-120	30	EPA 8270E-SIM
Benzo(b)fluoranthene	0.00137	0.005	NA	30	52-137	30	52-137	30	EPA 8270E-SIM
Benzo(g,h,i)perylene	0.00106	0.005	0.67	30	51-153	30	51-153	30	EPA 8270E-SIM
Benzo(k)fluoranthene	0.00076	0.005	NA	30	37-129	30	37-129	30	EPA 8270E-SIM
Benzofluoranthenes, Total	0.00301	0.010	3.2	30	46-120	30	46-120	30	EPA 8270E-SIM
Chrysene	0.00105	0.005	NA	30	48-120	30	48-120	30	EPA 8270E-SIM
Dibenzo(a,h)anthracene	0.000891	0.005	NA	30	66-139	30	66-139	30	EPA 8270E-SIM
Fluoranthene	0.00047	0.005	0.09	30	46-120	30	46-120	30	EPA 8270E-SIM
Fluorene	0.000631	0.005	0.0294	30	41-120	30	41-120	30	EPA 8270E-SIM
Indeno(1,2,3-cd)pyrene	0.00105	0.005	NA	30	67-132	30	67-132	30	EPA 8270E-SIM
Naphthalene	0.00128	0.005	0.0021	30	36-120	30	36-120	30	EPA 8270E-SIM
Phenanthrene	0.000718	0.005	1.5	30	46-120	30	46-120	30	EPA 8270E-SIM
Pyrene	0.000626	0.005	0.14	30	49-120	30	49-120	30	EPA 8270E-SIM
SVOCs (mg/kg)									
4-Nitroaniline	0.0294	0.1	0.0013	30	24-168	30	24-168	30	EPA 8270E
4-Nitrophenol	0.0326	0.1	7	30	15-138	30	15-138	30	EPA 8270E
Benzyl Alcohol	0.0163	0.02	0.0174	30	19-120	30	19-120	30	EPA 8270E
4-Bromophenyl phenyl ether	0.017	0.02	NA	30	39-120	30	39-120	30	EPA 8270E
Azobenzene (1,2-DP-Hydrazine)	0.00461	0.02	9.1	30	35-120	30	35-120	30	EPA 8270E
2,4-Dimethylphenol	0.00378	0.1	0.00230	30	10-120	30	10-120	30	EPA 8270E
4-Methylphenol	0.00739	0.02	0.0624	30	29-120	30	29-120	30	EPA 8270E
4-Chloroaniline	0.00838	0.1	0.0000772	30	11-120	30	11-120	30	EPA 8270E
Phenol	0.00439	0.02	0.115	30	34-120	30	34-120	30	EPA 8270E
Pyridine	0.0866	0.1	0.00287	30	10-147	30	10-147	30	EPA 8270E
bis(2-chloroethyl) ether	0.0193	0.05	0.0000144	30	36-120	30	36-120	30	EPA 8270E
Bis(2-Chloroethoxy)methane	0.00431	0.02	NA	30	39-120	30	39-120	30	EPA 8270E
bis(2-Ethylhexyl)phthalate	0.00546	0.05	0.00512	30	34-130	30	34-130	30	EPA 8270E
Di-n-Octylphthalate	0.00439	0.02	0.326	30	28-124	30	28-124	30	EPA 8270E
Hexachlorobenzene	0.0135	0.02	0.00000040	30	33-120	30	33-120	30	EPA 8270E
2,4-Dichlorophenol	0.0153	0.1	0.00434	30	28-120	30	28-120	30	EPA 8270E
2,4-Dinitrotoluene	0.0162	0.1	0.00016	30	44-150	30	44-150	30	EPA 8270E
1,4-Dioxane	0.017	0.335	0.00013	30	20.3-120	30	24.8-120	30	EPA 8270E
Dimethylphthalate	0.00439	0.02	0.0188	30	43-120	30	43-120	30	EPA 8270E
Dibenzofuran	0.0141	0.02	0.029	30	43-120	30	43-120	30	EPA 8270E
2,4-Dinitrophenol	0.0338	0.2	0.0092	30	10-120	30	10-120	30	EPA 8270E
4,6-Dinitro-2-methylphenol	0.038	0.2	0.00728	30	33-144	30	33-144	30	EPA 8270E
2,3,4,6-Tetrachlorophenol	0.00537	0.02	2400	30	30-160	30	30-160	30	EPA 8270E
4-Chloro-3-Methylphenol	0.0124	0.1	0.0280	30	32-120	30	32-120	30	EPA 8270E
2,6-Dinitrotoluene	0.0205	0.1	0.0000510	30	31-156	30	31-156	30	EPA 8270E
N-Nitroso-di-n-Propylamine	0.00745	0.02	0.00000388	30	34-120	30	34-120	30	EPA 8270E
Aniline	0.0169	0.1	0.00274	30	10-134	30	10-134	30	EPA 8270E
N-Nitrosodimethylamine	0.0224	0.04	0.000000265	30	17-120	30	17-120	30	EPA 8270E
Benzoic acid	0.039	0.2	0.17	30	10-120	30	10-120	30	EPA 8270E
Hexachloroethane	0.00345	0.02	0.0000097	30	38-120	30	38-120	30	EPA 8270E
4-Chlorophenylphenyl ether	0.0192	0.05	NA	30	36-141	30	36-141	30	EPA 8270E
Hexachlorocyclopentadiene	0.0245	0.1	0.00170	30	10-120	30	10-120	30	EPA 8270E
Isophorone	0.00393	0.02	0.0032	30	37-120	30	37-120	30	EPA 8270E
Diethyl phthalate	0.0197	0.05	0.0341	30	50-120	30	50-120	30	EPA 8270E
Butylbenzylphthalate	0.00941	0.02	0.000182	30	45-132	30	45-132	30	EPA 8270E
N-Nitrosodiphenylamine	0.00532	0.02	0.000000071	30	70-154	30	70-154	30	EPA 8270E
Carbazole	0.00429	0.02	NA	30	43-135	30	43-135	30	EPA 8270E
Pentachlorophenol	0.0312	0.1	0.0000018	30	16-120	30	16-120	30	EPA 8270E
2,4,6-Trichlorophenol	0.00898	0.1	0.0053	30	44.6-132	30	44.6-132	30	EPA 8270E
2-Nitroaniline	0.0164	0.1	0.064	30	40-152	30	40-152	30	EPA 8270E
2-Nitrophenol	0.00486	0.02	NA	30	30-120	30	30-120	30	EPA 8270E
2-Chloronaphthalene	0.00796	0.02	0.28	30	40-120	30	40-120	30	EPA 8270E
3,3'-Dichlorobenzidine	0.00709	0.1	0.000002	30	10-120	30	10-120	30	EPA 8270E
Benzidine	0.1	0.2	0.0000000340	30	57-120	30	57-120	30	EPA 8270E
2-Methylphenol	0.00666	0.02	0.0064	30	28-120	30	28-120	30	EPA 8270E
2-Chlorophenol	0.0138	0.02	0.0115	30	39-120	30	39-120	30	EPA 8270E
2,4,5-Trichlorophenol	0.0258	0.1	0.00007	30	51.5-129	30	51.5-129	30	EPA 8270E
Nitrobenzene	0.00724	0.02	0.0065	30	36-120	30	36-120	30	EPA 8270E
3-Nitroaniline	0.0223	0.1	NA	30	22-120	30	22-120	30	EPA 8270E
PCBs									
Total PCB Aroclors	0.00928	0.02	0.00000055	30	57-120	30	57-120	30	EPA 8082
Total PCB TEQ	--	--	3.50E-10	--	--	--	--	--	--

Notes:

[1] Preliminary cleanup levels from Ecology's PCUL spreadsheet emailed to GeoEngineers on January 18, 2022.

mg/kg = milligram per kilogram
RPD = Relative Percent Difference
%R = Percent recovery
HCID = Hydrocarbon Identification
NA = Not Applicable
PAHs- SIM = Polycyclic aromatic hydrocarbons - selected ion mode
VPH/EPH = Volatile petroleum hydrocarbons and extractable petroleum hydrocarbons analyzed in at least 3 samples if TPH detected in groundwater
PCUL = The saturated soil preliminary cleanup level as shown in Ecology's PCUL spreadsheet emailed to GeoEngineers on January 18, 2022.

SVOCs = Full suite Semivolatile Organic Compounds
VOCs = Volatile Organic Compounds
PFAS = Perfluoroalkyl substances
PCBs = Polychlorinated biphynels
EPA = United States Environmental Protection Agency

Table 8-2

Groundwater Reporting Limits, PCULs, Performance Criteria, and Analytical Methods

Precision Engineering, Inc.
Dick Morgan
Seattle, Washington

Analyte	Detection Limit (µg/L)	Reporting Limit (µg/L)	Groundwater PCUL[1] (µg/L)	Duplicate RPD	Matrix Spike		Blank Spike		Analytical Method
					%R	RPD	%R	RPD	
Metals (µg/L)									
Arsenic	0.0373	0.200	8.0	20	75-125	20	80-120	20	EPA 6020B UCT-KED
Cadmium	0.0400	0.100	1.2	20	75-125	20	80-120	20	EPA 6020B UCT-KED
Chromium	0.260	0.500	100	20	75-125	20	80-120	20	EPA 6020B
Hexavalent Chromium	0.0125	0.0125	0.046	20	85-115	20	85-115	20	EPA 7196A
Copper	0.216	0.500	3.1	20	75-125	20	80-120	20	EPA 6020B
Lead	0.0513	0.100	5.6	20	75-125	20	80-120	20	EPA 6020B
Mercury	0.000130	0.0004	0.025	20	75-125	20	80-120	20	EPA 7471B
Nickel	0.220	0.500	8.2	20	75-125	20	80-120	20	EPA 6020B UCT-KED
Selenium	0.179	0.500	50	20	75-125	20	80-120	20	EPA 6020B UCT-KED
Thallium	0.0240	0.200	0.062	20	75-125	20	80-120	20	EPA 6020B
Zinc	2.92	6.00	81	20	75-125	20	80-120	20	EPA 6020B UCT-KED
HCID (µg/L)									
Gasoline Range Organics	0.250	0.250	800/1,000	NA	NA	NA	NA	NA	NWTPH-HCID
Diesel Range Organics	0.500	0.500	500	NA	NA	NA	NA	NA	NWTPH-HCID
Oil Range Organics	1.00	1.00	500	NA	NA	NA	NA	NA	NWTPH-HCID
Total Petroleum Hydrocarbons (µg/L)									
Gasoline-range petroleum hydrocarbons	15.8	100	800/1000	30	71-127	30	71-127	30	NWTPH-G
Diesel-range petroleum hydrocarbons	50	100	500	30	30-160	30	30-160	30	NWTPH-Dx
Oil-range petroleum hydrocarbons	100	200	500	30	30-160	30	30-160	30	NWTPH-Dx
VPH/EPH (µg/L)									
VPH	25.0	50.0	NA	30	70-130	30	70-130	30	NWTPH-VPH
EPH	20.0	40.0	NA	30	10-130	30	10-130	30	NWTPH-EPH
VOCs (µg/L)									
1,1,1,2-Tetrachloroethane	0.0898	0.200	1.7	30	80-120	30	80-120	30	EPA 8260D
1,1,1-Trichloroethane	0.0773	0.200	200	30	79-123	30	79-123	30	EPA 8260D
1,1,2,2-Tetrachloroethane	0.102	0.200	0.22	30	77-123	30	77-123	30	EPA 8260D
1,1,2-Trichloroethane	0.104	0.200	0.90	30	80-121	30	80-121	30	EPA 8260D
1,1-Dichloroethane	0.0898	0.200	7.7	30	76-124	30	76-124	30	EPA 8260D
1,1-Dichloropropene	0.0948	0.200	NA	30	80-127	30	80-127	30	EPA 8260D
1,2,3-Trichlorobenzene	0.252	0.500	6.4	30	49-133	30	49-133	30	EPA 8260D
1,2,3-Trichloropropane	0.161	0.500	0.00038	30	76-125	30	76-125	30	EPA 8260D
1,2,4-Trichlorobenzene	0.208	0.500	NA	30	64-124	30	64-124	30	EPA 8260D
1,2,4-Trimethylbenzene	0.0997	0.200	80	30	80-127	30	80-127	30	EPA 8260D
1,2-Dibromo-3-chloropropane	0.394	0.500	0.042	30	62-123	30	62-123	30	EPA 8260D
1,2-Dichlorobenzene	0.0846	0.200	NA	30	80-120	30	80-120	30	EPA 8260D
1,2-Dichloroethane	0.0756	0.200	3.5	30	75-123	30	75-123	30	EPA 8260D
1,2-Dichloropropane	0.0656	0.200	3.1	30	80-120	30	80-120	30	EPA 8260D
1,3,5-Trimethylbenzene	0.0701	0.200	80	30	80-129	30	80-129	30	EPA 8260D
1,3-Dichlorobenzene	0.0751	0.200	NA	30	80-120	30	80-120	30	EPA 8260D
1,3-Dichloropropane	0.0661	0.200	160	30	80-120	30	80-120	30	EPA 8260D
1,4-Dichlorobenzene	0.104	0.200	NA	30	80-120	30	80-120	30	EPA 8260D
2,2-Dichloropropane	0.115	0.200	NA	30	66-147	30	66-147	30	EPA 8260D
2-Butanone	1.77	5.00	4800	30	61-140	30	61-140	30	EPA 8260D
2-Chloroethyl vinyl ether	0.545	1.00	NA	30	64-120	30	64-120	30	EPA 8260D
2-Chlorotoluene	0.0627	0.200	160	30	78-122	30	78-122	30	EPA 8260D
2-Hexanone	2.06	5.00	40	30	69-133	30	69-133	30	EPA 8260D
2-Pentanone	2.34	5.00	NA	30	69-134	30	69-134	30	EPA 8260D
4-Chlorotoluene	0.0610	0.200	NA	30	80-121	30	80-121	30	EPA 8260D
4-Isopropyl Toluene	0.0753	0.200	NA	30	79-130	30	79-130	30	EPA 8260D
4-Methyl-2-Pentanone	1.90	5.00	640	30	67-133	30	67-133	30	EPA 8260D
Acetone	4.33	5.00	7200	30	58-142	30	58-142	30	EPA 8260D
Acrolein	2.70	5.00	1.1	30	52-190	30	52-190	30	EPA 8260D
Acrylonitrile	0.398	1.00	0.028	30	64-134	30	64-134	30	EPA 8260D
Benzene	0.0531	0.200	1.6	30	80-120	30	80-120	30	EPA 8260D
Bromobenzene	0.0661	0.200	64	30	80-120	30	80-120	30	EPA 8260D
Bromochloromethane	0.0868	0.200	NA	30	80-121	30	80-121	30	EPA 8260D
Bromoform	0.154	0.200	12	30	51-134	30	51-134	30	EPA 8260D
Bromomethane	0.738	1.00	11.2	30	72-131	30	72-131	30	EPA 8260D
Carbon Disulfide	0.117	0.200	800	30	78-125	30	78-125	30	EPA 8260D
Carbon tetrachloride	0.0868	0.200	0.35	30	53-137	30	53-137	30	EPA 8260D
Chlorobenzene	0.0578	0.200	100	30	80-120	30	80-120	30	EPA 8260D
Chloroethane	0.176	0.200	14667	30	60-155	30	60-155	30	EPA 8260D
Chloroform	0.0548	0.200	1.2	30	80-122	30	80-122	30	EPA 8260D
cis-1,2-Dichloroethene	0.0811	0.200	16	30	80-121	30	80-121	30	EPA 8260D
cis-1,3-Dichloropropene	0.0890	0.200	0.44	30	80-124	30	80-124	30	EPA 8260D
Dibromochloromethane	0.0945	0.200	2.2	30	65-135	30	65-135	30	EPA 8260D
Dibromomethane	0.0641	0.200	80	30	80-120	30	80-120	30	EPA 8260D
Dichlorodifluoromethane	0.128	0.200	4.24	30	48-147	30	48-147	30	EPA 8260D
Ethylbenzene	0.0509	0.200	21	30	80-120	30	80-120	30	EPA 8260D
Hexachlorobutadiene	1.00	2.00	0.010	30	58-123	30	58-123	30	EPA 8260D
Isopropyl Benzene	0.0741	0.200	800	30	80-128	30	80-128	30	EPA 8260D
Methyl tert-butyl Ether	0.140	0.500	24.31	30	71-132	30	71-132	30	EPA 8260D
Methylene Chloride	0.531	1.00	5.0	30	65-135	30	65-135	30	EPA 8260D
Naphthalene	0.274	0.500	1.4	30	50-134	30	50-134	30	EPA 8260D
n-Butylbenzene	0.180	0.200	400	30	74-129	30	74-129	30	EPA 8260D
n-Hexane	0.100	0.200	4.1	30	70-130	30	70-130	30	EPA 8260D
n-Propylbenzene	0.0684	0.200	800	30	78-130	30	78-130	30	EPA 8260D
s-Butylbenzene	0.0632	0.200	800	30	78-129	30	78-129	30	EPA 8260D
Styrene	0.0876	0.200	100	30	80-124	30	80-124	30	EPA 8260D
t-Butylbenzene	0.0714	0.200	800	30	78-125	30	78-125	30	EPA 8260D
Tetrachloroethene	0.0911	0.200	2.9	30	80-120	30	80-120	30	EPA 8260D

Analyte	Detection Limit (µg/L)	Reporting Limit (µg/L)	Groundwater PCUL[1] (µg/L)	Duplicate RPD	Matrix Spike		Blank Spike		Analytical Method
					%R	RPD	%R	RPD	
Toluene	0.0485	0.200	102	30	80-120	30	80-120	30	EPA 8260D
trans-1,2-Dichloroethene	0.0692	0.200	77	30	78-128	30	78-128	30	EPA 8260D
trans-1,3-Dichloropropene	0.0891	0.200	0.44	30	71-127	30	71-127	30	EPA 8260D
trans-1,4-Dichloro 2-Butene	0.603	1.00	NA	30	55-129	30	55-129	30	EPA 8260D
Trichloroethene	0.0698	0.200	0.70	30	80-120	30	80-120	30	EPA 8260D
Trichlorofluoromethane	0.125	0.200	120	30	62-141	30	62-141	30	EPA 8260D
Vinyl Acetate	0.116	0.200	7800	30	55-138	30	55-138	30	EPA 8260D
Vinyl Chloride	0.0817	0.200	0.18	30	66-133	30	66-133	30	EPA 8260D
Xylenes, total	0.219	0.600	110	30	76-127	30	76-127	30	EPA 8260D
SVOCs - SIM (µg/L)									
1-Methylnaphthalene	0.0196	0.100	1.51	30	37-120	30	37-120	30	EPA 8270E-SIM
2-Methylnaphthalene	0.0259	0.100	14.04	30	29-120	30	29-120	30	EPA 8270E-SIM
Acenaphthene	0.0203	0.100	5.34	30	38-120	30	38-120	30	EPA 8270E-SIM
Acenaphthylene	0.0232	0.100	NA	30	32-120	30	32-120	30	EPA 8270E-SIM
Anthracene	0.0228	0.100	2.15	30	39-120	30	39-120	30	EPA 8270E-SIM
Benzo(a)anthracene	0.0458	0.100	0.00016	30	37-120	30	37-120	30	EPA 8270E-SIM
Benzo(a)pyrene	0.0559	0.100	0.000016	30	25-120	30	25-120	30	EPA 8270E-SIM
Benzo(b)fluoranthene	0.0854	0.100	0.00016	30	38-128	30	38-128	30	EPA 8270E-SIM
Benzo(g,h,i)perylene	0.0721	0.100	NA	30	28-120	30	28-120	30	EPA 8270E-SIM
Benzo(k)fluoranthene	0.0864	0.100	0.0016	30	36-130	30	36-130	30	EPA 8270E-SIM
Benzofluoranthenes, Total	0.191	0.200	NA	30	46-120	30	46-120	30	EPA 8270E-SIM
Chrysene	0.0552	0.100	0.016	30	48-120	30	48-120	30	EPA 8270E-SIM
Dibenzo(a,h)anthracene	0.0900	0.100	0.000016	30	21-120	30	21-120	30	EPA 8270E-SIM
Fluoranthene	0.0161	0.100	1.82	30	48-120	30	48-120	30	EPA 8270E-SIM
Fluorene	0.0161	0.100	3.7	30	41-120	30	41-120	30	EPA 8270E-SIM
Indeno(1,2,3-cd)pyrene	0.0840	0.100	0.00016	30	32-120	30	32-120	30	EPA 8270E-SIM
Naphthalene	0.0169	0.100	1.4	30	33-120	30	33-120	30	EPA 8270E-SIM
Phenanthrene	0.0243	0.100	NA	30	49-120	30	49-120	30	EPA 8270E-SIM
Pyrene	0.0254	0.100	2.011	30	48-120	30	48-120	30	EPA 8270E-SIM
SVOCs (µg/L)									
1,4-Dioxane	0.211	2.00	0.44	30	0-200	30	0-200	30	EPA 8270E
2,3,4,6-Tetrachlorophenol	0.134	1.00	480	30	60.9-120	30	60.9-120	30	EPA 8270E
2,4,5-Trichlorophenol	0.999	5.00	0.037	30	58.2-120	30	58.2-120	30	EPA 8270E
2,4,6-Trichlorophenol	1.15	3.00	8.0	30	58.5-120	30	58.5-120	30	EPA 8270E
2,4-Dichlorophenol	0.870	3.00	10	30	56.6-120	30	56.6-120	30	EPA 8270E
2,4-Dimethylphenol	1.00	3.00	2.90	30	50.4-120	30	50.4-120	30	EPA 8270E
2,4-Dinitrophenol	1.66	20.0	32.0	30	10-168	30	10-168	30	EPA 8270E
2,4-Dinitrotoluene	1.02	3.00	0.180	30	72.7-138	30	72.7-138	30	EPA 8270E
2,6-Dinitrotoluene	1.10	3.00	0.058	30	61-141	30	78.2-141	30	EPA 8270E
2-Chloronaphthalene	0.195	1.00	100	30	56-120	30	56-120	30	EPA 8270E
2-Chlorophenol	0.185	1.00	17	30	55.2-120	30	55.2-120	30	EPA 8270E
2-Methylphenol	0.215	1.00	11	30	48.5-120	30	48.5-120	30	EPA 8270E
2-Nitroaniline	1.18	3.00	160	30	61.8-120	30	61.8-120	30	EPA 8270E
2-Nitrophenol	0.189	3.00	NA	30	68-120	30	68-120	30	EPA 8270E
3,3'-Dichlorobenzidine	2.52	5.00	0.0033	30	41-171	30	41-171	30	EPA 8270E
3-Nitroaniline	1.03	3.00	NA	30	41.2-123	30	41.2-120	30	EPA 8270E
4,6-Dinitro-2-methylphenol	2.36	10.0	7	30	32.6-159	30	32.6-159	30	EPA 8270E
4-Bromophenyl phenyl ether	0.274	1.00	NA	30	66.2-120	30	66.2-120	30	EPA 8270E
4-Chloro-3-Methylphenol	0.899	3.00	36	30	54.6-120	30	54.6-120	30	EPA 8270E
4-Chloroaniline	0.915	5.00	0.440	30	10-120	30	10-120	30	EPA 8270E
4-Chlorophenylphenyl ether	0.214	1.00	NA	30	66.2-120	30	66.2-120	30	EPA 8270E
4-Methylphenol	0.263	2.00	110.0	30	46.6-120	30	46.6-120	30	EPA 8270E
4-Nitroaniline	1.15	3.00	4.40	30	50-135	30	50-135	30	EPA 8270E
4-Nitrophenol	0.692	10.0	NA	30	12.1-120	30	12.1-120	30	EPA 8270E
Aniline	0.912	1.00	15	30	22.1-125	30	22.1-120	30	EPA 8270E
Azobenzene (1,2-DP-Hydrazine)	0.269	1.00	0.4	30	55.9-120	30	55.9-120	30	EPA 8270E
Benzidine	5.00	10.0	0.000023	30	10-160	30	10-120	30	EPA 8270E
Benzoic acid	1.50	20.0	590	30	10-120	30	10-120	30	EPA 8270E
Benzyl Alcohol	0.500	2.00	56.4	30	20-120	30	20-120	30	EPA 8270E
Bis(2-Chloroethoxy)methane	0.254	1.00	NA	30	65.2-120	30	65.2-120	30	EPA 8270E
bis(2-chloroethyl) ether	0.265	1.00	0.040	30	57.3-120	30	57.3-120	30	EPA 8270E
bis(2-Ethylhexyl)phthalate	0.328	3.00	0.046	30	67.2-123	30	67.2-123	30	EPA 8270E
Butylbenzylphthalate	0.361	1.00	0.013	30	71-139	30	71-139	30	EPA 8270E
Carbazole	0.269	1.00	NA	30	42-177	30	42-177	30	EPA 8270E
Dibenzofuran	0.193	1.00	3.092	30	61.9-120	30	61.9-120	30	EPA 8270E
Diethyl phthalate	0.256	1.00	93	30	62-120	30	62-120	30	EPA 8270E
Dimethylphthalate	0.199	1.00	59.0	30	65-120	30	65-120	30	EPA 8270E
Di-n-Octylphthalate	0.266	1.00	2.3	30	60.9-120	30	60.9-120	30	EPA 8270E
Hexachlorobenzene	0.228	1.00	0.000005	30	62.2-120	30	62.2-120	30	EPA 8270E
Hexachlorocyclopentadiene	0.990	5.00	1.0	30	29.3-120	30	29.3-120	30	EPA 8270E
Hexachloroethane	0.227	2.00	0.020	30	40.3-120	30	40.3-120	30	EPA 8270E
Isophorone	0.756	1.00	92	30	77-146	30	77-146	30	EPA 8270E

Analyte	Detection Limit (µg/L)	Reporting Limit (µg/L)	Groundwater PCUL[1] (µg/L)	Duplicate RPD	Matrix Spike		Blank Spike		Analytical Method
					%R	RPD	%R	RPD	
Nitrobenzene	0.269	1.00	16.0	30	60.8-120	30	60.8-120	30	EPA 8270E
N-Nitrosodimethylamine	0.935	3.00	0.00023	30	17.7-120	30	17.7-120	30	EPA 8270E
N-Nitroso-di-n-Propylamine	0.239	1.00	0.013	30	59.3-120	30	59.3-120	30	EPA 8270E
N-Nitrosodiphenylamine	0.231	1.00	0.550	30	66-120	30	66-120	30	EPA 8270E
Pentachlorophenol	1.21	10.0	0.0020	30	40.7-124	30	40.7-124	30	EPA 8270E
Phenol	0.232	1.00	100	30	10-120	30	10-120	30	EPA 8270E
Pyridine	1.31	5.00	8.0	30	33.6-120	30	33.6-120	30	EPA 8270E
PCBs									
Total PCB Aroclors	0.0175	0.100	0.0000076	30	51-120	30	51-120	30	EPA 8082
Total PCB TEQ	--	--	4.4E-09	--	--	--	--	--	--

Notes:

[1] Preliminary cleanup levels from Ecology's PCUL spreadsheet emailed to GeoEngineers on January 18, 2022.

TPH = Total petroleum hydrocarbons

PCBs = Polychlorinated biphenyls

VOCs = Volatile organic compounds

SVOCs = Semivolatile organic compounds

SVOCs-SIM = Semivolatile organic compounds-selected ion monitoring

VPH/EPH = Volatile petroleum hydrocarbons/extractable petroleum hydrocarbons

NA = Not applicable

µg/L = Microgram per liter

PCUL = Preliminary cleanup level

%R = Percent recovery

RPD = Relative percent difference

EPA = United States Environmental Protection Agency

Table 8-3

Soil and Groundwater Reporting Limits, Performance Criteria, and Analytical Method for PFAS

Precision Engineering Site
Dick Morgan
Seattle, Washington

Analyte		Matrix	MDL	Accuracy (LCS %Rec)	Precision (RPD)	LODb	LOQ	Units	Method
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	Water	0.16	70-130	30	0.4	5.0	ng/L	537 Mod
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Water	0.32	70-130	30	0.74	5.0	ng/L	537 Mod
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	Water	1.50	70-130	30	4.8	5.0	ng/L	537 Mod
N-Methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	2355-31-9	Water	0.88	70-130	30	2	5.0	ng/L	537 Mod
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	Water	0.49	70-130	30	1.6	5.0	ng/L	537 Mod
Perfluoropentanoiic Acid (PFPeA)	2706-90-3	Water	1.6	70-130	30	4.8	5.0	ng/L	537 Mod
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	Water	0.46	70-130	30	1.5	5.0	ng/L	537 Mod
N-Ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	2991-50-6	Water	0.94	70-130	30	2.0	5.0	ng/L	537 Mod
Perfluorohexanoic acid (PFHxA)	307-24-4	Water	8.9	70-130	30	18	20	ng/L	537 Mod
Perfluorododecanoic acid (PFDoDA)	307-55-1	Water	1.2	70-130	30	4.8	5.0	ng/L	537 Mod
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	Water	0.39	70-130	30	0.8	5.0	ng/L	537 Mod
Perfluorooctanoic acid (PFOA)	335-67-1	Water	0.38	70-130	30	0.8	5.0	ng/L	537 Mod
Perfluorodecanoic acid (PFDA)	335-76-2	Water	1.2	70-130	30	4.8	5.0	ng/L	537 Mod
Perfluorodecane sulfonic acid (PFDS)	335-77-3	Water	0.87	70-130	30	1.9	5.0	ng/L	537 Mod
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	Water	0.77	70-130	30	1.8	5.0	ng/L	537 Mod
Perfluorobutane sulfonic acid (PFBS)	375-73-5	Water	0.27	70-130	30	0.71	5.0	ng/L	537 Mod
Perfluoroheptanoic acid (PFHpA)	375-85-9	Water	0.68	70-130	30	1.6	5.0	ng/L	537 Mod
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	Water	0.46	70-130	30	1.5	5.0	ng/L	537 Mod
Perfluorononanoic acid (PFNA)	375-95-1	Water	1.4	70-130	30	4.8	5.0	ng/L	537 Mod
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	Water	2.4	70-130	30	4.8	5.0	ng/L	537 Mod
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	Water	0.25	70-130	30	0.77	5.0	ng/L	537 Mod
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	Water	0.38	70-130	30	0.8	5.0	ng/L	537 Mod
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	Water	1.9	70-130	30	4.8	5.0	ng/L	537 Mod
Perfluorooctane sulfonamide (FOSA)	754-91-6	Water	0.59	70-130	30	0.59	5.0	ng/L	537 Mod
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	Soil	0.088	63-133	50	0.20	1.0	ng/g	537 Mod
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Soil	0.13	66-130	50	0.37	1.0	ng/g	537 Mod
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	Soil	0.18	61-136	50	0.40	1.0	ng/g	537 Mod
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	Soil	0.27	48-161	50	0.80	1.0	ng/g	537 Mod
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	Soil	0.054	68-126	50	0.20	1.0	ng/g	537 Mod
Perfluoropentanoic acid (PFPeA)	2706-90-3	Soil	0.21	66-121	50	0.80	1.0	ng/g	537 Mod
6:2 Fluorotelomersulfonic acid (6:2 FTS)	27619-97-2	Soil	0.15	69-143	50	0.38	1.0	ng/g	537 Mod
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	Soil	0.20	50-151	50	0.40	1.0	ng/g	537 Mod
Perfluorohexanoic acid (PFHxA)	307-24-4	Soil	0.31	62-138	50	0.80	1.0	ng/g	537 Mod
Perfluorododecanoic acid (PFDoDA)	307-55-1	Soil	0.27	62-138	50	0.80	1.0	ng/g	537 Mod
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	Soil	0.073	58-147	50	0.20	1.0	ng/g	537 Mod
Perfluorooctanoic acid (PFOA)	335-67-1	Soil	0.13	63-141	50	0.40	1.0	ng/g	537 Mod
Perfluorodecanoic acid (PFDA)	335-76-2	Soil	0.26	65-132	50	0.80	1.0	ng/g	537 Mod
Perfluorodecane sulfonic acid (PFDS)	335-77-3	Soil	0.17	71-153	50	0.39	1.0	ng/g	537 Mod
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	Soil	0.30	66-139	50	0.73	1.0	ng/g	537 Mod
Perfluorobutane sulfonic acid (PFBS)	375-73-5	Soil	0.22	44-139	50	0.71	1.0	ng/g	537 Mod
Perfluoroheptanoic acid (PFHpA)	375-85-9	Soil	0.19	68-127	50	0.40	1.0	ng/g	537 Mod
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	Soil	0.062	52-186	50	0.19	1.0	ng/g	537 Mod
Perfluorononanoic acid (PFNA)	375-95-1	Soil	0.33	62-137	50	0.80	1.0	ng/g	537 Mod
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	Soil	0.18	73-131	50	0.40	1.0	ng/g	537 Mod
8:2 Fluorotelomersulfonic acid (8:2 FTS)	39108-34-4	Soil	0.029	73-126	50	0.10	1.0	ng/g	537 Mod
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	Soil	0.11	60-147	50	0.40	1.0	ng/g	537 Mod
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	Soil	0.21	64-125	50	0.80	1.0	ng/g	537 Mod
Perfluorooctane sulfonamide (FOSA)	754-91-6	Soil	0.067	68-126	50	0.20	1.0	ng/g	537 Mod

Notes:

MDL = Method Detection Limit

LCS %Rec = Laboratory Control Sample Percent Recovery

RPD = Relative Percent Difference

LODb = Limit of Detection

LOQ = Limit of Quantitation

ng/L = Nanogram per Liter

ng/g = Nanogram per Gram

Table 8-4

Field Quality Control Sample Frequency

Precision Engineering Site
Dick Morgan
Seattle, Washington

QC Check Sample	Frequency	Acceptance Criteria
Soil		
Equipment Rinsate Blank	One per every 20 samples (or fewer) collected with reusable equipment	Below MRL[1]
Temperature Blank	One per sample cooler	4°C (±2°C)
Groundwater		
Equipment Rinsate Blank	One per every 20 samples (or fewer) collected with reusable equipment	Below MRL[2]
Filter Blank	One per every 20 filtered sample (or fewer).	Below MRL[2]
Trip Blank	One per sample cooler (for VOC analysis only)	Below MRL[2]
Field Duplicate Sample	One per every 20 samples (or fewer)	50% RPD[2, 3] for organics, 30% RPD[2, 3] for inorganics
Temperature Blank	One per sample cooler	4°C (±2°C)

Notes:

[1] Not all QC samples are applicable to every sampling event or analytical method.

[2] Criteria may change based on data validation.

[3] RPD not evaluated for sample results less than five times the MRL.

°C = Degrees Celsius

MRL = Method reporting limit

QC = Quality control

RPD = Relative percent difference

VOC = Volatile organic compound

Table 8-5

Laboratory Quality Control Sample Frequency

Precision Engineering Site
Dick Morgan
Seattle, Washington

QC check sample	QC Parameter	Frequency	Acceptance Criteria	Corrective Action
Metals, CR+6	CRM or LCS	1 per prep batch (20 samples or less)	+/- 20% or listed control limits	Rerun to confirm. Correct problem and if necessary reprep and reanalyze batch.
	Laboratory Replicate	1 per prep batch (20 samples or less)	+/- 20%	Review data for errors. Matrix QC control limits are advisory as an indication of sample characteristics.
	Matrix Spike	1 per prep batch (20 samples or less)	+/- 30%	Review data for errors. Matrix QC control limits are advisory as an indication of sample characteristics.
	Method Blank	1 per prep batch (20 samples or less)	Less than ½ the RL or greater than 1/10th the amount measured in any sample or 1/10th the regulatory limit, whichever is greater	Reprocess the batch. If insufficient sample volume remains for reprocessing or if holding times have been exceeded, report with the appropriate data qualifiers.
Organic Parameters (SVOA, VOA, TPHg, TPHDx, VPH, EPH)	LCS	1 per prep batch (20 samples or less). Run in duplicate if no sample available for MS/MSD.	Method control limits	Rerun to confirm and evaluate outliers. Correct problem and if necessary reprep and reanalyze batch.
	Matrix Spike	1 per prep batch (20 samples or less)	Laboratory listed control limits	Review data for errors. Matrix QC control limits are advisory as an indication of sample characteristics.
	Matrix Spike Duplicate	1 per prep batch (20 samples or less)	Laboratory listed control limits for recovery and RPD	Review data for errors. Matrix QC control limits are advisory as an indication of sample characteristics.
	Surrogates	Every Sample	Method limits	Evaluate the sample for matrix effect. Rerun at dilution if needed, or reprocess sample as needed.
	Method Blank	1 per prep batch (20 samples or less)	Less than ½ the RL or greater than 1/10th the amount measured in any sample or 1/10th the regulatory limit, whichever is greater, with the exception of known laboratory contaminants	Reprocess the batch if necessary. If insufficient sample volume remains for reprocessing or if holding times have been exceeded, report with the appropriate data qualifiers.

Notes:

[1] Not all quality control samples are applicable to every sampling event or analytical method.

[2] Criteria may change based on data validation.

[3] RPD not evaluated for samples less than five times the MRL.

Laboratory duplicate samples and laboratory control samples will be used when required by the method.

TPHg = Northwest total petroleum hydrocarbons – gasoline-range

TPHDx = Northwest total petroleum hydrocarbons – diesel extended

MS/MSD = Matrix spike and matrix spike duplicate

MRL = Method reporting limit

% = Percent

QC = Quality control

RPD = Relative percent difference

CRM = Certified Reference Material

LCS = Laboratory control sample

SVOA = Semivolatile organic analysis

VOA = Volatile organic analysis

EPH = Extractable petroleum hydrocarbon

VPH = Volatile petroleum hydrocarbon

Table 8-6
Soil Sample Handling Summary
Precision Engineering Site
Dick Morgan
Seattle, Washington

Analysis	Container	Containers Per Sample	Preservation[1]	Maximum Hold Time To Lab Prep	Maximum Hold Time To Analysis
Metals including hexavalent chromium and mercury, HCID, EPH, TPHDx	8 oz WMG	1	None	Extract/analyze within 14 days	Extract/analyze within 14 days
VOC	SoBi Vial	4	Sodium Bisulfate	Analyze within 14 days	Analyze within 14 days
VOC, VPH, TPHg	MeOH Vial	3	Methanol	Analyze within 14 days	Analyze within 14 days
SVOC, PAH, PCBs	8 oz WMG	1	Freeze at laboratory	Extract within 14 days; freeze	40 days
PFAS	125 ml HDPE	1	None	14 days	14 days

Notes:

[1] All samples cooled to approximately 4 degrees Celsius.

HCID = Hydrocarbon identification

EPH = Extractable petroleum hydrocarbon

VPH = Volatile petroleum hydrocarbon

TPHDx = Northwest total petroleum hydrocarbons – diesel extended

TPHg = Northwest total petroleum hydrocarbons – gasoline-range

ml = milliliter

VOC = Volatile organic compound

SVOC = Semivolatile organic compound

PAH = Polycyclic aromatic hydrocarbon

PCBs = Polychlorinated biphenyls

PFAS = Perfluoralkyl substance

WMG = Wide mouth glass jar

Oz = ounce

SoBi = Sodium bisulfate

MeOH = methanol

HDPE = High density polyethylene

Table 8-7
Groundwater Sample Handling Summary
Precision Engineering Site
Dick Morgan
Seattle, Washington

Analysis	Bottle Size And Type	Bottle Per Sample	Maximum Hold Time To Lab Prep	Maximum Hold Time To Analysis
Metals (total)	1-L HDPE w/HNO3	1	180 days	180 days
Hexavalent Chromium (total)	250 ml AG	1	Analyze within 24 hours	Analyze within 24 hours
Low level mercury (total+dissolved*)	500 mL AG BrCl	2	To lab within 48 hours for filtration/preservation	28 days
Metals (dissolved – field filtered)	1-L HDPE w/HNO3	1	180 days	180 days
Hexavalent Chromium (dissolved – field filtered)	250 ml AG	1	Analyze within 24 hours	Analyze within 24 hours
VOCs, TPHg, VPH	40-mL VOC w/HCl	5	14 days	14 days
HCID/TPHDx	500 ml AG w/HCl	3	14 days	40 days
EPH	500 ml AG w/HCl	1	14 days	40 days after prep
PAH SIM	500 ml AG	1	7 days	40 days after prep
PCBs	500 ml AG	2	NA	NA
SVOC	500 ml AG	2	7 days	40 days after prep
PFAS	250 ml HDPE	2	14 days**	14 days**
TOC	250 ml AG w/H2SO4	1	28 days	28 days
Nitrate, sulfate	250 ml plastic	1	Analyze within 48 hours for nitrate	Analyze within 48 hours for nitrate
Diss Mn (ff)	500 ml HDPE w/HNO3	1	180 days	180 days

Notes:

*Filtered at the laboratory

**Ecology has indicated hold time exceedances may be allowed due to the stability of PFAS

HCID = Hydrocarbon identification

EPH = Extractable petroleum hydrocarbon

VPH = Volatile petroleum hydrocarbon

TPHDx = Northwest total petroleum hydrocarbons – diesel extended

TPHg = Northwest total petroleum hydrocarbons – gasoline-range

VOC = Volatile organic compound

SVOC = Semivolatile organic compound

HCl = hydrochloric acid

PAH = Polycyclic aromatic hydrocarbon

PCBs = Polychlorinated biphenyls

PFAS = Perfluoralkyl substance

WMG = Wide mouth glass jar

HDPE = High density polyethylene

HN03 = Nitric Acid

H2S04 = Sulfuric acid

ml = milliliter

AG = Amber glass

BrCl = Bromium Chloride

NA = Not applicable

APPENDIX A
Standard Operating Procedures(SOPs)

SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the decontamination procedure for field equipment that may come in contact with contaminated media and that GeoEngineers staff may reuse at multiple sample locations or sites. Decontamination is performed to reduce the potential for cross- contamination of samples that will be collected with multiuse equipment and that will undergo physical or chemical analyses. Other equipment that is multiuse—not used specifically for sample collection (e.g., water level meter, pump used for well development)—also requires decontamination. Finally, decontamination is necessary to minimize the potential for GeoEngineers staff's exposure to chemicals.

Typically, decontamination is not necessary for field equipment that is disposable and intended to be used only once (e.g., disposable bailer). Additionally, this SOP does not apply to equipment used by subcontractors, such as drilling equipment. However, GeoEngineers staff should confirm that subcontractors are implementing appropriate decontamination procedures to minimize the potential for cross-contamination of samples or GeoEngineers staff's exposure to chemicals.

EQUIPMENT AND MATERIALS REQUIRED

The following materials are necessary for this procedure:

- Nonphosphate detergent solution (e.g., Alconox, Liquinox)
- Distilled and potable water
- Personal protective equipment (as specified in the site-specific health and safety plan)
- Buckets to contain rinsate, brushes, paper towels

Depending on the site conditions and the types of contaminants that may be present, the use of other decontamination materials, such as deionized water, methanol, hexane, or isopropyl alcohol, may be necessary. The need for other materials should be determined prior to fieldwork. The decontamination procedures using other materials should be described in a site-specific sampling and analysis plan (SAP).

METHODOLOGY

When the site-specific SAP specifies additional or different requirements for decontamination, it takes precedence over this SOP. In the absence of a SAP, the following procedures shall be used.

General Sampling Procedure

1. Rinse the equipment with potable water to remove visible soil, petroleum sheen, or contamination.
2. Scrub the equipment with a brush and solution of distilled water and nonphosphate detergent.
3. Rinse the equipment with distilled water.
4. Allow equipment to air dry, or dry it with paper towels.

5. At all times, ensure that the decontaminated equipment is stored to prevent it from becoming contaminated while not in use. Depending on the size of the equipment, it can be wrapped with new aluminum foil or placed in a new plastic bag.

Rinsate Storage

Fluids resulting from equipment decontamination shall initially be contained in a bucket and then transferred to a Department of Transportation-approved container (e.g., 55-gallon drum) stored on site at a location that does not interfere with on-site activities (e.g., vehicle traffic, pedestrian areas). Place a label on each container and include the following information:

- Contents (e.g., decontamination fluids)
- Origin of materials (i.e., site address)
- Client contact

Note that labels on containers exposed to sunlight or precipitation are prone to fading. Use a waterproof, indelible ink pen (e.g., Sharpie®) whenever possible. In the field notebook, keep a detailed inventory of all containers, including the number of containers, the approximate quantity of liquids generated, and a description of the source of the fluids. Provide this information to the GeoEngineers project manager. Take photographs of the drum labels and drum location on site.

Some clients and site owners have specific requirements for labeling and storing containers. Discuss potential site-specific requirements with the GeoEngineers project manager or site contact to prior to fieldwork. If the site is known to contain concentrations of contaminants that will classify investigation-derived waste as hazardous, a special label should be used and the waste generator number should be included.

SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the methods for observing and documenting the physical characteristics of unconsolidated geologic materials (soil and sediment) encountered during field investigations. If a GeoEngineers project requires hard rock drilling and description of rock core or cuttings, procedures for describing rock should be specified in a project-specific sampling and analysis plan (SAP).

EQUIPMENT AND MATERIALS REQUIRED

The following materials may be used for this procedure:

- Boring logs
- Dry-erase board
- Camera

METHODOLOGY

When the project-specific SAP specifies additional or different requirements for lithologic logging, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used. GeoEngineers uses a combination of the Unified Soil Classification System (USCS) and the ASTM International method D2487 for describing and classifying soil and sediment by visual and manual examination. Before beginning fieldwork, verify with the project manager the logging standard to be used.

Logging Process

The objective of lithologic logging is to document the physical characteristics of soil and sediment encountered and the changes in characteristics with depth. Typically, changes with depth will define the strata encountered. Therefore, each stratum encountered should be described and the following characteristics should be included in the description, in the order given:

- Depth interval of each stratum to the nearest tenth of a foot below ground surface
- USCS classification group name and symbol
- Color (if required, use Munsell color chart)
- Grain-size distribution, as percentages of fines (silt and clay combined), sand, and gravel
- Percentages of larger clasts (cobbles and boulders) if present
- Consistency, when the content of fines is 50 percent or greater
- Density, when the combined percentage of sand and gravel is 50 percent or greater
- Sand and gravel grain angularity
- Visual and/or olfactory evidence of contamination, including staining, odors, and/or sheen, if wet

- Structures, if present (e.g., laminae)
- Presence of organic matter (e.g., roots, leaves, twigs, wood fragments)
- Moisture content as “dry,” “moist,” or “wet”
- Optional geologic interpretation of each stratum (e.g., fill, alluvium)

SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the use of a photoionization detector (PID) to field screen soil for evidence of organic vapors. The PID measures the organic vapor concentration in parts per million, is not compound-specific, and provides a qualitative indication of the presence of organic vapors.

EQUIPMENT AND MATERIALS REQUIRED

The following materials may be used for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- PID
- Calibration gas
- Sealable plastic bags
- Field forms or notebook for documenting PID readings

METHODOLOGY

When the project-specific sampling and analysis plan (SAP) specifies additional or different requirements for organic vapor field screening, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

The electron volt (eV) rating for the PID lamp (i.e., 9.8, 10.6, or 11.7) must be greater than the ionization potential (in eV) of a compound in order for the PID to detect the compound. A lamp of at least 9.8 eV should be used for petroleum hydrocarbons. A lamp of at least 10.6 eV should be used for typical chlorinated alkenes (e.g., dry cleaning solvents). Before beginning field activities, verify the compatibility of the lamp size with the compounds expected to be present in soil.

General Procedure

Calibration:

- The PID should be calibrated daily, or as needed.
- Calibrate the PID according to the manufacturer's instructions.
- Document the calibration activities and results in the field notebook. Measuring organic vapor content:
  - Place a representative volume (generally, a handful) of freshly exposed soil into a sealable plastic bag.
  - Seal the bag and gently agitate the soil.
  - Let the bag sit for several minutes to allow any organic vapors to volatilize from the soil.
  - Partially open the bag so that the tip of the PID intake tube can be inserted into the bag but is not in contact with the soil, then close the bag seal around the intake tube.
  - Record the PID measurement and document results in the field notes or boring log.

SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the process of obtaining surface and subsurface soil samples for physical and/or chemical analysis. In instances where mechanical equipment is used (e.g., drill rig or excavator), soil samples may be obtained sample manually by grabbing soil directly from a drilled soil core or excavator bucket, thereby precluding the need for hand tools.

EQUIPMENT AND MATERIALS REQUIRED

The following materials may be used for this procedure:

- Personal protective equipment (as specified in the site-specific health and safety pan)
- Tools appropriate for the conditions that may be encountered (e.g., spoon, trowel, shovel, hand auger); stainless steel tools are preferred
- Stainless steel bowls
- Tape measure with increments in feet and tenths of a foot
- Laboratory-supplied sample containers, labels, and chain-of-custody form
- Cooler with ice
- Decontamination supplies if using reusable sampling equipment (see SOP 1 for decontamination procedures)
- Field forms or notebook for documenting sample information

METHODOLOGY

When the project-specific sampling and analysis plan (SAP) specifies additional or other requirements for soil sampling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

General Procedure:

- Don gloves as specified in the health and safety plan; don new gloves prior to collecting each sample.
- Clear the ground surface of grass, leaves, and other debris.
- Access soil at the targeted sample depth. Use a measuring tape to verify the sample depth and record the depth in the field notebook or boring log.
- Describe and document the soil lithology in accordance with SOP 2.
- If the sample volume requirement is small (generally one or two 8-ounce jars), the soil can be placed directly into the sample container. This can be done manually; however, if the gloves have become soiled, don new gloves before collecting the sample.

- If the sample volume requirement is large, or composite sample collection is required, collect and homogenize the soil in a decontaminated stainless-steel bowl or a dedicated Ziploc® bag, then transfer the sample to the sample container. If the gloves have become soiled during excavation, don new gloves before collecting the sample.
- Before sample collection, and to the extent possible, remove organic debris, anthropogenic material (e.g., brick, metal, glass), and gravels larger than 4 millimeters, unless a project-specific SAP directs otherwise.
- When sampling for gasoline-range total petroleum hydrocarbons (gasoline) or volatile organic compounds (VOCs), a subsample will be obtained from a discrete portion of the collected sample. To minimize the potential loss of volatiles during sampling, the subsample shall not be composited or homogenized. The sample container for gasoline and/or VOC analysis will be filled first if additional containers are necessary for other analysis. Specific procedures for collecting samples for gasoline and/or VOC analysis using the U.S. Environmental Protection Agency Method 5035 are specified in SOP 5.
- If using reusable sampling equipment, the equipment will be decontaminated between sample locations in accordance with SOP 1. Alternatively, new, disposable equipment can be used to collect each sample to preclude the need for equipment decontamination.

Backfilling Sample Locations:

Manual excavations can be backfilled with excess soil, unless the project-specific SAP requires a different backfill procedure.

SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the methods for obtaining soil samples for chemical analysis for gasoline-range petroleum hydrocarbons (gasoline) and volatile organic compounds (VOCs) by U.S. Environmental Protection Agency Method 5035.

EQUIPMENT AND MATERIALS REQUIRED

The following materials may be used for this procedure:

- Sampling equipment (i.e., tubular soil sampler or syringe capable of collecting a 5-gram soil sample)
- Laboratory-supplied sample containers, including:
  - Pre-weighed and -labeled 40-milliliter volatile organic analysis (VOA) vials, including preservative (typically methanol)
  - Two-ounce jar for percent total solids/moisture, if needed
- Laboratory chain-of-custody form and cooler with ice
- VOA packing cubes
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for decontamination procedures)
- Field forms or notebook for documenting the sampling procedures

METHODOLOGY

When the site-specific sampling and analysis plan (SAP) specifies additional or different requirements for soil sampling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Laboratory Analytical Considerations:

- VOCs must be analyzed within 14 days of sample collection.
- Samples must be maintained at a temperature less than 4°C, ±2°C.
- Discrete VOC samples may be composited at the laboratory.

General Procedure

- When using the tubular sampler, seat the plunger in the handle.
- Collect the sample by pushing the sampler into the soil until the soil has filled the sampler.
- Remove the sampler and confirm that the soil in it is flush with the mouth of the sampler.
- Wipe all debris from the outside of the sampler. Remove any soil that extends beyond the mouth of the sampler.

- Rotate the plunger handle 90 degrees until it is aligned with the slots in the body of the sampler. Place the mouth of the sampler into the sample container and extrude the sample into the sample container by pushing the plunger down. Hold the sample at an angle when extruding to minimize splashing of the preservative.
- Immediately remove any soil or debris from the threads of the vial and place the lid on the vial.
- Gently swirl the vial (do not shake) to allow the preservative to uniformly penetrate and wet the soil.
- Store the vials in an upright position in the sample cooler to avoid preservative leakage. Use VOA packing cubes if available.
- Repeat process for each additional sample container.
- If required by the laboratory, fill a 2-ounce container to capacity for percent total solids determination.

SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the use of a push probe (i.e., Geoprobe™) to observe subsurface conditions and collect samples of various environmental media (e.g., soil, sediment, groundwater, soil vapor) for laboratory analysis. Push-probe drilling is generally not suitable for soils with gravel/rock clast larger than about 4 inches in diameter. If gravelly/rocky soils are expected at the project site, consider use of the sonic drilling method described in SOP 8.

Push-probe drilling can be used for a variety of activities, including:

- Retrieving cores to document subsurface soil or sediment conditions and to obtain samples for physical and/or chemical evaluation
- Sampling soil vapors, using temporary well points
- Collecting reconnaissance groundwater samples from temporary well screens
- Installing permanent monitoring wells

EQUIPMENT AND MATERIALS REQUIRED

The following equipment and materials may be used for this procedure:

- Subcontractor push-probe drill rig and licensed operator
- Media-specific sampling equipment (e.g., water level meter, pumps, tubing)
- Laboratory-supplied sample containers, labels, and chain-of-custody forms.
- Traffic cones, measuring tape, and buckets
- Department of Transportation (DOT)-approved containers (e.g., 55-gallon drum) for storing excess soil and decontamination water; drums are typically provided by the drilling subcontractor
- Field forms and notebook
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for decontamination procedures)
- Personal protective equipment, as required by the site-specific health and safety plan.

METHODOLOGY

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for push-probe drilling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Utility Locate

- Before beginning the fieldwork, review the proposed drilling location(s) and identify the potential presence of overhead and underground utilities. Adjust the locations or have an air knife clear sample locations to avoid identified utilities.
- See SOP 18 for the utility locating procedures.

Push-Probe Drilling Process

- Ensure that the drilling subcontractor decontaminates all subsurface equipment before and after each boring. Document the decontamination procedures in the field notebook. Store decontamination water in DOT-approved containers for later off-site disposal.
- The push-probe drilling rig is equipped with a soil sampling device that retrieves a continuous soil core. A combination of static force and percussion is used to drive the soil sampler into unconsolidated geologic material. A plastic liner placed inside the sampler contains the soil core and permits its removal from the sampler for examination. The sampler is driven into the subsurface, typically in 4- or 5-foot intervals, depending on the length of the sampling device. When each interval depth is reached, the soil sampler is removed from the ground, and the liner is removed to facilitate soil observation and sampling.
- This process is repeated for each soil sample interval until the targeted boring depth is reached.

Logging and Soil Sampling Process

- Remove the soil core from the sampler for field screening, description, and sampling.
- Describe the lithology in accordance with SOP 2.
- Confirm the required depth interval(s) for soil sample collection and field screening with the GeoEngineers project manager, or conduct the work in accordance with the SAP. The sample interval may require adjustment based on core recovery, soil stratigraphy and characteristics, and evidence of contamination. Confirm any adjustments to the sample intervals with the project manager.
- If the project requires organic vapor screening, conduct screening in accordance with SOP 3.
- If the project requires laboratory analyses for gasoline-range petroleum hydrocarbons or volatile organic compounds, conduct the sampling in accordance with SOP 5.
- Contain all soil remaining after sample collection in DOT-approved containers for off-site disposal. See SOP 1 for drum storage, labeling, and documentation procedures.

Reconnaissance Groundwater Sampling Process

- Typically, reconnaissance groundwater samples are collected at the first occurrence of groundwater in a boring. Confirm the required depth and procedures for groundwater sample collection with the GeoEngineers project manager, or conduct the work in accordance with the SAP. If the project requires use of the low-flow sampling method, refer to SOP 9 for the low-flow sampling procedures.
- Reconnaissance groundwater samples are collected using a decontaminated stainless steel or disposable, temporary polyvinyl chloride well screen placed in the boring. If the soils in the boring are fine-grained and may cause excessive turbidity in groundwater, consider using a filter pack around

the screen to reduce turbidity. Alternatively, purging the well screen of groundwater prior to sample collection may also reduce the turbidity. See SOP 9 for purging procedures.

- Purging and sampling will be conducted using a peristaltic pump unless otherwise specified in the SAP. New tubing will be used for each boring. Field parameters (e.g., temperature, conductivity, and pH) will be recorded in accordance with SOP 9 during purging and sampling.

Monitoring Well Installation

- If the project requires installation of a monitoring well in the boring, refer to SOP 11 for the well installation procedures. Confirm the procedures with the GeoEngineers project manager.

Borehole Abandonment Process

- Abandon each borehole in accordance with local and state regulations/procedures. The abandonment will be performed by the drilling subcontractor.
- The abandonment procedure typically consists of backfilling the boring with granular bentonite and hydrating the bentonite with potable water.
- If the boring was advanced through concrete or asphalt, backfill the boring to about 6 inches below grade to allow for placement of asphalt or concrete in the remaining 6 inches to match the surface conditions.

SCOPE AND APPLICATION

This standard operating procedure (SOP) describes use of the low-flow sampling method for collection of reconnaissance groundwater samples from borings and groundwater samples from monitoring wells. The method uses low pumping rates during purging and sample collection to minimize water-level drawdown and hydraulic stress at the well-aquifer interface.

EQUIPMENT AND MATERIALS REQUIRED

The following materials may be used for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- Water quality meter
  - For monitoring well sampling, use a water quality meter capable of measuring pH, temperature, specific conductance, dissolved oxygen, and oxygen-reduction potential (e.g., YSI Professional Plus)
  - For reconnaissance groundwater sampling, use a multiparameter meter capable of measuring pH, specific conductance, and temperature (e.g., Oakton)
- Turbidity meter
- Water-level meter and/or interface probe
- Peristaltic pump and tubing
- Laboratory-supplied sample containers, labels, and chain-of-custody form
- Cooler with ice
- 0.45µ groundwater filters, if analyzing for dissolved metals
- Well construction logs documenting the screen depth and interval for all wells to be sampled
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures)
- Groundwater field sampling datasheet and notebook

METHODOLOGY

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for low-flow groundwater sampling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

General Sampling Procedure

Water Level Measurement

- Water-level measurement procedures are described in detail in SOP 13.
- Open the well cap to allow the water level to equilibrate for approximately ten minutes.

- Use an electronic water-level meter or interface probe, if light nonaqueous-phase liquid (LNAPL) is suspected, to measure the water level in the well to the nearest 0.01 foot.
- If LNAPL is measured with the interface probe or observed on the water level probe (typically indicated by a dark, viscous, or clear, spotty material on the tip of the probe), discuss with the GeoEngineers project manager how to proceed.

Purging

- If the water level is above the top of the well screen, place the end of the sample tubing in the middle of the well screen interval. If the water level is below the top of the screen, place the end of the sample tubing at the midpoint between the water level and the bottom of the well screen.
- Typical low-flow sampling pumping rates range from 0.1 to 0.5 liters per minute, depending on the hydrogeologic characteristics at the site. The objective of the rate selected is to minimize excessive drawdown (<0.3 feet) of the water level.
- Measure water quality parameters (pH, temperature, specific conductance, dissolved oxygen, and oxygen-reduction potential) using a flow-through cell connected to the discharge end of the peristaltic pump tubing. Purging will be considered complete when the water quality parameters from three consecutive readings taken over three- to five-minute intervals have stabilized according to the U.S. Environmental Protection Agency criteria (see table below).

Parameter	Stabilization Criteria
Turbidity	For values > 5 NTUs, 10% For values < 5 NTUs, stabilized
Dissolved oxygen	For values > 0.5 mg/L, 10% For values < 0.5 mg/L, stabilized
Specific conductance	3%
Temperature	3%
pH	±0.1
ORP	±10 mV

Notes:
mg/L = milligrams per liter. mV = millivolts
NTU = Nephelometric turbidity units. ORP = oxygen reduction potential.

- Document the purging procedures, including pumping rates, purge volumes, and water quality parameter measurements, on the field sampling datasheets.
- Place purge water in Department of Transportation-approved containers (e.g., 55-gallon drum) stored on site. See SOP 1 for drum storage, labeling, and documentation procedures.

Sample Collection

- One water quality parameters have successfully stabilized, disconnect the water quality meter and collect groundwater samples in laboratory-supplied containers.
- Confirm the laboratory analytical methods with the GeoEngineers project manager and sample container requirement with the analytical laboratory. If analysis for gasoline-range petroleum

hydrocarbons or volatile organic compounds (VOCs) is proposed, fill the sample containers for gasoline and VOC analysis before filling sample containers for other analyses.

Low Yield (Alternate Method)

- If drawdown of the water table cannot be avoided by reducing the pumping rate and the well goes dry during purging, discontinue pumping, and collect water quality parameter measurements.
- Collect the groundwater sample after the water level above the well bottom recovers to 90 percent of the pre-purge water level. For example, if the water level was 10 feet above the well bottom before purging, begin sampling when the water level has recovered to 9 feet or more above the well bottom.
- If the water column volume is insufficient to meet the sample volume requirement, allow the water level to again recover to 90 percent before continuing sampling. Repeat this procedure until all sample containers are filled.

SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the methods for installing monitoring wells using conventional machine-slotted polyvinyl chloride (PVC) or prepacked well screens. The well screen permits water to enter the well from the saturated aquifer, prevents soil from entering the well, and serves structurally to support the aquifer material. The slot size of the well screen is typically based on selection of the filter pack material. Monitoring wells must be designed and installed to allow low-turbidity groundwater samples, groundwater levels, and hydraulic conductivity data that are representative of conditions in the aquifer to be obtained.

EQUIPMENT AND MATERIALS REQUIRED

The following materials may be necessary for this procedure:

- Subcontractor drill rig and licensed operator.
- Personal protective equipment (as specified in the health and safety plan).
- Water-level meter.
- Boring logs, monitoring well construction logs, and notebook.

METHODOLOGY

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for well installation, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

The drilling contractor will be responsible for conforming to all applicable local and state regulations for well construction.

The proposed well construction should be provided to the driller in advance so that (1) the driller can confirm that the proposed construction is consistent with state regulations, and (2) the driller brings sufficient materials for the well construction.

General Procedure

Drilling and Well Construction. This SOP assumes that a boring has already been drilled and is ready for well installation. See SOPs 7 and 8 for drilling procedures. If the boring was advanced to a depth below the targeted well screen interval, backfill the boring with a cement-bentonite slurry or bentonite chips so that the boring bottom is at a depth about 1 foot below the lower screen interval depth. Well construction will include flush-threaded schedule 40 PVC casing and conventional PVC well screen or stainless-steel mesh prepacked well screen, placed at the bottom of the boring.

Filter Pack. Clean silica sand pack will be placed between the boring wall and the PVC screen/riser (i.e., the annulus) from the bottom of the well to approximately 1 to 2 feet above the screened interval. The filter pack should have greater hydraulic conductivity than the surrounding formation so that water is

drawn into the well. Before installation of the seal, the well may be surged using a surge block or similar technique to consolidate the filter pack and eliminate void space. Measure and document the depth to the sand filter pack before setting the seal.

Seal. A bentonite seal 1 to 2 feet thick will be placed above the sand. The bentonite will be hydrated and allowed to sit for a minimum of 30 minutes for proper hydration and sealing. Measure and document the depth to the top of the seal before placing grout.

Grout. A cement-bentonite slurry or bentonite chips (hydrated after installation) will be placed above the bentonite seal following proper hydration of the seal. The cement-bentonite slurry will be placed to within 1 foot of the ground surface.

Surface Seal and Monument. A concrete surface seal will secure a flush-mounted, traffic-rated monument, or a bollard-protected stickup monument. Flush-mounted surface monuments will be completed slightly above grade to prevent ponding of water on the monument lid. A locking cap and lock will secure the top of the well casing in a surface monument. Tamper-resistant bolts (e.g., pentagonal) may be used to secure the lid of a flush- mounted monument. The lid of an aboveground well monument will be secured with a lock.

The well constructor shall permanently affix a well identification label to the wellhead. A small v-notch or mark with permanent marker should be placed on the north rim of the PVC riser for use as a survey point and measuring point for water level measurements.

Documentation. The field representative will produce the following documentation during the well installation:

- Length of well components, including blank casing and wellscreen.
- Boring depth prior to well installation, in feet below ground surface (bgs).
- Depth in feet bgs to the top and bottom of screen.
- Depth in feet bgs to the top of filter pack and seal.
- Types of well materials (e.g., sand, bentonite, grout) used.
- If potable water was placed into the boring or well during installation, document the total volume of water placed; this information will be needed for well development (see SOP 12).
- Any deviation from standard procedures or any problems encountered during the installation activities (e.g., sand heaving).

SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the methods for developing newly installed monitoring well. New wells should be developed no sooner than 24 hours after the seal has been placed; longer periods of 48 to 72 hours may be necessary, depending on applicable local or state regulations. The objective of well development is to allow low-turbidity groundwater samples, groundwater levels, and hydraulic conductivity data representative of conditions in the aquifer to be obtained from the well. This SOP is also applicable to the redevelopment of existing monitoring wells, which may be necessary if long periods of time elapse between groundwater sampling events.

EQUIPMENT AND MATERIALS REQUIRED

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- Purging equipment (e.g., Waterra pump, bailer, and peristaltic pump)
- Water-quality meter (e.g., Oakton and turbidity meter)
- Water-level meter
- Well construction logs
- Equipment decontamination supplies if sampling equipment will be reused between locations (see SOP 1 for decontamination procedures)
- Buckets
- Department of Transportation-approved storage containers (e.g., 55-gallon drums, totes)
- Well development log and field notebook

METHODOLOGY

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for well development, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Owing to the potential for hazardous substances in groundwater, well development requires consideration of the work area and equipment setup, health and safety procedures, use of appropriate personal protective equipment, procedures for equipment decontamination, and disposal of expendable development supplies. Confirm all procedures in advance with the GeoEngineers project manager and the GeoEngineers health and safety professional.

1. Measure the depth to water and the total depth of the well before development. Confirm that the entire screen length is below the water level. Contact the GeoEngineers project manager if it is not to discuss potential modification of the well-development procedures.

2. Subtract the depth to water from the total well depth to evaluate the water column present in the well casing. Multiply the height by the gallon-per-foot value in the table below, corresponding to the diameter of the well being developed, to calculate the volume of water in the well casing. Record the readings and casing volume on the well development log.

Casing Diameter (inches)	Volume (gallons per foot)
0.75	0.023
1	0.041
1.5	0.092
2	0.163
4	0.653

3. Surge groundwater through the entire well screen interval with a weighted bailer or a surge block. Surge with the bailer or begin surging at the top of the well screen with a surge block in approximately 1-foot vertical increments. If using a surge block, gradually increase the surge depth until the entire screen interval has been surged. The surge time for each 1-foot increment will depend on type of drilling, lithology, and well completion details. Generally, there should be at least one minute of surging across each increment.

4. After surging the well screen, purge groundwater from the well into buckets at a higher purging rate than the expected purging rate of groundwater sampling. Ideally, purging will be completed using a method that does not continue to surge the well (i.e., peristaltic or submersible pump). If a Waterra pump is used, remove the surge block from the tubing and set the tubing intake above the well screen for purging. Measure the water level during the purging process and adjust the pumping rate to maintain a water level above the top of the screen interval if possible. Document the volume of water removed.

5. When the turbidity decreases and the water begins to clear up, use a multiparameter water-quality meter (e.g., Oakton) to measure the temperature, pH, and conductivity of the purge water. Use a turbidimeter to measure turbidity. Note that a YSI water-quality meter or similar meters should not be used in highly turbid water, per the manufacturers' recommendation.

6. After the removal of five casing volumes, review the stability of the water-quality meter readings. Water quality parameters will be considered stable when the measurement from three consecutive readings taken over three- to five-minute intervals have stabilized according to the U.S. Environmental Protection Agency criteria (see table below).

Parameter	Stabilization Criteria
Turbidity	For values > 5 NTUs, 10% For values < 5 NTUs, stabilized
Dissolved oxygen	For values > 0.5 mg/L, 10% For values < 0.5 mg/L, stabilized
Specific conductance	3%
Temperature	3%

Parameter	Stabilization Criteria
pH	±0.1
ORP	±10 mV

Notes:

mg/L = milligrams per liter. mV = millivolts

NTU = Nephelometric turbidity units. ORP = oxygen reduction potential.

7. If the water-quality readings stabilize before a total of ten casing volumes are removed, development is complete. If the water-quality readings do not stabilize, well development will be considered complete after ten casing volumes have been removed.
8. If the water level cannot be maintained above the well screen or the well pumps dry during purging, contact the GeoEngineers project manager for further instructions.
9. If potable water was placed into the boring during drilling or into the well during installation, remove that volume of water and then begin purging as described in step 5.

SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the methods for obtaining groundwater level measurements and light nonaqueous-phase liquid (LNAPL) measurements from monitoring wells. Water level measurements may be collected as an independent event or in conjunction with a sampling event.

EQUIPMENT AND MATERIALS REQUIRED

The following materials may be necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- Equipment decontamination supplies if equipment will be reused between well locations (see SOP 1 for equipment decontamination procedures)
- Field sampling datasheets or field notebook
- Water-level meter or oil/water interface probe if LNAPL is expected
- Bailers or tape/paste to confirm LNAPL detections if required; see SOP 10 for procedures for managing LNAPL

METHODOLOGY

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for water-level and LNAPL measurements, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

General Sampling Procedure

Review well construction details and historical groundwater and LNAPL levels and thicknesses, if available.

During groundwater sampling events, measurements should be collected before purging and sampling. During purging and low-flow sampling, water-level measurements may be collected to ensure that drawdown is not occurring. Low-flow sampling methods are described in SOP 9. The following procedures should be followed when collecting groundwater-level and LNAPL measurements.

Water Level Measurement

1. Test the water-level meter to ensure proper instrument response. This can be accomplished by immersing the probe tip in a small container of water.
2. Open the well cover and cap and allow the water level to equilibrate with atmospheric pressure for approximately 10 minutes so that a static water level is attained. Audible air movement into or out of the well upon loosening of the well cap is an indication that the water level is not in equilibrium with atmospheric pressure.

3. Locate the measurement reference point at the top of the well casing. Typically, this is a small notch in the casing or a point marked with a permanent marker. If no measurement point is present, measure the water level from the north side of the casing and mark measurement point with a permanent marker.
4. Lower the water-level meter probe into the well casing until the probe signal indicates that water has been contacted.
5. Observe the depth to water (DTW) reading from the measurement reference point at the top of the well casing to the nearest 0.01 foot. Over the course of about a minute, raise and re-lower the probe and observe the resulting DTW reading. If the reading remains unchanged to within 0.01 foot, this is an indication that the water level has equilibrated with atmospheric pressure; the reading can then be recorded in the field notebook as the static water level reading. If the reading changes, allow more time for the water level to become static.
6. Measure the depth to bottom (DTB) by lowering the probe to the bottom of the well and recording the reading to the nearest 0.01 foot. Note if the bottom feels soft, as this is an indication of sediment accumulation at the base of the well.
7. Remove and decontaminate the probe and the portion of the probe tape inserted into the well casing.

Water Level and LNAPL Measurement

1. Repeat above steps 1 through 3.
2. Lower the interface probe into the well casing until the probe signal indicates that LNAPL has been contacted. Typically, the interface probe will signal by a repeating beep when LNAPL is present. A steady signal indicates that LNAPL is absent and that the probe is recording the DTW.
3. Observe the LNAPL reading as described in step 5 above until a static reading to the nearest 0.01 foot is achieved. Record the reading in the field notebook.
4. Lower the probe until a steady signal indicates that water has been contacted. Observe the water-level reading as described in step 5 above to confirm a static water level, and record the reading in the field notebook.
5. Optional: if LNAPL is detected in a well with no prior history of LNAPL presence, or the LNAPL thickness is greater than in prior observations, verify the presence and thickness using an alternative technique (e.g., bailer, tape, and water/petroleum colorimetric paste). See SOP 10 for procedures for managing LNAPL.
6. Remove the interface probe and decontaminate the probe and the portion of the probe tape inserted into the well casing.

OBJECTIVE

The objective of this technical standard operating procedure (SOP) is to define the techniques and requirements for PFAS sampling. Techniques discussed in this SOP include field sampling and preservation methods using the protocols intended to be analyzed for per- and polyfluoroalkyl substances (PFAS) by Modified (Low Level) Test Method 537.

BACKGROUND

Discussion

Specialized techniques and procedures are used for collecting and analyzing samples for PFAS. The field procedures are outlined in the following sections showing restricted equipment and materials that can be used when sampling for PFAS. The Modified (Low Level) Test Method 537 provides PFAS results with reporting limits of approximately 2 nanograms per liter. Acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE) and polypropylene.

Additional materials may be acceptable if proven not to contain PFAS. NOTE: Grundfos pumps and bladder pumps are known to contain PFC materials (e.g. Teflon™ washers for Grundfos pumps and low-density polyethylene (LDPE) bladders for bladder pumps). Selection of sampling devices must be carefully researched. All sampling equipment components and sample containers should not come in contact with aluminum foil, LDPE, glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Standard two step decontamination using detergent and clean water rinse should be considered for equipment that does come in contact with polyfluorinated materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with polyfluorinated materials must be avoided. Many food and drink packaging materials and “plumbers thread seal tape” contain PFAS. All clothing worn by sampling personnel must have been laundered multiple times and dried without using dryer sheets of any type. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

There are special laboratory requirements and sample coolers are clearly identified for PFAS sampling. This SOP outlines the sampling procedure typically used to collect PFAS samples for analysis.

GENERAL RESPONSIBILITIES

Site Manager – The site manager is responsible for ensuring that field personnel are trained in the use of this procedure and the required equipment, and for ensuring that PFAS samples are collected in accordance with this procedure and any other SOPs pertaining to specific media sampling. The site manager must also ensure that the quantity and location of PFAS samples collected meet the requirements of the site-specific sampling and/or work plans.

Field Team Leader – The field team leader is responsible for ensuring that field personnel collect PFAS samples inaccordance with this SOP and other relevant procedures.

Note: All field team member responsibilities are defined in the project-specific quality assurance project plan (QAPP).

RECOMMENDED AND PROHIBITED FIELD EQUIPMENT

Recommended

- Site-specific plans (e.g., sampling, work, health and safety)
- HDPE and Silicon materials including tubing, bailers, tape, plumbing paste
- Loose paper
- Masonite or Aluminum Clipboard
- pens
- Insulated cooler(s) provided by lab with sample containers
- Cotton construction is recommended for field clothing and should be laundered a minimum of 6 times from time of purchase due to possible PFAS related treatments. Fabric softener and dryer sheets must be avoided. Rain gear should be made from polyurethane and wax-coated materials
- Plastic zip-top bags
- Decontamination supplies – Alconox®/Liquinox®
- Sample chain-of-custody forms
- Custody seals
- Nitrile or appropriate gloves
- Lab supplied and verified “PFAS Free” water to be used for trip and decontamination blanks and decontamination procedures
- Bags of ice
- Labels and appropriate forms/documentation for sample shipment provided by Laboratory

Prohibited

- Teflon®-containing materials, when possible, should be avoided (e.g., tubing, bailers, tape, and plumbing paste). In cases where Teflon® -containing materials are unavoidable, ensure adequate purging is performed prior to sampling (e.g., in-well pumps) and/or rinse blanks are collected prior to sampling.
- Paper products such as waterproof field books, plastic clipboards, binders, spiral hard cover notebooks, sticky notes or glue materials
- Water resistant, waterproof, stain-treated clothing or shoes including Gore-Tex™ and Tyvek® materials
- LDPE or polypropylene containing materials (e.g., bags or containers used to transport samples)
- Markers
- Chemical (blue) ice packs
- Decontamination soaps containing fluorosurfactants such as Decon 90
- Water that is not verified to be "PFAS-free" to be used for trip and decontamination blanks and decontamination processes
- Aluminum foil

Soil Sampling Equipment

Acceptable materials for sampling include: stainless steel, HDPE and polypropylene. Additional materials may be acceptable if proven not to contain PFAS. All sampling equipment components and sample containers **should not** come in contact with aluminum foil, LDPE, glass or PTFE, Teflon™ materials including sample bottle cap liners with a PTFE layer. A list of acceptable equipment is provided below, but other equipment may be considered appropriate at a later date.

- Stainless steel spoon
- Stainless steel bowl

PROCEDURES

Preparation

1. Review site-specific health and safety plan and project plans before initiating sampling activity.
2. Don the appropriate personal protective clothing as indicated in the site-specific health and safety plan.
3. Locate sampling location(s) in accordance with project documents (e.g., work plan) and document pertinent information in the appropriate field logbook. When possible, reference locations back to existing site features such as buildings, roads, intersections, monitoring wells, etc.
4. Verify sampling depths in as specified in the site-specific plans.
5. If decontamination of equipment and/or personnel is required, set up a decontamination zone.
6. Prepare an area near the sampling location to perform sample collection activities.

Groundwater Sample Collection

The following steps must be followed when collecting PFAS samples for environmental purposes.

- Wear clean Nitrile gloves during handling of all sample containers and sampling devices.
- All clothing worn by sampling personnel must have been laundered multiple times and dried without using dryer sheets of any type. The sampler must wear nitrile gloves while filling and sealing the sample bottles.
- Acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE) and polypropylene. Sampling with a Watera pump and tubing with check valve is the preferred method.
- Purge the well.
- Pre-cleaned sample bottles with closures, coolers, sample labels and a chain of custody form will be provided by the laboratory.
- Fill the laboratory-supplied bottle(s) with the sample.
- Cap the bottles with an acceptable cap and liner closure system.
- Label the sample bottles.
- Fill out the chain of custody.
- Place in a cooler maintained at 4 ± 2° Celsius.
- Decontaminate reusable sampling equipment according using PFAS Free water provided by lab and Alconox/Liquinox before proceeding to other sampling locations.
- Complete the field sampling form, being sure to record all relevant information before leaving the site. All sampling information, including well ID, sample depth, sample volume, and requisite analyses should be recorded in the field form as specified in the site-specific sampling/work plans. Field Log books shall not be used.
- Properly package all samples for shipment to laboratories and complete all necessary sample shipment documentation. Remand custody of the samples to appropriate personnel.

Soil Sample Collection

- The sampler must wear nitrile gloves while conducting field work and handling sample containers
- Sampling is often conducted in areas where a vegetative turf has been established. In these cases, a clean stainless- steel spoon should be used to carefully remove the turf so that it may be replaced at the conclusion of sampling. Surface soil samples (e.g. 0 to 6 inches below surface) shall then be collected using a pre-cleaned, stainless steel spoon.
- Shallow subsurface soil samples (e.g. 6 to ~36 inches below surface) may be collected by digging a hole using a stainless-steel hand auger.
- When the desired subsurface depth is reached, a pre-cleaned hand auger shall be used to obtain the sample.

Sample Shipment

Place the samples in a cooler with wet ice. The ice should be double bagged. The samples should be shipped for next day delivery. Always include enough ice to keep samples around 4°C, especially during summer months. The cooler drain spout should be closed and taped so that water does not flow out of the cooler.

- Always package samples securely to prevent breakage/spillage.
- Check with laboratory if Saturday delivery of samples is required.
- Be sure to include a completed chain of custody (COC) form in each shipment with all necessary information for both reporting and invoicing.
- Double check to make sure all samples are labeled correctly and correspond with the COC form.

RESTRICTIONS/LIMITATIONS

Acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE) and polypropylene. Additional materials may be acceptable if proven not to contain PFAS. NOTE: Grundfos pumps and bladder pumps are known to contain PFC materials (e.g. Teflon™ washers for Grundfos pumps and low-density polyethylene (LDPE) bladders for bladder pumps). Selection of sampling devices must be carefully researched. All sampling equipment components and sample containers should not come in contact with aluminum foil, LDPE, glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Standard two step decontamination using detergent and clean water rinse should be considered for equipment that does come in contact with polyfluorinated materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with polyfluorinated materials must be avoided. Many food and drink packaging materials and “plumbers thread seal tape” contain PFAS.

All clothing worn by sampling personnel must have been laundered multiple times and dried without using dryer sheets of any type. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the practices for locating underground utilities. Refer to the site-specific health and safety plan (HASP) for additional information regarding communication procedures to be followed when an inadvertent utility strike occurs, as well as methods for mitigating hazards during a utility strike.

EQUIPMENT AND MATERIALS REQUIRED

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the HASP)
- Marking materials (e.g., white marking paint, stakes, flags)
- Utility as-builts, if available
- Map of proposed excavation/boring locations

METHODOLOGY

When the project-specific sampling and analysis plan (SAP) specifies additional or different requirements for underground utility locates, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Before Conducting Utility Locates

- Ensure that the locate will be conducted reasonably soon before the excavation work begins, e.g., within 48 hours. There may be project-specific conditions, e.g., weather and/or ground features that could cause markings to fade, which would require scheduling of the locate sooner than 48 hours before the excavation work.
- Clearly mark the boundary of the work and the locations of all proposed excavations and/or borings with survey flags, stakes, and/or white survey paint.
- Interview site managers/property owners and obtain plans or drawings showing on-site utilities.
- For project work that will not take place in the public right-of-way, ensure that the public rights-of-way nearest to the project are identified and communicated during the one-call notification.
- Identify the township and range of the project area.
- If feasible, conduct a site visit to mark proposed locations and identify site conditions that could cause fading or disruption of marking paint (e.g., gravel, high traffic).
- Check the weather forecast to assess the potential for snow or rain, which may impede marking utilities or cause the markings to fade.

One-Call Utility Notification

- If possible, initiate the one-call utility notification at least one week before the proposed work begins.

- Include a map and a physical description of sample locations when submitting the notification.
- Before conducting any excavation activities, confirm with each public utility that the utility locate has been completed.
- On remote or complicated sites, consider meeting public locators on site.
- Document the one-call ticket number and results in the project files.
- Provide the one-call ticket number to subcontractors who will be doing the excavations.

Private Utility Locate

- Conduct the private utility locate only after confirmation that the public utility locate has been completed and all public utilities have been marked and the results reviewed by GeoEngineers staff who will be overseeing the excavations.
- Meet the private locator on site and participate in the entire private utility locate. Be engaged in the process, ask questions, and take time to walk the site thoroughly with the locator.
- Bring a copy of the one-call utility ticket and results of the one-call utility locater to check against the utility markings on the ground.
- If possible, have a site/property representative knowledgeable of on-site utilities participate in the private utility locate.
- If paint alone may not suffice to ensure clear marking of utilities, add vertical markers such as stakes or flags.
- Visually assess the area of the proposed excavation(s) to identify features potentially indicative of buried utilities. Have the private utility locator examine each feature identified below to assess the presence of buried utilities.
    - Examine adjacent public rights-of-way where public utilities have been marked for evidence of utilities that may extend onto the project site.
    - Identify nearby light poles, telephone poles, electrical utility poles, or other overhead utility poles with wires or conductors that run from the overhead utility, down the pole, and into the ground.
    - Identify the location of gas meters, water meters, or other aboveground junction boxes for evidence of utilities extending from these features into the ground.
    - Examine asphalt and concrete ground surfaces for discontinuities in the surface indicative of utility installations. Discontinuities may include recent patches of asphalt or concrete inlaid within older concrete or asphalt surfaces.
    - Identify manholes and catch basins indicative of buried storm or sanitary sewer pipes. Open manholes to examine the orientation of associated pipes to assess whether the utilities may be present near proposed excavations.
    - Identify tank ports and vent pipes.
    - Identify irrigation systems and associated features such as valve boxes and controllers.
    - Identify any other signs indicating the presence of buried utilities.
    - Be wary of utility marks that suddenly begin or dead end.

Preparing to Perform Subsurface Activities after a Locate

- Ensure that the markings are still visible when the work begins.
- Adjust locations, as needed, to avoid identified utilities, or use alternative methods such as nonmechanical excavation means (i.e., manual excavation or air-knifing) to a minimum depth of 5 feet.

American Public Works Association Utility Color Code	
	WHITE—Proposed Excavation
	PINK—Temporary Survey Markings
	RED—Electric Power Lines, Cables, Conduit and Lighting Cables
	YELLOW—Gas, Oil, Steam, Petroleum or Gaseous Materials
	ORANGE—Communication, Alarm or Signal Lines, Cables or Conduit
	BLUE—Potable Water
	PURPLE—Reclaimed Water, Irrigation and Slurry Lines
	GREEN—Sewers and Drain Lines
Source: Uniform Color Codes, ANSI Standard Z535.1. American Public Works Association. Revised 1999.	

APPENDIX J
Inadvertent Discovery Plan

INADVERTENT DISCOVERY PLAN

PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit https://ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.

Site Name(s): Precision Engineering, Inc. Location: 1231 S. Director St., Seattle, WA

Project Lead/Organization: GeoEngineers County: King

If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.

1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 05-05 or Section 106).

Once completed, **the IDP should always be kept at the project site** during all project activities. All staff, contractors, and volunteers should be familiar with its contents and know where to find it.

2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. ***Always assume these are live and never touch or move.***
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

3. ON-SITE RESPONSIBILITIES

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to ***Stop-Protect-Notify***. **If you suspect that the discovery includes human remains, also follow Sections 5 and 6.**

STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

STEP C: Notify Project Archaeologist (if applicable).

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.

Project Lead Contacts

Primary Contact		Alternate Contact	
Name:	Garrett Leque	Name:	Terry McPhetridge
Phone:	253.312.7958	Phone:	253.383.4940
Email:	gleque@geoengineers.com	Email:	tmcphetridge@geoengineers.com

Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager		Alternate or Cultural Resource Contact	
Name:	Priscilla Tomlinson	Name:	
Program:	Toxics Cleanup Program	Program:	
Phone:	206-594-0104	Phone:	
Email:	ptom461@ecy.wa.gov	Email:	

STEP E: Ecology will notify DAHP.

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology of additional steps to further protect the site.

Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.

DAHP Contacts:

Name: Rob Whitlam, PhD
Title: State Archaeologist
Cell: 360-890-2615
Email: Rob.Whitlam@dahp.wa.gov
Main Office: 360-586-3065

Human Remains/Bones:

Name: Guy Tasa, PhD
Title: State Anthropologist
Cell: 360-790-1633 (24/7)
Email: Guy.Tasa@dahp.wa.gov

4. TRIBAL CONTACTS

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

Tribe:	Muckleshoot Indian Tribe	Tribe:	Samish Indian Nation
Name:	Laura Murphy	Name:	Jackie Ferry
Title:	Cultural Resources	Title:	Cultural Resources
Phone:	253-876-3272	Phone:	360-293-6404 x215
Email:	laura.murphy@muckleshoot.nsn.us	Email:	jferry@samishtribe.nsn.us
Tribe:	Squaxin Island Tribe	Tribe:	Suquamish Tribe
Name:	Shaun Dinubilo	Name:	Dennis Lewarch
Title:	Cultural Resources	Title:	Cultural Resources
Phone:	360-870-6324	Phone:	360-394-8529
Email:	sdinubilo@squaxin.us	Email:	dlewarch@Suquamish.nsn.us

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

5. FURTHER CONTACTS (if applicable)

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

Federal Agency:		State Agency:	
Agency:	Not applicable	Agency	Not applicable
Name:		Name:	
Title:		Title:	
Phone:		Phone:	
Email:		Email:	

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under ***Stop-Protect-Notify.*** For specific instructions on how to handle a human remains discovery, see: *RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions*.

Suggestion: If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist
Guy.Tasa@dahp.wa.gov
(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

   Enter contact information below (required):
   - Local Medical Examiner or Coroner name and phone: King County Medical Examiner Office 206-731-3232
   - Local Law Enforcement main name and phone: Seattle Police Dept., SW Precinct, 206-625-5011
   - Local Non-Emergency phone number (911 if without a non-emergency number): Seattle Police Dept., SW Precinct, 206-625-5011
2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per RCW 27.44.055, RCW 68.50, and RCW 68.60, DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation. Organizations may also participate in consultation.
- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in RCW 27.44.055, RCW 68.50, and RCW 68.60.
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law RCW 27.56 and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessment are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

The archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below

surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, Ecology, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to Ecology, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

8. PROCEEDING WITH WORK

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

9. ORGANIZATION RESPONSIBILITY

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the sites and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

10. ADDITIONAL RESOURCES

Informative Video

Ecology recommends that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

Ecology's IDP Video (https://www.youtube.com/watch?v=ioX-4cXfbDY)

Informational Resources

DAHP (https://dahp.wa.gov)

Washington State Archeology (DAHP 2003)

(https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

Association of Washington Archaeologists (https://www.archaeologyinwashington.com)

Potentially Interested Tribes

Interactive Map of Tribes by Area

(https://dahp.wa.gov/archaeology/tribal-consultation-information)

WSDOT Tribal Contact Website

(https://wsdot.wa.gov/tribal/TribalContacts.htm)

11. ADDITIONAL INFORMATION

Please add any additional contact information or other information needed within this IDP.

Tulalip Tribes, Richard Young, Cultural Resources, 360-716-2652, ryoung@tulaliptribes-nsn.gov

Snoqualmie Indian Tribe, Steve Mullen-Moses, Director, 425-292-0249, steve@snoqualmietribe.us; Adam Osbekoff, Assistant Director, adam@snoqualmietribe.us

Implement the IDP if you see…

Chipped stone artifacts.

Examples are:

- Glass-like material.
- Angular material.
- “Unusual” material or shape for the area.
- Regularity of flaking.
- Variability of size.

Stone artifacts from Oregon.

Stone artifacts from Washington.

Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.

Implement the IDP if you see…

Ground stone artifacts.

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.

Above: Fishing Weight - credit CRITFC Treaty Fishing Rights website.

Artifacts from unknown locations (left and right images).

Implement the IDP if you see…

Bone or shell artifacts, tools, or beads.

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (dentalium) or tusk.

Upper Left:*Bone Awls from Oregon.*

Upper Center: *Bone Wedge from California.*

Upper Right: *Plateau dentalium choker and bracelet, from Nez Perce National Historical Park, 19th century, made using Antalis pretiosa shells Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, Public Domain.*

Above: *Tooth Pendants. Right: Bone Pendants. Both from Oregon and Washington.*

Implement the IDP if you see…

Culturally modified trees, fiber, or wood artifacts.

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.

Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP).*

Right, Top to Bottom: *Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry*.

Implement the IDP if you see…

Strange, different, or interesting looking dirt, rocks, or shells.

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- "Unusual" accumulations of rock (especially fire-cracked rock).
- "Unusual" shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a "layer cake" appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the "unusual" or out of place (for example, rock piles in areas with otherwise few rocks).

Shell Midden pocket in modern fill discovered in sewer trench.

Underground oven. Courtesy of DAHP.

Shell midden with fire cracked rock.

Hearth excavated near Hamilton, WA.

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.

Left: Top to Bottom: *Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Right: *Collections of historic artifacts discovered during excavations in eastern Washington cities.*

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.

Main Image: *Dishes, bottles, workboot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.*

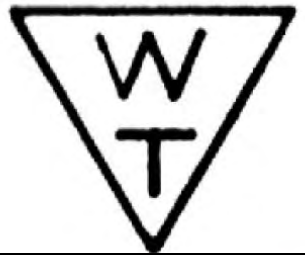
Right, from Top to Bottom: *Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Implement the IDP if you see…

- Old munition casings – if you see ammunition of any type – ***always assume they are live and never touch or move!***
- Tin cans or glass bottles with an older manufacturer's technique – maker's mark, distinct colors such as turquoise, or an older method of opening the container.

Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. Don't ever touch something like this!
Left: Maker's mark on bottom of old bottle.

Right: *Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.*



Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).

Can opening dates, courtesy of W.M. Schroeder.

Implement the IDP if you see…

You see historic foundations or buried structures.

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.

Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

Implement the IDP if you see...

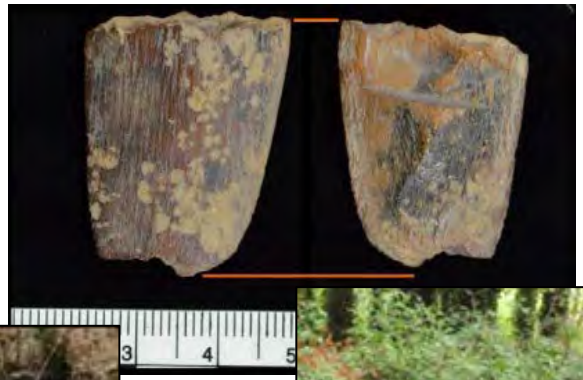
Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.

Center: *Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).*

Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.



Directly Above: This is a real discovery at an Ecology sewer project site.

What would you do if you found these items at a site? Who would be the first person you would call?

Hint: *Read the plan!*

APPENDIX K
Health and Safety Plan

Site Health & Safety Plan

Precision Engineering
1231 S Director St
Seattle, WA

February 2022

GeoEngineers

2101 4th Avenue, Suite 950
Seattle, Washington 98121
206.728.2674

Table of Contents

LIST OF FIGURES

ATTACHMENT

GEOENGINEERS, INC.
SITE HEALTH AND SAFETY PLAN
PRECISION ENGINEERING RI
FILE NO. 25806-001-00

This Health and Safety Plan (HASP) is to be used in conjunction with the GeoEngineers, Inc. (GeoEngineers) Safety Programs. Together, the written safety programs and this HASP constitute the site safety plan for this site. This plan is to be used by GeoEngineers personnel on this site and must be available on site. If the work entails potential exposures to other substances or unusual situations, additional safety and health information will be included, and the plan will need to be approved by the GeoEngineers Health and Safety Manager. All plans are to be used in conjunction with current standards and policies outlined in the GeoEngineers Health and Safety Programs.

Liability Clause: If requested by subcontractors, this site HASP may be provided for informational purposes only. In this case, Form 1 shall be signed by the subcontractor. Please be advised that this site-specific HASP is intended for use by GeoEngineers employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

1.0 GENERAL PROJECT INFORMATION

Project Name:	Precision Engineering
Project Number:	25806-001-00
Type of Project:	Remedial Investigation
Start/Completion:	March 2022 – TBD
Subcontractors:	Holt Services

Chain of Command	Title	Name	Telephone Numbers
1	**Project Manager (PM)**	Garrett Leque	253.312.7958
2	**Site Safety Officer (SS0)**	Paul Robinette	253.278.0273
3	**Health and Safety Manager (HSM)**	Mary Lou Sullivan	360.633.9821
4	**Site Personnel**	Dexter Chan	206.849.0644
		Paul Robinette	253.278.0273
5	**Client Assigned Site Supervisor**	NA	--
6	**Subcontractor(s)**	Holt Services	253.604.4878
7	**Current Owner**	Dick Morgan	--

1.1. Functional Responsibility

1.1.1. Health and Safety Manager (HSM)

GeoEngineers' Health and Safety Manager (HSM) is responsible for implementing and promoting employee participation in the program. The HSM issues directives, advisories and information regarding health and

safety to the technical staff. Additionally, the HSM has the authority to audit on-site compliance with HASPs, suspend work or modify work practices for safety reasons, and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others.

1.1.2. Project Manager (PM)

A PM is assigned to manage the activities of various projects and is responsible to the principal-in-charge of the project. The PM is responsible for assessing the hazards present at a job site and incorporating the appropriate safety measures for field staff protection into the field briefing and/or HASP. He or she is also responsible for ensuring that appropriate HASPs are developed. The PM will provide a summary of chemical analyses to personnel preparing the HASP. The PM shall keep the HSM informed of the project's health- and safety-related matters as necessary. The PM shall designate the project Site Safety Officer (SSO) and help the SSO implement the specifications of the HASP. The PM is responsible for communicating information in HASPs and checklists to appropriate site personnel. The PM is responsible for transmitting health and safety information to the SSO when appropriate.

1.1.3. Site Safety Officer (SSO)

The SSO will have the on-site responsibility and authority to modify and stop work or remove GeoEngineers personnel from the site if working conditions change that may affect on-site and off-site health and safety. The SSO will be the main contact for any on-site emergency. The SSO is first aid and cardiopulmonary resuscitation (CPR) qualified and has current Hazardous Waste Operations and Emergency Response (HAZWOPER) training. The SSO is responsible for implementing and enforcing the GeoEngineers HASP and safe work practices during site activities. The SSO shall conduct daily safety meetings, perform air monitoring as required, conduct site safety inspections as required, coordinate emergency medical care, and ensure personnel are wearing the appropriate personal protective equipment (PPE). The SSO shall have advanced field work experience and shall be familiar with health and safety requirements specific to the project. The SSO has the authority to suspend site activities if unsafe conditions are reported or observed.

Duties of the SSO include the following:

- Implementing the HASP in the field and monitoring compliance with its guidelines by staff.
- Being sure that all GeoEngineers site personnel have met the appropriate training requirements. Advising other contractor employees of these requirements.
- Maintaining adequate and functioning safety supplies and equipment at the site.
- Setting up work zones, markers, signs and security systems, if necessary.
- Performing or supervising air quality measurements. Communicating information on these measurements to GeoEngineers field staff and subcontractor personnel.
- Communicating health and safety requirements and site hazards to site personnel, subcontractors and contractor employees, and site visitors.
- Directing personnel to wear PPE and guiding compliance with health and safety practices in the field.

- Consulting with the PM regarding new or unanticipated site conditions, including emergency response activities. If monitoring detects concentrations of potentially hazardous substances at or above the established exposure limits, notify/consult with the PM. Consult with the PM and the HSM regarding new or unanticipated site conditions, including emergency response activities. If field monitoring indicates concentrations of potentially hazardous substances at or above the established exposure limits, the HSM must be notified and corrective action taken.
- Documenting all site accidents, illnesses and unsafe activities or conditions, and reporting them to the PM and the HSM.
- Directing decontamination operations of equipment and personnel.

Several GeoEngineers employees will be performing field work during this project. When working alone, the employee will be the SSO. When working in groups of two or more, the group will designate an SSO.

1.1.4. Field Employees

Employees working on site that have the potential to encounter hazardous substances or physical hazards are responsible for participating in the health and safety program and complying with the site-specific HASP. These employees are required to:

- Participate and be familiar with the health and safety program.
- Notify the SSO when there is a need to stop work to address an unsafe situation.
- Comply with the HASP and acknowledge understanding of the plan.
- Report to the SSO, PM or HSM any unsafe conditions and all facts pertaining to incidents or accidents that could result in physical injury or unsafe exposure to hazardous materials.
- Participate in health and safety training, including initial 40-hour Occupational Safety and Health Administration (OSHA) HAZWOPER course, annual 8-hour HAZWOPER refresher, and first aid/CPR training.
- Schedule and take a respirator fit test annually.
- Any field employee working on-site may stop work if the employee believes the work is unsafe.

1.1.5. Contractors Under GeoEngineers Supervision

Contractors working on the site under GeoEngineers supervision or direct control that have the potential of coming in contact with hazardous substances or physical hazards shall have their own health and safety program that is in line with the site-specific HASP.

1.2. List of Site Personnel and Training

Name of Employee on Site	Level of HAZWOPER Training (24-/40-hr)	8-Hr Refresher Training within last 12 mo?	First Aid/CPR Training within last 12 mo?	Respirator Fit Test within last 12 mo?
Dexter Chan	40-hr	Yes	Yes	Yes
Paul Robinette	40-hr	Yes	Yes	Yes

1.3. Site Description

The Property is in section 32, township 24 north, range 4 east of the Willamette Meridian, on King County tax parcel 000160-0055. The approximately 3.5-acre Property is zoned for industrial use. One 62,000-square-foot building comprising three warehouse bays is currently located on the Property. The east side of the building was constructed in 1968, and the west side was added in 1979. The building is surrounded by an asphalt-paved parking lot (see Figure 9-4 that is part of the field brief documents).

The surrounding area is a mix of industrial operations and residential properties. Since 1997, a towing and limousine service business has operated on the adjacent property to the east, which was formerly the Kaspac/Chiyoda property (also known as the "Carey Limousine" property), referred to herein as the former Kaspac/Chiyoda property, and is an Ecology cleanup site (CSID 2540). The former Kaspac/Chiyoda property was used for agriculture and agricultural-equipment storage before 1960; a car lot and gas station between 1960 and 1972; a road-striping paint company between 1972 and 1988; and a transmission repair shop, construction contracting company, and roofing contractor between 1988 and 1997. West of the Property is a business that repairs and sells refrigerators, and north of the Property are residential homes located across S Director Street.

1.4. Site Map (Attached)

See Figure 9-4 that is part of the field brief documents.

1.5. Site History

Precision operated an industrial manufacturing business on the Property from 1968 to March 1, 2005. The operation included manufacturing and repair of large hydraulic cylinders, large rolls used in the manufacturing of paper and sheet metal products, and other equipment. Services included grinding and polishing, honing, hard-chrome plating, milling, welding, and application of flame- and arc-applied metal coating, much of which involved the use of chromic acid. From 1985 to 2003, approximately 10,000 square feet of the west side of the building was leased to Baszile Metals Service, an aluminum distributorship.

Former operational areas and other historical features of interest associated with Precision's operations, including former tanks used to contain process chemicals and wastes, are shown on Figure 2-2 of the RI Work Plan and are summarized below:

- **Drainage ditch**. Metals (e.g., chromium, arsenic, and lead) impacts to shallow soil and surface water from impacted surface water runoff into the ditch and potential groundwater intrusion through cracks in storm system piping.
- **Former plating tanks**. Trichloroethene (TCE), chromium, and hexavalent chromium impacts to shallow soil, shallow groundwater, and vapor due to leaking aboveground storage tanks, underground storage tanks (USTs), and temporary tanks.
- **Tank vaults**. Hexavalent chromium impacts to shallow soil and shallow groundwater from cracks and seams in former tank vault 7 and the hydraulic cylinder test vault.
- **Trenches and drains**. TCE, chromium, and hexavalent chromium impacts to shallow soil and shallow groundwater from chrome-plating rinse water, which was discharged to the METRO's sanitary sewer prior to 1986, when it was routed to containment vaults.

- **Scrubber room**. Hexavalent chromium impacts to shallow soil and shallow groundwater from a chromic acid evaporator, chromic acid purification unit, and chromic acid holding tank in the scrubber room.
- **Parts washing**. TCE, TCE degradation products, methyl ethyl ketone, and Stoddard solvent impacts to shallow soil and shallow groundwater from parts washing and degreasing operations.
- **Steam cleaning area**. Petroleum hydrocarbons and metals (copper, lead, nickel, zinc, and chromium) impacts to shallow soil and shallow groundwater from steam cleaning and the use of a sodium hydroxide tank. In 1986, steam cleaning operations were moved from outside and southeast of the building to inside the building. Fluids were discharged to an oil/water separator.
- **Solid waste dumpster**. Petroleum hydrocarbons, benzo(a)pyrene, and metals (arsenic, copper, lead, nickel, and zinc) impacts to shallow soil and shallow groundwater from surface water runoff near the solid waste dumpster into the drainage ditch.

The Property was sold on March 29, 2007, to CL Frazier Properties, LLC, and is currently occupied by Pacific Industrial Supply, a wire rope and marine/industrial supply distributor (MFA, 2011).

Between 1986 and 2003, Precision completed several corrective actions at the Site in response to a February 1986 compliance order issued by Municipality of Metropolitan Seattle and as required by Ecology in response to National Pollutant Discharge Elimination System (NPDES) permit and hazardous waste regulation violations identified during Ecology inspections (SAIC, 2013). Corrective actions included measures to address sanitary sewer and stormwater discharge and hazardous waste storage violations. Precision also conducted several environmental investigations and cleanup actions at the Site between 1988 and 1993. Between 1988 and 1990, investigations were performed under the 1986 Ecology Administrative Order No. DE 86-307, an amendment to that order, and a 1987 Ecology compliance letter (SAIC, 2013). Precision conducted an independent remedial action in 1993. Between 2005 and 2011, Precision conducted additional environmental investigation and cleanup actions at the Site, including an RI, risk assessment, and feasibility study under Ecology's Voluntary Cleanup Program (VCP). Between 2013 and 2015, Ecology conducted additional environmental investigation of the Site, including an RI. Based on its review of this work, Ecology issued VCP opinion letters in 2009, 2011, and 2015 (Ecology, 2009, 2011, 2015) requesting further action.

2.0 WORK PLAN

The remedial investigation field work is described in the Remedial Investigation Work Plan, and generally consists of:

- Direct push and sonic drilling and soil sampling inside and outside the building
- Installation of monitoring wells, well development, and sampling
- Other tasks such as collecting one water sample from a former hydraulic cylinder test vault.

2.1. List of Field Activities

The following activities will (or may) be completed during the project:

☐ Vapor Measurements
☐ Site Reconnaissance
☒ Exploratory Borings
☐ Construction Monitoring
☐ Surveying
☐ Test Pit Exploration
☒ Soil Sample Collection
☒ Groundwater Sampling
☒ Groundwater Depth Measurement
☐ Product Sample collection
☐ Soil Stockpile Testing
☐ Remedial Excavation (consolidation)
☐ Recovery of Free Product
☒ Monitoring Well Installation
☒ Monitoring Well Development
☐ Underground Storage Tank (UST) Removal Monitoring
☒ Other: Water Sampling
☐ Other:

3.0 EMERGENCY INFORMATION

A hospital route map is attached at end of HASP.

Hospital Name and Address:	Harborview Hospital 325 9th Ave Seattle
Distance:	**6.7 miles**
Phone Numbers	
Hospital ER:	206.520.5000
Ambulance:	911
Police:	911
Fire:	911
Poison Control:	Seattle (206) 253-2121; Other (800) 732-6985
Location of Nearest Telephone:	Cell phones are carried by site personnel.
Nearest Fire Extinguisher:	GeoEngineers vehicle on-site.
Nearest First-Aid Kit:	GeoEngineers vehicle on-site.

3.1. Standard Emergency Procedures

Get help

- Send another worker to phone 911 (if necessary)
- As soon as feasible, notify the GeoEngineers Project Manager

Reduce risk to injured person

- Turn off equipment
- Move person from injury location (if in life-threatening situation only)
- Keep person warm
- Perform CPR (if necessary)

Transport injured person to medical treatment facility (if necessary)

- By ambulance (if necessary) or GeoEngineers vehicle

- Stay with person at medical facility
- Keep GeoEngineers Project Manager apprised of situation and notify Human Resources Manager of situation

4.0 HAZARD ANALYSIS

A hazard analysis has been completed as part of preparation of this HASP. The hazard analysis was performed considering the known and potential hazards at the site and surrounding areas, as well as the planned work activities. The results of the hazard analysis are presented in this section. The hazard analysis will be reviewed each day before beginning work. Updates will be made as necessary and documented in the Daily Field Report.

Anticipated site hazards are identified below and include equipment for drilling wells, as well as general equipment known to be used at the construction site as site development proceeds.

4.1. Physical Hazards

☒ Drill rigs

☐ Backhoe

☐ Trackhoe

☐ Crane

☐ Front end loader

☐ Dozer

☐ Open excavation/trenching

☐ Shored/braced excavation

☐ Overhead hazards/power lines

☐ Tripping/puncture hazards (debris on-site, steep slopes or pits)

☐ Unusual traffic hazard – street traffic

☒ Heat/cold, humidity

☒ Underground utilities

☒ Noise

☐ Other: Click here to enter text.

- A utility locate will be completed as required to prevent drilling or digging into underground utilities.
- Work areas will be marked with reflective cones, barricades and/or caution tap. High-visibility vests will be worn by on-site personnel to ensure they can be seen by vehicle and equipment operators.
- Site personnel will be aware at all times of the location and motion of heavy equipment in the area of work to ensure a safe distance between personnel and the equipment. Personnel will be visible to the operator at all times and will remain out of the swing radius or travel path while the equipment is operating. Personnel will approach heavy equipment only when they are certain the operator has indicated that it is safe to do so through hand signals or other acceptable means.

- Heavy equipment and/or vehicles used on this site will not work within 20 feet of overhead utility lines (if present) without first ensuring that the lines are not energized. This distance may be reduced to 10 feet depending on the client and the use of a safety watch. Note: If it is later determined that overhead lines are a hazard on this job site, a copy of the overhead lines safety section from the HASP Supplemental document shall be attached.
- Personnel entry into unshored or unsloped excavations deeper than 4 feet is generally not allowed. If a worker must enter an excavation deeper than 4 feet, the contractor must follow trenching and shoring requirements established in Washington Administrative Code (WAC) 296-155, the Washington State Construction Standards or OSHA 1926.651 Excavation Requirements. A trench box or other acceptable shoring should be used or the sidewalls of the excavation should be sloped according to the soil type and guidelines as outlined in OSHA and Washington State Department of Labor and Industries Division of Occupational Safety and Health (DOSH) regulations. If the shoring/sloping deviates from requirements outlined in the WAC, it must be designed and stamped by a professional engineer. Prior to entry, personnel will conduct air monitoring as described later in this plan. Hazardous encumbrances and excavated material will be stockpiled at least 2 feet from the edge of a trench or open excavation. If volatile gases accumulate within an open trench or excavation, the means of entering shall adhere to confined space entry and air monitoring procedures outlined under the air monitoring recommendations in this Plan and/or the GeoEngineers Health and Safety Program.
- Personnel will use extra caution for hazards such as slips, trips, and falls, steep slopes, deep excavations, and other hazardous encumbrances. If it becomes necessary to work within 6 feet of the edge of a steep slope, deep excavation, or other potentially hazardous area, appropriate fall protection measures will be implemented by the SSO in accordance with OSHA/DOSH regulations and the GeoEngineers Health and Safety Program.
- Cold stress control measures will be implemented according to the GeoEngineers Health and Safety Program to prevent frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature). Heated cars and warm beverages are a resource if necessary during periods of cold weather.
- Heat stress control measures required for this site will be implemented according to GeoEngineers Health and Safety Program with water carried in staff vehicles or with staff on-site.

4.2. Biological Hazards and Procedures

☐ Poison Ivy or other vegetation	Click here to enter text.
☐ Insects or snakes	Not known to be present
☐ Hypodermic needles or other infectious hazards	Not known to be present
☐ Wildlife	Not known to be present
☒ Other: COVID-19; see Form 3	

4.3. Ergonomic Hazard Mitigation Measures and Procedures

4.3.1. Avoiding Lifting Injuries

Back injuries often result from lifting objects that are too heavy or from using the wrong lifting technique. Keep your back healthy and pain free by following common-sense safety precautions.

- Minimize reaching by keeping frequently used items within arm's reach, moving your whole body as close as possible to the object.
- Avoid overextending by standing up when retrieving objects on shelves.
- Keep your back in shape with regular stretching exercises.
- Get help from a coworker or use a hand truck if the load is too heavy or bulky to lift alone.

4.3.2. Proper Lifting Techniques

- Face the load; don't twist your body. Stand in a wide stance with your feet close to the object.
- Bend at the knees, keeping your back straight. Wrap your arms around the object.
- Let your legs do the lifting.
- Hold the object close to your body as you stand up straight. To set the load down, bend at the knees, not from the waist.

4.4. Engineering Controls

☐ Trench shoring (1:1 slope for Type B Soils)

☒ Stay upwind of excavation work zones whenever possible/wind direction monitoring

☐ Other: soil covers as needed (e.g., plastic sheeting)

☐ Other (specify):

4.5. Chemical Hazards

4.5.1. Chemical Hazards (Potentially Present at Site)

The table below summarizes information on the constituents that have been detected in samples at levels exceeding MTCA concentrations protective of direct contact exposures or that may pose an inhalation hazard.

CHEMICAL HAZARDS (POTENTIALLY PRESENT AT SITE)

Compound/ Description	OSHA PEL Exposure Limit	WA-DOSH PEL Exposure Limit	ACGIH TLV Exposure Limits	NIOSH REL Exposure Limits	Exposure Routes	Toxic Characteristics	Hazard Type
Trichloroethene (trichloroethylene,TCE) Colorless liquid (unless dyed blue) with a chloroform-like odor	100 ppm (TWA) 200 ppm (C)	50 ppm (TWA) 200 ppm (STEL)	10 ppm (TWA) 25 ppm (STEL)	25 ppm (TWA) 1000 ppm (IDLH)	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Volatile Organic Compounds / Solvents

Compound/ Description	OSHA PEL Exposure Limit	WA-DOSH PEL Exposure Limit	ACGIH TLV Exposure Limits	NIOSH REL Exposure Limits	Exposure Routes	Toxic Characteristics	Hazard Type
Chromium (chromium metal) Blue-white to steel-gray, lustrous, brittle, hard, odorless solid.	1 mg/m^3 (TWA)	0.5 mg/m^3 (TWA)	0.5 mg/m^3 (TWA)	0.5 mg/m^3 (TWA) 250 mg/m^3 (IDLH)	Inhalation, ingestion, skin and/or eye contact	Chromium III is an essential nutrient, Chromium VI can cause irritation to nose, skin ulcers, linked to cancer.	Metals
Diesel Fuel liquid with a characteristic odor	None established	None established	100 mg/m^3 (as total hydrocarbons)	None established	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; and headache, and dermatitis; human carcinogen	Petroleum

Note: If a State has established a PEL more restrictive than the OSHA limits, then the applicable State limit becomes the legal limit.

Additional Notes:
IDLH = immediately dangerous to life or health
OSHA = Occupational Safety and Health Administration
ACGIH = American Conference of Governmental Industrial Hygienists
NIOSH = National Institute for Occupational Safety and Health
mg/m^3 = milligrams per cubic meter (in air)
$fibers/cm^3$ = fibers per cubic centimeter (in air)
TWA = time-weighted average (8 hours averaging time)
CL = ceiling limit – limit that cannot be exceeded
AL = action level – TWA limit which, if exceeded, invokes ancillary requirements in standard
WA DOSH = Washington Department of Labor and Industries Division of Safety and Health
PAHs = polycyclic aromatic hydrocarbons
ppm = parts per million
PEL = permissible exposure limit
REL = recommended exposure limit
TLV = threshold limit value (over 10 hours)
EL = excursion limit (over 30 minutes)
STEL = short-term exposure limit (over 15 minutes)

4.6. Summary of Selected Chemical Hazards

4.6.1 Trichloroethylene

The PEL is 100 ppm for an 8-hour average, or 200 ppm for a Ceiling limit(OSHA) and the ACGIH TLV is 10 ppm for an 8-hour average or 25 ppm for a 15 minute STEL (ACGIH). The PID will detect TCE. Central nervous system effects are the primary effects noted from acute inhalation exposure to trichloroethylene in humans, with symptoms including sleepiness, confusion, and feelings of euphoria. Effects on the gastrointestinal system, liver, kidneys and skin have also been noted. Trichloroethylene absorption by inhalation, dermal, and oral exposure is very rapid. Trichloroethylene is metabolized in humans and animals to a number of substances which themselves are known to be toxic: chloral hydrate, trichloroacetic acid, dichloroacetic acid and trichloroethanol. TCE is very lipophilic; hence, all routes of exposure can contribute to TCE absorption. Inhalation is the most important route of TCE uptake by which absorption is very rapid. The initial rate of uptake of inhaled TCE is quite high, leveling off after a few hours of exposure.

TCE defats the skin and disrupts the stratum corneum, thereby enhancing its own absorption. The rate of absorption probably increases with greater dermal disruption. However, dermal route is generally not a significant route of exposure. TCE is carcinogenic to animals, but there is limited evidence of carcinogenicity in humans. Trichloroethylene is a nonflammable colorless liquid with an odor similar to ether or chloroform. The odor threshold for trichloroethylene is 28 ppm.

4.6.2 Chromium

The summary below is for hexavalent chromium.

Hexavalent chromium [Cr(VI)] is one of the valence states (+6) of the element chromium. It is usually produced by an industrial process. Cr(VI) is known to cause cancer. In addition, it targets the respiratory system, kidneys, liver, skin and eyes. Chromium metal is added to alloy steel to increase hardenability and corrosion resistance. A major source of worker exposure to Cr(VI) occurs during "hot work" such as welding on stainless steel and other alloy steels containing chromium metal. Cr(VI) compounds may be used as pigments in dyes, paints, inks, and plastics. It also may be used as an anticorrosive agent added to paints, primers, and other surface coatings. The Cr(VI) compound chromic acid is used to electroplate chromium onto metal parts to provide a decorative or protective coating

4.6.3 Diesel Fuels

Diesel fuels are similar to fuel oils used for heating (fuel oils no. 1, no. 2, and no. 4). All fuel oils consist of complex mixtures of aliphatic and aromatic hydrocarbons. Diesel fuels predominantly contain a mixture of C10 through C19 hydrocarbons, which include approximately 64% aliphatic hydrocarbons, l-2% olefinic hydrocarbons, and 35% aromatic hydrocarbons. Workers may be exposed to fuel oils through their skin without adequate protection, such as gloves, boots, coveralls, or other protective clothing. Breathing diesel fuel vapors for a long time may damage your kidneys, increase your blood pressure, or lower your blood's ability to clot. Constant skin contact (for example, washing) with diesel fuel may also damage your kidneys. The International Agency for Research on Cancer (IARC) has determined that residual (heavy) fuel oils and marine diesel fuel are possibly carcinogenic to humans (Group 2B classification)

4.7. Additional Hazards

Daily Field Reports should include any site-specific notes or observations related to:

- *Physical Hazards* (e.g., excavations and shoring, equipment, traffic, trips/falls, heat stress, cold stress)
- *Biological Hazards* (e.g., snakes, spiders, bees/wasps, animals, discarded needles, poison ivy, pollen)
- *Ergonomic Hazards* (e.g., lifting heavy loads, tight workspaces, etc.)
- *Chemical Hazards* (e.g., odors, spills, airborne particulates)

Additional hazards, if identified during site work, should be identified in the Daily Field Reports.

5.0 AIR MONITORING PLAN

An air monitoring plan has been prepared as part of development of this HASP. The air monitoring plan is based on the results of the chemical exposure assessment and addresses steps necessary to limit worker exposure and health and safety risks related to potential vapor and gas hazards. Non-occupational exposures are not addressed in this HASP.

As discussed in Section 1.5, numerous investigations have occurred at the site, and multiple soil, groundwater, indoor air, and soil gas samples have been collected and analyzed. Taken together, the data indicate TCE is the primary contaminant of concern for air monitoring. TCE has been detected in all media, including at elevated concentrations in soil gas samples (up to 37,000 ug/m^3). Other VOCs were generally not detected, or were detected at low concentrations in only a few samples.

The remainder of this section discusses the air monitoring plan.

5.1. Air Monitoring Instrumentation, Frequency, and Locations

Work upwind if possible.

Check instrumentation to be used

☐ Multi-Gas Detector (includes methane/% LEL, oxygen, hydrogen sulfide)

☒ Photoionization Detector (PID)

☐ Dust Monitor

☐ Other (i.e., detector tubes or badges) Please specify: Click here to enter text.

Check monitoring frequency and locations (specify: works zone, borehole, breathing zone, etc.):

☒ Continuous during soil material disturbance and soil sampling activities.

☐ 15 minutes

☐ 30 minutes

☐ Hourly

5.2. Air Monitoring Activities

- The workspace will be monitored using a PID capable of monitoring organic vapors. These instruments must be properly maintained, calibrated and charged (refer to the instrument manuals for details). Zero the instruments in the same relative humidity as the area in which they will be used and allow at least a 10-minute warm-up prior to zeroing. Do not zero instruments in a contaminated area.
- An initial vapor measurement survey should be conducted to detect potential “hot spots” in work areas where vapor hazards may exist. Note that the site is an active industrial manufacturing facility that makes wire rope and other hardware. Activities include welding etc. indoors. Therefore “background” vapors could exist independent of soil contamination below the concrete floor of the building. Vapor measurement surveys of work areas should be conducted at least hourly, and more often if persistent odors are detected. Vapor measurements will be made continuously during soil sampling activities. Continuously monitor the work zone and in areas where sampling is conducted.
- Standard industrial hygiene/safety procedure is to require that action be taken to reduce worker exposure to organic vapors when vapor concentrations exceed one-half the TLV. Of the inhalation hazards at the site, TCE is the greatest risk driver based on past data. The TLV for TCE is 10 ppm. If the use of respirators becomes necessary based on air monitoring results, then employees shall use respirators with organic vapor cartridges and will contact the HSM to assess the need for other monitoring options.

5.3. Air Monitoring Action Levels

AIR MONITORING ACTION LEVELS

Parameter	Monitoring Device	Frequency of Monitoring Work Area	Action Level	Action
Organic Vapors (TCE is the primary concern at this site)	PID	Continuous	Background to 5 ppm 5 to 10 ppm for 5+ minutes >10 ppm for 5+ minutes	Use Level D or Modified Level D PPE. Upgrade to Level C PPE including air-purifying respirator with organic vapor cartridges. Stop work, cover borehole, and move people at least 50 feet away from the area. Run fans directed at work area and monitor air at distance of 50 feet. Contact PM for additional guidance.

6.0 SITE CONTROL PLAN

Work zones are defined as areas within 15 feet of operating drill rigs or other heavy equipment. Site personnel should work upwind of work zones whenever possible. To the extent practicable, use the buddy system. Do not approach heavy equipment unless you are sure the operator sees you and has indicated it is safe to approach. GeoEngineers and subcontractor personnel should be made aware of key safety items during tailgate safety meetings (e.g., location of equipment shutoff switches, location of fire extinguishers, cell phone numbers, etc.).

6.1. Traffic or Vehicle Access Control Plans

Use cones/caution tape for borings outside the building. Leave room for trucks / vehicles to drive around the work area. Work (i.e. place your body/drilling table) in an area protected from truck and vehicle traffic to extent practicable.

6.2. Exclusion, Contamination Reduction, and Support Zones

An exclusion zone, contamination reduction zone, and support zone should be established in work areas. Personnel leaving the site or on break should exit the exclusion zone through the contamination reduction zone. The contamination reduction zone, at a minimum, should consist of garbage bags into which used, disposable PPE should be disposed. Personnel should wash hands at the site before eating or leaving the site.

Exclusion zone: W*ork zones and other areas within 15 feet of operating machinery*

Method of delineation

☐ Fencing
☒ Survey/Caution Tape
☒ Traffic Cones
☐ Other: Click here to enter text.

6.3. Buddy System

Personnel on site should use the buddy system (pairs), particularly when communication is restricted. If only one GeoEngineers employee is present on site, a buddy system should be arranged with subcontractor or contractor personnel if possible.

6.4. Site Communication Plan

Positive communications (within sight and hearing distance or via radio) should be maintained between pairs on site, with the pair remaining in proximity to assist each other in case of emergencies. The team should prearrange hand signals or other emergency signals for communication when voice communication becomes impaired (including cases of lack of radios or radio breakdown) and an agreed-upon location for an emergency assembly area.

In instances where communication cannot be maintained, site personnel should consider suspending work until communication can be restored. If this is not an option, the following are some examples of hand signals that can be used:

- Hand gripping throat: Out of air, I can't breathe.
- Gripping partner's wrist or placing both hands around waist: Leave area immediately, no debate.
- Hands on top of head: Need assistance.
- Thumbs up: Okay, I'm all right; or, I understand.
- Thumbs down: No, negative.

6.5. Emergency Action

In the event of an emergency, employees will convene in a designated emergency assembly area. Employees should communicate with others working on site and the PM to determine the assembly area for each workday. GeoEngineers and subcontractor personnel should be made aware of the emergency plan for the site at tailgate safety meetings (e.g., location of equipment shutoff switches, location of fire extinguishers, cell phone numbers, etc.). See also Section 8.3 – Emergency Response.

6.6. Decontamination Procedures

Decontamination, at a minimum, should include removing and disposing of used, disposable PPE when exiting the exclusion zone, and washing hands. Decontamination may also consist of removing outer protective gloves and washing soiled boots and gloves using a bucket and brush provided on site in the contamination reduction zone. If applicable, inner gloves will then be removed, and respirator (if used), hands, and face will be washed in either a portable wash station or a bathroom facility at the site. Employees will perform decontamination procedures and should wash hands before eating, drinking, or leaving the site.

6.7. Waste Disposal or Storage

Used, disposable PPE is to be placed in waste receptacles.

Drill cuttings/excavated soil disposal or storage:

☒ On site, pending analysis and further action (store drill cuttings and decon water in separate drums)

☐ Secured (list method):

☐ Other (describe destination, responsible parties): Click here to enter text.

7.0 PERSONAL PROTECTIVE EQUIPMENT

After the initial and/or daily hazard assessment has been completed, the appropriate PPE will be selected to ensure worker safety. Task-specific levels of PPE should be reviewed with site personnel during the daily pre-work safety briefing.

Site activities include handling and sampling solid subsurface material (material may potentially be saturated with contaminated materials or groundwater). Depth-to-groundwater measurements may also be performed. Site hazards include potential exposure to hazardous materials, and physical hazards such as trips/falls and working around heavy equipment and open excavations.

Level D PPE will be worn at all times on site unless a higher level of protection is required.

Air monitoring will be conducted to determine the level of respiratory protection. Half-face, air-purifying respirators with organic vapor, acid gas, and HEPA (P100) cartridges will be available on site to be used as necessary. HEPA cartridges are to be used alone only if PID and 4-gas meter measurements are below action limits for upgrading to Level C PPE. HEPA cartridges are used to protect against dust and other airborne particulates, while a combination of HEPA and organic vapor cartridges is used to protect against both dust and vapor.

Personnel and equipment decontamination procedures will be used as necessary, including washing hands and/or face prior to hand-to-mouth activities such as eating, smoking, etc., to decrease potential ingestion and inhalation exposures.

Check applicable PPE to be used as needed:

☒ Hardhat

☒ Steel-toed boots (if crushing hazards are a potential or if client requests)

☒ Safety glasses

☒ Reflective vest

☒ Hearing protection (if it is difficult to carry on a conversation 3 feet away)

☐ Rubber boots (if wet/muddy conditions)

Gloves (specify):

☒ Nitrile

☐ Latex

☐ Liners

☒ Leather

☐ Other (specify) Click here to enter text.

Protective clothing:

☒ Tyvek (for modified Level D or Level C)

☐ Saranex (for modified Level D or Level C; use if liquids are handled or splash may be an issue)

☒ Cotton work pants/shirt (Level D)

☒ Rain gear (as needed) (Level D)

☒ Layered warm clothing (as needed) (Level D)

Inhalation hazard protection:

☒ Level D (no respirator)

☒ Level C (half-face, air-purifying respirator with organic vapor, acid gas, and/or HEPA cartridges as necessary).

☐ Level B (Self Contained Breathing Apparatus — STOP, consult the HSM)

7.1. Personal Protective Clothing Inspections

PPE clothing ensembles designated for use during site activities shall be selected to provide protection against known or anticipated hazards. However, no protective garment, glove or boot is entirely chemical-resistant, nor does any PPE provide protection against all types of hazards. To obtain optimum performance from PPE, site personnel should:

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures, or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears, or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after work breaks unless it has been properly decontaminated.

7.2. Respirator Selection, Use and Maintenance

If respirators are required, site personnel shall be trained before use on the proper use, maintenance, and limitations of respirators. Additionally, they must be medically qualified to wear respiratory protection in accordance with 29 CFR 1910.134. Site personnel who will use a tight-fitting respirator must have passed a qualitative or quantitative fit test conducted in accordance with an OSHA-accepted fit test protocol. Fit testing must be repeated annually or whenever a new type of respirator is used. Respirators will be stored in a protective container.

7.3. Respirator Cartridges

If the action levels identified in the Air Monitoring Action Levels table in Section 5.3 are exceeded, site personnel should don respiratory protection appropriate for the known or suspected chemicals of concern.

For this site, a half-face or full-face air purifying respirator with National Institute for Occupational Safety and Health (NIOSH)-approved organic vapor/acid gas/HEPA P100 cartridges (Level C) is expected to provide protection against the potential chemicals of concern.

Air monitoring should be performed continuously while using Level C respiratory protection. The SSO should closely monitor personnel using respiratory protection, including observing for signs of fatigue or respiratory distress; the potential for cartridge breakthrough or increased resistance to inhalation; and the need for changes in the level of respiratory protection based on air monitoring. The frequency and duration of work breaks should be increased for personnel working in respiratory protection. If at any time air monitoring indicates Level B respiratory protection is warranted, personnel should stop work, leave the exclusion zone, and consult with the HSM.

If site personnel are required to wear air-purifying respirators, the appropriate cartridges shall be selected to protect personnel from known or anticipated site contaminants. The respirator/cartridge combination shall be NIOSH-certified. A cartridge change-out schedule shall be developed based on known site contaminants, anticipated contaminant concentrations, and data supplied by the cartridge manufacturer related to the absorption capacity of the cartridge for specific contaminants. Site personnel shall be made aware of the cartridge change-out schedule prior to the initiation of site activities requiring use of a respirator.

If organic vapor and/or acid gas cartridges are used for protection against hydrogen sulfide, site personnel should change cartridges after each shift, or more frequently if supported by 4-gas meter readings and the rated hydrogen sulfide absorption capacity of the cartridges.

Site personnel should also change respirator cartridges if they detect increased resistance during inhalation or if they detect vapor or gas breakthrough by smell, taste, or feel. Note, however, that vapor or gas breakthrough is not an acceptable method of determining the change-out schedule.

7.4. Respirator Inspection and Cleaning

The SSO shall periodically inspect respirators at the site. Site personnel shall inspect respirators prior to each use in accordance with the manufacturer's instructions. In addition, site personnel wearing a tight-fitting respirator shall perform a positive and negative pressure user seal check each time the respirator is donned, to ensure proper fit and function. User seal checks shall be performed in accordance with the GeoEngineers respiratory protection program or the respirator manufacturer's instructions.

8.0 ADDITIONAL ELEMENTS

8.1. Cold Stress Prevention

Working in cold environments presents health hazards to site personnel and can result in frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature).

The combination of wind and cold temperatures increases the degree of cold stress experienced by site personnel. Site personnel shall be trained on the signs and symptoms of cold-related illnesses, how the

human body adapts to cold environments, and how to prevent the onset of cold-related illnesses. Heated work break areas and warm beverages should be provided during periods of cold weather.

8.2. Heat Stress Prevention

In hot outdoor environments it is important to keep workers hydrated with plenty of water. When employee exposure is at or above applicable temperatures listed in the Heat Stress table below, the SSO and/or PM will ensure that:

- A sufficient quantity of drinking water is readily accessible to employees at all times; and
- Employees have the opportunity to drink at least 1 quart of drinking water per hour.
- A shaded rest area is available for employee work breaks as needed.

HEAT STRESS

Type of Clothing Worn by Worker	Outdoor Temperature Action Levels
Nonbreathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52°
Double-layer woven clothes including coveralls, jackets, and sweatshirts	77°
All other clothing	89°

8.3. Emergency Response

The following constitutes emergency response procedures:

- Personnel on site should use the “buddy system” (pairs) if possible.
- Visual contact should be maintained between “pairs” on site, with the team remaining in proximity to assist each other in case of emergencies.
- If any member of the field crew experiences any adverse exposure symptoms while on site, the entire field crew should immediately stop work and act according to the instructions provided by the SSO.
- Wind indicators visible to all on-site personnel should be provided by the SSO to indicate possible routes for upwind escape. Alternatively, the SSO may ask on-site personnel to observe the wind direction periodically during site activities.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team to the designated emergency assembly area, contact of the PM, and reevaluation of the hazard and the level of protection required.
- If an accident occurs, the SSO and the injured person (if applicable) are to complete, within 24 hours, an Accident/Exposure Report Form (Form 4) for submittal to the PM, the HSM, and Human Resources. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

9.0 MISCELLANEOUS

9.1. Sampling, Managing, and Handling Drums and Containers

Any drums or containers used for waste storage during the project shall meet the appropriate Department of Transportation, OSHA, and EPA regulations for the waste they contain. Site operations shall be organized to minimize drum and container movement. When practicable, drums and containers shall be inspected, and their integrity shall be ensured before they are moved. Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are identified and labeled. Before drums or containers are moved, employees involved in the transfer operation shall be warned of the potential hazards associated with the contents.

9.2. Entry Procedures for Confined Spaces

GeoEngineers employees shall not enter confined spaces to perform work unless they have been properly trained, including hands-on experience in the use of retrieval equipment. Excavations greater than 4 feet in depth with the potential for buildup of a hazardous atmosphere are considered confined spaces.

Confined-space entry is not anticipated for this project.

9.3. Sanitation

Sanitary facilities are available at the site. Multiple service stations and other businesses are located within several miles of the site.

9.4. Lighting

Work is anticipated to be performed during daylight hours.

10.0 DOCUMENTATION FOR HAZWOPER PROJECTS

- Daily Field Report
- Field notes
- FORM 1 – Health and Safety Pre-Entry Briefing and Acknowledgment of Site Health and Safety Plan for use by employees, subcontractors and visitors
- FORM 2 – Safety Meeting Record
- FORM 3 – Job Hazard Analyses (JHA)
- FORM 4 – Accident/Exposure Report Form

NOTE: The Daily Field Report or field notes are to contain the following information:

- Updates on hazard assessments, field decisions, conversations with subcontractors, client or other parties, etc.
- Air monitoring/calibration check results, including personnel performing the monitoring/calibration check, locations monitored, work activity at the time of monitoring, etc.
- Health and safety-related actions taken, including PPE upgrades and rationale.
- Weather conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).

11.0 APPROVALS

1. Plan Prepared		February 2022
	Signature	Date
2. Plan Approval		February 2022
	PM Signature	Date
3. Health and Safety Manager	Connor Jordan on behalf of Mary Lou Sullivan	
	HSM Signature	Date 12APR2022

FORM 1
HEALTH AND SAFETY PRE-ENTRY BRIEFING AND ACKNOWLEDGEMENT OF THE SITE HEALTH AND SAFETY PLAN FOR GEOENGINEERS EMPLOYEES, SUBCONTRACTORS AND VISITORS

Inform employees, contractors and subcontractors, or their representatives about:

- The nature, level and degree of exposure to hazardous substances they are likely to encounter.
- Site-related emergency response procedures.
- Any identified potential fire, explosion, health, safety or other hazards.

Conduct safety meetings for employees, contractors and subcontractors, or their representatives as follows:

- A pre-entry briefing before site work is started.
- Additional tailgate safety meetings as needed.
- Safety meetings should include a discussion of emergency response, site communications and site hazards.
- Make sure employees working on the site are informed of known site hazards/health risks and informed on how to protect themselves and other workers against the Site hazards and risks.
- Update HASP information as needed to reflect current site activities and hazards.

GeoEngineers site workers shall sign this form, which should remain attached to the HASP and be filed with other project documentation. This HASP is intended for use by GeoEngineers employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

I hereby verify that a copy of the current HASP has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document and acknowledge an understanding of the safety procedures and protocol for my responsibilities on site. I agree to comply with the specified safety requirements and procedures.

Print Name	Signature	Date

FORM 2
SAFETY MEETING RECORD

Safety meetings should include a discussion of emergency response, site communications and site hazards.

- Use in conjunction with the HASP and Job Hazard Analyses (JHA) Form (Form 3) to help identify hazards.

Date: _____ **Site Safety Officer (SSO):**_____

Topics: _____

Attendees:

Print Name	**Signature**

FORM 3
JOB HAZARD ANALYSIS (JHA)
COVID-19 SUPPLEMENTAL JHA

Project Name: **File No:**	**Date:** March 2022	**Site Location:**

Application

This COVID-19 supplemental JHA is designed to meet the requirements of GeoEngineers' Field Safety During COVID-19 protocols and the COVID-19 Response Plan as well as the recommendations provided by the Centers for Disease Control and Prevention (CDC) and other applicable state or federal agencies

PPE/Supplies/Actions Equipment: (select those applicable to this jobsite)

PPE	Supplies	Tools	Actions
☒ Eye Protection	☒ Hand Washing Soap	☒ Cell Phone/Satellite	☒ Maximize Social Distance (≥6ft)
☒ Gloves	☒ Hand Washing Water Supply	☐ Scanning Thermometer	☒ Meeting Location Planning
☐ Cloth Face Covering	☒ Hand Sanitizer	☐ Water Basin	☒ Hand Washing
☐ N95 Mask	☒ Sanitizing Wipes	☐	☒ High Touch Surface Sanitation
☐ Disposable Coveralls	☐	☐	☐

Job Steps	Potential Hazard	Critical Actions to Mitigate Hazard
Mobilization to worksite	Transmission of COVID-19 Virus	■ Pack hand sanitizer and/or wipes for use during all modes of business travel. ■ Assign hand sanitizer to vehicle when able. ■ Sanitize "high touch" areas: keys, steering wheels, dash controls, door handles, mirror adjustments, shifter, blinkers, head rests, etc. ■ Re-Fueling: Use sampling gloves or wash hands after using the pump at a gas station. When possible, do this before you get back into the vehicle. ■ Intra-Site Transportation: Maintain social distancing on transport skiffs or multi-passenger ATVs. Request multiple trips if overcrowded. Keep your field PPE on during travel.
Pre-work Safety Meetings	Transmission of COVID-19 Virus	■ Review site maps, photos and routes prior to site arrival to anticipate present staffing or public density areas. ■ Conduct a tailgate safety meeting in location that can accommodate ≥6 feet social distancing. ■ Keep group sizes as small as possible (≤10 people or smaller depending on individual state guidance). ■ Meeting attendance should be verbally announced and recorded by a single representative to avoid contact with shared supplies/equipment/computers/work surfaces. ■ Use verbal greetings. Do not shake hands, hug, fist bump, or high five. ■ Wear face coverings if social distances cannot be maintained. ■ Use own supply of pens, notebooks and similar field supplies.

Job Steps	Potential Hazard	Critical Actions to Mitigate Hazard
Site Operations	Transmission of COVID-19 Virus	■ Maximize social distances to the greatest extent feasible. ■ If tasks or locations require sharing workspaces in proximity to others with <6' separation, wear a face covering. ■ Sanitize shared tools or equipment. ■ Use own vehicle as site office rather than shared spaces. ■ Wash ungloved hands after contacting shared surfaces. ■ Sanitize personal items regularly (cell phone, water bottle, clipboards, notebooks). ■ Set up exclusion zones surrounding public interface areas if <6' separation. ■ Wear face covering if traveling off site for lunch/coffee/supplies and recommended social distances cannot be maintained. ■ Leave job site if experiencing onset of COVID-19 symptoms.
Positive or Assumed Positive COVID-19 Result at Job Site	Transmission of COVID-19 Virus	■ Contact your manager as soon as information is received of a positive or assumed positive result on the jobsite. ■ Determine if you have had close and prolonged personal proximity to the individual. ■ Based on proximity, you may be asked to remove yourself from the worksite. ■ Your manager will provide guidance for how to proceed safely following worksite withdrawal.
Additional Comments:		

JHA RECORD OF SAFETY MEETINGS

Name of Attendees **Date**

_____

_____

_____

_____

_____

_____

_____

_____

Signature of Individual Verifying the Above **Date**

_____

_____

_____

_____

_____

_____

_____

_____

FORM 4
ACCIDENT/EXPOSURE REPORT FORM

To (Supervisor): _____ From (Employee): _____

Telephone (with area code): _____

Name of injured or ill employee: _____

Date of accident/exposure: Time of accident/exposure: Location of accident/exposure:

Narrative description of accident/exposure (circle one):

Medical attention given on site:

Nature of illness or injury and part of body involved: Lost Time? Yes ☐ No ☐

Probable Disability (check one):

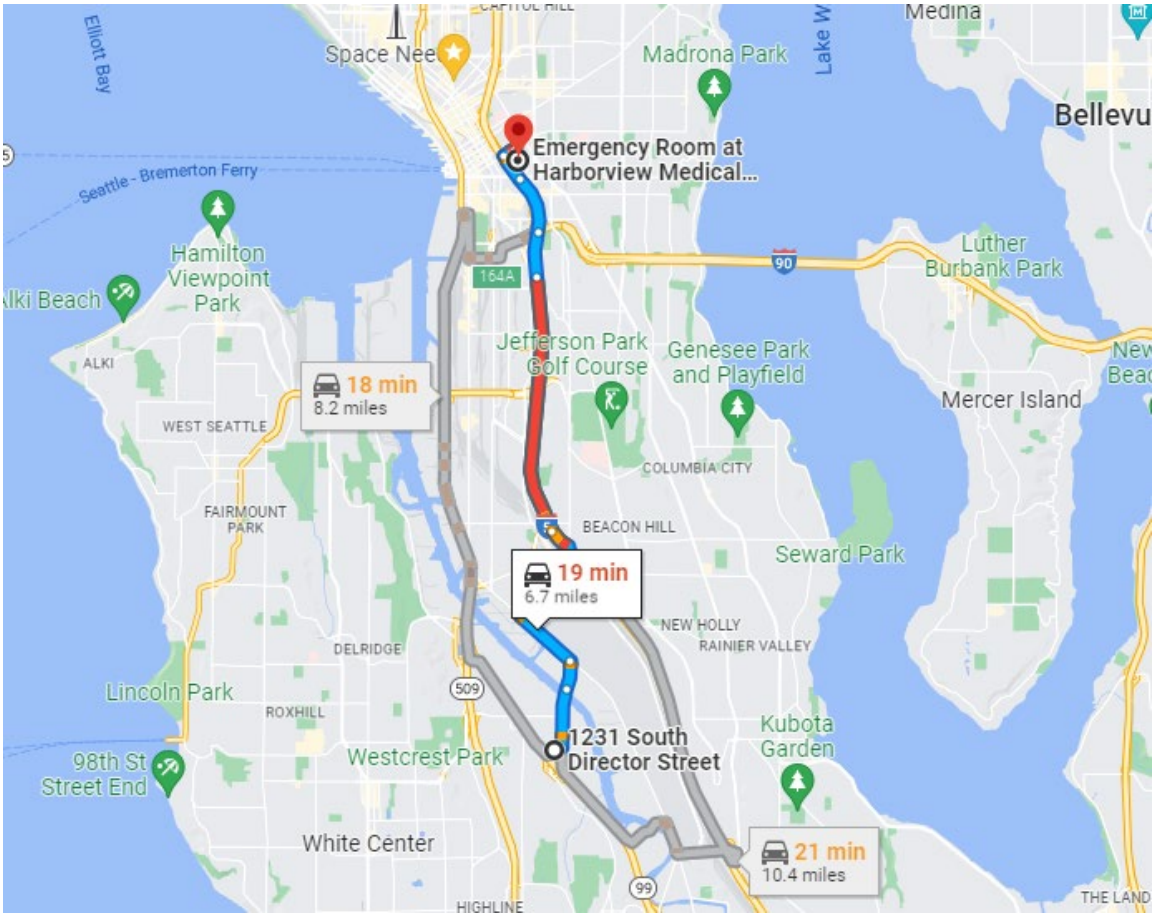
Fatal	Lost work day with days away from work	Lost work day with days of restricted activity	No lost work day	First Aid only
☐	☐	☐	☐	☐

Corrective action taken and corrective action that remains to be taken (by whom and when):

Employee Signature: Date:

Name of Supervisor:

ATTACHMENT
Hospital Route:
Harborview Medical Center



- Get on I-5 N in Seattle from 14th Ave S, E Marginal Way S and Corson Ave S

  8 min (2.7 mi)

- Take exit 164A from I-5 N

  5 min (3.8 mi)

- Continue on James St. Drive to 9th Ave

  2 min (0.2 mi)

Emergency Room at Harborview Medical Center | Seattle
325 9th Ave Main Hospital, Emergency Department, Seattle, WA 98104

APPENDIX L
Report Limitations and Guidelines for Use

APPENDIX L
REPORT LIMITATIONS AND GUIDELINES FOR USE[7]

This appendix provides information to help you manage your risks with respect to the use of this report.

Report Use and Reliance

This report has been prepared for Dick Morgan. GeoEngineers structures its services to meet the specific needs of its clients. No party other than Dick Morgan may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Agreement with the Client dated February 7, 2022 and generally accepted environmental practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or Projects other than those identified in this report.

If changes to the Project or property occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations in the context of such changes. Based on that review, we can provide written modifications or confirmation, as appropriate.

Information Provided by Others

GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.

Conditions Can Change

This report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by events such as construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Professional Judgment

It is important to recognize that the geoscience practices (geotechnical engineering, geology and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to its services, GeoEngineers includes these explanatory “limitations” provisions in its reports. Please confer with GeoEngineers if you need to know how these “Report Limitations and Guidelines for Use” apply to your Project or site.

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7 Developed based on material provided by GBA, GeoProfessional Business Association; www.geoprofessional.org.